

REFLEXION

REVIEW

ECONOMIC
COMMISSION FOR
LATIN AMERICA AND
THE CARIBBEAN



UNITED NATIONS

ECLAC

The role of productive and technological capabilities in export dynamics in developing countries SEBASTIÁN VERGARA	7
Constrained integration in Latin America: analysis based on a twenty-first-century centre-periphery vision MARCOS VINICIUS CHILIATTO-LEITE	31
Challenges for optimizing social protection programmes and reducing vulnerability in Latin America and the Caribbean JAVIER BRONFMAN H.	51
Globalization and national development paths: stylized facts for analysing the Argentine case LORENZO CASSINI, GUSTAVO GARCÍA ZANOTTI AND MARTÍN SCHORR	77
Greening small businesses in small States: the case of Barbados WINSTON MOORE AND CHRISTOPHER KINCH	99
Labour productivity and Central American economic integration: the case of El Salvador LUIS RENÉ CÁCERES	113
Production fragmentation, foreign trade and structural complexity: a comparative analysis of Brazil and Mexico KAIO GLAUBER VITAL DA COSTA, MARTA REIS CASTILHO AND MARTÍN PUCHET ANYUL	133
Inequality and social polarization in Chilean municipalities JESSICA CANDIA CID, JOSÉ MERINO ESCOBAR, CLAUDIO BUSTOS AND DAVID MARTÍNEZ	155
The effect of the economic crisis on the labour market for women in Mexico, 1987–2016 REYNA ELIZABETH RODRÍGUEZ PÉREZ AND MONA ZELINDA AGUILAR ARREDONDO	173
Why do conditional cash transfer programmes fail to target the poor? The case of urban areas in Mexico PIERRE LEVASSEUR	191

CEPAL REVIEW

ECONOMIC
COMMISSION FOR
LATIN AMERICA AND
THE CARIBBEAN



UNITED NATIONS

ECLAC

CEPAL REVIEW

ECONOMIC
COMMISSION FOR
LATIN AMERICA AND
THE CARIBBEAN

ALICIA BÁRCENA
Executive Secretary

MARIO CIMOLI
Deputy Executive Secretary

RAÚL GARCÍA-BUCHACA
*Deputy Executive Secretary
for Management and Programme Analysis*

OSVALDO SUNKEL
Chairman of the Editorial Board

MIGUEL TORRES
Editor



UNITED NATIONS

ECLAC

Alicia Bárcena
Executive Secretary

Mario Cimoli
Deputy Executive Secretary

Raúl García-Buchaca
Deputy Executive Secretary
for Management and Programme Analysis

Osvaldo Sunkel
Chair of the Editorial Board

Miguel Torres
Editor

The *CEPAL Review* was founded in 1976, along with the corresponding Spanish version, *Revista CEPAL*, and it is published three times a year by the Economic Commission for Latin America and the Caribbean (ECLAC), which has its headquarters in Santiago. The *Review* has full editorial independence and follows the usual academic procedures and criteria, including the review of articles by independent external referees. The purpose of the *Review* is to contribute to the discussion of socioeconomic development issues in the region by offering analytical and policy approaches and articles by economists and other social scientists working both within and outside the United Nations. The *Review* is distributed to universities, research institutes and other international organizations, as well as to individual subscribers.

The opinions expressed in the articles are those of the authors and do not necessarily reflect the views of ECLAC.

The designations employed and the way in which data are presented do not imply the expression of any opinion whatsoever on the part of the United Nations concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

To subscribe, please visit the Web page: <http://ebiz.turpin-distribution.com/products/197587-cepal-review.aspx>.

The complete text of the *Review* can also be downloaded free of charge from the ECLAC website (www.cepal.org/en).

*This publication, entitled CEPAL Review, is covered in the
Social Sciences Citation Index (SSCI), published by Thomson Reuters,
and in the Journal of Economic Literature (JEL),
published by the American Economic Association*

United Nations publication
ISSN: 0251-2920
LC/PUB.2021/6-P/Rev.1
Sales No.: E.21.II.G.9
Distribution: G
Copyright © United Nations, 2021
All rights reserved
Printed at United Nations, Santiago
S.21-00507

This publication should be cited as: Economic Commission for Latin America and the Caribbean (ECLAC), *CEPAL Review*, No. 133 (LC/PUB.2021/6-P/Rev.1), Santiago, 2021.

Requests for authorization to reproduce this work in whole or in part should be sent to the Economic Commission for Latin America and the Caribbean (ECLAC), Documents and Publications Division, publicaciones.cepal@un.org. Member States of the United Nations and their governmental institutions may reproduce this work without prior authorization, but are requested to mention the source and to inform ECLAC of such reproduction.

Contents

The role of productive and technological capabilities in export dynamics in developing countries <i>Sebastián Vergara</i>	7
Constrained integration in Latin America: analysis based on a twenty-first-century centre-periphery vision <i>Marcos Vinicius Chiliatto-Leite</i>	31
Challenges for optimizing social protection programmes and reducing vulnerability in Latin America and the Caribbean <i>Javier Bronfman H.</i>	51
Globalization and national development paths: stylized facts for analysing the Argentine case <i>Lorenzo Cassini, Gustavo García Zanotti and Martín Schorr</i>	77
Greening small businesses in small States: the case of Barbados <i>Winston Moore and Christopher Kinch</i>	99
Labour productivity and Central American economic integration: the case of El Salvador <i>Luis René Cáceres</i>	113
Production fragmentation, foreign trade and structural complexity: a comparative analysis of Brazil and Mexico <i>Kaio Glauber Vital da Costa, Marta Reis Castilho and Martín Puchet Anyul</i>	133
Inequality and social polarization in Chilean municipalities <i>Jessica Candia Cid, José Merino Escobar, Claudio Bustos and David Martínez</i>	155
The effect of the economic crisis on the labour market for women in Mexico, 1987–2016 <i>Reyna Elizabeth Rodríguez Pérez and Mona Zelinda Aguilar Arredondo</i>	173
Why do conditional cash transfer programmes fail to target the poor? The case of urban areas in Mexico <i>Pierre Levasseur</i>	191
Guidelines for contributors to the CEPAL Review	207
ECLAC recent publications	209

Explanatory notes

- Three dots (...) indicate that data are not available or are not separately reported.
- A dash (-) indicates that the amount is nil or negligible.
- A full stop (.) is used to indicate decimals.
- The word “dollars” refers to United States dollars, unless otherwise specified.
- A slash (/) between years (e.g. 2013/2014) indicates a 12-month period falling between the two years.
- Individual figures and percentages in tables may not always add up to the corresponding total because of rounding.

The role of productive and technological capabilities in export dynamics in developing countries¹

Sebastián Vergara

Abstract

Productive and technological capabilities are major engines of export. But how they affect export behaviour at the microeconomic level is less clear and many questions remain. This paper empirically investigates their role in export dynamics in 40 developing countries. The analysis shows that, within sectors, countries with greater productive capacities have more exporters, and the exporters are larger and charge higher prices for their products. The results also confirm a positive relationship between technological capabilities and diversification: within sectors, exporters in countries with stronger capabilities tend to export a higher number of products and to more destination markets. Lastly, technological capabilities also play a specific role in the diversification of products and market destinations of high-technology sectors. Thus, even comparing exporters' behaviour only among developing countries, productive and technological capabilities are found to be strongly related to the extensive and intensive margins of exports, and to diversification and product quality.

Keywords

Exports, export development, technological change, technological innovations, productivity, measurement, research and development, investments, developing countries

JEL classification

F14, O3

Author

Sebastián Vergara is an Economic Affairs Officer at the United Nations Department of Economic and Social Affairs (DESA). Email: vergaras@un.org.

¹ The author is grateful for suggestions from an anonymous referee and comments made by Helena Afonso, Roberto Alvarez, Dan Gay, Thomas Grebel, Dawn Holland, Lucas Navarro, Poh Lynn Ng and Ingo Pitterle, and by participants at the Group Meeting on the World Economy (Project LINK) 2018, held at the Economic Commission for Latin America and the Caribbean (ECLAC) in Santiago, on 5–7 September 2018. The views expressed in this paper are those of the author and do not necessarily reflect those of the United Nations. The author is responsible for errors and omissions.

I. Introduction

Productive capacities and technological capabilities have been emphasized in several areas of economic literature as major engines of export, growth and development. The early contributions on development theory highlighted the transformation of the productive structure —from agriculture and extractive industries to more sophisticated and knowledge-based industries— as a critical factor in shaping international specialization patterns (Hirschman, 1958; Singer, 1950; Prebisch, 1950). This appears to entail a process of accumulation of knowledge within the economy (Cimoli, Dosi and Stiglitz, 2009). Schumpeterian ideas also emphasized the importance of research and development (R&D) investments and innovation activities in shaping market dynamics, particularly through the process of creative destruction (Schumpeter, 1943).

Later, modern growth theories underscored the role of human capital, R&D investments and, more broadly, knowledge, as major drivers of economic growth (Romer, 1990; Aghion and Howitt, 1998). Lastly, contributions to technology and trade theory underscored that technological asymmetries were major determinants of trade flows and specialization patterns in foreign markets, influencing economic performance in the short and medium terms. The key idea was that trade patterns among countries would persist as long as differences in technological capabilities to absorb, generate and use knowledge remained in place (Posner, 1961; Dosi, Pavitt and Soete, 1990).

From an aggregate perspective, previous studies have shed light on the existing asymmetries regarding technological, export and growth indicators between countries. For example, Cimoli and others (2005) discuss the position and evolution of Latin American countries on different indicators regarding structural change, international trade and productivity growth vis-à-vis the United States, Scandinavian countries and the Republic of Korea. The analysis shows that the performance of Latin American economies was relatively weak, with the region lagging behind with respect to several indices of technological efforts, capability accumulation and productivity growth.

From an individual country perspective, many studies have shown the connection between capabilities and exports. For example, Ernst, Ganiatsos and Mytelka (1998) examine technological capabilities and export success in the electronics and textile industries in six East Asian countries (Indonesia, the Republic of Korea, Taiwan Province of China, Thailand, and Viet Nam). They clearly show that the accumulation of learning, innovation and capabilities —including product design, production processes, management routines, marketing and the organization of production— is critical to export growth and to expanding developing countries' market share. In addition, there is ample evidence that exporters are more productive than non-exporters, and that exporter productivity premia tend to increase with the share of exports in total sales (World Bank, 2007). There is also compelling evidence of self-selection of more productive firms into export markets. Yet, recent research has also begun to emphasize the learning-by-exporting hypothesis in developing countries, where exporters are further away from the technological frontier (Brenton, Cadot and Pierola, 2012). Notably, recent research has also emphasized that firms choose to enter or expand their operations in foreign markets together with decisions on investment, technology adoption, product mix, R&D and innovation.² For example, Aw, Roberts and Yi Xu (2011) show that productivity growth for electronic producers in Taiwan Province of China evolves endogenously to firms' decisions to export and invest in R&D. The results also show that a firm's export and R&D decisions affect each other and that both decisions affect productivity growth.

² Recent advances in the literature on international trade also offer interesting insights to understand the relationship between the weaknesses in global trade and the deceleration in productivity growth in recent years. It shows how trade, investment and technology decisions at the firm level interact with each other and affect aggregate productivity growth (Vergara, 2017).

Despite these long-standing theoretical and empirical contributions, many questions remain regarding how productive and technological capabilities influence export performance and dynamics, particularly across developing countries. This paper attempts to shed light on the role of productive and technological capabilities in export dynamics at the microeconomic level using a large sample of developing countries. For example, on average a steel exporter in Turkey is 1.5 times larger than a steel exporter in Mexico, and the initial level of exports of a new steel exporter in Turkey is around 1.6 times higher than in Mexico. Meanwhile, Bangladeshi exporters of apparel and clothing accessories export to more than four destinations on average, while Pakistani exporters export to only two. The average Mexican exporter of electrical machinery and equipment exports on average more than six different products (at the six-digit level of the Harmonized System (HS) 2002 classification), while Thai exporters export only four products. Obviously, these differences are related to the country's size, level of development, market structure, trade policy and comparative advantages. But what about national productive and technological capacities? And how do these affect the export margins?

Against this backdrop, this article tackles the following questions: do countries with stronger productive capacities have more and larger exporters, and do these exporters charge higher unit prices for their products? Do new exporters to foreign markets display a higher initial level of exports in countries with more productive capacities? Are exporters based in countries with higher technological capabilities more diversified in terms of products and destinations? Thus, the goal is to uncover the links between capabilities and exporter dynamics in foreign markets. In particular, by seeking to establish the connection between the issue of capabilities and the extensive and intensive margins of exports (number and size of exporters), the diversification of export products and market destinations, and product quality, all of which have been identified as crucial aspects of international competitiveness. To this end, the empirical strategy employed controls for other country dimensions that may also be relevant, such as the economy's size, level of development, trade openness, manufacturing sector size and commodity dependency.

This article uses data from the World Bank's Exporter Dynamics Database (Fernandes, Freund and Pierola, 2016), which compiles statistical information from national sources of exporter-level customs information, covering the universe of annual exporter transactions.³ The database contains exporter-level information for 40 developing countries covering the period between 2002 and 2012, aggregated at the sectoral level. A key issue is that there is no obvious approach for measuring productive and technological capabilities. The concept of capabilities is closely connected to the accumulation of explicit and tacit knowledge, and to how different abilities are mixed, combined and used to generate new productive and technological capacities. Thus, the issue of capabilities is multidimensional, encompassing economic, technological and institutional aspects.

The paper uses two proxies of capabilities, one each for productive capacities and technological capabilities. To measure productive capacities, the empirical approach uses the Economic Complexity Index (ECI) (Hausmann and others, 2011), which measures the multiplicity of useful knowledge embedded in an economy by capturing information on the diversity of a country's exports (based on the number of products it exports) and on the ubiquity of its products (based on the number of countries that export a given product). Thus, ECI is built on the basis of productive diversification⁴ and capabilities. As discussed by Mealy, Farmer and Teytelboym (2018) and Kemp-Benedict (2014), ECI is orthogonal to diversity, and captures information on the type of products and capabilities in which countries are competitive. Furthermore, it ranks countries according to how similar their exports and capabilities are

³ Fernandes, Freund and Pierola (2016) presents the Exporter Dynamics Database. They analyse how export behaviour is linked to country size and stage of development. Interestingly, the results show that larger and more developed countries have more and larger exporters, and a greater share of exports controlled by the top 5% of firms. This database opens up a variety of research possibilities to improve understanding of export dynamics at disaggregated levels.

⁴ There is ample evidence on the relationship between diversification and economic growth, especially for less developed countries (Cherif, Hasanov and Wanget, 2018; Al-Marhubi, 2000; Herzer and Nowak-Lehmann, 2006).

to each other. This ranking helps to explain variations in per capita GDP and future growth (Hidalgo and Hausmann, 2009). This suggests that some types of exports, and thus some types of capabilities, are more relevant to development, a crucial argument of the early economic development theories.⁵

Meanwhile, to measure technological capabilities, the empirical approach uses R&D investments as a proxy,⁶ as they reflect the technological efforts that countries make to foster knowledge creation and technological progress. In fact, firms' R&D investments encourage product and process innovations and enhance the absorptive capacity to assimilate external knowledge (Griliches, 1979; Cohen and Levinthal, 1990; Griffith, Redding and Van Reenen, 2003). In addition, R&D investments can bring intangible benefits to overcome barriers to exporting (Harris and Li, 2009; Teece and Pisano, 1998) and they are also a crucial feature of national innovation systems.⁷ In comparison to developed countries, national innovation systems in developing economies are generally characterized by low levels of R&D, a large proportion of public sector spending in total R&D expenditure, innovation activities concentrated in natural resources and low-tech manufactured products, a low level of human capital and workforce capabilities, and a lack of interactions among economic agents (Arocena and Sutz, 2002).

The empirical hypotheses are that ECI and R&D investments are positively correlated with different export dimensions. Intuitively, a higher level of sophistication and a wider variety of productive knowledge embedded in the productive structure should be reflected in a country's international competitiveness. Thus, a higher ECI score could indicate a larger number of exporters and higher levels of exports per exporter. Also, productive knowledge could be reflected in product quality, thus a positive correlation with unit prices is also tested.⁸ Similarly, the level of R&D is expected to be positively connected with diversification across products and destination markets, particularly given the vital role it plays in product and process innovations (Mairesse and Mohnen, 2010).

The contribution of this work is threefold. Firstly, it presents a comprehensive analysis of the role of productive and technological capabilities in export dynamics in developing countries. While the relevance of technological and innovation capabilities for firms' export indicators has been documented, comprehensive cross-country comparisons are scarce. Second, the paper uncovers explicit links between productive and technological capabilities and export dynamics. Third, the links between capabilities and export dynamics highlight their role in developing countries' resilience to trade shocks. This is a crucial issue if, for example, the current reconfigurations of global and regional value chains in the wake of the global coronavirus disease (COVID-19) pandemic gain further traction. The article has several limitations: most importantly, the nature of the data precludes any inference regarding causality between capabilities and export dynamics. This article is organized as follows. The data and some basic statistics are described in section II, providing an aggregate picture for the empirical analysis. Then, the empirical approach is presented in section III, while the main results are discussed in section IV. Lastly, the conclusions are set out in section V.

⁵ For example, Hirschman (1958) and Singer (1950) emphasize that development implies the reallocation of factors from low-productivity sectors to high productivity sectors. See Hausmann, Hwang and Rodrik (2007) for a formal empirical validation. In developing countries, Lall (2000) shows that high-tech products are more strongly associated with export and income growth.

⁶ Measuring technological capabilities is a difficult task. On one hand, technological capabilities encompass multifaceted aspects, including the composition of the productive structure, R&D investments, patents and labour skills, among others. On the other, R&D investments are not the only way to acquire new technologies in developing countries, as these can be obtained through capital goods, technology licences and foreign direct investment (Lall, 1992; Smith, 2005).

⁷ The national innovation system (NIS) concept emerged to explain the differences in innovative performances of developed countries. The underlying idea was that innovation differences depended on "institutional differences in the mode of importing, improving, developing and diffusing new technologies, products and processes" and on the level of interactions of different agents and institutions within the society (Freeman, 1995, p. 20). The NIS approach then became a useful framework to address the complexity of innovation activities as a "systemic process" in developing countries.

⁸ Using unit prices as a proxy of product quality at sectoral level is a simplification. Price dispersions exist owing to quality differences and for several other reasons, including demand shocks, market power and production costs. However, using unit prices across sectors for a comprehensive set of countries and for a relatively extended period seems to be a plausible approach to reduce their problems as a proxy for product quality. For example, Schott (2004) shows that countries that are more abundant in physical and human capital export to the United States at higher unit prices, even within narrow categories.

II. Data and basic statistics

The statistical information regarding export dynamics comes from the Exporter Dynamics Database (Fernandes, Freund and Pierola, 2016).⁹ This database compiles export information from national sources of exporter-level customs data, covering the universe of annual exporter transactions for 40 developing countries between 2002 and 2012. Thus, it is a country-sector-year dataset, unevenly distributed across developing countries (see annex A1). In particular, it comprises aggregated information at the sectoral level (the two-digit level of the HS 2002 classification)¹⁰ for the number of exporters (total and per product), the average value of exports per exporter and per entrant (new exporters in year t), average unit prices per exporter, average number of products per exporter and the average number of destinations per exporter, among other variables.

As discussed, for productive capacities the proxy used is ECI,¹¹ from the Observatory of Economic Complexity developed at the MIT Media Lab of the Massachusetts Institute of Technology. ECI measures the sophistication of a country's productive structure by combining information on the diversity of its exporting activity and the ubiquity of its products. These dimensions are based on the number of products that a country exports and the number of countries that export a specific product, respectively. The intuition is that more sophisticated economies tend to be more diversified and they are able to export products that, on average, have low ubiquity. Thus, ECI encompasses information on product diversification and on the capabilities in which countries are competitive. Technological capabilities are proxied by R&D investments over GDP, through data taken from the World Development Indicators of the World Bank.¹² This variable reflects technological efforts and is commonly used to measure the effort to generate, absorb and use knowledge. As such, these investments constitute a crucial input for introducing product and process innovations.

Figure 1 displays a simple correlation plot of ECI and R&D investments across developing countries,¹³ showing significant country variation across both dimensions. The ECI values range from -2.2 to 0.98, with an average of -0.39 and a standard deviation of 0.70.¹⁴ Meanwhile, R&D investments range from 0% to over 2.0% of GDP, with an average of 0.45% and a standard deviation of 0.36.¹⁵ As expected, there is a relatively strong and positive correlation between ECI and R&D investments, and countries with more productive knowledge tend to exhibit greater technological efforts. China and Malaysia are among those with the highest combinations of productive and technological capabilities, while the performance of countries such as Nicaragua and Tajikistan is relatively poor.

The different combinations of these indicators for specific countries also underscore that ECI and R&D investments reflect different aspects of capabilities. For example, Mexico displays a relatively high ECI value, as its export structure is diversified, with a relatively large share of medium-high and high-technology products.¹⁶ However, technological effort in the Mexican economy is limited, with relatively low levels of R&D investment, at only 0.55% of GDP. This illustrates several weaknesses in the country's national innovation system, including low participation by the private sector in R&D activities,

⁹ For details on the database, see [online] <http://www.worldbank.org/en/research/brief/exporter-dynamics-database>.

¹⁰ See [online] <https://unstats.un.org/unsd/tradekb/Knowledgebase/50043/HS-2002-Classification-by-Section>.

¹¹ See annex A2 for details concerning the calculation of the Economic Complexity Index. See also the Observatory of Economic Complexity [online] <https://oec.world/>.

¹² See [online] <https://data.worldbank.org/products/wdi>.

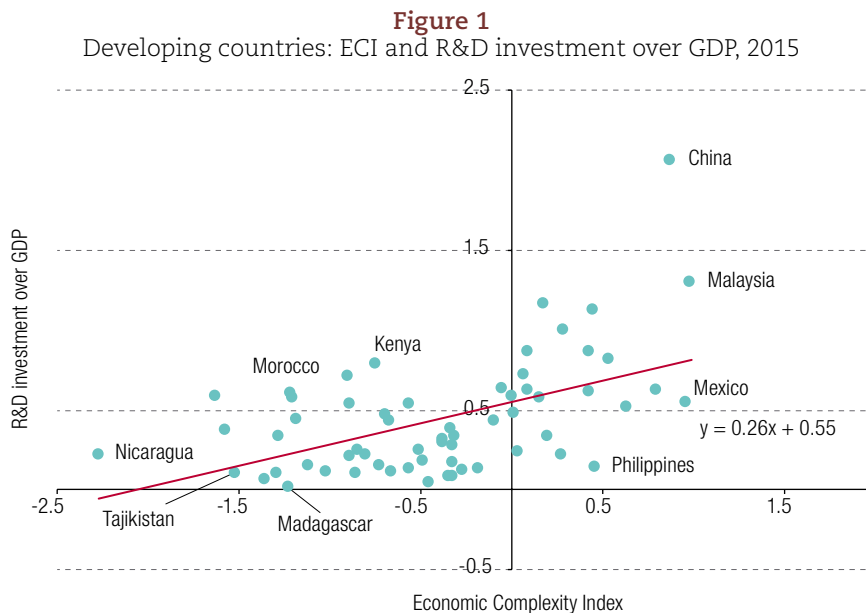
¹³ This description covers all developing countries with available information for ECI and R&D investments, not only the 40 developing countries included in the sample estimation. China, for example, is not included in the Exporters Dynamics Database. Thus, China is included only in the descriptive statistics (figures 1 and 2), but not in the econometric estimations (see annex A.1).

¹⁴ For developed countries, ECI values range from -0.27 to 2.42, with an average of 1.11 and a standard deviation of 0.60.

¹⁵ Annex A3 displays the histograms of ECI and R&D investments based on the sample estimation data.

¹⁶ In Mexico, export products such as automobiles, vehicle parts, trucks, computers and other machinery and equipment products account for more than 60% of total merchandise exports.

a lack of interaction and cooperation between the private sector and universities, and a relatively low level of human capital (Casanova and Rullán, 2015). By contrast, Kenya exhibits a relatively low ECI value, with an export structure that is highly concentrated in a few agricultural products and textiles. However, Kenya has strengthened its efforts to increase R&D investment, which stands at around 0.8% of GDP, in particular by designing comprehensive innovation policy frameworks (Ndemo, 2015).

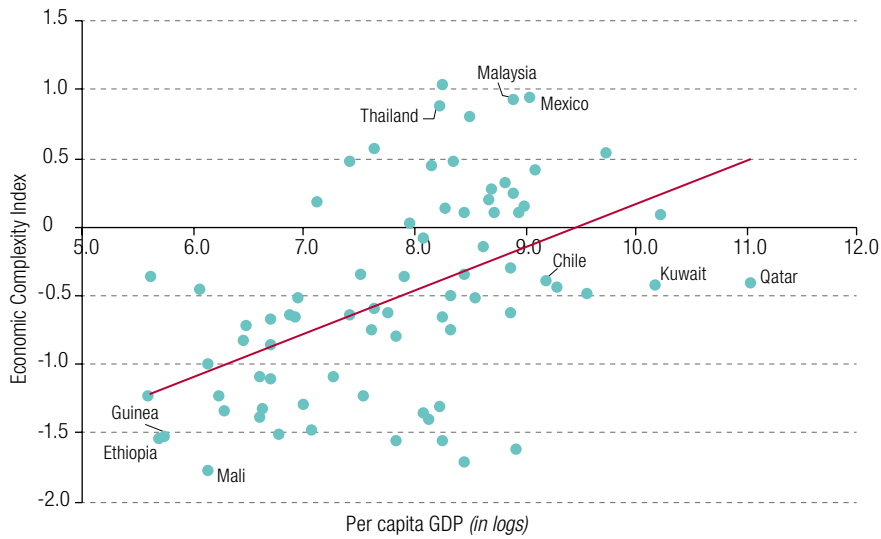


Source: Prepared by the author, on the basis of World Bank, "World Development Indicators", 2020 [online database] <https://databank.worldbank.org/source/world-development-indicators>, and A. Simoes and C. Hidalgo, "The Economic Complexity Observatory: an analytical tool for understanding the dynamics of economic development", 2011 [online database] <https://oec.world/>.

Figures 2 and 3 display the simple correlation plots of ECI and R&D investment with the level of development across developing countries, using per capita GDP as a proxy. As expected, both variables are positively correlated with per capita GDP. The correlation is higher for ECI (0.49), yet some countries — such as Kuwait, Qatar and some Latin American economies — exhibit low productive capacities, despite a relatively high per capita GDP (see figure 2). The correlation between R&D and level of development across developing countries is lower, at just 0.26. This shows that, while relatively poor countries generally invest little in R&D, there are also a variety of country-specific circumstances.¹⁷ For example, countries such as Chile, Colombia and some Gulf States display relatively high per capita GDP, but underperform on R&D investment (see figure 3).

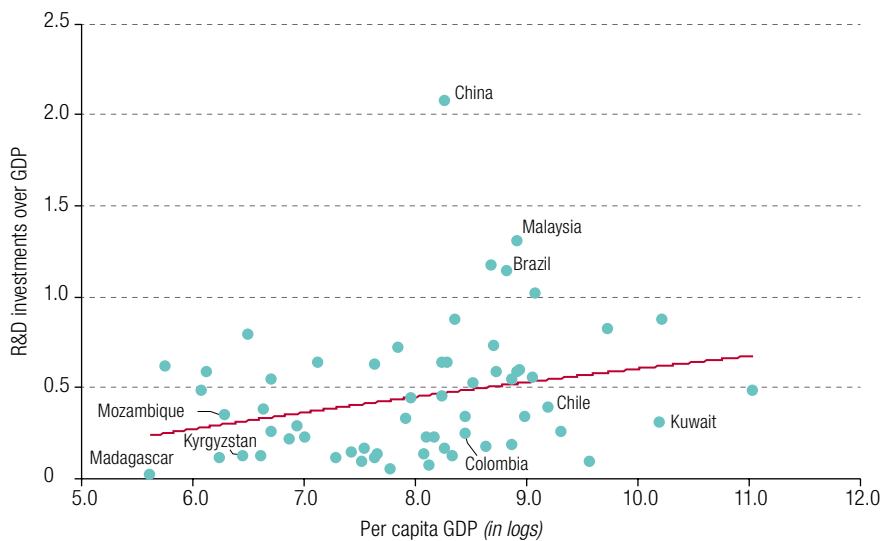
¹⁷ There is an extensive body of literature attempting to explain why poor countries invest too little in R&D. Cirera and Maloney (2017) argue that the main reason is the scarcity of factors that are complementary to innovation, including physical and human capital, credit markets and managerial quality.

Figure 2
Developing countries: ECI and per capita GDP, 2015



Source: Prepared by the author, on the basis of World Bank, “World Development Indicators”, 2020 [online database] <https://databank.worldbank.org/source/world-development-indicators>, and A. Simoes and C. Hidalgo, “The Economic Complexity Observatory: an analytical tool for understanding the dynamics of economic development”, 2011 [online database] <https://oec.world/>.

Figure 3
Developing countries: R&D investment and per capita GDP, 2015^a



Source: Prepared by the author, on the basis of World Bank, “World Development Indicators”, 2020 [online database] <https://databank.worldbank.org/source/world-development-indicators>.

^a R&D investment data are for 2015 or latest available year.

III. Empirical approach

This section describes the empirical strategy employed to analyse the role of productive and technological capabilities in the different dimensions of export dynamics. The approach closely follows Fernandes, Freund and Pierola (2016). To analyse the role of productive capacities on different export dimensions, the following equation is specified:

$$\text{Export dimensions}_{ijt} = \alpha_i + \delta_t + \theta ECI_{jt} + \beta X_{jt} + \varepsilon_{ijt} \quad (1)$$

where i , j , and t represent sectors, countries and years, respectively. There are several dependent variables: (i) *Number of exporters* (log of the total number of exporters); (ii) *Exports per exporter* (log of average exports per exporter); (iii) *Exports per entrant* (log of average exports per entrant, an “entrant” being a new exporter in year t); and (iv) *Unit prices* (log of average export value over quantity). The variable ECI is the Economic Complexity Index and the vector X encompasses several control variables: GDP is the log of GDP in constant United States dollars; *per capita GDP* is the log of per capita GDP in constant dollars; *Trade over GDP* is total merchandise exports and imports over GDP; *Manufacturing sector* is the share of the manufacturing sector in the economy; *Financial sector* is an index of financial development;¹⁸ *Exchange rate* is an index that measures fluctuations in the real effective exchange rate; *Trade costs* is a proxy for transportation costs¹⁹ and *Commodity-dependent* is a dummy variable that takes the value 1 if the country’s economy is commodity-dependent.²⁰ Lastly, α_i and δ_t correspond to sectoral and year effects. Equation (1) is estimated by ordinary least squares (OLS), using robust standard errors adjusted by clustering at the country level.

Similarly, the equation to investigate the role of technological capabilities — using R&D investments as a proxy — in diversification across products and destinations is as follows:

$$\begin{aligned} \text{Diversification dimension}_{ijt} &= \alpha_i + \delta_t + \theta I + D_{jt} + \gamma I + D_{jt} * \\ \text{HighTech}_{ijt} &+ \beta X_{jt} + \varepsilon_{ijt} \end{aligned} \quad (2)$$

where i , j , and t represent sectors, countries and years, respectively. The dependent variables are: (i) *Products per exporter* (log of the average number of products per exporter, with products defined at the six-digit level of the HS 2002 classification); and (ii) *Destination per exporter* (log of the average number of destination countries per exporter). $R\&D$ is aggregate R&D investments over GDP. The control variables GDP , *per capita GDP*, *Trade over GDP*, *Manufacturing sector*, *Financial sector*, *Exchange rate*, *Trade costs* and *Commodity-dependent* are also included in the regressions. This approach includes a multiplicative variable of $R\&D$ and *HighTech*, which is a dummy variable that takes the value 1 if the sector is R&D-intensive.²¹ Including this multiplicative variable allows us to test for a heterogeneous relation between R&D investments and export dynamics across different sectors. In fact, it has been widely discussed that technical progress does not occur evenly across sectors, and some sectors are more innovative and stimulate technological diffusion more than others (Pavitt, 1984). An illustration of this is that R&D investments are not distributed homogeneously across sectors,

¹⁸ This variable is an index that ranges from 0 to 1. For more details, see Sahay and others (2015).

¹⁹ Trade costs measure the fees levied on a 20-foot container in United States dollars. All the fees associated with completing export and import procedures are taken into account, including the costs of documents, administrative fees for customs clearance and technical controls, customs broker fees, terminal handling charges and inland transport. See [online] <https://wits.worldbank.org>.

²⁰ There are 22 commodity-dependent economies in the estimation sample: Cameroon, Chile, Colombia, Ecuador, Ethiopia, Gabon, Guatemala, Guinea, Kenya, Kuwait, Kyrgyzstan, Lao People’s Democratic Republic, Madagascar, Malawi, Mali, Paraguay, Peru, Senegal, Uganda, Uruguay, Yemen and Zambia (UNCTAD, 2017).

²¹ High-technology sectors are defined following the definition of medium- and high-technology manufacturing products (Lall, 2000). See annex A4 for the list of high-technology sectors (“sections” at the two-digit level of HS 2002).

and the bulk of technological efforts are concentrated in sectors such as electronics, machinery and pharmaceuticals. Again, equation (2) is estimated by OLS, using robust standard errors adjusted by clustering at the country level.

IV. Regression results

The estimation results of how productive capacities relate to the number of exporters are presented in table 1. Column (1) provides the baseline estimation, including only ECI and the level of GDP as explanatory variables, while column (2) includes the whole set of control variables. All regressions include sectoral and year fixed effects. The coefficient associated with ECI is significant at 5% in the baseline regression and at 10% when including all the control variables. This suggests that countries with stronger productive capacities have more exporters within sectors. Thus, productive capacities tend to be positively correlated with the extensive margin of exports across a relatively large sample of developing countries. The regressions also show that the size of the economy, as expected, is positively associated with the number of exporters, which confirms previous results obtained by Fernandes, Freund and Pierola (2016). Interestingly, there also seems to be a role for the development of the financial sector in promoting the extensive margin of exports across countries.

Table 1
Productive capacities and the extensive margin of exports

	Number of Exporters (1)	Number of Exporters (2)
ECI	0.472 (2.60)**	0.414 (1.82)*
GDP	0.690 (8.28)***	0.722 (6.61)***
Per capita GDP		-0.03 (0.26)
Trade over GDP		-0.000 (0.08)
Manufacturing sector		0.030 (1.22)
Financial sector		1.176 (3.07)**
Exchange rate		0.003 (0.68)
Trade costs		0.107 (0.47)
Commodity-dependent		0.065 (0.26)
Sectoral dummies	Yes	Yes
Year dummies	Yes	Yes
R-squared	0.69	0.74
Number of countries	40	32
Observations	28 921	17 972

Source: Prepared by the author.

Notes: *Number of exporters* is the log of the total number of exporters. *ECI* is the Economic Complexity Index. *GDP* is the log of GDP in constant dollars and *Per capita GDP* is the log of per capita GDP in constant dollars. *Trade over GDP* is total merchandise exports and imports over GDP. *Manufacturing sector* is the share of the manufacturing sector in the economy. *Financial sector* is an index of financial development. *Exchange rate* is an index that measures fluctuation of the real effective exchange rate. *Trade costs* is the log of a variable that measures transportation costs. *Commodity-dependent* is a dummy variable that takes a value of 1 if the country's economy is commodity-dependent. OLS estimations were performed at the sector level (at the two-digit level of HS 2002). *t* statistics (shown in parentheses) with robust standard errors were adjusted by clustering at the country level. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Table 2 displays the estimation results regarding the intensive margin of exports, and particularly how ECI relates to the level of exports per exporter and per new entrant in foreign markets. Columns (1) and (3) provide the baseline regressions, while columns (2) and (4) present the regressions with the full set of control variables. Notably, in all regressions the coefficients associated with ECI are positive and significant, either at 10% or 5%. This shows that, within sectors, exporters and new exporters based in countries with greater productive capacities tend to be larger, even when controlling for other relevant variables. This points to a clear-cut correlation between productive capacities and the intensive margin of exports across developing countries. Among the other variables, the results show that economy size, trade openness and the relative size of the manufacturing sector are also positively correlated with the size of exporters.

Table 2
Productive capacities and the intensive margin of exports

	Exports per exporter (1)	Exports per exporter (2)	Exports per entrant (3)	Exports per entrant (4)
ECI	0.497 (1.88)*	0.262 (1.92)*	0.251 (1.74)*	0.217 (2.10)**
GDP	0.384 (5.56)***	0.439 (5.06)***	0.266 (4.24)***	0.398 (6.58)***
Per capita GDP		0.126 (1.49)		-0.120 (1.76)*
Trade over GDP		0.008 (2.06)**		0.012 (4.56)***
Manufacturing sector		0.035 (1.87)*		-0.003 (0.16)
Financial sector		-0.490 (1.85)*		-1.153 (4.53)***
Exchange rate		0.002 (0.87)		-0.002 (0.74)
Trade costs		-0.291 (0.87)		-0.04 (0.47)
Commodity-dependent		0.412 (2.79)		-0.119 (0.89)
Sectoral dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
R-squared	0.40	0.44	0.32	0.35
Number of countries	40	32	39	31
Observations	27 634	17 242	24 195	15 562

Source: Prepared by the author.

Notes: *Exports per exporter* is the log of (mean) exports per exporter. *Exports per entrant* is the log of (mean) exports per entrant. *ECI* is the Economic Complexity Index. *GDP* is the log of GDP in constant dollars and *Per capita GDP* is the log of per capita GDP in constant dollars. *Trade over GDP* is total merchandise exports and imports over GDP. *Manufacturing sector* is the share of the manufacturing sector in the economy. *Financial sector* is an index of financial development. *Exchange rate* is an index that measures fluctuation of the real effective exchange rate. *Trade costs* is the log of a variable that measures transportation costs. *Commodity-dependent* is a dummy variable that takes a value of 1 if the country has a commodity-dependent economy. OLS estimations were performed at the sector level (at the two-digit level of HS 2002). *t* statistics (shown in parentheses) with robust standard errors were adjusted by clustering at the country level. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Interestingly, the financial sector also seems to play a major role in the size of exporters. In the case of new exporters (entrants), in the comparison across countries the negative coefficient suggests that development of the financial sector allows smaller firms to become exporters. Column (4) of table 2 also shows that the level of development, measured by the proxy per capita GDP, is negatively associated with average export level per entrant. This indicates that initial export levels of new exporters

are higher in countries with lower levels of development. While this might seem counterintuitive, it is consistent with the literature on barriers to trade, which underscores that becoming an exporter is easier as countries develop. In fact, new exporters from poorer countries face higher export costs and have less public support than new exporters from more developed and globally integrated economies. As a result, new exporters from poorer countries need to start their activity in foreign markets with a relatively larger volume of exports.

The regression results regarding unit prices per exporter are presented in table 3. Again, ECI is significant in explaining differences in unit prices. Thus, in the comparison across sectors, exporters from countries with higher productive capacities tend to have higher average unit prices for their products. This is a strong indication that across developing countries productive capacities are positively correlated with product quality within sectors. In fact, while a multiplicity of factors determine unit price — such as demand shocks or market power— the role played by productive capacities in such a comprehensive sample of countries and over an extended period of time is a firm indication that the main driver of these unit price differences (in levels) is product quality. In addition, economy size, trade openness and financial sector development are all positively correlated with unit prices.

Table 3
Productive capacities and unit prices

	Unit prices per exporter (1)	Unit prices per exporter (2)
ECI	0.519 (4.15)***	0.458 (3.85)**
GDP	0.147 (1.81)*	0.219 (2.85)**
Per capita GDP		0.061 (0.81)
Trade over GDP		0.004 (1.87)*
Manufacturing sector		-0.022 (1.22)
Financial sector		0.546 (2.32)**
Exchange rate		0.002 (0.85)
Trade costs		-0.404 (1.90)*
Commodity-dependent		0.342 (2.10)**
Sectoral dummies	Yes	Yes
Year dummies	Yes	Yes
R-squared	0.55	0.58
Number of countries	34	28
Observations	21 543	14 316

Source: Prepared by the author.

Notes: *Unit prices* is the log of total export value over quantity. *ECI* is the Economic Complexity Index. *GDP* is the log of GDP in constant dollars and *Per capita GDP* is the log of per capita GDP in constant dollars. *Trade over GDP* is total merchandise exports and imports over GDP. *Manufacturing sector* is the share of the manufacturing sector in the economy. *Financial sector* is an index of financial development. *Exchange rate* is an index that measures the fluctuation of the real effective exchange rate. *Trade costs* is the log of a variable that measures transportation costs. *Commodity-dependent* is a dummy variable that takes a value of 1 if the country has a commodity-dependent economy. OLS estimations were performed at the sector level (at the two-digit level of HS 2002). *t* statistics (in parentheses) with robust standard errors were adjusted by clustering at the country level. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Lastly, table 4 displays the regression results for the role of R&D investments in exporters' diversification across products and destinations. Fewer countries are considered in these estimations, owing to the more limited availability of R&D investment data for some countries. Column (1) presents the baseline regression when using products per exporter as a dependent variable. Then, columns (2) and (3) sequentially add the control variables and the multiplicative variable *R&D*High-Tech*, respectively. The coefficients associated with R&D investments are stable and suggest a positive and significant correlation with the number of products per exporter. Thus, exporters in countries with a higher level of R&D investment export a larger number of products to foreign markets, at the six-digit level of the HS 2002 classification. Meanwhile, economy size, manufacturing sector size and financial sector development are also positively associated with product diversification. These are, a priori, intuitive results. Interestingly, the multiplicative variable *R&D*High-tech* is not significant, showing there are no heterogeneous effects for R&D investments on product diversification in high-technology sectors.

Table 4
Technological capabilities and diversification

	Products per exporter (1)	Products per exporter (2)	Products per exporter (3)	Destinations per exporter (4)	Destinations per exporter (5)	Destinations per exporter (6)
R&D	0.182 (2.05)**	0.118 (1.89)*	0.116 (1.88)**	0.148 (1.57)	0.315 (3.31)**	0.294 (3.13)**
GDP	0.016 (2.22)**	0.031 (2.52)**	0.031 (2.52)**	0.043 (2.01)*	-0.012 (0.50)	-0.012 (0.50)
Per capita GDP		-0.003 (0.26)	-0.003 (0.26)		0.072 (3.92)**	0.072 (3.92)**
Trade over GDP		0.000 (1.23)	0.000 (1.23)		-0.001 (1.66)	-0.001 (1.66)
Manufacturing sector		0.005 (1.82)*	0.004 (1.82)*		0.015 (3.28)**	0.015 (3.28)**
Financial sector		0.212 (2.13)**	0.212 (2.13)**		0.134 (1.32)	0.134 (1.31)
Exchange rate		-0.000 (0.76)	-0.000 (0.76)		-0.000 (0.26)	-0.000 (0.26)
Trade cost		-0.214 (1.66)*	-0.214 (1.66)*		-0.026 (0.73)	-0.026 (0.72)
Commodity-dependent		0.066 (2.24)**	0.066 (2.24)**		0.163 (2.59)**	0.163 (2.59)**
R&D * High-tech sector			0.011 (0.54)			0.170 (2.28)**
Sectoral dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.60	0.65	0.65	0.26	0.33	0.33
Number of countries	31	25	25	31	25	25
Observations	13 107	8 597	8 597	13 107	8 597	8 597

Source: Prepared by the author.

Notes: *Products per exporter* and *Destinations per exporter* are the logs of the (mean) number of products and destinations per exporter, respectively. *R&D* is aggregate R&D investments over GDP. *GDP* is the log of GDP in constant dollars and *Per capita GDP* is the log of per capita GDP in constant dollars. *Trade over GDP* is total merchandise exports and imports over GDP. *Manufacturing sector* is the share of the manufacturing sector in the economy. *Financial sector* is an index of financial development. *Exchange rate* is an index that measures fluctuation of the real effective exchange rate. *Trade costs* is the log of a variable that measures transportation costs. *Commodity-dependent* is a dummy variable that takes a value of 1 if the country has a commodity-dependent economy. *High-tech sector* is a dummy variable that takes a value of 1 if the sector is R&D-intensive. OLS estimations were performed at the sector level (at the two-digit level of HS 2002). *t* statistics (in parentheses) with robust standard errors were adjusted by clustering at the country level. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Columns (4), (5) and (6) of table 4 display the regressions for the number of destinations per exporter. When including all the control variables, the results show that R&D investments are positively correlated with diversification across destinations. Thus, within sectors, exporters from countries with higher R&D investments tend to export their products to more destination markets. Interestingly, the variable *R&D*HighTech* is positive and significant at 5%. This shows that there is an additional correlation between R&D investment and the number of destinations per exporter in high-technology sectors. The higher the level of R&D investment, the higher the (average) number of destinations per exporter in high-technology sectors. This result is consistent with a growing empirical literature emphasizing the relationship between R&D activities and export diversification, with a causality that can run in both directions.²²

To analyse the sensitivity of the results, several robustness checks were performed. A key aspect to consider is the extent to which the empirical results could be driven by the estimation sample. The estimation sample is not balanced across countries, and some countries are observed in the database for longer periods than others. To address this issue, a twofold strategy was adopted. First, the equations were estimated using a restricted sample with the same number of observations per country. Thus, the “additional” observations for some countries, in comparison to countries with fewer observations, are omitted from the sample. Second, the estimations were performed for a second restricted sample, of countries with at least 500 observations. With this approach, countries with fewer observations — around 20% of the full sample — were omitted from the estimations. Lastly, the equations were estimated by correcting for the fact that some sectors have zero exports; in other words, not all countries export in every sector. Correcting this issue expands the database by approximately 5%. Despite some variations, the robustness checks, particularly the results regarding productive and technological capabilities, confirm the main conclusions.²³

V. Conclusions

The accumulation of productive and technological capabilities is a major driver of economic growth and structural change and, consequently, also of development. This paper examines the role of these capabilities in export dynamics at the microeconomic level, for a large sample of developing countries. The results indicate that productive capabilities, proxied by ECI, are positively correlated with the intensive and the extensive margins of exports and product quality. The results also confirm that technological capabilities, measured using R&D investment as a proxy, are strongly linked to firms’ diversification across products and destinations, especially in high-technology sectors. In short, within sectors, developing countries with greater productive and technological capabilities have more exporters; in addition, exporters in such countries are larger, more diversified and charge higher unit prices for their products.

These findings are important for several reasons. Firstly, they explicitly and empirically underscore the importance of asymmetries of productive and technological capabilities across developing countries, a crucial issue highlighted by the structuralist tradition. To date, most of the aggregate literature has compared technological capabilities between developing and developed countries. As is to be expected, these studies demonstrate that capabilities are a major determinant of productivity, exports and growth. This paper shows that capabilities matter even when comparing export dynamics only

²² For example, Baum, Caglayan and Talavera (2015) examine the endogenous relationship between diversification and R&D activities in firms in the United Kingdom. The results suggest that geographical sales diversification induces British firms to increase R&D expenditures. They also suggest that R&D expenditures cause higher export sales but do not cause export sales diversification. Meanwhile, Wagner (2017) investigates the links between innovation and R&D activities and diversification in manufacturing firms in Germany. The results confirm that more innovative firms outperform less innovative firms in terms of number of products and destinations.

²³ Tables A5.1 to A5.4 in annex A5 display the regressions for the robustness checks using a balanced number of observations across countries (“balanced sample”). Other robustness checks are available upon request.

among developing countries. Secondly, the results illustrate how the accumulation of productive and technological capabilities plays a role in developing countries' insertion in international markets through different channels. These results are consistent with the Kaldorian view that the productive capacities for export activity must first be built and developed, in order for "incentives" such as trade liberalization reform to have an effect on exports.

Therefore, this paper underlines the role of capabilities not only in the macroeconomic resilience of developing countries to trade shocks but also in their medium-term development prospects. Indeed, the accumulation of capabilities is reflected in product and market diversification, which are key factors when navigating international trade shocks. In addition, productive and technological capabilities are mirrored in the extensive and intensive margins of trade and in product quality, which are key aspects of international competitiveness and of how countries dynamically adjust to changing demand patterns. These links underscore the diverse ways that micro-macro interactions drive development trajectories under different capability setups. This suggests that, on the whole, productive and technological capabilities will also play a crucial role in how developing countries adjust to significant and permanent reconfigurations of global and regional value chains in the wake of the COVID-19 pandemic.

Bibliography

- Aghion, P. and P. Howitt (1998), *Endogenous Growth Theory*, Cambridge, The MIT Press.
- Al-Marhubi, F. (2000), "Export diversification and growth: an empirical investigation", *Applied Economics Letters*, vol. 7, No. 9.
- Arocena, R. and J. Sutz (2002), "Innovation systems and developing countries", *DRUID Working Paper*, No. 02-05, Aalborg, Danish Research Unit for Industrial Dynamics (DRUID).
- Aw, B., M. Roberts and D. Yi Xu (2011), "R&D investment, exporting, and productivity dynamics", *The American Economic Review*, vol. 101, No. 4, June.
- Baum, C., M. Caglayan and O. Talavera (2015), "R&D expenditures and geographical sales diversification", *The Manchester School*, vol. 84, No. 2.
- Brenton, P., O. Cadot and M. Pierola (2012), *Pathways to African Export Sustainability*, Directions in Development: Trade, Washington, D.C., World Bank.
- Casanova, L. and S. Rullán (2015), "A review of the Mexican national innovation system", *International Journal of Business and Economic Sciences Applied Research*, vol. 8, No. 3.
- Cherif, R., F. Hasanov and L. Wang (2018), "Sharp instrument: a stab at identifying the causes of economic growth", *IMF Working Paper*, No. 18/117, Washington, D.C., International Monetary Fund (IMF), May.
- Cimoli, M., G. Dosi and J. Stiglitz (eds.) (2009), "The political economy of capabilities accumulation: the past and future of policies for industrial development", *Industrial Policy and Development: the Political Economy of Capabilities Accumulation*, New York, Oxford University Press.
- Cimoli, M. and others (2005), "Cambio estructural, heterogeneidad productiva y tecnología en América Latina", *Heterogeneidad estructural, asimetrías tecnológicas y crecimiento en América Latina*, Project Documents (LC/W.35), M. Cimoli (ed.), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), November.
- Cirera, X. and W. Maloney (2017), *The Innovation Paradox: Developing-Country Capabilities and the Unrealized Promise of Technological Catch-Up*, Washington, D.C., World Bank.
- Cohen, W. and D. Levinthal (1990), "Absorptive capacity: a new perspective on learning and innovation", *Administrative Science Quarterly*, vol. 35, No. 1.
- Dosi, G., K. Pavitt and L. Soete (1990), *The Economics of Technical Change and International Trade*, New York, Harvester Wheatsheaf.
- Ernst, D., T. Ganiatsos and L. Mytelka (eds.) (1998), *Technological Capabilities and Export Success in Asia*, Routledge Studies in the Growth Economies of Asia, London, Routledge.
- Fernandes, A., C. Freund and M. Pierola (2016), "Exporter behavior, country size and stage of development: evidence from the Exporter Dynamics Database", *Journal of Development Economics*, vol. 119, March.

- Freeman, C. (1995), "The 'National System of Innovation' in historical perspective", *Cambridge Journal of Economics*, vol. 19, No. 1, February.
- Griffith, R., S. Redding and J. Van Reenen (2003), "R&D and absorptive capacity: theory and empirical evidence", *The Scandinavian Journal of Economics*, vol. 105, No. 1, March.
- Griliches, Z. (1979), "Issues in assessing the contribution of research and development to productivity growth", *Bell Journal of Economics*, vol. 10, No. 1.
- Harris, R. and Q. Li (2009), "Exporting, R&D, and absorptive capacity in UK establishments", *Oxford Economic Papers*, vol. 61, No. 1, Oxford, Oxford University Press, January.
- Hausmann, R., J. Hwang and D. Rodrik (2007), "What you export matters", *Journal of Economic Growth*, vol. 12, No. 1, March.
- Hausmann, R. and others (2011), *The Atlas of Economic Complexity: Mapping Paths to Prosperity*, [online] <https://growthlab.cid.harvard.edu/publications/atlas-economic-complexity-mapping-paths-prosperity-0>.
- Herzer, D. and F. Nowak-Lehmann (2006), "What does export diversification do for growth? An econometric analysis", *Applied Economics*, vol. 38, No. 15.
- Hidalgo, C. and R. Hausmann (2009), "The building blocks of economic complexity", *Proceedings of the National Academy of Sciences of the United States of America*, vol. 106, No. 26, Washington, D.C., National Academy of Sciences (NAS).
- Hirschman, A. (1958), *The Strategy of Economic Development*, Yale Studies in Economics, vol. 10, New Haven, Yale University Press.
- Kemp-Benedict, E. (2014), "An interpretation and critique of the Method of Reflections", *MPRA Paper*, No. 60705, December.
- Lall, S. (2000), "The technological structure and performance of developing country manufactured exports, 1985-98", *Oxford Development Studies*, vol. 28, No. 3.
- _____(1992), "Technological capabilities and industrialization", *World Development*, vol. 20, No. 2, February.
- Mairesse, J. and P. Mohnen (2010), "Using innovation surveys for econometric analysis", *Handbook of the Economics of Innovation*, vol. 2, B. Hall and N. Rosenberg (eds.), Amsterdam, North-Holland.
- Mealy, P., J. Farmer and A. Teytelboym (2018), "A new interpretation of the Economic Complexity Index", *INET Oxford Working Paper*, No. 2018-04, Oxford, Institute for New Economic Thinking at the Oxford Martin School (INET Oxford).
- Ndemo, B. (2015), "Effective innovation policies for development: the case of Kenya", *The Global Innovation Index 2015: Effective Innovation Policies for Development*, S. Dutta, B. Lanvin and S. Wunsch-Vincent (eds.), Geneva, Cornell University/European Institute of Business Administration (INSEAD)/World Intellectual Property Organization (WIPO).
- Pavitt, K. (1984), "Sectoral patterns of technical change: towards a taxonomy and a theory", *Research Policy*, vol. 13, No. 6, December.
- Posner, M. (1961), "International trade and technical change", *Oxford Economic Papers*, vol. 13, No. 3, Oxford, Oxford University Press, October.
- Prebisch, R. (1950), *The Economic Development of Latin America and its Principal Problems (E/CN.12/89/Rev.1)*, New York, United Nations.
- Romer, P. (1990), "Endogenous technological change", *Journal of Political Economy*, vol. 98, No. 5, Chicago, The University of Chicago Press, October.
- Sahay, R. and others (2015), "Rethinking financial deepening: stability and growth in emerging markets", *IMF Staff Discussion Note*, No. 15/08, Washington, D.C., International Monetary Fund (IMF), May.
- Schott, P. (2004), "Across-product versus within-product specialization in international trade", *The Quarterly Journal of Economics*, vol. 119, No. 2, Oxford, Oxford University Press, May.
- Schumpeter, J. (1943), *Capitalism, Socialism & Democracy*, London, Routledge.
- Simoes, A. and C. Hidalgo, "The Economic Complexity Observatory: an analytical tool for understanding the dynamics of economic development", 2011 [online database] <https://oec.world/>.
- Singer, H. (1950), "The distribution of gains between investing and borrowing countries", *The American Economic Review*, vol. 40, No. 2, May.
- Smith, K. (2005), "Measuring innovation", *The Oxford Handbook of Innovation*, J. Fagerberg, D. Mowery and R. Nelson (eds.), New York, Oxford University Press.
- Teece, D. and G. Pisano (1998), "The dynamic capabilities of firms: an introduction", *Technology, Organization, and Competitiveness: Perspectives on Industrial and Corporate Change*, G. Dosi, D. Teece and J. Chytrý (eds.), Oxford, Oxford University Press.

- UNCTAD (United Nations Conference on Trade and Development) (2017), *The State of Commodity Dependence 2016* (UNCTAD/SUC/2017/2), Geneva.
- Vergara, S. (2017), "The slowdown in productivity growth: a view from international trade", *Development Issues*, No. 11, New York, United Nations Department of Economic and Social Affairs (DESA).
- Wagner, J. (2017), "R&D activities and extensive margins of exports in manufacturing enterprises: first evidence for Germany", *The International Trade Journal*, vol. 31, No. 3.
- World Bank (2016), "Exporter Dynamics Database" [online] <https://www.worldbank.org/en/research/brief/exporter-dynamics-database>.
- _____(2007), "Exports and productivity – comparable evidence for 14 countries", *Policy Research Working Paper*, No. 4418, Washington, D.C., November.

Annex A1

Table A1.1
Distribution of observations across countries

Country	Frequency	Percent	Cumulative
Albania	834	3.00	3.00
Bangladesh	756	2.72	5.72
Botswana	939	3.38	9.1
Cambodia	569	2.05	11.15
Cameroon	893	3.21	14.36
Chile	950	3.42	17.78
Colombia	570	2.05	19.83
Costa Rica	934	3.36	23.19
Dominican Republic	925	3.33	26.52
Ecuador	931	3.35	29.87
El Salvador	665	2.39	32.26
Ethiopia	422	1.52	33.78
Gabon	80	0.29	34.07
Georgia	926	3.33	37.04
Guatemala	760	2.73	40.14
Guinea	280	1.01	41.14
Jordan	896	3.22	44.37
Kenya	665	2.39	46.76
Kuwait	188	0.68	47.44
Kyrgyzstan	654	2.35	49.79
Lao People's Democratic Republic	377	1.36	51.15
Lebanon	475	1.71	52.86
Madagascar	559	2.01	54.87
Malawi	613	2.21	57.07
Mali	336	1.21	58.28
Mauritius	944	3.4	61.68
Mexico	950	3.42	65.10
Morocco	950	3.42	68.51
Nicaragua	912	3.28	71.80
Pakistan	760	2.73	74.53
Paraguay	473	1.70	76.23
Peru	950	3.42	79.65
Senegal	904	3.25	82.90
South Africa	948	3.41	86.32
Thailand	95	0.34	86.66
Turkey	950	3.42	90.08
Uganda	587	2.11	92.19
Uruguay	930	3.35	95.53
Yemen	397	1.43	96.96
Zambia	844	3.04	100.0

Source: Prepared by the author, on the basis of World Bank, "Exporter Dynamics Database", 2016 [online] <http://www.worldbank.org/en/research/brief/exporter-dynamics-database>.

Annex A2

Economic Complexity Index

The Economic Complexity Index (ECI) is calculated from export data that connect countries to products where they have a revealed comparative advantage. Defining M_{cp} as a matrix that is 1 if country c produces product p , and 0 otherwise, then it is possible to measure *diversity* and *ubiquity* by summing over the rows or columns of the matrix.

$$Diversity = K_{c,0} = \sum_p M_{cp} \quad (1)$$

$$Ubiquity = K_{p,0} = \sum_c M_{cp} \quad (2)$$

Then, a matrix can be defined that connects countries that export similar products, weighted by the inverse of the ubiquity of a product to discount for common products, and normalized by the diversity of a country:

$$M_{cc'}^* = \frac{1}{K_{c,0}} \sum_p \frac{M_{cp} M_{c'p}}{K_{p,0}} \quad (3)$$

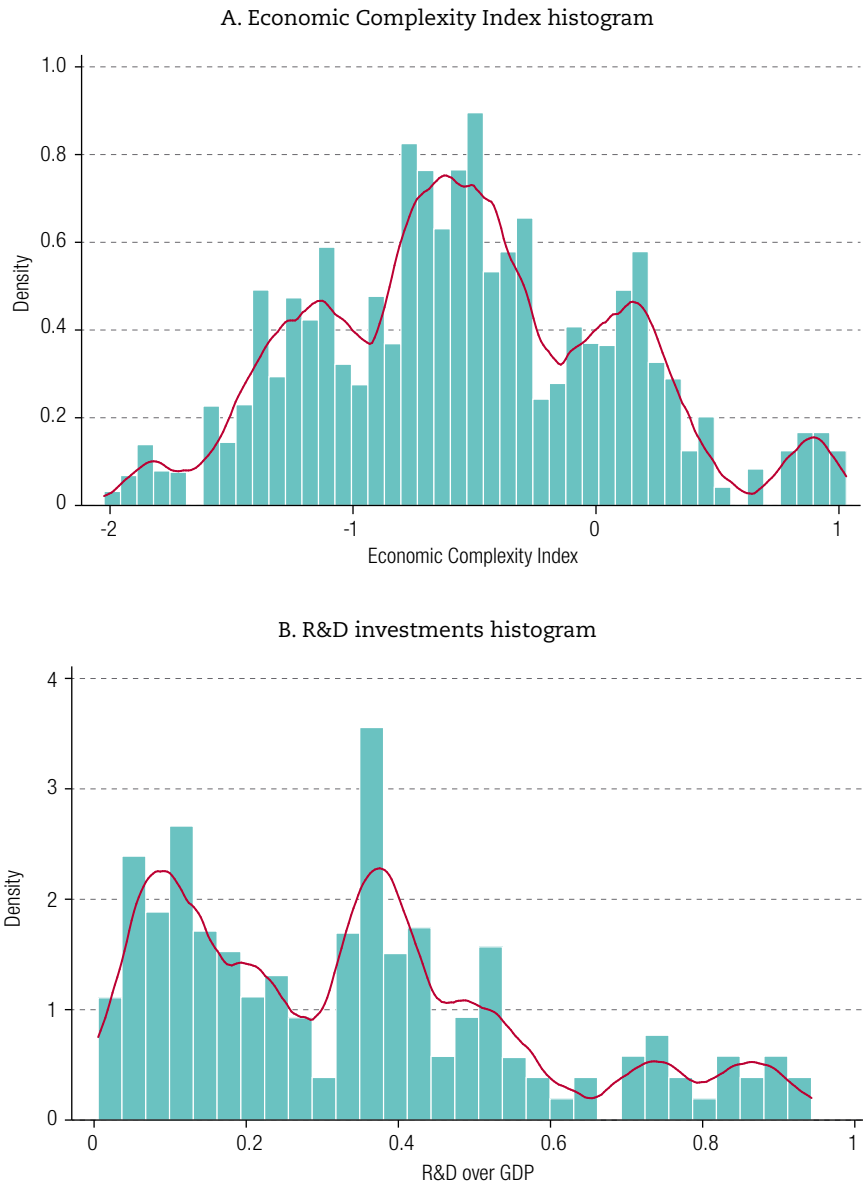
Lastly, ECI can be defined as:

$$ECI_c = \frac{K_c - \langle K \rangle}{std(K)} \quad (4)$$

Where $\langle K \rangle$ represents the average and K_c is the eigenvector of $M_{cc'}^*$ associated with the second eigenvalue (the vector associated with the largest eigenvalue is a vector of ones). For more details, see Hausmann and others (2011).

Annex A3

Figure A3.1



Source: Prepared by the author, on the basis of World Bank, “World Development Indicators”, 2020 [online database] <https://databank.worldbank.org/source/world-development-indicators>, and A. Simoes and C. Hidalgo, “The Economic Complexity Observatory: an analytical tool for understanding the dynamics of economic development”, 2011 [online database] <https://oec.world/>.

Annex A4

Table A4.1
High-technology sectors at two-digit HS 2002 classification

Section	Description
30	Pharmaceutical products.
37	Photographic or cinematographic goods.
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof.
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles.
86	Railway or tramway locomotives, rolling-stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical (including electro-mechanical) traffic signalling equipment of all kinds.
87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof.
88	Aircraft, spacecraft, and parts thereof.
89	Ships, boats and floating structures.
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof.
91	Clocks and watches and parts thereof.
92	Musical instruments; parts and accessories of such articles.
93	Arms and ammunition; parts and accessories thereof.

Source: Prepared by the author, on the basis of United Nations International Trade Statistics Database, "HS 2002 Classification by Section", 2016 [online] <https://unstats.un.org/unsd/tradekb/Knowledgebase/50043/HS-2002-Classification-by-Section>, and S. Lall, "The technological structure and performance of developing country manufactured exports, 1985-98", *Oxford Development Studies*, vol. 28, No. 3, 2000.

Annex A5

Table A5.1
Productive capacities and the extensive margin of exports
(Balanced sample)

	Number of Exporters
ECI	0.523 (2.22)**
GDP	0.751 (5.86)***
Per capita GDP	-0.073 (0.49)
Trade over GDP	-0.000 (0.13)
Manufacturing sector	0.016 (0.57)
Financial sector	1.318 (3.00)**
Exchange rate	0.005 (0.69)
Trade costs	-0.052 (0.20)
Commodity-dependent	0.240 (0.89)
Sectoral dummies	Yes
Year dummies	Yes
R-squared	0.73
Number of countries	31
Observations	9 625

Source: Prepared by the author.

Notes: *Number of exporters* is the log of the number of exporters. *Exporters per product* is the log of the number of exporters per product. *GDP* is the log of GDP in constant United States dollars and *per capita GDP* is the log of per capita GDP in constant dollars. *ECI* is the Economic Complexity Index. *Trade over GDP* is total merchandise exports and imports over GDP. *Manufacturing sector* is the share of the manufacturing sector in the economy. *Financial sector* is an index of financial development. *Exchange rate* is an index that measures fluctuation of the real effective exchange rate. *Trade costs* is the log of a variable that measures transportation costs. *Commodity-dependent* is a dummy variable that takes the value 1 if the country has a commodity-dependent economy. OLS estimations were performed at the sector level (the two-digit level of HS 2002), using a balanced estimation sample. *t* statistics (in brackets) with robust standard errors were adjusted by clustering at the country level. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Table A5.2
Productive capacities and the intensive margin of exports
(Balanced sample)

	Exports per exporter (1)	Exports per entrant (2)
ECI	0.257 (1.86)*	0.154 (1.46)
GDP	0.441 (4.66)***	0.411 (6.37)***
Per capita GDP	0.093 (1.08)	-0.099 (1.48)
Trade over GDP	0.008 (2.19)**	0.012 (4.77)***
Manufacturing sector	0.041 (1.93)*	-0.010 (0.62)
Financial sector	-0.415 (1.46)	-1.107 (4.18)***
Exchange rate	0.002 (0.47)	0.0006 (0.14)
Trade costs	-0.250 (1.94)*	-0.007 (0.06)
Commodity-dependent	0.686 (2.43)**	-0.197 (1.28)
Sectoral dummies	Yes	Yes
Year dummies	Yes	Yes
R-squared	0.43	0.34
Number of countries	31	31
Observations	9 177	8 248

Source: Prepared by the author.

Notes: *Per exporter* is the log of the (mean) exports per exporter. *Exports per entrant* is the log of the (mean) exports per entrant. *GDP* is the log of GDP in constant United States dollars and *Per capita GDP* is the log of per capita GDP in constant dollars. *ECI* is the Economic Complexity Index. *Trade over GDP* is total merchandise exports and imports over GDP. *Manufacturing sector* is the share of the manufacturing sector in the economy. *Financial sector* is an index of financial development. *Exchange rate* is an index that measures fluctuation of the real effective exchange rate. *Trade costs* is the log of a variable that measures transportation costs. *Commodity-dependent* is a dummy variable that takes the value 1 if the country has a commodity-dependent economy. OLS estimations were performed at the sector level (at the two-digit level of HS 2002). *t* statistics (in brackets) with robust standard errors adjusted by clustering at the country level. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Table A5.3
Productive capacities and unit prices
(Balanced sample)

	Unit prices per exporter
ECI	0.510 (3.72)**
GDP	0.259 (2.68)**
Per capita GDP	-0.035 (0.41)
Trade over GDP	0.005 (1.67)*
Manufacturing sector	-0.020 (0.93)
Financial sector	0.739 (3.37)*
Exchange rate	0.003 (0.66)
Trade costs	-0.534 (2.64)**
Commodity-dependent	0.432 (2.62)**
Sectoral dummies	Yes
Year dummies	Yes
R-squared	0.58
Number of countries	25
Observations	7 336

Source: Prepared by the author.

Notes: *Unit prices* is the log of the total export value over quantity. *ECI* is the Economic Complexity Index. *GDP* is the log of GDP in constant United States dollars and *Per capita GDP* is the log of Per capita GDP in constant dollars. *Trade over GDP* is total merchandise exports and imports over GDP. *Manufacturing sector* is the share of the manufacturing sector in the economy. *Financial sector* is an index of financial development. *Exchange rate* is an index that measures fluctuation of the real effective exchange rate. *Trade costs* is the log of a variable that measures transportation costs. *Commodity-dependent* is a dummy variable that takes the value 1 if the country has a commodity-dependent economy. OLS estimations were performed at the sector level (at the two-digit level of HS 2002). *t* statistics (in brackets) with robust standard errors adjusted by clustering at the country level. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Table A5.4
Technological capabilities and diversification

(Balanced sample)	Products per exporter (1)	Destinations per exporter (2)
R&D	0.190 (2.25)**	0.354 (3.50)**
GDP	0.042 (3.12)**	-0.023 (1.05)
Per capita GDP	-0.010 (0.81)	0.057 (3.94)**
Trade over GDP	0.001 (1.71)*	-0.001 (1.61)
Manufacturing sector	0.004 (0.84)	0.020 (4.17)***
Financial sector	0.194 (2.34)**	0.144 (1.28)
Exchange rate	-0.000 (0.13)	-0.000 (0.58)
Trade costs	0.038 (1.50)	-0.026 (0.69)
Commodity-dependent	0.103 (2.30)**	0.150 (2.27)**
R&D * High-tech sector	0.009 (0.30)	0.112 (1.81)*
Sectoral dummies	Yes	Yes
Year dummies	Yes	Yes
R-squared	0.64	0.33
Number of countries	22	22
Observations	4 550	4 550

Source: Prepared by the author.

Notes: *Products per exporter* is the log of the (mean) number of products per exporter. *Destination per exporter* is the log of the (mean) number of destination countries per exporter. *R&D* is aggregate R&D investments over GDP. *GDP* is the log of GDP in constant United States dollars and *Per capita GDP* is the log of Per capita GDP in constant dollars. *Manufacturing sector* is the share of the manufacturing sector in the economy. *Financial sector* is an index of financial development. *Exchange rate* is an index that measures fluctuation of the real effective exchange rate. *Trade costs* is the log of a variable that measures transportation costs. *Commodity-dependent* is a dummy variable that takes the value 1 if the country has a commodity-dependent economy. *High-tech sector* is a dummy variable that takes the value 1 if the sector is R&D intensive. OLS estimations were performed at the sector level (at the two-digit level of HS 2002). *t* statistics (in brackets) with robust standard errors adjusted by clustering at the country level. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Constrained integration in Latin America: analysis based on a twenty-first-century centre-periphery vision

Marcos Vinicius Chiliatto-Leite¹

Abstract

The early twenty-first century in Latin America was characterized by a “pink tide”, in which a reorientation of national policies produced positive social outcomes and changed both the regional order and the role of regional integration in the different countries. Alongside this process, the international economy provided relief from the external constraint, which meant that growth paths were not interrupted by balance-of-payments crises. Nonetheless, the progress made in regional integration falls well short of political intentions. This article posits that major transformations occurring at the centre of the international economy prevented the region’s production structure from becoming more diversified. Unfortunately, as existing production structures were reproduced (or reprimerized), external engagement outside the region became deeper and Latin American integration remained constrained and confined to a secondary role.

Keywords

Economic development, economic integration, peripheral capitalism, regionalism, development models, productivity, economic dependency, international economic relations, Latin America, China

JEL classification

F14, F15, O14

Author

Marcos Vinicius Chiliatto-Leite holds a PhD in Economics and is Coordinator at the Secretariat of the Inter-American Development Bank (IDB). He previously served as Economic Affairs Officer at the Economic Commission for Latin America and the Caribbean (ECLAC). Email: chiliatto@iadb.org.

¹ The views and opinions expressed in the text are the author’s and do not necessarily represent those of the IDB Group. The author is grateful to Ricardo Carneiro for valuable collaboration. Naturally, any inaccuracies and other shortcomings in this essay are the author’s exclusive responsibility.

I. Introduction

In the early twenty-first century, Latin America lived through a political moment in which pragmatically-minded left-wing and centre-left movements gained power through democratic elections, in a process that has come to be known as the “pink tide”.² A “Latin Americanist” order, as distinct from the earlier Pan-Americanism, gained strength, expressing an integrationist rhetoric in different regional and subregional forums and agreements. This article analyses some of the reasons why Latin America has found it difficult to integrate regionally in terms of trade and production, despite political intentions.

During the pink tide period, Latin America was confronted by changes taking place at the centre of the international economy. The spread of financialization, the fragmentation and global redistribution of production, and the rise of China all combined to fuel a commodity boom, a fall in the relative prices of manufactured goods and abundant international liquidity. As a result of these changes at the centre of the global economy, Latin America’s political context benefited from an easing of the external constraint, with the result that growth ceased to be hindered by the balance of payments, as it had been in various earlier periods. This easing of the external constraint was facilitated by low interest rates and by financial inflows from the centre of the international economy, in conjunction with a terms-of-trade shock (which, in this case, affected the subregions in different ways).³

Despite this political and economic context, progressive structural change did not occur in Latin America; and, as a result, it is argued that the region failed to integrate as advocated by the rhetoric propounded by its leaders. While many countries made progress on social inclusion and in reducing inequalities, the production structure did not become more diversified. The same factors that helped ease the external constraint, such as the liquidity cycle and the relative price shock, also played a key role in the production structure and even led to a reprimarization of the economy in some countries.

Understanding the characteristics of regional integration requires a joint analysis of production structures, viewing one element as a reflection of the other. The key to understanding the constriction of regional integration is the fact that existing production structures have been reproduced. The fragile regional integration of the early twenty-first century reflects the fact that the region has failed to build an integration-friendly production structure. The region’s markets cannot absorb the primary commodities, or raw materials, produced by Brazil, Chile or Peru. The experiences of Europe, Asia and the North American Free Trade Agreement (NAFTA) show that regional integration goes hand-in-hand with integrated industrial production chains. Primary commodities have low levels of complexity and are generally destined for markets outside the region. This means that they have shorter and less fragmented production chains, with less capacity for regionalization.⁴

Differences in development patterns distinguish a Latin America to the north and another to the South.⁵ This article analyses the region in terms of the differences it displays in production structure, international position, the composition of aggregate demand and distribution, in a specific historical context. The conclusion is that, in the Southern part of Latin America, integration is difficult to envisage without a change in the commodity export structure. In the North, however, the production structure of the maquila industry is very closely bound to the United States economy; and the deepening of this strategy has also downgraded the priority assigned to regional integration. Based on this understanding of the link between the production structure and extraregional or regional relations, the article makes an analysis of the constriction of Latin American integration.

² In an article published in the *New York Times*, Rohter (2005) described the election of Tabaré Vázquez in Uruguay as part of a widespread Latin American phenomenon, in which left-aligned governments were elected, often with anti-American discourses and representing a post-Washington Consensus period. The term “pink tide,” rather than “red tide,” evoked the pragmatic orientation of those left-wing movements that came to power and eschewed ruptures.

³ In a complementary way, domestic policies such as the accumulation of reserves, macroeconomic management with floating exchange rates and a change in the debt profile, among others, contributed to the easing of external constraints.

⁴ The topic of complexity has gained importance through the writings of Hausmann and others (2011). For a discussion of complexity and the structuralism view, see Chliatto-Leite (2017) and also Gala, Rocha and Magacho (2018).

⁵ For an analysis of development patterns or styles —originating with Anibal Pinto— see Bielschowsky (1998 and 2013).

There are five sections, including this introduction. While section II deals with the pink tide and the Latin Americanist order, section III analyses China's relationship with Latin America. Section IV describes the key aspects of regional integration in Latin America, and section V offers some final thoughts.

II. The pink tide and the Latin Americanist order

In the early years of the twenty-first century, several Latin American countries elected left-wing or centre-left governments, in a trend that came to be known as the “pink tide”. Albeit with significant differences between individual countries, the region's political orientation distinguished that period from the 1990s, when the “Washington Consensus” held sway (Natanson, 2009).

This moment in the region's political history changed the understanding of regional integration and its role in development in region, the Americas and the world, in contrast to the situation in the late twentieth century. This section of the article discusses regional integration in its political dimensions, highlighting two fundamental elements: the formation of a new Latin Americanist order (distinct from the Pan-American vision) with political interests in forging greater regional integration, and the diversity of strategies in the region's different development patterns.

The pink tide had major effects on the international agenda and forums, and it defined a change of era. The “open regionalism” vision that had held sway in the 1990s was replaced by a new regional order which, albeit heterogeneous, had a Latin Americanist nature that differed from that of the earlier Pan-Americanism. This difference was expressed in various regional and subregional initiatives to promote economic and political rapprochement between the countries.⁶

After 2003, Brazilian foreign policy paid greater attention to Latin America and, in particular, to its southern portion (Almeida, 2004; Amorim, 2005). The Southern Common Market (MERCOSUR) was given new impetus, and emphasis was placed on the need to address structural asymmetries between members and the social issues on the agenda (Teixeira and Desiderá Neto, 2012). In 2004, negotiations were held between MERCOSUR and the Andean Community (CAN); and, in the same year, the new South American integration project, the South American Community of Nations (SACN), was launched. While this initiative focused on trade and infrastructure issues, it also sought greater political capacity and better representation in international forums. The agenda of the Latin American Integration Association (LAIA) was reiterated as the basis for promoting intrazone free trade, but it also went further. In the ensuing years, SACN attempted to establish a strategic plan and lines of action based on the goal of defining a common agenda. In 2007, SACN became the Union of South American Nations (UNASUR); and councils that reflected the integrationist, cooperative, political and developmentalist nature of the period became consolidated, in contrast to the “open regionalism” initiatives that had been driven by agreements on trade liberalization and regulatory convergence.⁷

Extending beyond South America, the first Summit of Latin America and the Caribbean on Integration and Development (CALC) was held in 2008, with participation by all of the region's 33 countries. In 2011, the Community of Latin American and Caribbean States (CELAC) was created by merging the Rio Group and CALC; and this served as a framework countering United States Pan-Americanism, since it excluded the United States and Canada, but did embrace Cuba (which remains excluded from the Organization of American States (OAS)).

The fact that countries had divergent development strategies did not prevent them all from meeting in CELAC. This grouping embraces Mexico, Central America and the Caribbean (which are more closely integrated with the United States) along with the South America of the pink tide. It is important to note that there were also other initiatives that cut across the South American space, such as the Bolivarian Alternative for the Americas (ALBA) and the PetroCaribe alliance.

⁶ Mota Veiga and Ríos (2007) examine 1990s regionalism —referred to by ECLAC (1994) as “open regionalism”— which emerged after the breakdown of “national developmentalism”. In open regionalism, integration was subordinated to a broader liberalizing agenda.

⁷ For further details, see Calixtre and Barros (2011).

Some countries had agendas that diverged from those of the pink-tide countries. For example, in addition to their agreements with the United States, Chile, Colombia, Mexico and Peru formed the Pacific Alliance in 2012, with the aim of deepening integration by progressively pursuing the free movement of goods, services, people and capital.

This early twenty-first-century shift marked the end of the greater liberal convergence and homogeneity of the 1990s, which spawned a new regional order with broader integration agendas. Teixeira and Desiderá Neto (2012) note the existence of an integrationist agenda and a new rhetoric around development, and argue that open regionalism was replaced by a “developmentalist regionalism”. More cautiously, Bastos (2012) claims that the deepening of free trade agreements and the inoperability of collective mechanisms for managing imbalances, even within UNASUR, would suggest that proclaiming a post-liberal regionalism is an exaggeration, because the anti-liberal stance exists more in rhetoric than in practice. For Calixtre and Barros (2011), this is a historical moment following the crisis of neoliberalism — one which seeks to return to development pursued through regional integration.⁸

Notwithstanding the controversies, heterogeneous strategies clearly coexist, whereas the strategies of the neoliberal era coalesced more homogeneously around the Washington Consensus. The early twenty-first century saw signs of Latin American regionalism; and countries whose strategies continued to be based on subordinate engagement (pursuing ties with developed economies, with the prospect of greater asymmetrical integration) coexisted with those that were striving for a new regional geopolitical architecture, of a more developmentalist and regionalist hue. This implies a new regional order in which different models coexist.

Despite the new order, the results in terms of the integration of regional trade and production remain frustrating (as shown in section IV). It is therefore worth discussing some of the reasons why Latin America has intensified its extraregional relations while relegating regional integration to the background. The next section reviews a number of changes at the centre of the international economy.

III. The new centre and peripheral Latin America in the early the twenty-first century

In the early twenty-first century various changes took place at the centre of the international economy. The first is the advancing tide of financialization and the fragmentation of production chains, driven by large firms globally. The second is China’s national development strategy and the rise of its economy to take a central role in production, trade and the generation of technical progress.

Chesnais (1995, 1996, 2003 and 2005), Epstein (2001), Belluzzo (1997), Tavares and Melin (1997), Plihon (2005), Aglietta and Rebérioux (2005), Aglietta (2006), Carneiro (2007), Palley (2007) and Guttman (2008) analyse the topic of financial dominance, finance-dominated capitalism, globalized finance or the phenomenon of financialization. Late twentieth century capitalism has witnessed a predominance of the logic whereby the maximization of share values and dividend payments take precedence over any other objective of firms, workers and States. Gains for shareholders (who can easily sell their shares) in the shortest possible time are imposed as a top priority among the managers of the different corporations. Financial logic, therefore, subordinates and controls the production domain. The consequences of this process are analysed in various studies that address this issue.⁹

The key point is the preponderance of the goal of maximizing shareholder value, as the force driving the offshoring of production. Given the sovereignty of this goal, in conjunction with the liberalization of trade and capital flows, the intensification of international competition and the advent

⁸ Medeiros (2010) also proposes two theoretical-political paths for regional integration: “neoliberal” and “progressive”.

⁹ Recently this process has given rise to the proliferation of financial derivatives, in which no physical delivery of goods is required, transactions are purely monetary, and there is no change in the ownership of the underlying assets. As Carneiro and others (2015) have noted, financialization is reaching a peak, as reflected in the inflated and more volatile prices of assets and commodities, the paths of exchange rates, interest rates, credit and the international financial crisis of 2008.

of new communication and logistics technologies, large groups organized the offshoring of production and the creation of vast international subcontracting systems. This makes it possible to exploit a (sometimes highly) skilled labour force in countries with low or very low wages to produce goods and services for sale in advanced countries (Chesnais, 2005, p. 55). Duménil and Lévy (2005) found that foreign subsidiaries used these “subcontracting networks” to successfully maintain the profits and equity values of the firms that embarked on this process.

Milberg (2004) and Chesnais (2016) describe the relationship between financialization and the fragmentation of production chains; and Milberg (2004) notes the “coincidence” between the decline in manufacturing activity in various countries and the expansion of global value chains and outsourcing. Outsourcing and the fragmentation of value chains have enabled firms to increase shareholder returns, sometimes to the neglect of reinvestment in new production capacity.

Alongside this process, the Chinese economy grew exceptionally fast in the early twenty-first century and thus regained its position of international prominence (ECLAC, 2016a). Initially, this was linked to the geopolitical interests of the United States (Medeiros, 1999) and large-scale international industry outsourcing; but later it used the planning State to promote its own strategy of industrialization, urbanization, and development and to forge its sovereignty (Medeiros, 1999; 2006; Belluzzo, 2005; 2006; Carneiro, 2006; De Conti and Blikstad, 2017).

Initially a “peripheral” country, China founded its development on international trade and global value chains. Benefiting from flows of foreign direct investment (FDI) and trade, it thus complemented the strategy of the large international firms and the global production offshoring process; and in the early twenty-first century it showed signs of having become part of a central dynamic hub, rather than a satellite in the United States orbit. Although China continues to depend on United States growth, finance and currency and, partly, on imported technology in the most technology-intensive sectors, a new international economic hub has been created, of which it is a part; and this has major consequences for Latin America (Chiliatto-Leite, 2017).

In the twenty-first century, the meaning of “centre” or “centre-periphery” is based on analytical pillars that invoke production and technology issues, the spillover effects from the centre to its periphery and the role of currency in the international monetary system. It also depends on financial capacity, the political-military condition of the centre and the degree of structural heterogeneity of its economies. On this conceptual basis, there is much discussion about the conditions under which China rose with some (but not all) of the characteristics of the centre (Chiliatto-Leite, 2017). Based on this general understanding, this section describes the typical relationship of the centre-periphery relations between China and Latin America, highlighting the following aspects: (i) the capacity to boost the region’s growth with spillover effects; (ii) the trade and production relationship; and (iii) financial flows (in particular FDI). An understanding of China’s relationship with Latin America and its specific production structure will make it possible to analyse the deepening of extraregional integration and the difficulties of integration within the region.

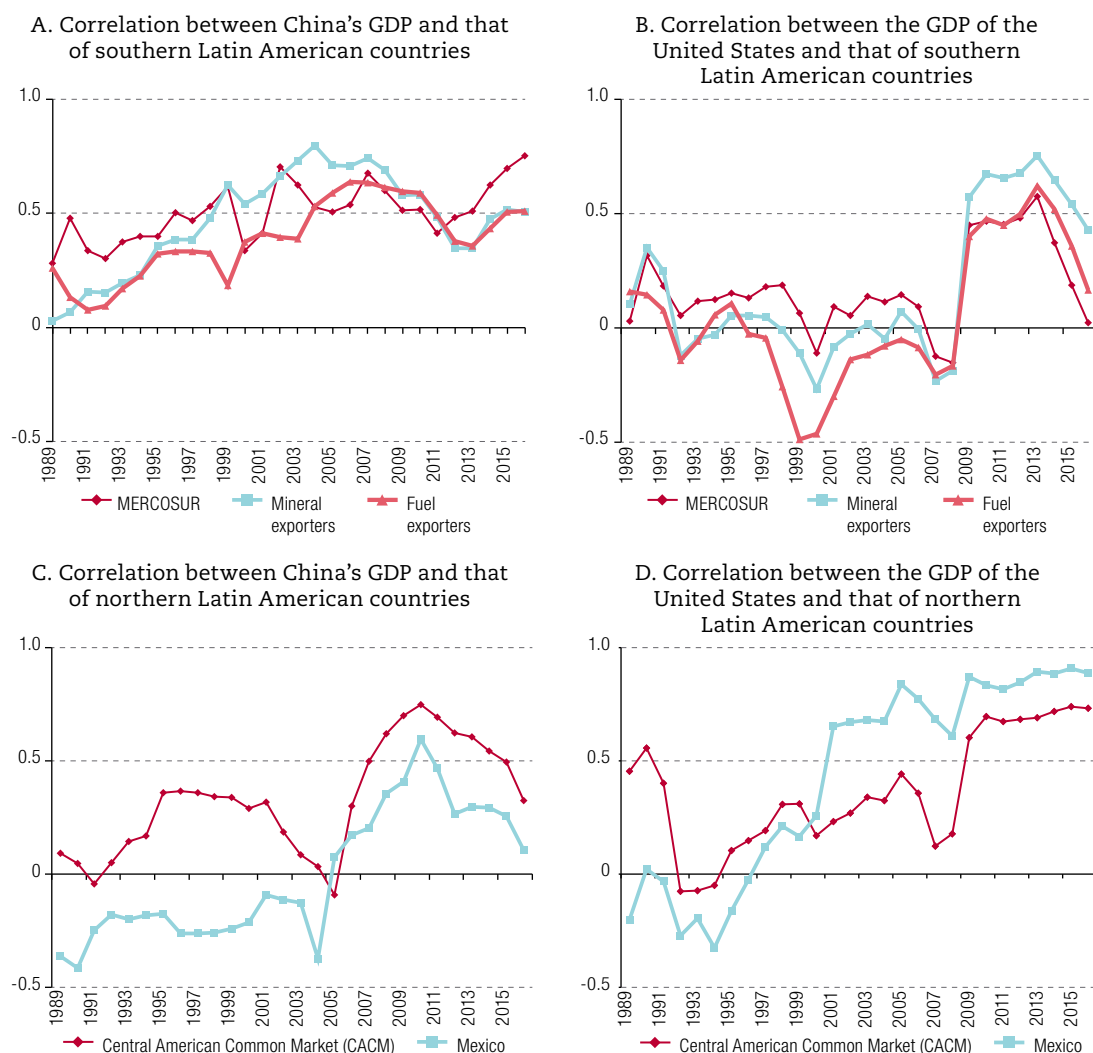
The aim is to understand how changes in the centre, specifically the China link, have affected one part of the periphery, Latin America. While the international commodity and liquidity cycles generated in the centre eased Latin America’s external constraint (Medeiros, 2015), they also served to reproduce its existing production structures (ECLAC, 2012). The formation of this new centre and the reproduction of the production structures in the region’s development patterns are at the core of hypotheses that seek to explain the difficulties of Latin American regional integration in this study.¹⁰

¹⁰ For the United States view of China’s rise in Latin America, see Gallagher (2016). This article examines the new central player (China) and leaves the traditional centre (the United States) in the background. However, China is advancing into trade, financial and political spaces that were traditionally occupied by the United States; and Chinese bilateral financing already outweighs flows from the multilateral banks led by the United States (Gallagher, Irwin and Koleski, 2012).

The first strand of the argument that China built a new centre-periphery relationship with Latin America is that country's capacity to radiate growth through spillover effects. According to data from the International Monetary Fund (IMF), in 2015 China accounted for 15.5% of global gross domestic product (GDP) and more than 230% of the GDP of Latin America and the Caribbean. In addition to comparing the size of these economies, figure 1 displays the correlation between China's GDP growth and that of various Latin American countries, which generally increased in the different groupings, albeit with varying intensity. The main differences reflect development patterns, in terms of the production structure and international position, so they were affected differently by the expansion of Chinese demand and by commodity prices, as reflected in the correlation between growth paths.¹¹

Figure 1

China, United States and Latin America (selected countries):^a GDP correlations, 1980–2015
(Rolling averages, 10 years of annual growth, in percentages)



Source: Prepared by the author, on the basis of International Monetary Fund (IMF).

^a Southern Common Market (MERCOSUR): Argentina, Brazil, Paraguay and Uruguay; Mineral exporters: Chile, Peru; Fuel exporters: the Bolivarian Republic of Venezuela, Colombia, Ecuador and the Plurinational State of Bolivia); and Central American Common Market (CACM): Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua.

¹¹ Although it is well known that correlation is not causation, it does serve as a pointer in the debate, in which these data are presented in an analysis that combines both theoretical and historical elements to construct an argument.

In the southern Latin American countries particularly, the stronger correlation with the growth of Chinese output has been relatively homogeneous and clear. Both in the MERCOSUR countries and in the mining and fuel-exporting countries, the correlation with China has strengthened significantly, even though the 2008 crisis generated a good deal of noise in the indicators. This crisis, which had its epicentre in the United States, spread worldwide and caused growth in most countries to collapse, after which the correlation became high and positive. While the correlations with China increased, those between southern Latin America and the United States displayed relatively haphazard or even declining paths compared to the pre-crisis period.

In the northern countries of Latin America, the correlation with China is also increasing, but with a different profile from that of the South. In Mexico specifically, the correlation strengthened during the commodity boom, owing to indirect spillover effects (derived either from commodities or from other countries that grew alongside China), since China's relations with Mexico did not develop as robustly as in the South. In the Central American countries (Central American Common Market (CACM)), although the correlation with China generally increased over the period, there were significant differences between the individual countries (which are concealed in the average shown in figure 1), and the path was not homogeneous.

The differentiation between the countries of the North (Central America and Mexico) and the South in the correlation analysis sheds light on the former's relationship with the United States. In the case of Mexico, the increase in correlations with the United States is clear to see, and reflects the deepening of integration after NAFTA in the 1990s. Correlation rates in Central America were also consolidated at high levels, as most countries became more closely integrated with the United States.

The effects of the growing importance of Chinese output growth on the region's countries are similar to those obtained by Cesa-Bianchi and others (2011), who made estimates for some of the region's largest economies (Argentina, Brazil, Chile, Mexico and Peru) in 1980–2010. According to these authors, this likely stems from the greater depth of the region's trade and production relations with China; but it is also seen as an indirect result of commodity prices or China's deeper relations with Latin America's traditional partners (such as the United States and Europe), which probably transmit the Chinese cycle to the region. Moreover, in the case of Mexico, the indirect effects are more prevalent than in the other countries, reflecting differences in development patterns and in the economies' international engagement.

The second aspect to be highlighted in a putative centre-periphery relationship with China concerns the region's trade patterns with that new participant in the central economy. The reproduction of existing production structures (ECLAC, 2012) reflects a deepening of relations between the region and China, which has become a dynamic hub. According to ECLAC (2016c), in Latin America's development patterns, the technological-intensity profile of trade relations changes according to the geographical destination of the products, such that in many cases regional trade has a higher technological content than trade outside the region, while the opposite is the case in relations with Asia.

The quality of the relationship between China and Latin America is similar to the traditional model of centre-periphery relations — that is an asymmetrical trade pattern in which Latin America (especially the South) imports more technology-intensive manufactures and exports commodities. ECLAC (2016c) highlighted the asymmetry of this trading relationship, in which Latin America exports a small number of natural-resource-based products while purchasing a wide range of products of higher technological content. Given this profile, the difference in the relationship between the countries of the north and south of Latin America and China is not surprising, because the Southern countries export commodities, whereas the north buys inputs for its maquila and competes directly in the United States market with the final product manufactured in Asia.

The third key feature of China's relationship with Latin America — and is also related to the quality of the trade and production relationship — is FDI flows. China is striving to consolidate its position in the regional (and global) financial architecture; and it is pursuing a strategy of expanding bilateral and

multilateral credit operations in Latin America, which are also typical features of a centre economy relative to its periphery.¹² From this standpoint, it seems clear that China has expanded its influence in the region and is now a major player.

ECLAC (2016c) made its own estimates to obtain a more accurate notion of the real importance of Chinese FDI flows to Latin America. Although there are many dimensions to this debate, the estimates objectively highlight the magnitude and profile of the flows, which are concentrated in natural resources.

Between 1990 and 2009, Chinese FDI flows to the region totalled about US\$ 7 billion. In 2010, the year of largest inflows, the figure was almost double the cumulative flow in that period, amounting to US\$ 13.7 billion (equivalent to 11% of total FDI flows to the region that year). In the ensuing years, from 2011 to 2015, FDI flows varied between US\$ 6 billion and US\$ 10 billion per year (about 3% to 8% of total flows). In addition to the increased amount, the strategic profile of flows into the region is highly concentrated in natural resources. Nearly 90% of China's post-2009 FDI flows went to natural resources, whereas just 25% of total FDI in Latin America and the Caribbean targeted this sector (ECLAC, 2016c). Flows from Chinese firms have therefore increased in the recent period and have been largely directed towards natural resources, thus reproducing the previous trade pattern and indicating China's clear strategic interest in Latin American commodities.¹³

To summarize these three typical elements of the centre-periphery relation, China has gained increased capacity to cause spillover effects in Latin America, so Chinese GDP growth has become more closely correlated with that of the region. China's trade pattern with Latin America is asymmetric and similar to the classic centre-periphery model; and there are increasing FDI flows from China to Latin America, concentrated in natural resources.

In addition to this classical centre-periphery pattern, there are major developments in the way Latin America relates to the central economies on the global scale, now reconfigured by the rise of China. One interesting feature concerns the prices of manufactures versus those of commodities, or the terms of trade. This has changed the challenges and "principal problems" that were discussed by Prebisch in the twentieth century, since, while commodity prices have trended up (between 2003 and 2011) and have been volatile, China has driven down the prices of manufactured goods, as will be discussed below. In addition to the classical features of the centre-periphery model, a new configuration can thus be seen in the centre of capitalism that has defined a new reality for peripheral economies in the twenty-first century.

One of the key elements of Prebisch's twentieth-century centre-periphery model was based on the fact that productivity growth in the industrialized countries was not lowering the prices of manufactured goods relative to commodities, so the neoclassical mechanism whereby the fruits of technical progress spread throughout the world failed to operate. Given the conditions of competition and the fact that profits and wages in the industrialized countries were sustained through successive business cycles, in the economies that led technical progress and controlled technology, the price of manufactured goods relative to raw materials did not fall over the years. Thus, the fruits of technical progress could not be transmitted to the peripheral countries (producers of commodities and consumers of manufactures). Unlike conventional theory, which postulates specialization based on comparative advantage, the fruits of technical progress were thus absorbed mainly in the centre.

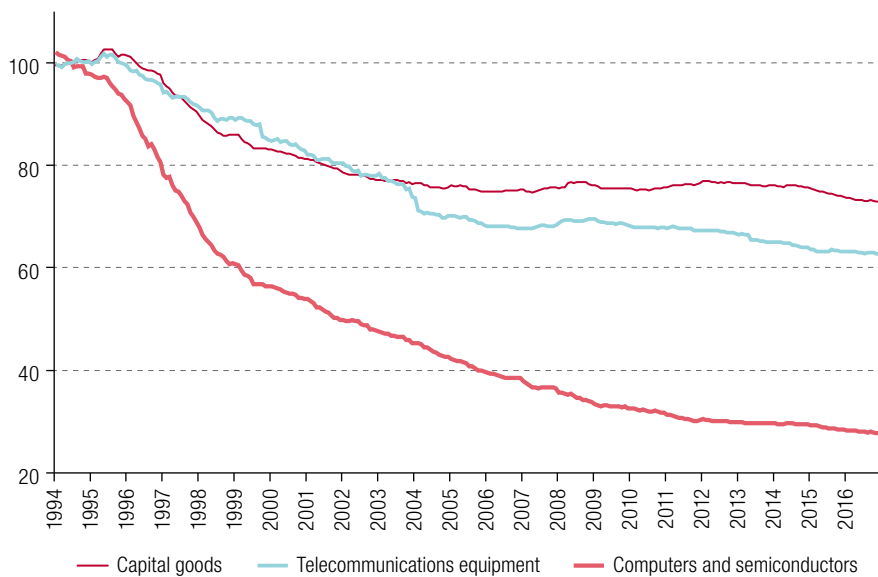
¹² Aspects of the financial architecture, the construction of new development banks centralized in China and the growing volume of Chinese lending to Latin America are gaining increasing importance; and they are crucial in addressing the qualities that place China at the centre of the world economy more generally. This article only considers aspects related to FDI flows in more detail, owing to the limited space available.

¹³ For further details on China's FDI strategy (both inward and outward), see OECD (2008) and Davies (2013). In a more recent study, De Conti and Blikstad (2017) note that, while FDI continues to flow predominantly to natural resources, there are also increasing flows and projects targeted on markets and profits. This may also reveal a strategy to create captive demand for Chinese inputs and capital goods in Latin American markets.

It is curious that China displays the characteristics of a centre for Latin America; but given the global reorganization of production chains, in conjunction with Asian scale, productivity, logistics and low wages, the emergence of China in the new centre has also played a role in reducing the prices of manufactured goods. At the same time, it also fuelled an upswing in commodity prices, which then faded and revealed their volatility (leveraged and made even more volatile by financialization).

Ocampo (2007) and UNCTAD (2011) have described rising commodity prices in the long cycle; and Hiratuka and Sarti (2015) have reported falling prices among manufactured goods. Figure 2 displays the price indices of manufactures imported by the United States, which serve as an indicator of the declining trend in the prices of industrialized products on international markets. This information completes the argument that, while the early twenty-first century has witnessed upward and volatile pressures on commodity prices, those of manufactured products have indeed fallen.

Figure 2
United States: prices of imported manufactures, January 1994–December 2016
(Average index 1994=100)



Source: Prepared by the author, on the basis of Bureau of Labor Statistics (BLS).

This change in the centre-periphery relationship does not mean that specialization in natural resources is now justified, because this would ultimately validate the argument that productivity increases can be redistributed from the centre to the periphery by reducing the prices of manufactured goods. There are several factors that continue to make commodity export specialization problematic. First, an analysis of value chains shows that these include stages with higher technology and knowledge content, which are difficult to replicate and therefore involve higher wages, and continue to be located in the central economies (Hiratuka and Sarti, 2015). Second, the rise in commodity prices relative to those of manufactured goods is not yet clearly established. With the end of the commodity cycle consolidated, the price trajectories of manufactured products and commodities need to be assessed more carefully to see whether more technology-intensive products have maintained their capacity to protect prices and incomes better than commodities. The sharp economic and income slowdown in commodity-producing countries suggests that the problem persists. Third, after 2014 it became clear that the new centre was in fact able to produce a cycle of rising commodity prices; and that commodity price trends, which are more prone to financial shocks, were more volatile and therefore persistently

vulnerable to price-setting abroad. International trade data from the United Nations International Trade Statistics Database shows that manufacturing flows were larger and remained more dynamic even after the international crisis. This confirms that Latin America will remain at a disadvantage as long as commodity specialization persists.

Lastly, Gallagher and Porzecanski (2010) argue that China is threatening Latin America's manufactured exports both to the rest of the world and within the region itself. While China and the dynamics of the new centre have boosted demand for the region's exports and pushed up their prices, thereby fuelling foreign exchange inflows through trade, China has also captured manufacturing markets in Latin America and has fostered a reprimarization of the region through two channels — namely the incentive to invest in commodity-producing sectors (ECLAC, 2012; Rocha, 2015) and its high competitiveness and threat to Latin American manufacturing exports.

Gallagher and Porzecanski (2010) estimate the “threat analysis” based on the methodology developed by Lall, Weiss and Oikawa (2005). A direct threat is identified as when China gains a market share in exports of a certain product to a specific market at the same time as Latin America loses it; while a partial threat arises when China and Latin America both gain market shares but China expands more rapidly. Based on these two definitions, Gallagher and Porzecanski (2010) estimate that Chinese posed a significant threat to manufactured products in Latin America in 2000–2006. China either gained international and domestic markets that were previously served by Latin American manufactures, or else it outpaced Latin America in terms of selling manufactured goods (see table 1).

Table 1
Latin America: manufacturing exports “threatened” by China, 2000–2006
(Percentages)

A. Exports to the world “under threat”				B. Exports to Latin America “under threat”			
Country	Direct threat	Partial threat	Total	Country	Direct threat	Partial threat	Total
Argentina	37	59	96	Argentina	40	28	68
Brazil	20	70	91	Brazil	9	36	45
Chile	29	53	82	Chile	28	64	91
Colombia	15	66	81	Colombia	21	47	67
Costa Rica	36	60	96	Costa Rica	27	69	95
Mexico	70	28	99	Mexico	32	46	78
Latin America and the Caribbean	62	31	94				

Source: K. Gallagher and R. Porzecanski, *The Dragon in the Room: China and the Future of Latin American Industrialization*, Palo Alto, Stanford University Press, 2010.

The rise of China as a central player in the global economy has boosted the demand for commodities; but it has also built a relationship that is more complex than the classical centre-periphery relations of the twentieth century. This is because it is also tending to lower the price of manufactured products, compete for manufacturing markets and make the task of diversifying production, with greater industrialization, much more difficult. In addition to the dramas of the past, the twenty-first-century centre-periphery approach has to face competition from low industrial prices in Asia and the consequent heightened risk of deindustrialization and reprimarization in economies that had succeeded in industrializing in the twentieth century, in a deeply financialized international economy with more volatile commodity prices.¹⁴

¹⁴ Although this article does not enter into the deindustrialization debate, it draws on that rich literature, such as Rowthorn and Wells (1987), Palma (2005), Rocha (2015) and Rodrik (2016).

IV. Latin American integration in the early the twenty-first century

It is important to recognize the existence of regional heterogeneities within Latin America. In the north, the Mexican and Central American economies are characterized by industries with a high import content, serving demand from the United States; while production structures in the economies of the South are biased towards natural resources. Nonetheless in the large MERCOSUR countries the aggregate demand share of commodities (and of exports generally) is less than in the mineral-exporting countries (Chile and Peru) and those that export fossil fuels (the Bolivarian Republic of Venezuela, Colombia, Ecuador and the Plurinational State of Bolivia). The size of the different countries and the importance of their distribution path also vary in the different subregions. Moreover, the production structures and international positioning of the various development patterns did not change in the early twenty-first century — a period characterized by the transformation of central capitalism, increased financialization, the commodity price boom, the emergence of China as a central player in the international economy and the development of a centre-periphery relationship with Latin America, as described above. In short, while the characteristics of the maquila industry were maintained in the North, types of natural-resource dependency were preserved in the South. Furthermore, during this period political leaders tended to prioritize social issues and cherish the idea of changing production structures and increasing regional trade and production integration. However, despite making social progress, the region's production structure and its international position remained unchanged, so regional integration also failed to advance in consonance with the rhetoric.

The combination of the structural and integration issues completes the argument proposed here that integration objectives were not achieved and that integration was therefore constrained. Regional integration is evaluated from a trade and production standpoint using data on total trade, followed by value-chain indicators, using flows of value added and trade in intermediate goods.

There was clearly an absolute increase in total values traded at the regional level, with an interesting dynamic in which income growth, resulting from the expansion of activities linked to the export of commodities to the rest of the world, fuelled an expansion in regional trade, especially in manufactured products. This issue has been analysed by Hiratuka and Cunha (2011) for the specific case of Brazil. These authors note that apart from the growth in agricultural and mining exports, the expansion of international trade also indirectly affected Brazilian manufactured exports, because South American countries benefited from terms-of-trade gains and also started to import more manufactured goods from Brazil. This represents a procyclical effect of regional integration.

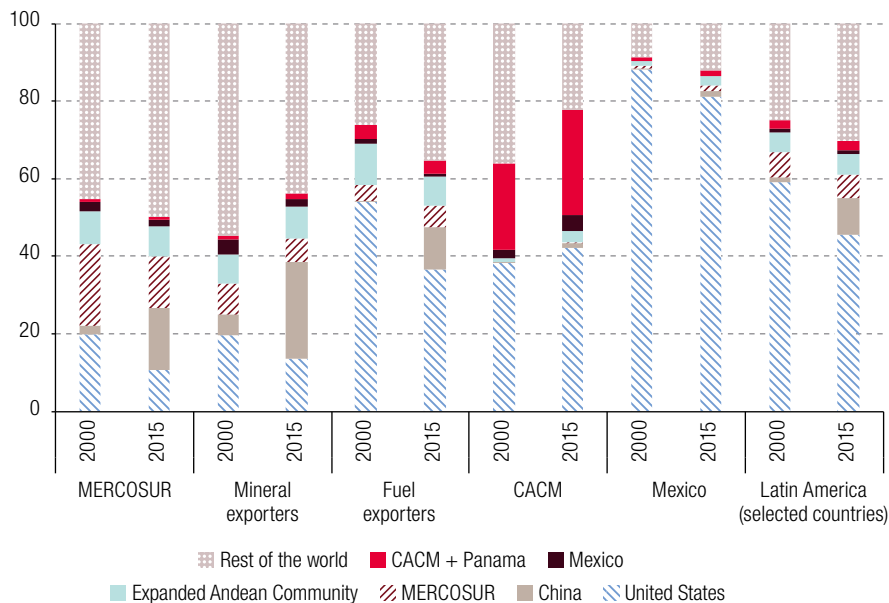
However, the results show a loss of relative trade share or, in some cases, very small growth. Thus, despite absolute growth, figure 3 shows that the region's relative share fell in nearly all of the selected development patterns.

In the southern part of Latin America, the absolute and relative growth of trade with China is the most salient feature, both in MERCOSUR and in the mineral- and fossil-fuel exporting countries. While growth in intragroup and intraregional trade increased considerably in absolute terms in the period under review, the total trade of these country groupings grew by more, so the relative importance of intragroup and intraregional trade declined. This reflects the fact that trade growth was mostly extraregional, while the increase in regional trade was secondary and procyclical relative to the growth of the economies in question, following a pre-existing structure of production and trade.

In the South, fossil-fuel-exporting countries were an important exception, with exports to MERCOSUR growing by more than total trade, thereby increasing the share of the Southern Cone countries. This reflects a number of specific influences, such as the growth of Bolivian gas exports to MERCOSUR.

In the north of Latin America, where different production structures compete for the United States market with Asian manufactures, sales to China did not grow by as much as they did in the South. After the Central America-United States-Dominican Republic Free Trade Agreement (CAFTA) was signed, sales from the Central American Common Market (CACM) to the United States grew by more than total CACM trade with the world, so the relative share of the United States increased. In Mexico, the relative share of the United States slipped somewhat, but remained structurally high. The case of CACM is evidence of greater subregional integration, which continued to make headway in the early twenty-first century.

Figure 3
Latin America (selected countries):^a bilateral exports
by country grouping, 2000–2015
(Percentages)



Source: Prepared by the author, on the basis of UN Comtrade - International Trade Statistics Database and R. Hausmann and others, *The Atlas of Economic Complexity: Mapping paths to Prosperity*, 2011 [online] <http://www.tinyurl.com/lf8y4uw>.

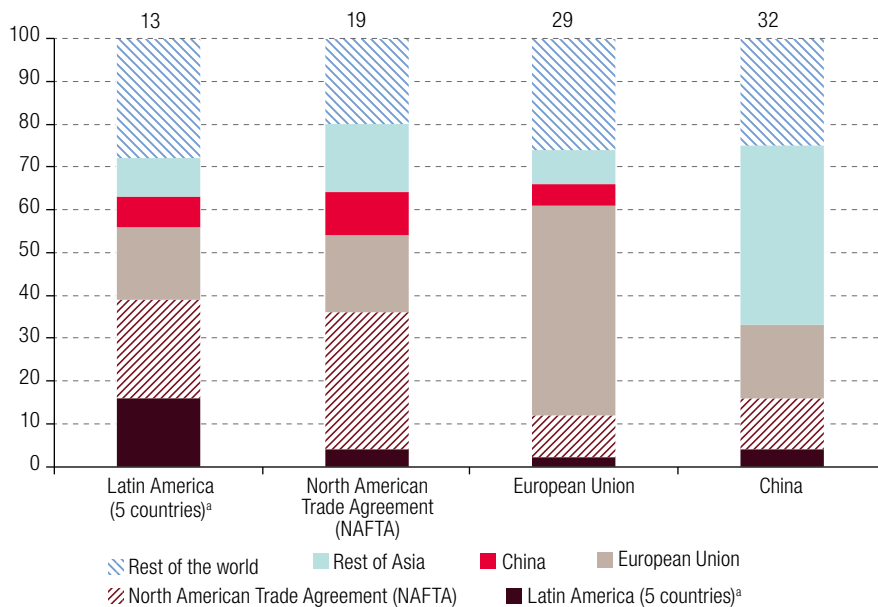
^a Expanded Andean Community (CAN): the Bolivarian Republic of Venezuela, Chile, Colombia, Ecuador, Peru and the Plurinational State of Bolivia; (Latin America (selected countries): Southern Common Market (MERCOSUR) (Argentina, Brazil, Paraguay, Uruguay); mining countries (Chile and Peru); fossil-fuel-exporting countries (the Bolivarian Republic of Venezuela, Colombia, Ecuador, and the Plurinational State of Bolivia); Central American Common Market (CACM) (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua); and Mexico. Data for the Bolivarian Republic of Venezuela in the column for 2015 are taken from the 2014 Atlas. Data for Honduras in the 2015 column are taken from UN Comtrade 2014.

In addition to total trade, data on value added abroad in the upstream and downstream stages of global value chains should also be considered. Then, trade in intermediate goods (excluding commodities) need to be analysed to assess the region's participation in value chains both inside and outside the region.

The shares of Latin American value added in global exports (downstream) and the foreign value added contained in Latin American exports (upstream) indicate a consistently low regional share in global value chains in the early twenty-first century. Data for five of the region's countries (Argentina, Brazil, Chile, Colombia and Costa Rica) that have relatively more developed industries (Mexico is not included because its development pattern is associated with United States value chains) show that in 1995 these contributed less than 2% of value added in world exports and that, in 2011, the share in the later stages was just 3% (ECLAC, 2016b). This generally weak participation in value chains is further aggravated by the fact that a substantial part of the region's value added in the later phases is commodity-based: in 2011, 32% of the region's global value added was contributed by the primary sectors, compared to 17% in 1995. This growth is explained by the increase in demand and rise in prices.

In the case of upstream content, the share of foreign value added in Latin American exports remained low compared to that of other world regions. Based on the same source, figure 4 shows that in 2011 just 13% of the value exported by Argentina, Brazil, Chile, Colombia and Costa Rica was generated abroad, compared to 19% in the NAFTA countries, nearly 30% in the European Union and 32% in China.

Figure 4
Selected world regions: regional distribution of foreign value added contained in exports, 2011
(Percentages of exports)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), *Latin America and the Caribbean in the World Economy, 2016* (LC/G.2697-P), Santiago, 2016.

Note: Share of world value-added in exports, preliminary phases (percentage shown at top of each column).

^a Argentina, Brazil, Chile, Colombia and Costa Rica.

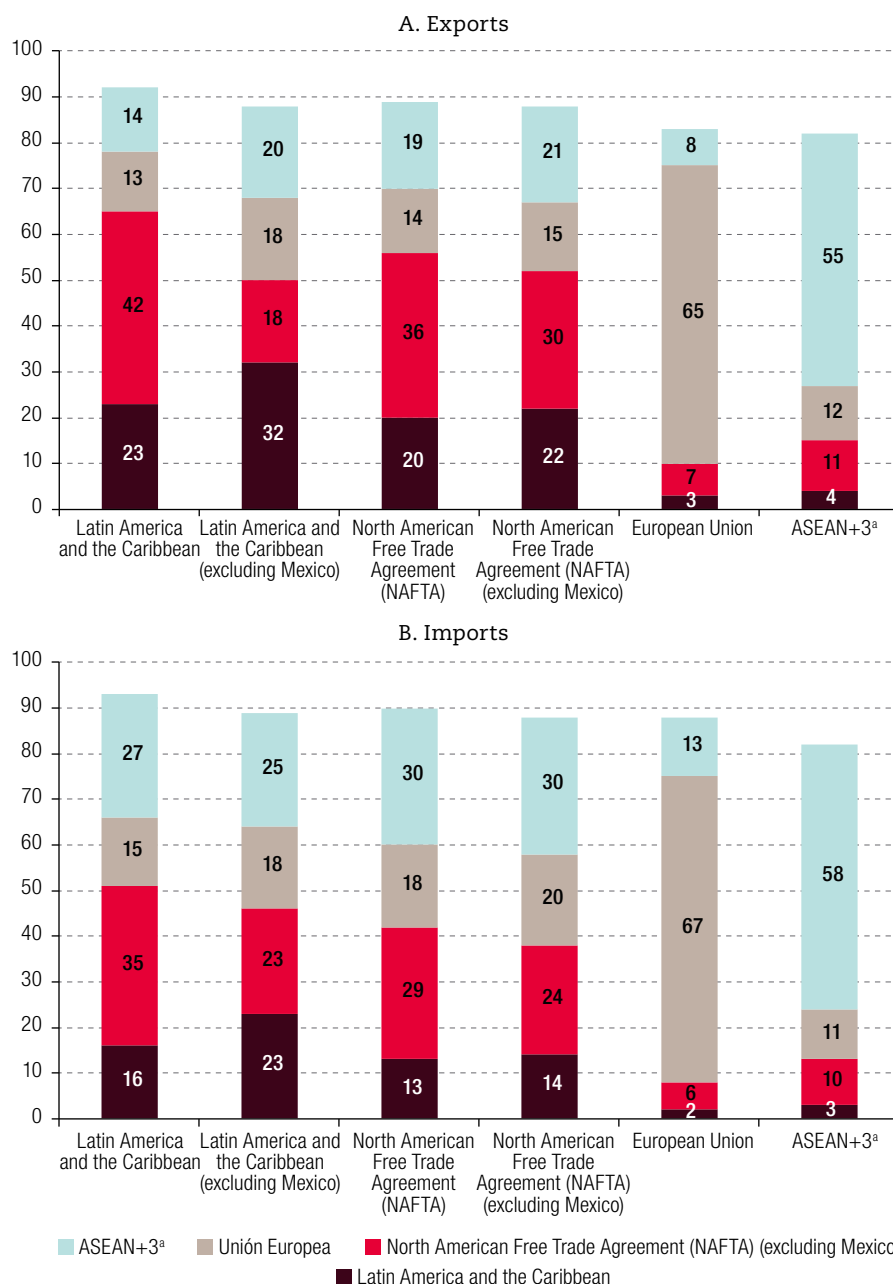
One of the characteristics of global value chains is their regionalization; and from this perspective too, Latin America lags behind other regions. In a world of fragmented production, the region does not participate massively in global and regional value chains and few value chains have been constituted in the region. Figure 4 shows that, of the meagre foreign value added contained in exports by Latin American countries (the 13% mentioned above), only 16% was generated within the region. In the rest of the world, the regional nature of value chains is evidenced by the fact that the intraregional share of export value added was 32% in the case of NAFTA, 49% in the European Union and 42% in China.

Data on intermediate goods trade for the region as a whole reinforce observations based on the flows of value added contained in exports, which were limited to five Latin American countries. Figure 5 shows the values of intermediate goods trade (excluding commodities) for Latin America and the Caribbean,¹⁵ and also for NAFTA, the European Union and the Association of Southeast Asian Nations (ASEAN) plus China, Japan and the Republic of Korea, in order to compare the flow of intermediate goods trade within the country groupings. A greater flow of trade in intermediate goods within a region itself will indicate a higher prevalence of regional production chains. Figure 5 shows that Latin America and the Caribbean was the region in which value chains were the least regionally integrated of all of the selected groupings. In the region's trade in intermediate goods (excluding commodities), 23% of its exports were intraregional if Mexico is included and 32% if it is not; on the import side, those figures

¹⁵ Based on ECLAC data prepared by Durán Lima and Zaicever (2013), intermediate goods are defined according to the Classification by Broad Economic Categories (BEC), together with technological-intensity criteria. In practice, the database excludes commodities (which appear as "semi-finished intermediate goods" in another category) from the total number of intermediate goods.

stood at 16% and 23%, respectively. For comparison, in the European Union the equivalent flows were much larger than those of Latin America, at 65% and 67%, respectively. Similarly, in the group comprising ASEAN, China, Japan and the Republic of Korea, the figures were 55% and 58%, while in NAFTA they attained 36% and 29%, respectively.

Figure 5
Selected world regions: regional structure of trade in intermediate goods (excluding commodities)
by destination and origin grouping, average 2010–2011
(Percentages)

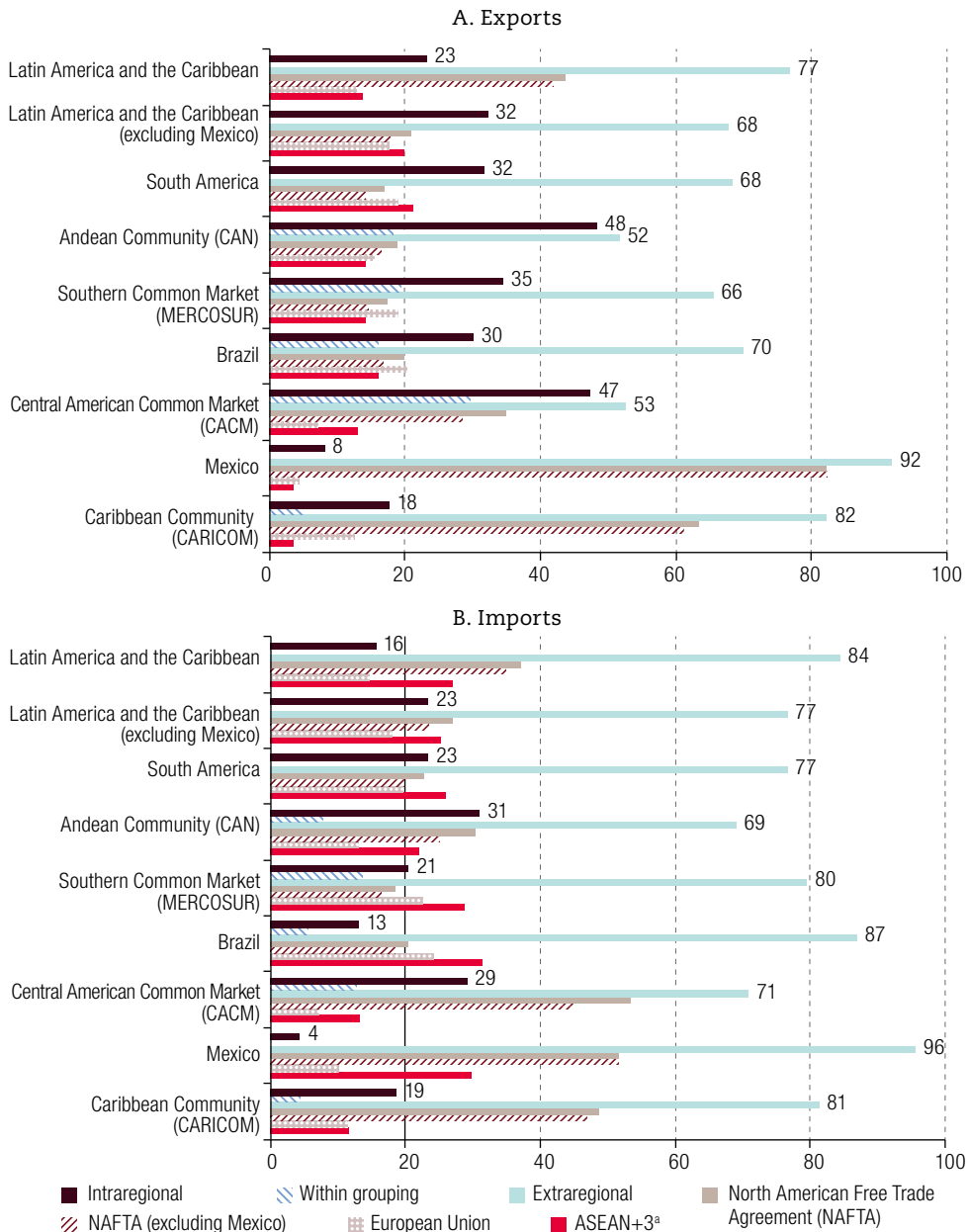


Source: Prepared by the author, on the basis of J. Durán Lima and D. Zaicever, "América Latina y el Caribe en las cadenas internacionales de valor", *International Trade series*, No. 124 (LC/L.3767), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), 2013.

^a Association of Southeast Asian Nations (ASEAN) plus China, Japan and the Republic of Korea.

By disaggregating the region's share in intermediate goods trade by destination and origin (using the same concept of intermediate goods excluding commodities), figure 6 shows the structure of intermediate goods exports and imports by destination and origin grouping. Once again, the degree of regional and subregional integration is low; and it is clear that Latin America has generally kept its production structure more closely aligned to extraregional groupings than to regional ones.

Figure 6
Selected world regions: disaggregated regional structure of trade in intermediate goods (excluding commodities) by destination and origin grouping, average 2010–2011 (Percentages)



Source: Prepared by the author, on the basis of J. Durán Lima and D. Zaclicever, “América Latina y el Caribe en las cadenas internacionales de valor”, *International Trade series*, No. 124 (LC/L.3767), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), 2013.

^a Association of Southeast Asian Nations (ASEAN) plus China, Japan and the Republic of Korea.

While Mexico has the highest rates of participation in extraregional value chains, the intermediate goods (exports and imports) of both the Andean Community and MERCOSUR in South America is also greater with extraregional groupings than within Latin America. This means that the historical pattern of participation in extraregional value chains or, in general, a deeper productive relationship with countries outside the region, is a structural feature that still endures. In the case of imports, the extraregional origin of intermediate goods is even more prevalent and reflects the fact that Latin America's production structures are less able to meet the demand for higher-technology parts and components and therefore have a greater need to source inputs from outside the region. These data show that it has been impossible to construct a new profile for trade and production integration in the region in the early twenty-first century.

Castilho (2012) argues that, while production integration is weaker in Latin America than in other regions of the world, the low transaction costs (reflecting geographical and cultural proximity) and the regional strategy pursued by some multinational firms have helped generate a considerable degree of production integration between neighbouring countries. Within MERCOSUR, Brazil and Argentina are the countries most deeply integrated in global trade flows in finished goods, parts and components.¹⁶ Moreover, part of the manufacturing industry of these countries has consolidated a significant degree of production integration, as exemplified by the automotive industry.

Also according to Castilho (2012), although Latin America is less integrated into global value chains than other regions of the world, the share of regional exports of components, parts and fittings in total exports is greater in regional sales.¹⁷ In other words, while production integration globally and regionally are relatively weak, it is greater at the regional level when measured as the share of total exports. This means that regional exports are more highly processed than extraregional ones and that the region's production integration is greater within the region than outside it (where commodity flows are substantial).

Castilho's conclusion (2012) is based on the weight of intermediate goods —parts, components and capital goods (also excluding commodities)— in total exports. Thus, when comparing the intermediate goods share of total exports, these extraregional flows are proportionately smaller, because commodity sales are much larger outside the region than inside it. Thus, using the data presented here, in conjunction with Castilho's conclusion (2012), a picture emerges of extraregional production integration which is more substantial in absolute terms, but, in proportion to total bilateral trade, reveals a greater relative share of intermediate goods at the regional level. This supports the idea that regional integration in industrial production chains could be deepened, and therefore regional flows of more technology-intensive intermediate goods could be increased in absolute terms.

Lastly, it can be argued that weak regional integration reflects the production structures that exist. The reproduction of commodity-intensive and less industrially diversified production structures, in the context of an international capitalism in which production processes are fragmented, has prevented further regional integration. The southern portion of Latin America displays a pattern of commodity-intensive or low-technology goods, which was stimulated by the commodity price boom; while the north of Latin America exports industrialized and more technology-intensive goods, but is productively integrated into United States value chains. Thus, Latin America's total regional trade and its intermediate goods trade cannot be at the same level as those of Europe, the group formed by ASEAN plus China, Japan and the Republic of Korea, or NAFTA. In contrast to Latin American development patterns these three groupings have succeeded in developing regional industrial value chains that are more technology-intensive and hence more regionally integrated. Commodities produced in the South cannot be absorbed by markets in the South, so they are sent to markets outside the region.

¹⁶ Excluding the Bolivarian Republic of Venezuela and Mexico, because the former has exports that are highly concentrated in oil, and the latter is integrated into extraregional value chains, basically with the United States, in its maquila strategy.

¹⁷ In the case of Castilho's study (2012), the region means LAIA.

The northern maquila industry receives inputs from the United States itself (with increasing flows also from Asia in recent times); and the finished goods are destined mainly for the United States or, at times of more intense competition, for markets elsewhere.

Based on the European example, Dullien (2010) notes that the most successful cases of production integration involve countries that are included in the production networks of a larger number of sectors, which therefore have a more diversified production structure. The author also notes greater production integration among countries with higher and more similar relative development levels. Furthermore, a dynamic analysis of the changes that occurred in Europe between 2000 and 2010 shows that production integration was driven by the interests of large industries (especially German ones), which outsourced their production to countries on the European periphery. Thus, the experience of European production integration again shows that integration reflects the production structure.

The reality in other regions reinforces the thesis that the weakness of regional integration in Latin America mainly reflects the commodity export production structures that deepened in the early twenty-first century, in the case of the South, or the reproduction of the maquila strategy in the North, which intensified the development of value chains integrated with those of the United States. Thus, the lack of structural change towards greater industrial diversification, as opposed to the production of commodities, in the early twenty-first century largely explains the constraints on regional trade and production integration, despite the political will that exists to construct it.

Considering regional integration requires thinking about structural change. Moreover, in periods of rising commodity prices, commodity-related assets become relatively more profitable than other activities, particularly more knowledge- and technology-intensive ones (ECLAC, 2012). Commodity boom periods, such as the early twenty-first century, strongly attract private investment into primary activities. Sectoral and macroeconomic policies need to be better coordinated at the national and regional levels, in order to generate economic incentives to elicit structural change and consolidate a more integrated regional trade and production space.¹⁸ The commodity cycle ended without a regional market consolidating strongly enough to achieve self-sustaining growth; external vulnerability was clearly revealed, and progressive projects in the region came under threat, even jeopardizing the social progress achieved in the early years of the century.

V. Final remarks

This article has addressed a number of aspects of regional integration, taking into account the changes that have occurred at the centre of the international economy, together with the heterogeneity of Latin America and the way in which the region's production structures reproduced themselves in the early twenty-first century. Although the expansion of international liquidity and the rise in commodity prices in the early part of the century eased Latin America's external constraint, these same factors provided a strong incentive for the maintenance of existing production structures (or even for reprimarization), which proved stronger than the efforts made by some countries to formulate industrial diversification policies.

Faced with this reality of production structures in the early twenty-first century, the article began by describing a new regional order in Latin America, fostered by a political moment characterized by the emergence of left and centre-left governments, dubbed the "pink tide". This process gave rise to a new Latin Americanist regional order that was different from the Pan-Americanism prevailing earlier, which, however, lacked homogeneous strategies.

¹⁸ The difficulty in furthering regional integration is also explained by the fragility of the industrial policies implemented; but that goes beyond the scope of this article. For the Brazilian case, see Carneiro (2017) and Mello and Rossi (2017). A number of industrial policy weaknesses, in adverse macroeconomic contexts, obstructed a process of structural change that would have led to greater regional integration. This reinforces the view that the economic incentives for reproducing existing structures outweighed forces for structural change.

The article then described the transformations that have occurred at the centre and, in particular, the way in which the new central player in the international economy, China, developed a particular centre-periphery relationship with Latin America. This involves an asymmetrical form of bilateral trade, in which the region imports industrialized products and exports commodities. It also noted that Chinese direct investment flows into the region were also strategically targeted on raw materials. In addition to this asymmetry, which is reminiscent of the classic centre-periphery arguments of the twentieth century, additional features were observed in the rise of China and the transformation of the centre of capitalism, particularly the dynamics of commodity prices and those of manufactures.

It was found that, on the one hand, the dynamics of the new centre, of which China is a constituent part, eased external constraints and produced spillovers to the economies of the region: but on the other hand, it also encouraged the reproduction of existing production structures, created new difficulties for industrialization strategies and deepened extraregional engagement. Thus, absent structural change, regional integration remained constrained.

Bibliography

- Aglietta, M. (2006), "The future of capitalism", *The Hardship of Nations: Exploring the Paths of Modern Capitalism*, B. Coriat, P. Petit and G. Schméder (eds.), Cheltenham, Edward Elgar.
- Aglietta, M. and A. Rebérioux (2005), *Corporate Governance Adrift: a Critique of Shareholder Value*, Cheltenham, Edward Elgar.
- Almeida, P. R. (2004), "Uma política externa engajada: a diplomacia do governo Lula", *Revista Brasileira de Política Internacional*, vol. 47, No. 1.
- Amorim, C. (2005), "Política externa do Governo Lula: os dois primeiros anos", *Análise de Conjuntura OPISA*, No. 4, University Research Institute of Rio de Janeiro (IUPERJ), Cândido Mendes University (UCAM).
- Bastos, P. P. (2012), "A economia política da integração da América do Sul no mundo pós-crise", *Observatório da Economia Global. Textos Avulsos*, No. 10, Institute of Economics (IE), Center for Studies of Current Trend and Economic Policy (CECON), State University at Campinas (UNICAMP).
- Belluzzo, L. G. (2006), "As transformações da economia capitalista no pós-guerra e a origem dos desequilíbrios globais", *A supremacia dos mercados e a política econômica do governo Lula*, R. Carneiro (org.), São Paulo, Editora Unesp.
- _____(2005), "Prefácio à edição brasileira", *A finança mundializada: raízes sociais e políticas, configuração, consequências*, F. Chesnay (ed.), São Paulo, Boitempo.
- _____(1997), "Dinheiro e as transfigurações da riqueza", *Poder e dinheiro: uma economia política da globalização*, M. C. Tavares and J. L. Fiori (orgs.), Petrópolis, Editora Vozes.
- Bielschowsky, R. (2016), "Fifty years of ECLAC thought: a review", *ECLAC Thinking: Selected Texts (1948-1998)* ", Santiago, Economic Commission for Latin America and the Caribbean (ECLAC)/Fondo de Cultura Económica.
- _____(2013), "Introdução ao estudo sobre padrões de desenvolvimento em 13 países – esquema analítico", *Padrões de desenvolvimento econômico (1950–2008): América Latina, Ásia e Rússia*, vol. 1. Centre for Strategic Management and Studies (CGEE).
- Calixtre, A. and P. Barros (2011), "Além da circunstância: caminhos da integração regional sul-americana - do MERCOSUL à UNASUL", *Governança global e integração da América do Sul*, R. V. Viana, P. S. Barros, and A. B. Calixtre (orgs.), Brasília, Institute of Applied Economic Research (IPEA).
- Carneiro, R. (2017), "Navegando a contravento: uma reflexão sobre o experimento desenvolvimentista do Governo Dilma Rousseff", *Texto para Discussão*, No. 289, Institute of Economics (IE), State University at Campinas (UNICAMP).
- _____(2007), "Globalização e integração periférica", *Texto para Discussão*, No. 126, Institute of Economics (IE), State University at Campinas (UNICAMP).
- _____(2006), "Introdução", *A supremacia dos mercados e a política econômica do governo*, R. Lula Carneiro (org.), São Paulo, Editora Unesp.
- Carneiro, R. and others (2015), "The Fourth Dimension: derivatives and financial dominance", *Review of Radical Political Economics*, vol. 47, No. 4.

- Castilho, M. (2012), "Comércio internacional e integração produtiva: uma análise dos fluxos comerciais dos países da ALADI", *Texto para Discussão*, No. 1705.
- Cesa-Bianchi, A. and others (2011), "China's emergence in the world economy and business cycles in Latin America", *Discussion Paper Series, IZA*, No. 5889.
- Chesnais, F. (2016), *Finance Capital Today: Corporations and Banks in the Lasting Global Slump*, Historical Materialism Book Series, Boston, Brill.
- _____(2005), "O capital portador de juros: acumulação, internacionalização, efeitos econômicos e políticos", *A finança mundializada: raízes sociais e políticas, configuração, consequências*, F. Chesnais (ed.), São Paulo, Boitempo.
- _____(2003), "A 'nova economia': uma conjuntura própria à potência econômica estadunidense", *Uma nova fase do capitalismo?*, F. Chesnais and others (eds.), São Paulo, Xamã.
- _____(1996), *A mundialização do capital*, São Paulo, Xamã.
- _____(1995), "A globalização e o curso do capitalismo de fim-de-século", *Economia e Sociedade*, vol. 5.
- Chiliatto-Leite, M. V. (2017), "Integração constrangida na América Latina: velhos e novos problemas do subdesenvolvimento no início do século XXI", Ph.D. thesis, Institute of Economics (IE), State University at Campinas (UNICAMP).
- Davies, K. (2013), "China investment policy: an update", *OECD Working Papers on International Investment*, No. 01.
- De Conti, B. and N. Blikstad (2017), "Impactos da economia chinesa sobre a brasileira no início do século XXI: o que queremos que sejamos e o que queremos ser", *Texto para Discussão*, No. 292, Institute of Economics (IE), State University at Campinas (UNICAMP).
- Dullien, S. (2010), "Integração produtiva na União Européia: uma perspectiva alemã", *Integração Produtiva - caminhos para o Mercosul*, Série Cadernos da Indústria ABDI, vol. XVI, Brasília.
- Duménil, G. and D. Lévy (2005), "O neoliberalismo sob a hegemonia norte-americana", *A finança mundializada: raízes sociais e políticas, configuração, consequências*, F. Chesnais (org.), São Paulo, Boitempo.
- Durán Lima, J. and D. Zaclicever (2013), "América Latina y el Caribe en las cadenas internacionales de valor", *International Trade series*, No. 124 (LC/L.3767), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).
- ECLAC (Economic Commission for Latin America and the Caribbean) (2016a), *Horizons 2030: Equality at the Centre of Sustainable Development* (LC/G.2660/Rev.1), Santiago.
- _____(2016b), *Latin America and the Caribbean in the World Economy. The region amid the tensions of globalization, 2016* (LC/G.2697-P), Santiago.
- _____(2016c), *Relaciones económicas entre América Latina y el Caribe y China: oportunidades y desafíos* (LC/L.4241), Santiago.
- _____(2012), *Structural Change for Equality: An integrated approach to development* (LC/G.2524(SES.34/3)), Santiago.
- _____(1994), *Open regionalism in Latin America and the Caribbean: economic integration as a contribution to changing productions patterns with social equity*, ECLAC Books, No. 39 (LC/G.1801/Rev.1-P), Santiago.
- Epstein, G. (2001), "Financialization, rentier interests, and central bank policy", unpublished.
- Gala, P., I. Rocha and G. Magacho (2018), "The structuralist revenge: economic complexity as an important dimension to evaluate growth and development", *Brazilian Journal of Political Economy*, vol. 38, No. 2.
- Gallagher, K. (2016), *The China Triangle: Latin America's China Boom and the Fate of Washington Consensus*, New York, Oxford University Press.
- Gallagher, K. and R. Porzecanski (2010), *The Dragon in the Room: China and the Future of Latin American Industrialization*, Palo Alto, Stanford University Press.
- Gallagher, K., A. Irwin and K. Koleski (2012), *The New Banks in Town: Chinese Finance in Latin America*, Inter-American Dialogue.
- Guttmann, R. (2008), "Uma introdução ao capitalismo dirigido pelas finanças", *Novos estudos-CEBRAP*, vol. 82.
- Hausmann, R. and others (2011), *The Atlas of Economic Complexity: Mapping Paths to Prosperity*, Cambridge, Center for International Development, Harvard University.
- Hiratuka, C. and S. Cunha (2011), "Qualidade e diferenciação das exportações brasileiras e chinesas: evolução recente no mercado mundial e na ALADI", *Texto para Discussão*, No. 1622.
- Hiratuka, C. and F. Sarti (2015), "Transformações na estrutura produtiva global, desindustrialização e desenvolvimento industrial no Brasil: uma contribuição ao debate", *Texto para Discussão*, No. 255, State University at Campinas (UNICAMP).
- Lall, S., J. Weiss and H. Oikawa (2005), "China's competitive threat to Latin America: an analysis for 1990–2002", *Oxford Development Studies*, vol. 33, No. 2.

- Medeiros, C. A. (2015), *Inserção externa, crescimento e padrões de consumo na economia brasileira*, Brasília, Institute of Applied Economic Research (IPEA).
- (2010), “Modelos alternativos para la integración sudamericana”, *Integración regional en América Latina: desafíos y oportunidades*, Geneva, United Nations Conference on Trade and Development (UNCTAD).
- (2006), “A China como um duplo pólo na economia mundial e a recentralização asiática”, *Revista de Economia Política*, vol. 26, No. 3.
- (1999), “Economia e política do desenvolvimento recente na China”, *Revista de Economia Política*, vol. 19, No. 3.
- Mello, G. and P. Rossi (2017), “Do industrialismo à austeridade: a política macro dos governos Dilma”, *Texto para Discussão*, No. 309, Institute of Economics (IE), State University at Campinas (UNICAMP).
- Milberg, W. (2004), “The changing structure of international trade linked to global production systems: what are the policy implications?”, *Working Paper*, No. 33.
- Mota Veiga, P. and S. P. Ríos (2007), “O regionalismo pós-liberal, na América do Sul: origens, iniciativas e dilemas”, *International Trade series*, No. 82 (LC/L.2776-P), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).
- Natanson, J. (2009), *La nueva izquierda: triunfos y derrotas de los Gobiernos de Argentina, Brasil, Bolivia, Venezuela, Chile, Uruguay y Ecuador*, Buenos Aires, Debate.
- Ocampo, J. A. (2007), “The macroeconomics of the Latin American economic boom”, *CEPAL Review*, No. 93 (LC/G.2347-P), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), December.
- OECD (Organization for Economic Cooperation and Development) (2008), *OECD Investment Policy Reviews. China 2008: Encouraging Responsible Business Conduct*, Paris, OECD Publishing.
- Palley, T. (2007), “Financialization: What it is and why it matters”, *Working Paper*, No. 525, Levy Economics Institute.
- Palma, G. (2005), “Four sources of ‘De-Industrialisation’ and a new concept of the ‘Dutch Disease’”, *Beyond Reforms: Structural Dynamics and Macroeconomic Vulnerability*. J. A. Ocampo (ed.), New York, Stanford University Press/World Bank.
- Plihon, D. (2005), “As grandes empresas fragilizadas pelas finanças”, *A finança mundializada: raízes sociais e políticas, configuração e conseqüências*. F. Chesnais (ed.), São Paulo, Boitempo Editorial.
- Prebisch, R. (2016), “The economic development of Latin America”, *ECLAC Thinking: selected Texts (1948-1998)*, R. Bielschowsky (comp.), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).
- Rocha, I. L. (2015), *Essays on Economic Growth and Industrial Development: A Comparative Analysis between Brazil and South Korea*, Cambridge University.
- Rocha, M. (2015), “Transformações produtivas e patrimoniais no Brasil pós-crise”, *Dimensões estratégicas do desenvolvimento brasileiro. Brasil: em busca de um novo modelo de desenvolvimento*, vol. 4, Brasília, Centre for Strategic Management and Studies (CGEE).
- Rodrik, D. (2016), “Premature deindustrialization”, *Journal of Economic Growth*, vol. 21, No. 1.
- Rohter, L. (2005), “With new chief, Uruguay veers left, in a latin pattern”, *New York Times*, 1 March.
- Rowthorn, R. and J. Wells (1987), *De-industrialisation and Foreign Trade*, Cambridge, Cambridge University Press.
- Tavares, M. C. and L. E. Melin (1997), “Pós-escrito: a reafirmação da hegemonia norte-americana”, *Poder e dinheiro: uma economia política da globalização*, M. C. Tavares and J. L. Fiori (orgs.), Petrópolis, Editora Vozes.
- Teixeira, R. A. and W. A. Desiderá Neto (2012), “La recuperación del desarrollismo en el regionalismo Latinoamericano”, *Perspectivas para la Integración de América Latina*, W. A. Neto and R. A. Teixeira (orgs.), Brasília, Institute of Applied Economic Research (IPEA).
- UNCTAD (United Nations Conference on Trade and Development) (2011), *Price Formation in Financialized Commodity Markets: The Role of Information*, Geneva.

Challenges for optimizing social protection programmes and reducing vulnerability in Latin America and the Caribbean¹

Javier Bronfman H.

Abstract

This article provides a reflexive analysis of the design and implementation of social protection systems and anti-poverty programmes in Latin America and the Caribbean. It focuses particularly on the expansion of the conditional cash transfer and non-contributory pension programmes implemented over recent decades. The aim of this study is to distil policy lessons and foster debate on the challenges and opportunities that the 2030 Agenda for Sustainable Development currently poses for social protection systems. The article argues that more of the same will not be enough to maintain progress and achieve higher levels of development in the future. Using examples, the discussion turns to the challenges lying ahead under the paradigm of the 2030 Agenda for Sustainable Development. These include excluded groups, life cycle needs, better coordination between sectors and fiscal constraints. It ends with a number of questions to foster discussion and a conclusion with policy recommendations.

Keywords

Social security, poverty mitigation, social policy, 2030 Agenda for Sustainable Development, income, pensions, programmes of action, administrative reform, equality, Latin America and the Caribbean

JEL classification

I3, H0, H4

Author

Javier Bronfman H. holds a degree in Business Administration and a doctorate in Public Administration and Policy from American University, United States, and is Assistant Lecturer at the Faculty of Economics and Business at Andrés Bello University, Chile. Email: javier.bronfman@unab.cl.

¹ The author is grateful for comments on this article received from staff of the United Nations Development Programme (UNDP) and colleagues at the School of Government of Universidad Adolfo Ibáñez, Chile, to which the author was affiliated when this article was accepted for publication. Any remaining errors are the author's own.

I. Introduction

This article provides an analysis of the design and implementation of social protection systems and anti-poverty programmes in Latin America and the Caribbean, in order to learn lessons from the past and improve future policy. The analysis aims to distil policy messages and foster a rich discussion on the challenges and opportunities for a new generation of social protection systems in light of the 2030 Agenda for Sustainable Development.

Although there are various definitions of social protection, all of them agree that social protection systems involve policies and programmes to address poverty and vulnerability. The United Nations Development Programme (UNDP) defines social protection systems operationally as systems that: provide contributory or non-contributory forms of income support that reduce and prevent poverty; ensure access to basic social services to all, especially for groups that are traditionally vulnerable or excluded; stimulate productive inclusion through the development of capabilities, skills, rights and opportunities for the poor and excluded; build resilience and protect people against the risks of livelihood shocks throughout their lifecycle; and help remove structural barriers, including barriers within the household, that prevent people from achieving well-being. (UNDP, 2016c p. 16).

To address inequality in its multiple forms, social protection systems consist of three elements: social assistance, social insurance, and labour market policies (Barrientos, 2011). Inequality can be identified through a matrix consisting of four axes: (i) socioeconomic status; (ii) gender, race and ethnic origin; (iii) stages of the lifecycle, and (iv) territorial heterogeneities (ECLAC, 2016, p. 16). These variables are naturally interconnected; it is easy to see how increasing one can affect the others.

Social protection systems have become prevalent worldwide as a way to reduce and prevent poverty by helping people mitigate their exposure to risks and absorb negative shocks. They have also incorporated human capital investments, promoting human development and breaking free from the existing poverty traps. However, several challenges remain. While social protection systems have potential, the existing programmes are not strong enough to ensure the targets of the Sustainable Development Goals (SDGs) are attained.

Reforms are needed to underpin multidimensional progress and achieve sustainable development. Social protection needs to be expanded and a minimum floor of benefits guaranteed, to mitigate life-cycle risks and protect the region's expanding vulnerable population. Attention also needs to be paid to historically excluded or stigmatized groups (for example indigenous populations, women, and lesbian, gay, bisexual, transgender and intersex persons (LGBTI), addressing structural factors limiting expansion and considering the environment throughout the reform process.

The next section will contextualize Latin America and the Caribbean's regional development status by presenting data on development trends over the past two decades. Section III briefly discusses past social protection reforms, with emphasis on the expansion of conditional cash-transfer (CCT) and non-contributory pension programmes that have been implemented over the past two decades. Section IV discusses a set of key challenges facing the social protection system. The final section concludes.

II. Latin America and the Caribbean: past achievements and development trends

Since the Millennium Declaration in 2000, which defined the Millennium Development Goals, Latin America and the Caribbean has thrived. The region has seen major achievements in terms of poverty reduction, gender parity, improved health status, and overall well-being. According to the Millennium Development Goals Report 2015, Latin America and the Caribbean achieved the

target of halving the extreme poverty rate. The proportion of people living on less than US\$ 1.25 a day fell from 13% in 1990 to 4% in 2015. Access to safe drinking water increased 10 percentage points to 95%, and the number of people without access to basic sanitation has been nearly halved (United Nations, 2015).

Achievements also abound in health outcomes and access to services. The rate of malnutrition fell from 15% in 1990 to 6% in 2015. The under-fives mortality rate dropped sharply, surpassing the two-thirds reduction target. In contrast, maternal mortality remains high in many of the region's countries (United Nations, 2015). Progress has also been made in controlling the HIV/AIDS epidemic; and HIV infections among children have declined as a result of programmes to prevent mother-to-child transmission. Among adults, however, the rate of new infections increased by 3% between 2010 and 2015, with infections still concentrated among gay men, transgender people, sex workers (UNAIDS, 2016), and young people in the Caribbean. School enrolment and labour market participation have both nearly attained gender parity.

However, in most countries there are groups for whom this is not the reality, owing to discrimination on gender, ethnicity, and race. Indigenous and Afrodescendent people, for example, have faced discrimination since the colonization period (ECLAC and others, 2018). Several programmes and initiatives have been put in place since 1948 to recognize their equal rights; nonetheless, these goals remain a key element of the social inequality matrix (ECLAC, 2016). While there has been a focus on gathering better data on these groups, they are still underrepresented in public institutions and overrepresented in the poorest deciles of the income distribution. Moreover, owing to territorial segregation, they often lack access to basic services (ECLAC, 2016); and they are also among the least educated groups, despite efforts to introduce bilingual education in the 1970s (ECLAC, 2016). Other minorities, such as transgender people, are denied legal identification documents that recognize their gender identity, thus preventing them from completing basic education.²

Notably, the Latin American and Caribbean region has more girls than boys enrolled in secondary education — a unique achievement worldwide. Nonetheless, educational achievement does not always translate into opportunities in terms of formal and high-quality employment. Despite the increase in female labour market participation, women still face higher rates of unemployment, underemployment, discrimination, and informality — especially among indigenous people, who also tend to suffer wider gender gaps in the first place. While Latin America and the Caribbean enjoys the highest female representation in parliament among developing regions of the world,³ women are still underrepresented. They are also more likely to live in poverty than men; the ratio of women to men in poor households rose from 108 women per 100 men in 1997 to 117 per 100 in 2012 (United Nations, 2015).

It is also important to recognize that regional successes do not tell the whole story. Reductions in extreme poverty have not been uniform across and within countries or subregions. While extreme poverty in the region as a whole decreased from 12% to 4% between 1990 and 2015, Caribbean countries saw a reduction of 11 percentage points during that time, reaching a level of 22% in 2015. While the latest data report the prevalence of undernourishment regionwide is below 5%, the rate in the Caribbean is 20%.

Since 1990, monetary poverty has gradually declined for most Latin American and Caribbean countries. However, in some cases (such as Colombia, Mexico, Peru and the Plurinational State of Bolivia) poverty increased between 1990 and 2000, before declining until 2015. In Belize, between 2002 and 2009, overall and extreme poverty increased from 34% to 42% and from 11% to 16% respectively

² The fact that a majority of transgender Latin Americans have not completed a basic level of education conflicts with the guarantee for primary education (article 13, para. 2(a) of the International Covenant on Economic, Social and Cultural Rights) (Rachid and Massenzio, 2014, p. 31).

³ Although it is still only 27%.

(Government of Belize/CDB, 2010).⁴ Multidimensional poverty rates also vary significantly between countries.⁵ In Haiti, 50% of the population live in multidimensional poverty; in Barbados and Saint Lucia, the figure is less than 1%.

Even within countries, multidimensional poverty is more prevalent among specific groups. Two recent studies report higher prevalence among the indigenous populations of Chile (Bronfman Horovitz, 2014; Bronfman and Hadad, 2016). Both estimate that the Mapuche people⁶ in Chile suffer much higher rates of multidimensional poverty than the rest of the population, even when controlling for their living standards (Bronfman and Hadad 2016).⁷ These findings support the idea that racial minorities continue to suffer social and economic inequalities that are rooted in the past. These groups need greater recognition, especially in statistical data, to help protect their rights. Brazil, Ecuador and the Plurinational State of Bolivia have recently moved in the right direction by recognizing indigenous people's rights in their respective constitutions (ECLAC and others, 2018).

Many of the 72 million people lifted out of poverty in Latin America and the Caribbean over the past decade have become vulnerable to poverty once more.⁸ According to the latest UNDP estimations, 38.4% of the region's population could fall into poverty in the near future (UNDP, 2016a). This vulnerability is not simply a matter of income, but involves other development indicators as well, possibly reflecting social discrimination (López-Calva and others 2014; UNDP, 2016a).⁹ Much of the population faces high levels of exposure to both idiosyncratic and aggregate shocks — a major concern given the region's high prevalence of environmental shocks and natural disasters. The Latin American and Caribbean region has seen steady growth in the number and severity of natural disasters over the past 50 years (Vargas, 2015), particularly in the Caribbean subregion. Recent events have resulted in significant costs in terms of human lives and economic activity, especially in the agriculture and tourism sectors. In the absence of strong safety nets and access to coping mechanisms, these shocks have the potential to push large swathes of the population back in poverty, thereby giving up previous achievements.

Nonetheless, the countries are recognizing the existing environmental challenges. Many of the region's countries have based their development on the extraction of non-renewable resources — minerals and fossil fuels — while ignoring sustainability and environmental protection. The results have been environmental degradation and ecosystem fragility, including the endangering of valuable natural reserves. This spurs a socioenvironmental conflict that disproportionately affects the indigenous people who live in these territories (ECLAC and others, 2018).

⁴ The poverty figures for Belize are less recent owing to a data availability problem common to the region, particularly in the Caribbean countries.

⁵ In an effort to understand poverty beyond income and recognize that both development and poverty are multidimensional, UNDP, in partnership with the Oxford Poverty and Human Development Initiative, published its first International Multidimensional Poverty Index (MPI) in the *2010 Human Development Report* (UNDP, 2010). This novel measure complements income poverty by considering simultaneous deprivations along three dimensions (education, health, and standard of living).

⁶ The Mapuche are the largest indigenous group in Chile, representing 7.5% of the total population.

⁷ The methodology tailored to estimate the rural Mapuche MPI accounted for differences in living standards by not considering dirt floors as a deprivation and changing the cut-off for water-access deprivation.

⁸ Several studies have examined vulnerability to poverty in the light of recent methodological developments and availability of data. Cruces and others (2010) provide vulnerability-to-poverty estimates for 18 Latin American and Caribbean countries between the early 1990s and mid-2000s. Using different international poverty lines, their results indicate a much higher rate of vulnerability than actual poverty in Latin America. While aggregate vulnerability in the region has decreased over time, individual countries vary widely, and some are left behind entirely. Using household survey panel data, Bronfman Horovitz (2014) explores poverty dynamics in Chile to reveal a high level of vulnerability. For each of the years surveyed (1996, 2001 and 2006), vulnerability significantly surpasses the prevailing poverty estimates.

⁹ LGBT people face the same socioeconomic challenges as others who share their sex, race, ethnicity, age, and disability status. But they also face unique obstacles owing their sexual orientation and gender identity. These include higher risks of youth homelessness, harassment and discrimination at school and in the workplace, and denial of the economic benefits of marriage (Sears and Badgett, 2012).

Governments must recognize the importance of social protection systems as a tool to attain the Sustainable Development Goals. Designing and implementing a social protection floor for the poorest and most vulnerable has become essential, particularly in the context of economic slowdown. Strong, inclusive, and wide-ranging social protection systems need to be built to overcome these difficulties; this can only be achieved if consideration of both social and environmental challenges is at the core of the new generation of policies and programmes.

III. Social protection systems in Latin America and the Caribbean: past and recent developments

As noted above, social protection systems consist of three elements: social assistance, social insurance, and labour market policies. They aim to reduce poverty and vulnerability and are generally financed from general revenues. Examples include conditional and unconditional cash transfers, direct subsidies, non-contributory pensions, and services that are free at the point of use. In contrast social insurance programmes provide mechanisms for coping with shocks; they include contributory pensions, insurance, and federal or private-but-subsidized, fee-based services. Social protection systems are multidimensional and complex, often encompassing several programmes or sectors. They are used to address poverty, both chronic and transitory, and to reduce vulnerability.

The countries of Latin America and the Caribbean have experienced two major waves of reform in their social protection systems. During the early 1990s, several reforms were made to social insurance programmes, particularly the old-age and disability pension systems. These programmes, all heavily dependent on the government's capacity to finance them, had been developed in the 1920s and reformed mid-century, following Bismarck's and then Beveridge's ideas on the welfare state.

The need for adjustment emerged in the aftermath of the 1980s debt crisis. Large deficits generated by social funds fostered widespread adoption of neoliberal economic policies across the region. Several countries changed their defined benefits schemes to defined-contribution and fully-funded systems, while others made parametrical changes to manage the fiscal pressure. In 1981 Chile became the first country to replace the regional pay-as-you-go (PAYG) system with private savings accounts for retirement. Several countries followed suit in the 1990s, some embracing Chile's system (the Dominican Republic, El Salvador, Mexico and the Plurinational State of Bolivia) while others (Argentina, Colombia, Costa Rica, Peru and Uruguay) mixed private accounts with defined-benefit PAYG systems (see Barrientos 2011 and Mesa-Lago 2008 for further details).

The second wave of regional social protection reforms occurred in the early years of the 2000 decade and focused on social assistance. Most of the region's countries expanded their social-assistance programmes by recognizing different life cycle needs and introducing non-contributory income transfers targeting the poor and vulnerable. Several countries extended the non-contributory pension to reduce old-age poverty (such as Panama's Special Cash Transfers Programme for Older Adults (120 at 65), Trinidad and Tobago's Senior Citizens' Pension, Chile's Basic Solidarity Pension, and Brazil's Continuous Benefit Programme (BPC). Over the last 15 years, 18 Latin American and Caribbean countries have introduced similar reforms, increasing elderly income protection by expanding coverage beyond formal-sector workers (Rofman, Apella and Vezza, 2015).

In addition, while recognizing the importance of childhood development and dependency on others (parents or caretakers), several systems also designed programmes to promote and protect development. For example, in 2009, the *Chile Crece Contigo* [Chile grows with you] programme allowed mothers access to health care during pregnancy and offered children regular check-ups from birth until they entered school. Coverage was later extended through to the completion of primary

education. The education and health ministries were also involved to provide a comprehensive set of childhood development programmes. Similarly, Peru's national development and social inclusion strategy, "Inclusion for Growth", focused on five different areas of child and adolescent development, aiming to reduce early childhood malnutrition, improve physical and emotional development, and foster the capabilities of older children. Bolivia, Colombia, and the Bolivarian Republic of Venezuela have all developed similar programmes.

Table 1 lists several non-contributory pension programmes and their characteristics. Most programmes were implemented independently from the existing contributory pension system, targeting individuals who were previously excluded; in other cases, the newly established non-contributory systems became part of the previous scheme (for example in Brazil, Chile, and Uruguay).

Table 1
Latin America and the Caribbean (selected countries): non-contributory pension programmes, by beneficiary population and integration with contributory system

Country	Programme	Beneficiary population	Integration with contributory system
Argentina	Pension Inclusion Programme	Targeted to achieve universality	Independent
Bolivia (Plurinational State of)	Renta Dignidad	Universal	Independent
Brazil	Rural Pension Continuous benefit programme	Targeted to achieve universality Targeted to achieve universality	Integrated Integrated
Chile	Basic Solidarity Pension	Targeted to achieve universality	Integrated
Colombia	Colombia Mayor	Targeted	Independent
Costa Rica	Non-contributory scheme for basic pensions	Targeted	Independent
Ecuador	Human Development Grant	Targeted	Independent
El Salvador	Universal Basic Pension	Targeted	Independent
Mexico	"70 and over"	Targeted to achieve universality	Independent
Panama	Special Cash Transfers Programme for Older Adults (120 at 65)	Targeted to achieve universality	Independent
Paraguay	Maintenance for Older Persons	Targeted	Independent
Peru	"Pension 65" National Solidarity Assistance Programme	Targeted	Independent
Uruguay	Contributory system relaxation/ Elderly Pension Reform	Targeted to achieve universality	Integrated
Trinidad and Tobago	Senior Citizens' Pension	Universal	Integrated

Source: Prepared by the author, on the basis of R. Rofman, I. Apella and E. Vezza (eds.), *Beyond Contributory Pensions: Fourteen Experiences with Coverage Expansion in Latin America*, Washington, D.C., World Bank, 2015; and Economic Commission for Latin America and the Caribbean, Non-contributory Social Protection Programmes Database - Latin America and the Caribbean, 2016 [online] <https://dds.cepal.org/bpsnc/home>.

This wave of reforms also introduced conditional cash transfer (CCT) programmes. Following Mexico's pioneering CCT *Progresa* (later known as *Oportunidades*, and now *Prospera*), which was designed and implemented in the late 1990s, all other Latin America and Caribbean countries have incorporated these types of programmes into their social assistance schemes. Although such programmes are non-contributory, the beneficiaries have to fulfil conditions to obtain the benefits. Conditional cash transfer programmes seek to change behaviour by requiring their beneficiaries to make use of health, nutrition, and education services, and by linking human capital accumulation to income transfers. This model of social assistance helps recipients in the short term by providing direct income support to poor and vulnerable households and by promoting human capital accumulation. In the long term it also promotes development and reduces dependency.

Table 2 lists the CCT programmes implemented in the region, most of which focus on school attendance and health check-ups, targeting women and children. Nonetheless, the programmes vary in their conditions, complexity, and breadth. Each country has tailored its programmes to its specific political and institutional context, with differences in terms of benefits, delivery mechanisms, geographic and demographic coverage, institutional linkages, and budgetary commitment (Cecchini and Atuesta, 2017). The latest data show that coverage varies significantly between countries. In some cases, the programmes serve more than a quarter of the population (for example, those of Brazil, the Dominican Republic, Ecuador and Mexico) whereas others (such as those of Belize, Chile, Costa Rica, and Haiti) cover less than 5%. Low coverage could actually be a sign of success for programmes targeted on the extreme poor, as in the case of Chile or Costa Rica; but, in other cases (Belize or Haiti) it is a sign of institutional or implementation difficulties. Regionwide, CCT coverage increased from fewer than 300,000 households in 1997 to 29.8 million in 2015 (17.5% of all households in the region). However, the data show a decline in participation from 2014 onward — a troublesome trend as it coincides with rising poverty rates across Latin America and the Caribbean (Cecchini and Atuesta, 2017).

Table 2

Latin America and the Caribbean (selected countries): conditional cash transfer programmes

Country	Programme	Conditionality	Coverage (percentages)
Argentina	Families for Social Inclusion (FIS). (2005–2010)	E, H and S	7.47
	Universal Child Allowance (AUH) (AUH) (2009–)	E, H and S	8.04
	Porteña.citizenship programme (2005–)	E, H, and Id	0.38
	Unemployed Heads of Household Plan (2002–2005)	E, H and T	5.56
Belize	Building Opportunities for Our Social Transformation, BOOST (2011–)	E and H	2.65
Bolivia (Plurinational State of)	Juancito Pinto Grant (2006–)	E	20.74
	Juana Azurduy Mother-and-Child Grant (2009–)	E and H	2.19
Brazil	Bolsa Escola (2001–2003)	E	0.00
	Bolsa Família (2003–)	E, H and S	26.57
	Bolsa Alimentação (2001–2003)	H	0.00
	Child Labour Eradication Programme (PETI) (1997–)	E and S	0.43
	Bolsa Verde (2011–)	NRS	0.14
Chile	Solidarity Chile (2002–2012)	E and H	12.36
	Ethical Family Income (2012–)	E, H and L	4.08
Colombia	Families in Action	E, H and T	9.21
	Income for Social Prosperity	E and H	–
	Unidos Network	E and S	9.65
	Conditional Subsidies for School Attendance (Bogotá)	E	0.10
Costa Rica	Superémonos (2000–2002)	E	–
	Avancemos (2006–)	E and H	3.15
Dominican Republic	Solidarity (2005–2012)	E and H	29.37
	Progressing with Solidarity (2012–)	E and H	31.33
Ecuador	Human Development Grant (BDH) (2003–)	E and H	32.60
	Zero Malnutrition (2011–)	E, H and S	–
El Salvador	Programme of Support for Solidarity in Communities in El Salvador (PACSES) (2005–)	E, H, T and S	8.58
Guatemala	Mi Familia Progresá (MIFAPRO). (2008–2011)	E and H	–
	My Secure Grant. (2012–)	E and H	13.02
	Protection and development of working childhood and adolescence (2007–2008)	E	–
Haiti	Ti Manman Cheri (2012)	E	4.40
Honduras	Family Allowance Programme (PRAF) and PRAF I. (1990–2009)	E and H	8.96
	PRAF/IDB Phase II. (1998–2005)	E, H and S	–
	PRAF/ IDB Phase III. (2006–2009)	E and H	–
	Bono 10 000 programme for Education, Health and Nutrition. (2010–)	E and H	19.97
Jamaica	Programme of Advancement Through Health and Education (PATH) (PATH)	E and H	13.51

Table 2 (concluded)

Country	Programme	Conditionality	Coverage (percentages)
Mexico	Opportunities Human Development Programme, formerly Progresa.(1997–2014)	E and H	24.90
	Prospera (social inclusion programme. (2014–))	E and H	24.65
Nicaragua	Crisis support programme	E, H and T	–
	Social Protection Network	E, H and T	–
Panama	Opportunities Network	E, H and T	7.62
	Grant for Food Purchase	E, H and T	1.18
Paraguay	Abrazos programme	E and S	0.11
	Tekopora programme	S	8.63
Peru	National Programme of Direct Support for the Poorest (Juntos)	E and H	10.67
Trinidad and Tobago	Targeted Conditional Cash Transfer Program (TCCTP)	S	13.19
Uruguay	Family allowances	E and H	14.00
	National Social Emergency Response Plan (PANES)	E, H and CA	9.59

Source: Economic Commission for Latin America and the Caribbean (ECLAC), Non-contributory Social Protection Programmes Database - Latin America and the Caribbean, 2016 [online] <https://dds.cepal.org/bpsnc/home>.

Note: E stands for education, H for health, L for labour, S for social, Id for identification, T for training, NRS for natural resource and sustainability and CA for community activities.

As shown in table 2, most CCT programmes make their cash transfers conditional on households making investments in education and health. The educational conditions include school enrolment and attendance,¹⁰ and in some cases specific performance measures (for example in Chile, Colombia, and Guatemala). Health conditions include periodic check-ups (mostly targeting newborns and children), vaccinations for young children, perinatal care for mothers, and attendance at health information meetings. Some CCT programmes have grown in complexity beyond health and education, adding conditions to address other dimensions of poverty and vulnerability.

In line with the Sustainable Development Goals, countries are also recognizing the linkages between poverty and the environment. Nonetheless, only one CCT encourages ecosystem conservation while simultaneously improving living conditions for the poor. Built on Brazil's CCT *Bolsa Família* family allowance programme, the *Bolsa Verde* programme encourages beneficiary families living in conservation priority areas to adopt sustainable practices by providing cash transfers as incentives. This innovative programme fosters conservation, supports improvements in living standards, increases income for those undertaking conservation activities, and encourages participation in environmental, social, technical, and professional training. Activity is monitored via satellite and periodic visits. As more than 50% of Brazil's extremely poor live in rural areas, this programme represents an important step towards recognizing and compensating those traditional communities and family farmers for the environmental services they provide.

In 2016, the Dominican Republic designed and implemented the Climate Change Adaptation and Vulnerability Index (IVACC). This index contains information on 2.5 million households and calculates which areas and households face the greatest risk from the yearly ravages of the hurricane season. This knowledge can help prevent both human and material losses and also inform the design and implementation of remedial actions targeted to the most vulnerable sectors. The index also acts as a crucial targeting tool for various social programmes by adding supplementary information on vulnerability and enabling better understanding of the risk exposure that determines multidimensional poverty. The first index of its kind, IVACC helps target governmental action, avoiding loss of social investment and optimizing social expenditure. It has become the cornerstone of the country's Prevention, Mitigation and Response (PMR) Plan and facilitated overall coordination of its social protection system.

¹⁰ School attendance requirements range from 80% of school days in the Plurinational State of Bolivia to 95% in Nicaragua. Most countries set the minimum requirement to 85%.

These waves of reform were a product of political change and popular demand, coupled with a robust fiscal position. They largely explain the impressive improvements the region experienced over this period of time. The programmes' expansion came hand-in-hand with increased government spending on social protection. Between 2002 and 2012, per capita government social spending grew at an average annual rate of 7.3% across Latin American and Caribbean countries, driven by social protection expenditures (UNDP, 2016a).

However, these efforts have not been sufficient. The region still faces major challenges in increasing social protection coverage. On average, the region covers just 56% of the population above the minimum pensionable age, with many countries falling well below this level (for example, the Dominican Republic, El Salvador, Guatemala, Honduras, Paraguay and others). Access to health services also remains highly unequal and dependent on employment type and geographical location. The large segments of the population who work in the informal sector or are territorially marginalized cannot access social security benefits at all.

Table 3 displays the vast differences that exist between countries in terms of social protection coverage. Countries such as, Chile, Mexico and Peru all have coverage levels above 86%, while coverage in Honduras is just 2.5%; a large group of countries (Argentina, Belize, Brazil, Colombia and Nicaragua) cover less than half their population. There are also significant gaps in terms of social protection coverage for women and even more so for other vulnerable groups, such as the LGBTI population.

Table 3
Latin America and the Caribbean: social policy coverage, 2015
(Percentages)

	All social protection and labour market coverage	All social assistance coverage	All social insurance coverage
South America			
Argentina	41.1	16.3	29.0
Bolivia (Plurinational State of)	76.8	75.2	8.5
Brazil	46.4	19.5	28.3
Chile	88.4	74.2	44.6
Colombia	48.9	41.7	8.9
Ecuador	74.0	68.0	10.7
Paraguay	52.3	47.8	6.3
Peru	89.5	86.6	12.2
Suriname	–	–	–
Uruguay	79.8	59.2	36.6
Central America			
Belize	39.3	16.2	28.1
Costa Rica	67.3	47.5	15.0
El Salvador	60.2	56.2	5.5
Guatemala	64.3	61.6	3.9
Honduras	2.5	50.9	49.2
Mexico	86.7	58.9	47.0
Nicaragua	45.7	39.7	5.6
Panama	63.5	52.4	17.2
The Caribbean			
Dominican Republic	35.5	31.5	5.7
Jamaica	68.8	67.3	4.3

Source: World Bank, World Development Indicators, 2016 [online database] <http://data.worldbank.org/data-catalog/world-development-indicators>.

Note: In cases where data are not available for 2015, the figures shown in the table refer to neighbouring years.

The large proportion of people who either live in poverty or are economically vulnerable calls for an expansion of social protection systems. Accounting for the economic and social cost of reproduction and dependent care could help make social security a universal human right and bridge the gender gap that the current system has created.

IV. The future of social protection systems and the challenges ahead

The positive evolution of social protection systems over the past quarter-century in the Latin American and Caribbean region is partly responsible for the success achieved by many countries in reducing poverty and promoting human development. Expanded coverage of non-contributory schemes, coupled with the creation and implementation of both conditional and unconditional cash-transfer programmes, have had a profound impact on millions of lives. However, the new development agenda raises major challenges, putting pressure on social protection systems to develop innovative ways to both retain and expand welfare developments. They call for multidimensional progress at a time when most countries have tight budgets and are under financial constraints. Although Latin America and the Caribbean was able to effectively navigate the aftermath of the 2008 financial crisis, several countries remain at risk of reversing these achievements.

The 2016 *Regional Human Development Report for Latin America and the Caribbean* highlights the great danger facing the region today. Social protection systems and safety nets play a vital role in ensuring that those at risk of falling back into poverty in the current economic contraction continue to develop and build resilience toward both natural and man-made external shocks (UNDP, 2016a).

To this end, and in response to the 2007–2008 financial crisis, the International Labour Organization (ILO) Social Protection Floor (SPF-I) Initiative proposes that “social protection floors should comprise at least the following basic social-security guarantees: minimum levels of income security during childhood, working age and old age, as well as affordable access to essential health care” [...] “including maternity care, that meets the criteria of availability, accessibility, acceptability and quality” (ILO, 2012).

This initiative calls for a set of nationally defined basic social security guarantees over the citizen life cycle. It guarantees that those in need have access to health care and basic income security, promoting access to necessary goods and services defined at the national level.

The literature also highlights two main drivers calling for stronger social protection systems in Latin America and the Caribbean today. The first is the recognition of poverty as a multidimensional phenomenon. UNDP (2016a) stresses that well-being goes beyond income alone, focusing on combating multidimensional poverty and on “multidimensional progress”. In fact, the past decade has seen significant methodological advances in the measurement of multidimensional poverty (Bourguignon and Chakravarty 2003; Bossert, Chakravarty and D’Ambrosio 2009; Alkire and Foster 2011; Chakravarty and D’Ambrosio 2013). The work begun by the Oxford Poverty and Human Development Initiative (OPHI), including the Multidimensional Poverty Index (MPI), is particularly relevant. Initially launched in 2010 by OPHI and UNDP, MPI tracks multidimensional progress in more than 100 countries year-by-year.

Several Latin American and Caribbean countries have implemented (or are designing) their own multidimensional poverty measures (for example, Chile, Colombia, the Dominican Republic, El Salvador, Mexico, Nicaragua and Peru). This new set of measures enhances understanding of poverty and deprivation, by providing evidence on different aspects of well-being that are not captured by income or consumption expenditures. Nonetheless, more information is needed on marginalized groups.

These new measures and estimations place great pressure on existing government programmes to tackle multiple deprivations. An example is Mexico's *Prospera* programme. According to 2014 multidimensional poverty measurements in Mexico, 55.3 million (or 42%) of its people live without access to basic social rights (CONEVAL 2015). This index revealed that most deprivation stemmed from a lack of access to social security, food, and health services. Given this diagnostic, the National Social Development Programme (2014–2018) established that cash transfers should be combined with other policies to build opportunity and enhance capacity to combat poverty in Mexico.

The new approach led Mexico's CCT *Progresa* programme to evolve into the *Prospera* social inclusion system. The new programme aimed to strengthen the implementation of social rights and capacity-building, to break the intergenerational cycle of poverty. To achieve this goal, *Prospera* provides beneficiaries with the following: direct monetary support to improve their quality and quantity of food; access to quality health services; improved education access and scholarships to encourage achievement; and increased access to information on financial literacy, employment training, and more.

The second force for stronger social protection systems is increased exposure to risk and vulnerability to poverty. As noted above, most people who have escaped poverty still live on the edge; any idiosyncratic or aggregate shock could push them back into deprivation. Moreover, the recent frequency and severity of natural disasters such as hurricanes, volcanic eruptions, and earthquakes have impacted millions of lives. For example, the 7.0-magnitude earthquake that struck Haiti in January 2010 took an enormous toll; and high poverty levels coupled with the lack of a strong social protection network has prevented the country from making a rapid recovery. As Haiti continues to improve its infrastructure, it also needs to work toward constructing stronger and more resilient systems.

The fact remains that, while there are several positive examples of innovative progress, the region's existing social protection systems have severe limitations and face major challenges. Further social policy innovation is needed to address these issues and promote a more sustainable and inclusive development process. The main challenges are highlighted below.

1. Poverty, vulnerability, and excluded groups

According to UNDP (2016b), over half of the population of Latin America and the Caribbean is either poor or vulnerable to poverty, especially in view of the region's frequent environmental and natural shocks. Most social programmes target the poor, but they do not include those at risk of falling into poverty as beneficiaries; once people leave income poverty, they become ineligible for social assistance, thereby creating a substantial protection gap. There is an urgent need to expand social safety-net programmes to reduce vulnerability and build resistance.

At the same time, vulnerability and exclusion from the social protection system is a function of labour market characteristics and the type of employment. Much of the region's population remains excluded from social protection because of their type of employment; while wage-earning and formal workers are covered by pension and health systems, informal and non-wage-earning workers are not. Expanding access to physical and financial assets, improving care systems, and developing skills could lead to better coping mechanisms and higher levels of protection against shocks for all. Evidence shows that strong social protection systems help people both escape income poverty and avoid falling back into it; for example, increased pension coverage in Chile and Peru seems to be linked to a higher probability of households escaping income poverty (UNDP 2016a).

Several important groups of the population are also excluded from existing social protection systems as a result of flawed design and targeting mechanisms. The need for expansion and reform are justified not only by the expanding vulnerable population, but also as a means to include those who historically have been excluded from the development process.

Over the past two decades, women's labour market participation has increased significantly, and the gender wage gap has narrowed. However, women still experience institutional and cultural challenges and discrimination, and they earn less than men for the same jobs. The more precarious and less formal nature of their work also makes them more vulnerable. Even when they do manage to enter the formal labour force, they are disproportionately excluded from full-time work because they bear the majority of household and child-related responsibilities. The path toward identifying the existing gender gaps and helping to close them starts by identifying the economic and social costs of reproduction and dependent care. The establishment of a universal social security system that recognizes this, and does not make transfers conditional on labour market participation, will be crucial.

Another important segment of the population, the indigenous community, has also been excluded from the development process and suffered limited access to social protection programmes. They are considered highly vulnerable given their lifestyle and the high level of discrimination they face. As noted earlier, having an indigenous or Afrodescendent ethnic or racial background is associated with a lower probability of escaping poverty; and social protection systems have failed them due to distance or a lack of consistency between government policy and cultural practices.

For example, social protection coverage for indigenous people is extremely low in the Plurinational State of Bolivia, although over 40% of the country self-identifies as indigenous.¹¹ A recent study found that much of this exclusion reflects the limited labour market opportunities available to this group (Monterrey Arce, 2013). Additionally, most indigenous people live in rural areas and work the land for subsistence, which places them at risk of experiencing large and damaging natural shocks. The lack of coverage for indigenous people is coupled with a higher incidence of disease and less access to public vaccination programmes (Monterrey Arce, 2013), as well as lower levels of institutional childbirth which increases the risk of maternal mortality. Similar gaps exist in the education indicators, including literacy levels, years of schooling, and attendance.

Similarly, 21.5% of Panama's population have indigenous and African roots.¹² These groups have less access to education, training services, and overall opportunities, which results in higher poverty and vulnerability levels. Panama has undertaken several initiatives to improve their social protection coverage, such as simplifying registration systems, designing and implementing multicultural resources for educational and health facilities, and improving infrastructure in remote areas — measures that have been successful in promoting poverty-reduction and human-capital accumulation.

Mexico's *Prospera* programme has also evolved to target the country's indigenous population. When these groups displayed a low take-up rate and difficulties accessing services, the 2014–2018 Indigenous Plan produced communications materials on health and educational resources in several languages, benefiting the Maya, Tzotzil, Tarahumara, Tepehuanos, Mazahuas, Tlapanecos/Mephaa, Otomís, Huicholes, Coras, Mixteca, and Náhuatl communities. Future goals include producing materials in additional languages. The plan also hired programme staff who speak indigenous languages to gather information on households, thereby enabling the programme to provide personalized guidance and support to beneficiaries.

In the case of groups such as LGBTI that re subject to discrimination, there are no regional studies providing information on their conditions of life. There are also few examples of positive actions to promote their inclusion in social protection systems.

Tailoring social protection systems to the needs of the historically excluded could profoundly impact the lives of millions of people across the region. The question remains: How can governments and citizens design and implement new systems that reach the excluded (for example “the last mile”,

¹¹ 2012 census data.

¹² 2012 census data.

the poorest, most vulnerable and those furthest behind specified in the 2030 Agenda)? Understanding cultural differences and expanding social services to remote areas could be the best combination of actions to promote inclusive growth and equality, while preserving the value of ancient cultures.

2. Life cycle challenges: tailoring protection to encompass children, youth, the working-age population and the elderly

Under the new development paradigm that demands multidimensional progress and protection of previous achievements, social protection systems must be reformed to cover citizens throughout their life cycle. These systems must become a continuum of protection, with different programmes to cope with the risks people face at different stages of their lives. Programmes should be designed to cover early childhood development, school-aged children, youth, working-aged adults, and the elderly. Tackling life cycle vulnerabilities prevents people from accumulating risk as they proceed through life; for example, early-childhood development will have a lasting impact on citizens' productivity and well-being in older life. Increased protection and capacity development also help diminish the intergenerational transmission of deprivation and poverty.

Latin American and Caribbean countries are in the midst of a demographic transition, characterized by sustained increases in the older-adult dependency ratio. Decreased birth rates and increased life expectancy are putting pressure on social protection systems, especially old-age pensions and health care. According to the United Nations Population Division, the population's median age, old-age dependency ratio, and life expectancy at birth are all projected to rise significantly in the coming decades (United Nations, 2019). People of working age will face a major shock in the future, as they become fully responsible for both children and elderly dependents, unless countries implement a robust system to bear some of the burden.

Social protection programmes must consider the conditions of each household in terms of its composition and the specific risks it faces. The need for this type of tailoring generates significant information challenges; better data and information systems need to be developed in tandem with reforms.

In the early stages of life, when dependency is high and interventions have long-lasting effects, systems should include programmes focused on nutrition, health, education, and care. For young people starting their working life, programmes should enhance and guarantee access to jobs and opportunities that foster independence, while also supporting reproductive life. In the case of adults, social protection systems should focus on promoting and protecting jobs and generating income, while also equipping citizens with appropriate mechanisms for coping with both idiosyncratic and aggregate shocks. Senior-citizen programmes should focus on income protection and ensuring access to health and care services, in conjunction with contributory and non-contributory pension systems.

In short, public interventions need to be better coordinated, and efforts made to expand the coverage of specific programmes aligned with the different priorities, needs, and risks citizens face throughout their lives.

3. Combining and articulating programmes and sectors

Multidimensional problems need both multisectoral and intersectoral responses — a systematic approach to protect citizens against poverty and risk. Across Latin America and the Caribbean, social protection systems have evolved without a master plan in mind; programmes and institutions have proliferated with no clear mandate regarding benefits and beneficiaries, particularly in the case of health systems (Ribe,

Robalino and Walker 2012). Fragmented systems constrain labour mobility and reduce productivity; and the lack of coordination between programmes makes it difficult to pool risks or take advantage of economies of scale, thereby raising administrative and delivery costs.

Reform of the social protection system should ensure programme and subsystem coordination by exploiting potential synergies between different interventions, reducing duplication and overall effort. Creating a “one-stop shop” for all social programmes would enhance overall efficiency, increase coverage, and improve responsiveness to shocks. The *Chile Solidario* programme is a good example of an effort to coordinate programmes and extend beneficiary reach; other countries could adopt a similar approach.

One element that could facilitate coordination is the development of a unique beneficiary information system that can guarantee life cycle needs are identified and met in all areas relevant to sustainable development. Incorporating additional dimensions such as ecosystem services, addressing climate resilience and helping citizens cope better with natural disasters into system design also require both coordination and better information sources. The Dominican Republic’s IVACC is an example of success.

Single beneficiary registries enable more efficient targeting, by reducing the cost of data collection and management, and minimizing exclusion and inclusion errors. For example, Chile has moved to a new system to identify social programme beneficiaries. The Social Household Registry, which was launched in early 2016, combines information from its former system with administrative data obtained from Chile’s unemployment system, social security institute, and other ministries to calculate a household’s socioeconomic status —adjusted for the number of dependents— and eligibility for various benefits.

The combination of high levels of vulnerability with unstable labour markets and natural disasters, and the need to foster sustainable development, call for much higher levels of coordination in programme design. Coordinating interventions across different ministries, sectors, and tiers of government is difficult, but not impossible.

4. Fiscal restrictions and universal programmes vs. targeting

Earlier waves of social assistance reform occurred during an economic boom period. Now that fiscal space is more exiguous, innovative ways are needed to deal with social protection that both address vulnerabilities and consider the financial restrictions that countries are facing. Thus, another main challenge is how to improve social protection within a fiscal responsibility framework. The new generation of reforms, based on social rights, must tackle design and coordination issues while improving the fiscal capacity to sustain them. This demands not just resources, but a change of mindset. Moving from programmes targeted on specific groups to universal programmes is not easy, especially considering resource scarcity and competing needs. When fiscal resources are limited, decisions on social spending and the role of the State rest with the people. Setting priorities through bottom-up democratic discussion is necessary to legitimize a strong social protection system.

A new fiscal covenant is needed to achieve these results, especially considering the new regional economic conditions. The tax structure should be changed to increase government revenue from direct taxation, as opposed to the indirect and regressive taxation systems currently in place (for example value-added or sales taxes) —which often cancel out the benefits of social transfers altogether (UNDP 2016a)— to meet the challenges of the 2030 Agenda.

The need for social protection resources also represents an opportunity to revise and reform the existing tax systems. New social contracts and political agreements are needed to increase tax revenues while maintaining incentives for economic growth and private sector development. Some

countries need to reform the administration of their tax system, decreasing the number of deductions and exemptions and closing loopholes; while others should raise tax rates or broaden the tax base to ensure revenue that covers the growing demand for non-contributory benefits.

Each country needs to tailor tax reform to its specific circumstances, strengths, and weaknesses, and reach a lasting social consensus on the funding needed to implement stronger and broader social protection systems.

5. Technological changes and labour market

There has been a highly polarizing discussion around technological change and its effects on the labour market. One view sees innovation as an imminent threat that will change or replace most jobs by introducing artificial intelligence and automation. Few countries are ready to confront such rapid and disruptive change; and technological progress and the associated increase in skill premium have contributed to inequality in both advanced and emerging countries (Dabla-Norris and others 2015). Another view highlights the benefits that technological change can bring, as productivity and quality improvements can offer an opportunity to make a positive impact on living standards.

Based on case studies of five Asian countries, Chang and Huynh (2016) find that the sectors most likely to be automated are hospitality, wholesale and retail commerce, construction and manufacturing; in contrast, automation is less likely in education and training, health care and social work. The study implies that the risk of automation is greater in industries that involve the performance of routine and codifiable tasks; and it is lower in those requiring abstract, intuitive, or creative problem-solving ones. The authors also show that women and the less educated are more likely to have jobs at high risk of automation, thus leaving them highly vulnerable. This is especially true in Latin America and the Caribbean, where self-employment, informal work, and jobs in low-skill and low-wage industries can marginalize workers and discourage technological growth.

Technological change is certain disrupt existing systems and policies. Social programmes and public policy must incorporate capacity-building programmes in order to keep abreast of progress and cope with the impending changes. Catering to low-skill workers and women will be particularly important (Chang, Rynhart and Huynh 2016).

V. Conclusion and questions for further discussion

Latin America and the Caribbean is the region with the largest number of countries to have achieved most of the Millennium Development Goal targets. In light of the 2030 Agenda for Sustainable Development for the post-2015 period, countries need to recognize and approach multidimensional poverty reduction in a sustainable way. This requires addressing the gaps that exist in protection by providing specific programmes to the marginalized, vulnerable, and poor.

Social protection systems must expand beyond tackling current deprivations to account for environmental and social risks (including exclusion due to discrimination). Implementing a minimum service floor, extended throughout the citizen's life cycle, can break free from existing poverty traps, and help countries attain higher levels of multidimensional development. This new approach must also protect citizens from idiosyncratic and aggregate shocks faced at different stages of their lives.

Based on social justice principles, SPF-I could raise living standards and safeguard past achievements. The Social Protection Floor includes a broad range of initiatives, including age- and gender-sensitive programmes, allowances for family care, food security support, access to health and sanitation, labour market programmes, and more.

Over the past two decades, Latin America and the Caribbean has done much to increase social protection coverage. However, more of the same will not be enough to attain the SDG targets or to maintain past development achievements. The new development agenda presents countries with an opportunity to reform their social protection systems and tackle several targets simultaneously. The SDG framework acknowledges the importance of social protection, both in itself and as a vehicle for achieving other goals.¹³ As Latin America and the Caribbean prepares to implement it, governments must consider innovative ways to sustain past achievements and include those who have been excluded.

Several questions remain for discussion: (i) Where should countries begin to change their existing social protection systems? (ii) How can governments and citizens decide which dimensions to consider beyond income poverty? (iii) How can low-income countries afford basic social protection programmes and plan for expansion as they become fiscally stronger? (iv) How can citizens and government officials build coalitions to advance social protection reforms toward universality and a minimum floor? (v) What are the coordination challenges in these countries and their institutional implications? (vi) How can countries narrow the gender gap to keep women out of poverty in all its dimensions?

Bibliography

- Alkire, S. and J. Foster (2011), "Counting and multidimensional poverty measurement", *Journal of Public Economics*, vol. 95, No. 7-8, August.
- Barrientos, A. (2011), "On the distributional implications of social protection reforms in Latin America", *WIDER Working Paper*, No. 2011/069, Helsinki, World Institute for Development Economics Research (UNU-WIDER).
- Bossert, W., S. Chakravarty and C. D'Ambrosio (2009), "Multidimensional poverty and material deprivation", *Working Paper Series*, No. 2000-129, Society for the Study of Economic Inequality (ECINEQ).
- Bourguignon, F. and S. Chakravarty (2003), "The measurement of multidimensional poverty", *The Journal of Economic Inequality*, vol. 1, April.
- Bronfman Horovitz, J. (2014), *Essays on vulnerability, poverty and social policies: the case of Chile*, Washington, D.C., American University.
- Bronfman, J. and Hadad, M. I. (2019), *Life versus Mogen: Are the Mapuche People Living a Different Life? Working paper*, Universidad Adolfo Ibáñez
- Cecchini, S. and B. Atuesta (2017), "Conditional cash transfer programmes in Latin America and the Caribbean: coverage and investment trends", *Social Policy series*, No. 224 (LC/TS.2017/40), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).
- Chakravarty, S. and C. D'Ambrosio (2013), "A family of unit consistent multidimensional poverty indices", *Poverty and Social Exclusion around the Mediterranean Sea*, V. Berenger and F. Bresson (eds.), New York, Springer.
- Chang, J. H. and P. Huynh (2016), *ASEAN in Transformation: The Future of Jobs at Risk of Automation*, Geneva, International Labour Organization (ILO).
- Chang, J. H., G. Rynhart and P. Huynh (2016), *ASEAN in Transformation: How Technology is Changing Jobs and Enterprises*, Geneva, International Labour Organization (ILO).
- CONEVAL (National Council for the Evaluation of Social Development Policy) (2015), "Multidimensional poverty in Mexico", presentation at the Technical Workshop on Multidimensional Poverty, Brasilia, 25-26 August.
- Cruces, G. and others (2010), "Vulnerability to poverty in Latin America: empirical evidence from cross-sectional data and robustness analysis with panel data", *Working Paper*, No. 170, Chronic Poverty Research Centre (CPRC).
- Dabla-Norris, E. and others (2015), "Causes and consequences of income inequality: a global perspective", *IMF Staff Discussion Note*, No. 15/13, Washington, D.C., International Monetary Fund (IMF).
- ECLAC (Economic Commission for Latin America and the Caribbean) (2016), *The social inequality matrix in Latin America* (LC/G.2690(MDS.1/2)), Santiago.
- ECLAC (Economic Commission for Latin America and the Caribbean) and others (2018), "Promoting equality: an interregional perspective", *Project Documents* (LC/TS.2018/50/Rev.1), Santiago.

¹³ See annex table A2 for the complete list of the 17 Sustainable Development Goals.

- Government of Belize/CDB (Caribbean Development Bank) (2010), *Country Poverty Assessment Final Report*, vol. 1, London, Halcrow Group Limited.
- ILO (International Labour Organization) (2012), *Social Security for All: Building Social Protection Floors and Comprehensive Social Security Systems*, Geneva.
- López-Calva, L. and others (2014), "Clases medias y vulnerabilidad a la pobreza: reflexiones desde América Latina", *El Trimestre Económico*, vol. 81, No. 322, April-June.
- Mesa-Lago, C. (2008), *Reassembling Social Security: A Survey of Pensions and Health Care Reforms in Latin America*, Oxford, Oxford University Press.
- Monterrey Arce, J. (2013), "Social protection systems in Latin America and the Caribbean: Plurinational State of Bolivia", *Project Documents* (LC/W.553), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).
- Rachid, M. and F. Massenzio (2014), *Report on the Economic, Social and Cultural Rights of the Transgender Population of Latin America and the Caribbean*, Latin American and Caribbean Network of Transgender People (REDLACTRANS) [online] <https://plataformalac.org/wp-content/uploads/2016/05/FSCGD20ENG.pdf>.
- Ribe, H., D. Robalino and I. Walker (2012), *From Right to Reality: Incentives, Labor Markets, and the Challenge of Universal Social Protection in Latin America and the Caribbean*, Washington, D.C., World Bank.
- Rofman, R., I. Apella and E. Vezza (eds.) (2015), *Beyond Contributory Pensions: Fourteen Experiences with Coverage Expansion in Latin America*, Washington, D.C., World Bank.
- Sears, B. and L. Badgett (2012), "Beyond stereotypes: poverty in the LGBT community", *Momentum*, No. 4.
- UNAIDS (Joint United Nations Programme on HIV/AIDS) (2016), *Prevention Gap Report*, Geneva.
- UNDP (United Nations Development Programme) (2016a), *Multidimensional progress: well-being beyond income. Regional Human Development Report for Latin America and the Caribbean*, New York.
- _____(2016b), *Human Development Report 2016: Human Development for Everyone*, New York.
- _____(2016c), *Leaving No One Behind: A Social Protection Primer for Practitioners*, New York.
- _____(2010), *Human Development Report 2010. The Real Wealth of Nations: Pathways to Human Development*, New York.
- United Nations (2019), "Data Query" World Population Prospects, 2019 [online] <https://population.un.org/wpp/DataQuery/>.
- _____(2015), *The Millennium Development Goals Report 2015*, New York.
- Vargas, L. H. (2015), "Disaster response challenges for social protection systems", *Towards universal social protection: Latin American pathways and policy tools*, ECLAC Books, No. 136 (LC/G.2644-P), S. Cecchini and others (eds.), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).

Annex A1

Table A1.1
Definitions of “Social Protection” from Agencies and International Organizations

Agency	Definition	Source
International Labour Organization (ILO)	<p>“In this report, reference is made to “social protection” both as an alternative expression for “social security” and to denote the protection provided by social security in case of social risks and needs.”</p> <p>The notion of social security adopted here covers all measures providing benefits, whether in cash or in kind, to secure protection, inter alia, from</p> <ul style="list-style-type: none"> • lack of work-related income (or insufficient income) caused by sickness, disability, maternity, employment injury, unemployment, old age, or death of a family member • lack of (affordable) access to health care • insufficient family support, particularly for children and adult dependants • general poverty and social exclusion 	ILO, <i>World Social Protection Report 2014/2015: building economic recovery, inclusive development and social justice</i> , Geneva, 2014
World Bank	Systems, policies, and programmes that “help individuals and societies manage risk and volatility and protect them from poverty and destitution—through instruments that improve resilience, equity, and opportunity.”	World Bank, <i>Resilience, Equity, and Opportunity: The World Bank’s Social Protection and Labor Strategy 2012–2022</i> , Washington, D.C., 2012.
United Nations Children’s Fund (UNICEF)	“The set of public and private policies and programs aimed at preventing, reducing and eliminating economic and social vulnerabilities to poverty and deprivation.”	UNICEF, <i>Integrated Social Protection Systems: Enhancing Equity for Children</i> , New York, 2012.
Institute of Development Studies (IDS)	“...All public and private initiatives that provide income or consumption transfers to the poor, protect the vulnerable against livelihood risks, and enhance the social status and rights of the marginalized; with the overall objective of reducing the economic and social vulnerability of poor, vulnerable and marginalized groups.”	Devereux, Stephen and Rachel Sabates-Wheeler, 2004. <i>Transformative Social Protection</i> . IDS Working Paper 232.
Asian Development Bank	“Set of policies and programs designed to reduce poverty and vulnerability by promoting efficient labour markets, diminishing people’s exposure to risks, and enhancing their capacity to protect themselves against hazards and interruption/loss of income.”	AsDB, <i>Social Protection</i> , 2003 [online] https://www.adb.org/sites/default/files/institutional-document/32100/social-protection.pdf .
European Union	“...the specific set of public actions to address the vulnerability of people’s life via social insurance, offering protection against risk and adversity throughout life; via social assistance, offering payments to support and enable the poor; and via social inclusion efforts that enhance the capability of the marginalized to access social insurance and assistance.”	Robert Schuman Centre for Advanced Studies, <i>European Report on Development 2010. Social Protection for Inclusive Development: A New Perspective in EU Co-operation with Africa</i> , European Union, Brussels, 2010.
Joint United Nations Programme on HIV/AIDS (UNAIDS)	“The objective of ‘social protection’ is broadly to reduce the economic and social vulnerability of all people, and to enhance the social status and rights of poor and marginalized people by providing social transfers, and ensuring access to basic essential services and equitable regulation, which can take many forms.”	M. Temin, <i>HIV-Sensitive Social Protection: What Does The Evidence Say?</i> , Joint United Nations Programme on HIV/AIDS (UNAIDS), Geneva, 2010.

Source: United Nations Development Programme (UNDP), *Leaving No One Behind: A Social Protection Primer for Practitioners*, New York, 2016.

Table A1.2
List of all Sustainable Development Goals

17 Sustainable Development Goals	
Goal 1	End poverty in all its forms everywhere
Goal 2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3	Ensure healthy lives and promote well-being for all at all ages
Goal 4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5	Achieve gender equality and empower all women and girls
Goal 6	Ensure availability and sustainable management of water and sanitation for all
Goal 7	Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10	Reduce inequality within and among countries
Goal 11	Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12	Ensure sustainable consumption and production patterns
Goal 13	Take urgent action to combat climate change and its impacts
Goal 14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17	Strengthen the means of implementation and revitalize the global partnership for sustainable development

Source: United Nations, *Transforming our world: the 2030 Agenda for Sustainable Development (A/RES/70/1)*, New York, 2015.

Table A1.3
Latin America and the Caribbean: health-related indicators circa 1990–2000–2015

	Child mortality, under-ones (per 1,000 live births)			Child mortality in under-fives (per 1,000 live births)			Maternal mortality (per 100,000 live births)			Prevalence of undernourishment in the population (percentages)		
	1990	2000	2015	1990	2000	2015	1990	2000	2015	1990	2000	2015
South America												
Argentina	24.4	18	11.1	27.6	20.2	12.5	72	60	52	5	5	5
Bolivia (Plurinational State of)	85.6	58.8	30.6	124.4	80.2	38.4	425	334	206	38	34.6	15.9
Brazil	50.9	28.1	14.6	60.8	32	16.4	104	66	44	14.8	12.3	5
Chile	16	9.2	7	19.1	10.9	8.1	57	31	22	9	5	5
Colombia	28.9	21.2	13.6	35.1	25.1	15.9	118	97	64	14.6	9.9	8.8
Ecuador	44.2	28.4	21.6	56.9	34.4	64	185	103	22.5	19.4	17.8	10.9
Guyana	46.6	37.2	32	60.4	46.7	39.4	171	210	229	22.8	10.4	10.6
Paraguay	37.1	27.7	17.5	46.5	33.5	20.5	150	158	132	19.5	13.3	10.4
Peru	56.3	29.6	13.1	79.7	38.6	16.9	251	140	68	31.6	21.6	7.5
Suriname	40.7	30.2	19	47.6	34.4	21.3	127	259	155	15.5	14.1	8.3
Uruguay	20.3	14.6	8.7	23.1	16.8	10.1	37	31	15	8.6	5	5
Venezuela (Bolivarian Republic of)	24.7	18.5	12.9	29.6	21.7	14.9	94	90	95	14.1	16.6	5
Central America												
Belize	32.2	21.1	14.2	39.6	25	16.5	54	53	28	9.7	6.5	6.2
Costa Rica	14.3	11.2	8.5	16.9	13	9.7	43	38	25	5.2	5.2	5
El Salvador	45.9	26.8	14.4	59.4	32.4	16.8	157	84	54	16.2	12.5	12.4
Guatemala	59.8	39.9	24.3	80.9	50.6	29.1	205	178	88	14.9	22.1	15.6
Honduras	45.1	30.5	17.4	58.2	37.4	20.4	272	133	129	23	19	12.3
Mexico	37.1	21.6	11.3	46.6	25.6	13.2	90	77	38	6.9	5	5
Nicaragua	50.9	32.6	18.8	66.9	40.3	22.1	173	202	150	54.4	34.8	16.6
Panama	25.7	21.9	14.6	30.9	26	17	102	82	94	26.4	27.4	10
The Caribbean												
Antigua and Barbuda	24	13.8	5.8	25.5	15.5	8.1	–	–	–	–	–	–
Bahamas	19.7	13.2	9.9	23.5	15.7	12.1	46	61	80	–	–	–
Barbados	16	14.8	12	17.9	16.3	13	58	48	27	5	5	5
Cuba	10.6	6.5	6.5	13.3	8.4	8.4	58	43	43	5.7	5.6	5
Dominica	14.2	13.4	19.6	17.1	15.3	21.2	–	–	–	–	–	–
Dominican Republic	46.5	33.3	25.7	60.2	41.3	30.9	198	79	92	34.3	30.7	12.5
Grenada	18	13.6	10.8	23.3	16	11.8	41	29	27	–	–	–
Haiti	101	75	52.2	145.8	104.8	69	625	505	359	61.1	55.2	53.4
Jamaica	25.4	19.3	13.5	30.6	22.7	15.7	79	88	89	10.4	7.8	8.1
Puerto Rico	–	–	–	–	–	–	26	22	14	–	–	–
Saint Kitts and Nevis	23.1	15	8.4	28.4	18.6	10.5	–	–	–	–	–	–
Saint Lucia	18.7	15.2	12.7	22.6	17.8	14.3	45	54	48	–	–	–
Saint Vincent and Grenadines	20.3	19.2	16.6	24.5	22.2	18.3	58	74	45	20.7	18.9	6.2
Trinidad and Tobago	26.9	25.3	18.2	30.5	28.7	20.4	90	62	63	12.6	13	8

Source: World Bank, World Development Indicators, Washington, D.C., 2016 [online database] <http://data.worldbank.org/data-catalog/world-development-indicators>.

Note: In cases where data are not available for the exact year, the figures shown in the table refer to neighbouring years. Several Caribbean countries do not have data available on poverty rates.

Table A1.4
Latin America and the Caribbean Education-Related Indicators (Circa 1990, 2000 and 2015)

	Enrolment rate (Primary, female) <i>(percentage of primary school age children)</i>			Enrolment rate (Primary, male) <i>(percentage of primary school age children)</i>			Enrolment rate (Secondary, female) <i>(percentages)</i>			Enrolment rate (Secondary, male) <i>(percentages)</i>		
	1990	2000	2015	1990	2000	2015	1990	2000	2015	1990	2000	2015
South America												
Argentina	96.3	98.9	98.3	96.2	99.8	99.6	–	77.2	90.3	–	72.0	84.4
Bolivia (Plurinational State of)	–	94.3	87.0	–	95.2	88.4	–	–	76.2	–	–	75.2
Brazil	–	–	–	–	–	–	–	–	–	–	–	–
Chile	–	–	92.4	–	–	92.5	–	–	90.3	–	–	86.9
Colombia	72.8	94.5	92.8	63.3	94.8	93.7	–	–	80.4	–	–	74.1
Ecuador	–	95.9	95.5	–	95.1	93.8	–	48.6	84.0	–	47.2	81.1
Guyana	–	88.0	79.9	–	97.0	82.8	–	72.7	82.6	–	73.2	82.3
Paraguay	92.1	97.7	88.3	93.8	97.1	88.8	34.3	53.6	66.3	32.4	50.9	66.6
Peru	93.3	97.5	93.1	94.2	97.9	92.5	–	63.9	79.4	–	66.1	77.4
Suriname	–	–	91.8	–	–	91.0	–	–	50.0	–	–	43.9
Uruguay	92.5	92.6	–	91.5	91.8	–	–	–	–	–	–	–
Venezuela (Bolivarian Republic of)	–	86.2	90.6	–	85.3	90.7	–	55.3	78.5	–	45.8	71.2
Central America												
Belize	–	94.0	95.5	–	95.6	97.6	–	60.2	71.1	–	57.0	67.3
Costa Rica	88.0	–	96.1	87.5	–	96.2	38.7	–	80.1	36.4	–	76.2
El Salvador	–	90.3	94.7	–	90.9	94.6	–	47.5	70.1	–	48.6	69.0
Guatemala	–	80.8	86.1	–	86.9	86.7	–	24.3	45.4	–	26.9	48.0
Honduras	88.7	89.0	94.2	87.6	88.1	93.9	–	–	53.0	–	–	45.7
Mexico	–	96.9	96.0	–	96.3	95.3	–	59.6	68.8	–	57.8	66.1
Nicaragua	69.2	82.7	98.0	65.9	80.8	95.9	–	40.8	53.0	–	33.5	45.1
Panama	86.8	95.0	95.5	86.4	95.4	96.3	–	61.2	80.6	–	55.5	75.2
The Caribbean												
Antigua and Barbuda	–	–	83.2	–	–	86.7	–	66.6	81.3	–	72.0	78.2
Bahamas	88.9	89.9	98.62	88.2	91.6	93.21	90.4	70.4	85.68	87.9	71.2	79.74
Barbados	96.7	95.5	92.0	98.5	95.5	90.1	73.7	91.3	100.0	84.0	92.5	98.9
Bermuda	–	–	81.5	–	–	85.3	–	–	78.6	–	–	67.9
Cuba	92.5	96.1	93.5	92.5	97.2	92.8	72.0	82.3	91.1	67.1	80.0	87.9
Dominica	–	–	–	–	–	–	–	89.5	81.5	–	78.2	76.5
Dominican Republic	–	83.7	82.6	–	83.2	84.5	–	44.2	69.8	–	35.7	61.2
Grenada	–	93.7	89.5	–	95.1	91.5	–	91.2	80.9	–	76.1	79.6
Haiti	–	56.9	–	–	57.8	–	–	–	–	–	–	–
Jamaica	98.4	92.1	–	98.1	92.5	–	–	78.5	77.5	–	76.1	69.7
Puerto Rico	–	–	83.3	–	–	80.0	–	–	77.2	–	–	72.3
Saint Kitts and Nevis	–	95.7	80.2	–	93.4	77.8	80.0	98.9	84.7	78.0	92.9	81.2
Saint Lucia	95.9	87.1	–	98.7	91.4	–	–	69.5	81.2	–	54.8	80.2
Saint Vincent and the Grenadines	–	–	84.8	–	–	86.6	–	78.4	86.5	–	57.6	83.9
Trinidad and Tobago	91.9	93.8	94.8	88.2	93.9	95.7	68.0	75.2	–	65.7	70.2	–

Source: World Bank, World Development Indicators, Washington, D.C., 2016 [online database] <http://data.worldbank.org/data-catalog/world-development-indicators>.

Note: In cases where data are not available for the exact year, the figures shown in the table refer to neighbouring years. Several Caribbean countries do not have data available on poverty rates.

Table A1.5
Latin America and the Caribbean Access to Water (Circa 1990–2000–2015)
(Percentages)

	Water Access – Urban population			Water Access – Rural population		
	1990	2000	2015	1990	2000	2015
South America						
Argentina	97.5	98.1	99.0	68.8	81.3	100
Bolivia (Plurinational State of)	90.5	93.1	96.7	40.4	55.1	75.6
Brazil	95.8	97.6	100	67.7	75.7	87.0
Chile	98.9	99.2	99.7	48.2	67.8	93.3
Colombia	97.5	97.2	96.8	68.8	71.0	73.8
Ecuador	83.9	87.9	93.4	61.4	67.3	75.5
Guyana	92.6	94.5	98.2	73.6	81.8	98.3
Paraguay	84.9	91.0	100	22.7	51.6	94.9
Peru	88.0	89.4	91.4	43.9	54	69.2
Suriname	97.8	97.8	98.1	–	72.5	88.4
Uruguay	97.8	98.5	100	70.3	77.0	93.9
Venezuela (Bolivarian Republic of)	92.6	93.6	95.0	68.4	72.5	77.9
Central America						
Belize	87.4	92.4	98.9	59.8	78.5	100
Costa Rica	99.2	99.4	99.6	86.5	88.8	91.9
El Salvador	90.4	93.3	97.5	50.6	65.0	86.5
Guatemala	89.8	93.6	98.4	67.5	75.9	86.8
Honduras	92.4	94.4	97.4	59.9	69.5	83.8
Mexico	91.5	94.1	97.2	59.4	74.4	92.1
Nicaragua	90.6	94.4	99.3	53.0	60.1	69.4
Panama	97.8	97.8	97.7	67.5	75.9	88.6
The Caribbean						
Antigua and Barbuda	97.4	97.7	97.9	97.4	97.7	97.9
Bahamas	96.3	96.6	98.4	96.3	96.6	98.4
Barbados	96.1	97.6	99.7	96.1	97.6	99.7
Bermuda	–	–	–	–	–	–
British Virgin Islands	94.8	94.9	–	94.8	94.9	–
Cayman Islands	92.3	93.3	97.4	–	–	–
Cuba	93.9	94.9	96.4	–	77.3	89.8
Dominica	95.7	95.7	95.7	–	91.8	–
Dominican Republic	96.7	92.2	85.4	75.8	78.2	81.9
Grenada	99.0	99	99	95.3	95.3	95.3
Haiti	91.2	81.6	64.9	50.2	49.3	47.6
Jamaica	97.9	97.7	97.5	88.5	88.9	89.4
Puerto Rico	93.6	93.6	–	93.6	93.6	–
Saint Kitts and Nevis	98.3	98.3	98.3	98.3	98.3	98.3
Saint Lucia	95.4	97.1	99.5	91.3	93.1	95.6
Saint Vincent and the Grenadines	88.2	93.5	95.1	88.2	93.5	95.1
Trinidad and Tobago	91.6	93.3	95.0	91.6	93.3	95.0
Turks and Caicos Islands	87.1	87.1	–	87.0	87.0	–
United States Virgin Islands	100	100	100	100	100	100

Source: World Bank, World Development Indicators, Washington, D.C., 2016 [online database] <http://data.worldbank.org/data-catalog/world-development-indicators>.

Note: In cases where data are not available for the exact year, the figures shown in the table refer to neighbouring years. Several Caribbean countries do not have data available on poverty rates.

Table A1.6
Latin America and the Caribbean: employment related indicators
(around 1990, 2000 and 2015)
(Percentages)

	Unemployment (Total)			Unemployment (Male)			Unemployment (Female)			Informal employment ^a		
	1990	2000	2015	1990	2000	2015	1990	2000	2015	1990	2000	2015
South America												
Argentina	5.8	15.0	8.2	5.4	13.7	7.1	6.4	17.1	9.8	45.0	42.0	47.1
Bolivia (Plurinational State of)	2.9	4.8	2.7	2.4	4.0	2.2	3.8	5.9	3.3	–	–	71.8
Brazil	6.9	9.5	6.8	5.3	7.7	5.2	9.6	12.0	8.7	41.9	46.6	36.8
Chile	8.1	9.2	6.4	7.3	8.8	5.8	10.1	10.1	7.3	33.7	33.1	–
Colombia	13.9	16.6	10.1	11.5	13.0	7.7	19.6	22.2	13.3	50.0	60.9	63.7
Ecuador	4.0	7.2	4.6	3.4	5.4	3.5	5.2	10.1	6.2	–	48.1	–
Guyana	12.0	11.5	11.1	9.4	9.8	9.6	17.4	15.1	14.0	–	–	–
Paraguay	6.5	7.6	4.5	5.4	6.7	3.8	8.5	9.2	5.6	–	–	64.4
Peru	6.0	6.4	4.2	5.5	6.1	3.7	6.9	6.8	4.8	–	–	68.8
Suriname	10.6	14.8	5.6	8.3	11.7	3.6	14.8	20.6	8.9	–	–	–
Uruguay	7.0	10.7	7.0	5.4	7.9	5.3	9.5	14.5	9.1	–	40.3	–
Venezuela (Bolivarian Republic of)	9.5	13.2	8.6	8.8	12.6	8.1	10.9	14.3	9.4	–	–	–
Central America												
Belize	10.8	10.9	11.5	7.9	8.0	6.5	17.6	16.9	19.7	–	–	–
Costa Rica	5.6	5.1	8.3	4.8	4.3	6.7	7.7	6.8	11.0	36.5	35.4	30.7
El Salvador	6.5	7.0	6.2	7.9	8.6	7.4	4.0	4.5	4.4	–	–	65.4
Guatemala	3.2	1.4	2.9	3.2	1.2	2.8	3.3	1.8	3.0	–	–	74.4
Honduras	4.7	3.9	3.9	4.0	3.8	3.3	6.4	4.1	5.1	47.2	60.9	73.4
Mexico	3.0	2.5	4.9	2.5	2.1	4.9	4.2	3.2	5.0	–	–	53.9
Nicaragua	4.7	6.2	5.3	4.7	7.4	5.3	4.7	3.7	5.3	–	57.0	–
Panama	16.1	13.5	4.3	12.8	11.1	3.6	22.7	17.8	5.6	33.3	32.8	–
The Caribbean												
Bahamas	12.2	7.2	15.4	12.4	5.7	15.1	12.0	8.8	15.7	–	–	–
Barbados	17.1	9.3	12.0	13.5	7.3	9.9	21.1	11.6	14.3	–	–	–
Bermuda	–	–	–	–	–	–	–	–	–	–	–	–
Cuba	2.3	5.4	3.3	2.1	4.9	2.9	2.7	6.4	3.9	–	–	–
Dominican Republic	19.9	14.2	15.0	12.9	8.8	9.5	33.5	23.6	23.4	–	–	51.4
Haiti	11.4	7.4	6.8	8.6	6.4	5.9	14.8	8.5	7.8	–	–	–
Jamaica	15.7	15.5	13.2	9.7	10.0	9.7	22.6	22.4	17.3	–	–	–
Puerto Rico	17.1	10.3	14.3	18.9	12.1	16.1	13.7	7.5	11.9	–	–	–
Trinidad & Tobago	18.5	12.1	4.0	15.7	10.2	3.1	22.7	15.1	5.3	–	–	–

Source: World Bank, World Development Indicators, Washington, D.C., 2016 [online database] <http://data.worldbank.org/data-catalog/world-development-indicators>.

Note: In cases where data are not available for the exact year, the figures shown in the table refer to neighbouring years. Several Caribbean countries do not have data available on poverty rate.

^a Percentages of total non-agricultural employment.

Table A1.7
Latin America and the Caribbean: human development index (1990, 2000 and 2015)

	Human development index		
	1990	2000	2015
South America			
Argentina	0.71	0.76	0.84
Bolivia (Plurinational State of)	0.54	0.60	0.66
Brazil	0.61	0.68	0.76
Chile	0.69	0.75	0.83
Colombia	0.59	0.65	0.72
Ecuador	0.65	0.70	0.77
Guyana	0.54	0.60	0.64
Paraguay	0.58	0.62	0.68
Peru	0.61	0.68	0.73
Suriname	–	–	0.71
Uruguay	0.69	0.74	0.79
Venezuela (Bolivarian Republic of)	0.64	0.67	0.76
Central America			
Belize	0.64	0.68	0.72
Costa Rica	0.65	0.70	0.77
El Salvador	0.52	0.60	0.66
Guatemala	0.48	0.55	0.63
Honduras	0.51	0.56	0.61
Mexico	0.65	0.70	0.76
Nicaragua	0.50	0.57	0.63
Panama	0.66	0.68	0.78
The Caribbean			
Antigua and Barbuda	–	–	0.78
Bahamas	–	0.78	0.79
Barbados	0.71	0.75	0.79
Cuba	0.67	0.69	0.77
Dominica	–	0.69	0.72
Dominican Republic	0.57	0.65	0.72
Grenada	–	–	0.75
Haiti	0.42	0.44	0.48
Jamaica	0.67	0.70	0.72
Saint Kitts and Nevis	–	–	0.75
Saint Lucia	–	–	0.73
Saint Vincent and the Grenadines	–	–	0.72
Trinidad and Tobago	0.67	0.72	0.77

Source: United Nations Development Programme (UNDP), *Human Development Report 2016: Human Development for Everyone*, New York, 2016.

Table A1.8
Latin America and the Caribbean: gender development index, 2014

	Gender development index (GDI)		Human development index (HDI)		Gender inequality index	
	Value	GDI group	Value		Value	Rank
			Female	Male		
	2014	2014	2014	2014	2014	2014
South America						
Argentina	0.982	1	0.819	0.834	0.376	75
Bolivia (Plurinational State of)	0.931	3	0.637	0.684	0.444	94
Brazil	0.997	1	0.752	0.754	0.457	97
Chile	0.967	2	0.815	0.843	0.338	65
Colombia	0.997	1	0.719	0.721	0.429	92
Ecuador	0.980	1	0.722	0.737	0.407	83
Guyana	0.984	1	0.626	0.636	0.515	114
Paraguay	0.956	2	0.662	0.692	0.472	101
Peru	0.947	3	0.712	0.752	0.406	82
Suriname	0.975	1	0.702	0.720	0.463	100
Uruguay	1.018	1	0.797	0.783	0.313	61
Venezuela (Bolivarian Republic of)	1.030	2	0.772	0.749	0.476	103
Central America						
Belize	0.958	2	0.696	0.727	0.426	90
Costa Rica	0.974	2	0.753	0.774	0.349	66
El Salvador	0.965	2	0.652	0.676	0.427	91
Guatemala	0.949	3	0.608	0.641	0.533	119
Honduras	0.944	3	0.583	0.618	0.480	106
Mexico	0.943	3	0.731	0.775	0.373	74
Nicaragua	0.960	2	0.615	0.640	0.449	95
Panama	0.996	1	0.776	0.779	0.454	96
The Caribbean						
Antigua and Barbuda	–	–	–	–	–	–
Bahamas	–	–	–	–	0.298	58
Barbados	1.018	1	0.791	0.777	0.357	69
Bermuda	–	–	–	–	–	–
British Virgin Islands	–	–	–	–	–	–
Cayman Islands	–	–	–	–	–	–
Cuba	0.954	2	0.747	0.783	0.356	68
Dominica	–	–	–	–	–	–
Dominican Republic	0.995	1	0.710	0.713	0.477	104
Granada	–	–	–	–	–	–
Haiti	–	–	–	–	0.603	138
Jamaica	0.995	1	0.715	0.719	0.430	93
Puerto Rico	–	–	–	–	–	–
Saint Kitts and Nevis	–	–	–	–	–	–
Saint Lucia	0.991	1	0.725	0.731	–	–
Saint Vincent and the Grenadines	–	–	–	–	–	–
Trinidad and Tobago	0.985	1	0.763	0.774	0.371	73
Turks and Caicos Islands	–	–	–	–	–	–
United States Virgin Islands	–	–	–	–	–	–

Source: United Nations Development Programme (UNDP), *Human Development Report 2016: Human Development for Everyone*, New York, 2016.

Note: All Latin America and the Caribbean countries available in the dataset (even if incomplete).

Table A1.9
Latin America and the Caribbean: multidimensional poverty index (MPI),
most recent year available

	Multidimensional Poverty Index (HDRO)		
	Year	Headcount (percentages)	Intensity ^a
South America			
Argentina	2005	3.7	39.1
Bolivia (Plurinational State of)	2008	20.6	47.0
Brazil	2013	2.9	40.2
Colombia	2010	7.6	42.2
Ecuador	2013/2014	3.7	39.6
Guyana	2009	7.8	40.0
Peru	2012	10.4	41.4
Suriname	2010	7.6	43.1
Central America			
Belize	2011	7.4	41.2
Honduras	2011/2012	20.7	47.4
Mexico	2012	6.0	39.9
Nicaragua	2011/2012	19.4	45.6
The Caribbean			
Barbados	2012	0.9	33.7
Dominican Republic	2013	6.0	4.6
Haiti	2012	50.2	48.1
Jamaica	2010	3.7	38.8
Saint Lucia	2012	0.8	34.5
Trinidad and Tobago	2006	1.7	38.0

Source: United Nations Development Programme (UNDP), *Human Development Report 2016: Human Development for Everyone*, New York, 2016.

^a Weighted average number of deprivations poor people experience at the same time.

Globalization and national development paths: stylized facts for analysing the Argentine case

Lorenzo Cassini, Gustavo García Zanotti and Martín Schorr

Abstract

This paper uses stylized facts to analyse the production paths and socioeconomic performance of a group of countries over the last few decades, with a view to making a comparative analysis of the Argentine case. Nine countries were selected for this purpose (Argentina, Australia, Brazil, Chile, China, India, Mexico, Norway and the Republic of Korea); and a long-term analysis was performed by constructing indicators that synthesize the production paths and performance of these economies. The paper concludes that two major types of production paths have predominated during this period. The first is based on dynamic advantages concentrated in high-technology goods, which results in a positive performance. The second is based on static advantages, such as cheap labour or natural resource abundance, which leads to more heterogeneous outcomes.

Keywords

Globalization, economic development, social development, development policy, industrialization, technological change, science and technology capacity, development strategies, case studies, Argentina, Australia, Brazil, Chile, China, India, Mexico, Norway, Republic of Korea

JEL classification

O57, O14, O33

Author

Lorenzo Cassini is a doctoral scholar at the Institute of Higher Social Studies (IDAES), attached to the National University of San Martín (UNSAM). Email: lcassini@unsam.edu.ar.

Gustavo García Zanotti is a postdoctoral fellow at the National Scientific and Technical Research Council (CONICET). Email: gustavo.d.garcia89@gmail.com.

Martin Schorr is a research fellow at CONICET and a research fellow and professor at the Institute of Higher Social Studies (IDAES), attached to the National University of San Martín (UNSAM). Email: schorr.mar@gmail.com.

I. Introduction

The economic development process generally involves a two-dimensional structural transformation: first, a change in the sectoral specialization pattern, with activities of higher productivity and technological vigour gaining an increasing share; second, productivity growth and technological improvements, which include the development of production higher-value-added linkages. The countries that have successfully consolidated their economies have pursued a variety of strategies in terms of both their specialization patterns and the policy implemented to promote structural change. Conversely, other countries, which did not make the necessary structural change, are distinguished from the successful countries both by their specialization pattern and by the policies they implemented. This article considers potential development paths for Argentina, based on a stylized analysis of the paths travelled by countries that can be considered “successful” and others that might be considered “unsuccessful”.

Nine countries are analysed for this purpose, representing various development strategies: Argentina, Australia, Brazil, Chile, China, India, Mexico, Norway and the Republic of Korea. The time period chosen for this research spans 1963–2014. Each country's path is characterized in terms of structural change, the instruments used and the industrial policies applied, with a view to analysing the technical-production behaviour and role of the various economic actors. This long-term analysis makes it possible to identify both production paths and performance, measured by the standard of living and the degree of trade participation, which each path enabled.¹

The main Latin American countries are included because their production structures share several features: a high level of structural heterogeneity and a specialization based mainly on their respective comparative advantages. Australia and Norway are included in the sample because they have a large per capita natural resource endowment, and some of the studies in this area propose these two countries as a model for Latin American countries. These envisage a development strategy founded on technological scaling-up based on natural resources (Pérez, 2010). Lastly, the selection of China, India and the Republic of Korea is justified by their rapid growth in recent decades.

The literature on this subject is sparse. A number of empirical studies have reported a significant relationship between a country's trade specialization profile and its growth rate (Hausmann, Hwang and Rodrik, 2007; Rodrik, 2006; Dalum, Laursen and Verspagen, 1999; Lavopa, 2015). Others use shift-share analysis techniques to determine how much of a country's economic growth is due to changes in its productive structure and how much can be attributed to increases in intrasectoral productivity (Castaldi, 2009; De Vries and others, 2011; Verspagen, 2000; Wang and Szirmai, 2008). However, these studies do not distinguish between the long-term paths pursued by each country or between the public policies and actors involved in each process. There are also studies that address the evolution of individual countries' production, and these are drawn on throughout this article; but there are few comparative studies with such a long-term perspective in the analytical dimensions considered here (ECLAC, 2007; Cimoli and others, 2005; Schteingart, 2017).

The article is structured as follows: section II discusses the methodological issues involved in preparing the variables that represent the different paths, and it proposes a taxonomy for them. Section III describes the different paths pursued by the selected countries, based on the classification applied in the previous section; and the closing section offers some final thoughts on alternative development strategies for Argentina.

¹ Owing to space constraints, this article focuses on the main stylized facts that distinguish national paths in a long-term perspective and according to the proposed analytical design. This does not ignore the fact that many different variables have intervened in specific ways in each national space, to account for the different paths adopted (macroeconomic regime, prioritized development instruments, historical path, institutional context or social coalitions, among others). A comprehensive analysis of the various cases discussed in this article can be found in Cassini, García Zanotti and Schorr (2017) and the bibliography compiled there.

II. Methodological issues

1. Technological capacities and net technology content

Two dimensions of the development path followed by each country are analysed: net technology content, which is linked to productive specialization; and net technological capacities, which is related to technological progress. In the first case, capacities for technology creation and learning (here referred to as “technological capacities”) are fundamental in the economic development process to improve systemic competitiveness and add value to production (Marín, 2016; Pérez, 2001; Lugones, Suárez and Gregorini, 2007). In the second case, specialization in the production of high-tech goods drives technical progress and stimulates wealth creation (Araujo and Lima, 2007; Cimoli, Porcile and Rovira, 2010; Dosi, Pavitt and Soete, 1993).

Techno-productive specialization is inferred in this study from the trade balance, by analysing the extent to which a country specializes in the production of more technology-intensive goods. This indicator is synthesized as net technology content,² which, by considering both imports and exports, can be used to proxy for clearly national technology content. This is important for evaluating the path followed by countries that have a large share of maquila or assembly sectors in their export basket. The net technology content indicator can take theoretical values ranging from -100, when a country imports only very high-tech goods without exporting such goods, to 100, if a country exports only very high-tech goods, without importing them. Within this framework, a country will be a net exporter of technology goods if its net technology content is above a horizontal dividing line (that is, above zero or neutral).³

Technological capacities⁴ were synthesized using an index number that reflects the per capita trend of technology patents in each country,⁵ together with expenditure on innovation and development (I&D)

² To calculate this indicator, expenditure on private research and development (R&D) is taken as a percentage of value-added (technology intensity or technology content) for each of the 34 branches of activity (at the 2, 3 or 4-digit level, depending on the availability of data in OECD.Stat [online] <https://stats.oecd.org/>) and normalized by taking the highest value as 100. For each country, normalized technological intensity is weighted by the share of each branch in the country's export basket, to generate an index of the technology content of that country's exports. The same is done with imports, and the technology content index of the trade balance (TCI) is calculated as the difference between the technology content index of exports and imports, which can assume values between 100 and -100. The TCI for a given country is calculated as follows: $CTN = \sum_{i=1}^{34} I + D_i * S_i^{exp} - \sum_{i=1}^{34} I + D_i * S_i^{imp}$, where $I + D_i$ is private R&D expenditure as a percentage of (normalized) value-added in activity branch i , and $S_i^{exp/imp}$ is the share of activity branch i in the country's import or export basket. This indicator compares the composition of exports and imports according to their technology content, but does not consider their total amounts. Each country's exports and imports are classified according to the technology content taxonomy proposed by the Organization for Economic Cooperation and Development (OECD) to complement the characterization of development paths. Lastly, services are excluded from both the indicator and the classification, since they are not included in the OECD classification (see [online] <https://www.oecd.org/sti/ind/48350231.pdf>).

³ However, this does not mean that such a country necessarily generates technology; to do so, it would need high levels of technological capacities.

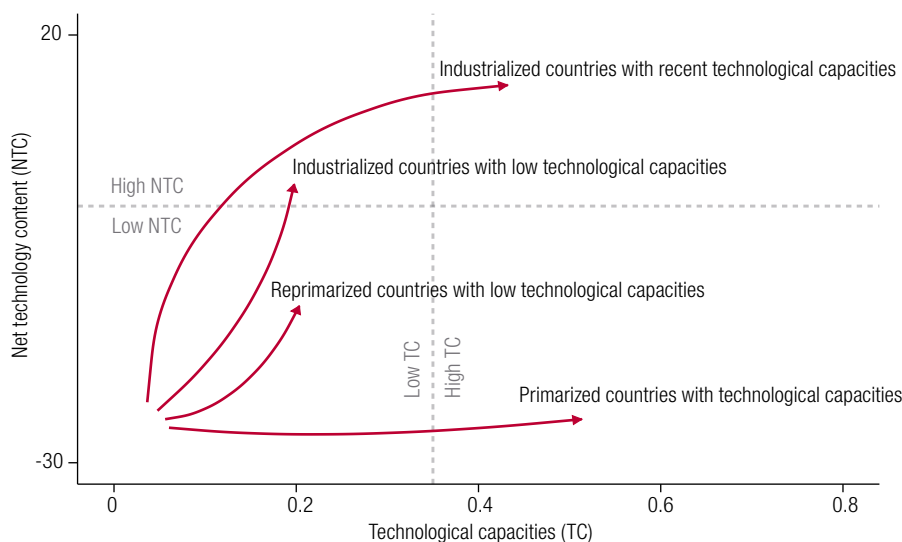
⁴ The steps followed to calculate technological capacities (TC) are described below: (a) a patent index (IP) was developed as follows $IP = \frac{\log(P \text{ per capita}_{it} + 1)}{\log(P \text{ per capita}_{taiwan} + 1)}$, where $P \text{ per capita}$ represents the patents granted; (b) then an index of investment in R&D (II+D) was constructed as follows: $II + D = \frac{\log(\%I + D_{it} + 1)}{\log(\%I + D_{israel} + 1)}$, where $\%I + D$ is the percentage of investment in R&D in each country's GDP; and (c) lastly, TCs were calculated as $CT = [IP_i * II + D_{it}]^{1/2}$.

⁵ Although technology patents are not considered an innovation phenomenon, they are used as a proxy. Nonetheless, one cannot ignore the fact that, in many peripheral countries, patents are locally validated patents of transnational companies involving little (or no) domestic technological effort.

as a percentage of the corresponding gross domestic product (GDP).⁶ The index number normalizes technological capacities to between 0 and 1.⁷ Countries with high technological capacities have an index close to 1. In addition, a dividing line is added at 0.35 in terms of technological capacities, which corresponds to the median of those capacities in the selected countries. This makes it possible to distinguish between countries with low and those with high technological capacities.

These two indicators can be used to distinguish different types of path (see figure 1). The countries that are currently in the southwestern quadrant have an international trade specialization profile dominated by primary goods and difficulties in incorporating technology. These are the “reprimarized countries with low technological capacities”.

Figure 1
Production paths: net technology content of the trade balance and technological capacities



Source: Prepared by the authors.

The northwest quadrant corresponds to countries that base their development strategy on maquila. Accordingly, in this study they are classified as “Industrialized countries with low technological capacities”.

The southeast quadrant contains countries that have deployed a strategy based on their natural resource endowment, but with significant local value added and technological knowledge. These countries are classified as “Primarized countries with technological capacities”.

Lastly, the northeast quadrant corresponds to countries pursuing an industrialization strategy that is embedded in the highest-tech links of global value chains. These include countries that were initially in the southwest quadrant and pursued an industrialization path leading into the northeast quadrant. This path is referred to as “Industrialized countries with recent technological capacities”.

⁶ The index number was developed following Schteingart (2014). Approved patents were taken from the United States Patent and Trademark Office (USPTO [online] https://www.uspto.gov/web/offices/ac/ido/oeip/taf/cst_utlh.htm), while population trends were based on the World Bank series [online] <https://datos.bancomundial.org/indicador/SP.POP.TOTL>. The evolution of the percentage of R&D over GDP was extracted from the following sources: OECD Data [online] <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm>, National Science Foundation (NSF) [online] <https://www.nsf.gov/statistics/2018/nsb20181/report/sections/research-and-development-u-s-trends-and-international-comparisons/recent-trends-in-u-s-r-d-performance> (United States), the Ibero-American Network on Science and Technology Indicators (RICYT) [online] <http://www.ricyt.org/category/indicadores/> (Latin America), and the United Nations Educational, Scientific and Cultural Organization (UNESCO) [online] <http://data.uis.unesco.org/index.aspx?queryid=74>, and World Bank [online] <https://datos.bancomundial.org/indicador/GB.XPD.RSDV.GD.ZS>.

⁷ They were transformed into an index number using the level of patents per capita in Taiwan Province of China in 2014 and the GDP share of R&D in Israel in the same year. In other words, the value of technological capacities will be between 0 and 1 depending on their similarity with those countries.

2. Trade impact and quality of life

The path followed by each country during the period studied will also be analysed in two other dimensions of economic performance. The first of these is the extent to which a country specializes in goods whose share of world trade is increasing. This is considered a performance variable because it is partly a consequence of the technology content of the export basket referred to in the previous section, and because sustained export growth lays the foundations for a relaxation of the external constraint on growth (Thirlwall and McCombie, 2004; Cimoli, Porcile and Rovira, 2010). This dimension is represented empirically by an index referred to as the “Increasing-share basket”, which measures the extent to which the products in a given country’s export basket are gaining an increasing share in world trade.⁸ This index can take theoretical values ranging from -0.73 and 5.79, according to whether the country specializes entirely in exporting the good that lost the most in terms of its share in world exports or gained the most, respectively. In the analytical exercises that follow, if the increasing share index is to the right of the dividing line (in other words, if it is above zero or above the neutral level), this means that the export basket of the country in question has a larger weight in international trade.

Also, following the methodological proposal of Bértola, Hernández and Siniscalchi (2012), a human development index (HDI) was developed, which serves as an indirect indicator of the average quality of life of the population in each country.⁹ A country will move closer to optimal conditions as its GDP per capita, education level and health status all increase.¹⁰ When HDI approaches 1, it is assumed that the economy is achieving high levels of human development. Again, a dividing line is added at HDI value 0.6, which corresponds to the median HDI of the currently selected countries. This level distinguishes countries with low from those with high human development. Countries that are close to this level are considered to be of medium human development.

Figure 2 displays various types of performance. Countries that are currently close to the northwest quadrant are considered countries of medium human development with no trade impact.

The countries in the northeast quadrant are classified as high human development with trade impact. This category could vary if the country were previously in the southwest quadrant. In the case of a steep rise, it could be considered as high human development with increasing trade impact.

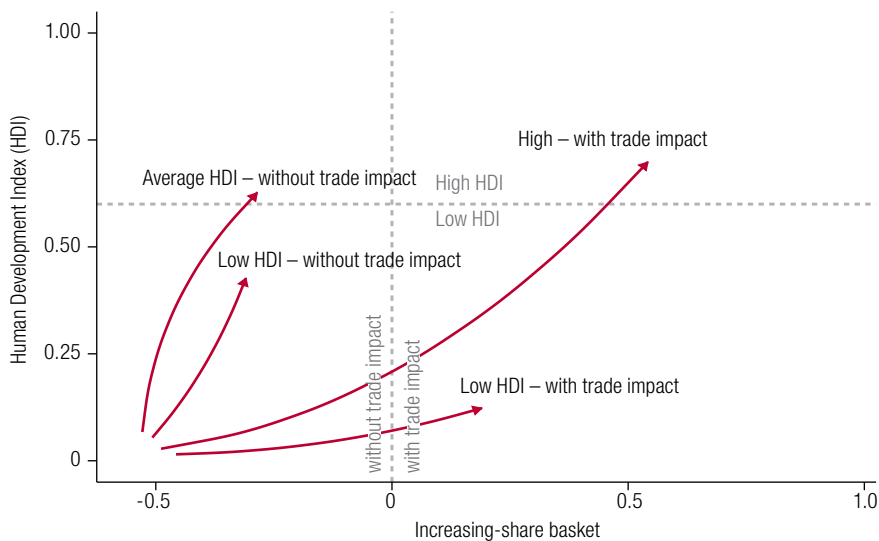
Countries in the southwest quadrant are classified as being of low human development with no trade impact. The countries in the southeast can be classified as being of low human development with trade impact.

⁸ This index was calculated by first estimating the increase in the share of each item (to three digits) in world trade, comparing the average for the periods 1964–1974 and 2004–2014. Then, the index for each country is obtained by weighting the increase in the share of each item by the share each item’s share in the country’s export basket. The formula for calculating the index for a given country is as follows: $CPC = \sum_i^n \Delta s_i^{expmun} * s_i^{exp}$, where Δs_i^{expmun} is the increase in the share of each item in world trade, s_i^{exp} is the share of that item in the country’s export basket, and n is the number of items.

⁹ The formula for calculating HDI is as follows: $IDH = \left[\left(\frac{PIB \text{ per capita}_t - 100}{40000 - 100} \right) * \left(\frac{PAE_t}{16} \right) * \left(\frac{EV_t - 20}{85 - 20} \right) \right]^{1/3}$, where $PIB \text{ per capita}$ is per capita GDP in purchasing power parity, PAE_t is the average years of schooling and EV_t is life expectancy.

¹⁰ The methodology of Bértola, Hernández and Siniscalchi (2012) was used to calculate HDI. This index is similar to that developed by the United Nations Development Programme (UNDP, 2015), except that it is not corrected for inequality. The decision was made to develop a new index, since the UNDP index does not cover the time dimension studied. In terms of the variables for the index, GDP at purchasing power parity was extracted from the Maddison Project Database (Bolt and van Zanden, 2014); education level was calculated through the average number of years of schooling, based on data from Barro and Lee (2013); and the health level indicator was based on World Bank data on life expectancy at birth [online] <https://datos.bancomundial.org/indicador/SP.DYN.LE00.IN>.

Figure 2
Performance path: increasing-share basket and human development index



Source: Prepared by the authors.

III. National development paths: a long-term perspective

1. Industrialized countries

(a) Countries with technological capacities

According to the methodological criteria applied, this typology includes both the Republic of Korea and China, countries which —of course, with their particular features— have been characterized by a high level of state intervention, in terms of technological modernization and the expansion and diversification of the production structure driven by goods exports.

In the Republic of Korea, the State has established itself as a disciplinary body on labour and capital issues; in the latter case, by punishing bad results and rewarding the good performance of the firms promoted; but, at the same time, it has embedded itself with relative autonomy in business through a meritocratic bureaucracy (Hikino and Amsden, 1995; Chang, 2009). The policies implemented to achieve this include bank credits, tax exemptions, import quotas, subsidies, tariff protection and preferential tariffs, among others. In this way, the State encouraged the creation of its own diversified conglomerates, known as *chaebol*, with a view to developing the industries defined as priority and strategic (Amsden, 1992 and 1993).

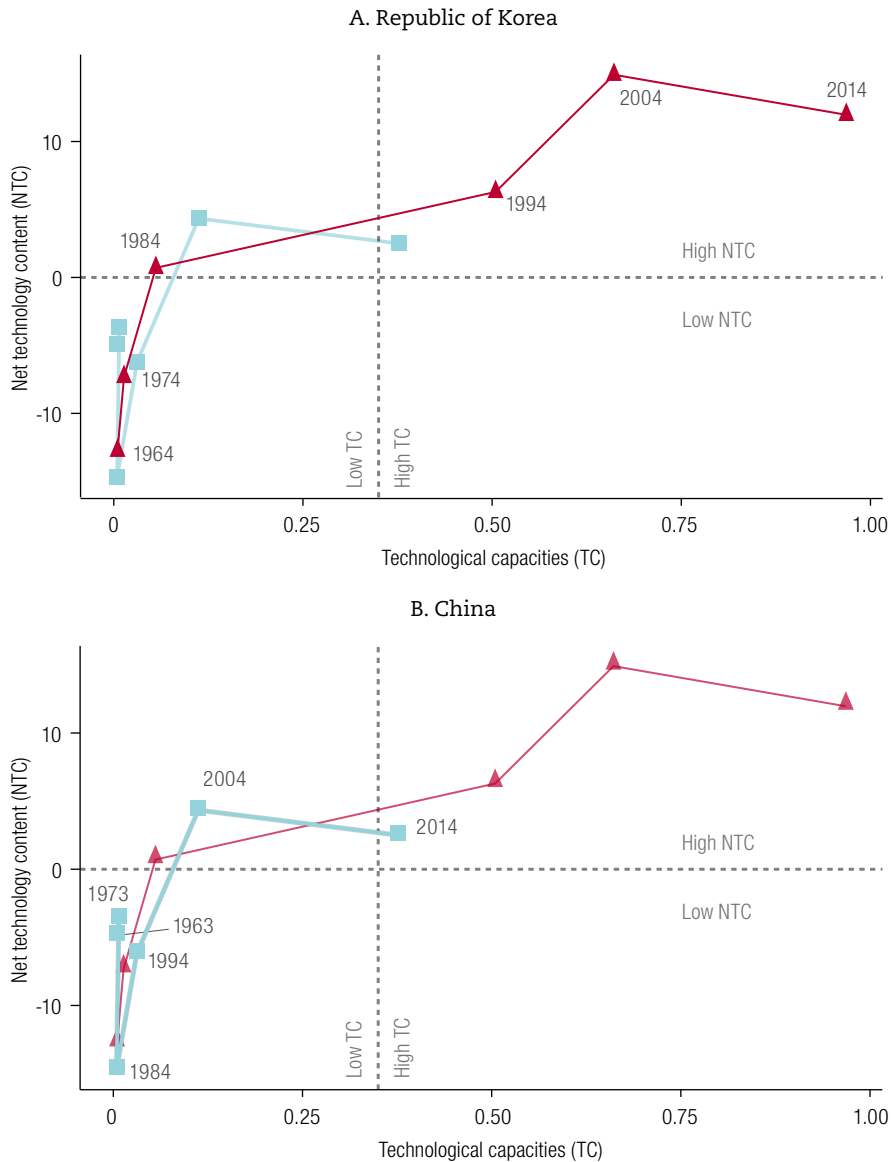
China's reform path, firstly towards a "market socialism", and later as a capitalist country, began in 1978, with the elimination of the rural communes and the lifting of restrictions on the marketing of agricultural produce by rural families.

The Chinese State did not focus its economic policy on steering development towards export growth until 1992, after the Communist Party had seen the success of exclusive economic zones (EEZs).¹¹ This process was boosted in 2001, when China joined the World Trade Organization (WTO) (Moncaut and Vázquez, 2017). Meanwhile, the State has participated fully in production —firstly through State-owned enterprises, which are predominant in the oil and mining sectors, in heavy industry (chemicals and steel) and in public services; and, secondly, through joint ventures (Gereffi, 2010).

¹¹ The special export zones were created in the 1980s to encourage the installation of factories for export through tax exemptions.

The development path followed by the Republic of Korea and China in recent decades has enabled them to gain in production complexity. As shown in figure 3, both countries are currently positioned in the northeast quadrant of the production path. Yet both of them were in the southwestern quadrant in the 1960s.

Figure 3
China and the Republic of Korea: net technology content of the trade balance and technological capacities (production path) of two newly industrializing countries with recent technology capacities, 1963–2014



Source: Prepared by the authors, on the basis of United Nations, “UN Comtrade Database”, 2017 [online database] <https://comtrade.un.org/>; United States Patent and Trademark Office (USPTO), “Extended year set - patent counts by country, state, and year utility patents (December 2015)”, 2020 [online] https://www.uspto.gov/web/offices/ac/ido/oeip/taf/cst_utlh.htm; Organization for Economic Cooperation and Development (OECD), “Gross domestic spending on R&D”, 2020 [online database] <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm>; National Science Foundation (NSF), “Recent trends in U.S. R&D performance”, 2018 [online database] <https://www.nsf.gov/statistics/2018/nsb20181/report/sections/research-and-development-u-s-trends-and-international-comparisons/recent-trends-in-u-s-r-d-performance>; Ibero-American Network on Science and Technology Indicators (RICYT), “Comparatives”, 2020 [online database] <http://www.rieyt.org/en/category/indicators/>; United Nations Educational, Scientific and Cultural Organization (UNESCO), “Science, technology and innovation: Gross Domestic Expenditure on R&D (GERD), GERD as a percentage of GDP, GERD per capita and GERD per researcher”, 2020 [online database] <http://data.uis.unesco.org/index.aspx?queryid=74>, and World Bank, “Research and development expenditure (% of GDP)”, 2020 [online database] <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>.

The share of high-tech exports in China's total foreign sales rose from 2.0% in 1974 to 28.4% in 2014, while medium-high technology exports expanded from 10.0% to 24.7% in the same period. China has become a natural-resource importer in the last decade and a half, with the share of raw materials in its imports growing from 14% to nearly 30% between 2000 and 2014. According to the data reported in figure 3, the Republic of Korea displays increasing net technology content throughout the timeseries. The share of high-tech exports rose from 1% in 1963 to about 35% in 2004, before dropping back to 24% in 2014. High-tech imports, on the other hand, declined from 32% of total external purchases to less than 1% at the end of the period analysed, while the share of primary goods in total imports increased sharply (from 9% to about 36%).

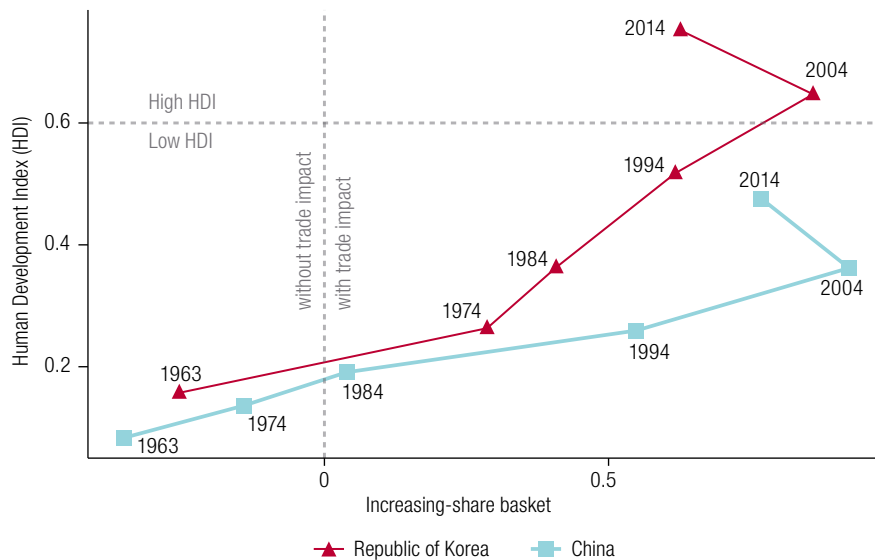
The technological capacities of both countries grew, although at different times. The technology incorporation paths of the Republic of Korea and China have both similarities and differences. In terms of similarities, their economic development process (*catching up*) was sustained through State planning, but late, after the start of institutional reforms. Therefore, both countries prioritized an initial ascent towards the northwest quadrant (see figure 3); and, once they had increased their production capacities, they took a course towards the northeast. Whereas in the Republic of Korea the State made a strong commitment to increasing its technological capacities in the 1980s (Bekerman and Sirlin, 1996), China prioritized this process in 2004 (Jaguaribe, 2015).

In terms of success of their performance path, measured by the increasing-share basket, both countries managed to consolidate an export basket that contributes to increasing their share in world exports. As figure 4 shows, both economies are currently positioned to the right of the neutral dividing line. However, in the 1960s, they were below the median. In the Republic of Korea, this unfavourable starting position was reversed early (in the 1970s), while China achieved this during the 1980s. As can be seen from the information presented, in the last decade under study, both countries saw their increasing-share basket decline, yet they are still well above the neutral level.¹²

Meanwhile, the standard of living in both economies, as measured by HDI, has risen steadily over the period under review (see figure 4): the Republic of Korea has moved from being well below other countries to now rank on a par with many developed nations. In particular, it moved beyond the HDI median line in the 1990s and into the northeast quadrant. China, in contrast, started in a worse position than the Republic of Korea in the 1960s and now has welfare levels similar to those of middle-income countries such as Mexico, but below the HDI median in the southeast quadrant.

¹² This phenomenon occurred mainly because of the rise in commodity prices.

Figure 4
China and the Republic of Korea: increasing-share basket and human development index (performance path) of two newly industrialized countries with recent technological capacities, 1963–2014



Source: Prepared by the authors, on the basis of United Nations, “UN Comtrade Database”, 2017 [online database] <https://comtrade.un.org>; J. Bolt and J. van Zanden, “Maddison Project Database, version 2013”, 2014 [online] <http://www.ggdc.net/maddison/maddison-project/home.htm>; R. Barro and J. Lee, “A new data set of educational attainment in the world, 1950-2010”, *Journal of Development Economics*, vol. 104, September, 2013; World Bank, “Research and development expenditure (% of GDP)”, 2020 [online database] <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>; World Bank, “Population, total”, 2020 [online database] <https://data.worldbank.org/indicator/SP.POP.TOTL>, and United Nations Development Programme (UNDP), *Human Development Report 2015: Work for Human Development*, New York, 2015.

(b) Countries with low technological capacities

This category includes Mexico and India. Both of these countries carried out institutional reforms in the 1990s and, with their individual specifics, pursued the path of trade liberalization and international capital mobility as the lynchpin of their development.

In the first case, the accumulation regime based on State-led industrialization, which was pursued in the second half of the twentieth century, declined rapidly after the Mexican debt crisis of the early 1980s. The way out of the crisis involved an increase in the relative importance of foreign actors, including international credit institutions, together with a quest to attract capital from the United States. The first reform began in 1983 with the signing of agreements with the United States and membership of the General Agreement on Tariffs and Trade (GATT) in 1986. However, the flood of investments from the United States did not occur until after the North American Free Trade Agreement (NAFTA) was signed in 1994 (Mariña and Cámara, 2015).

Thus, unlike other countries with significant economic weight in Latin America (especially Argentina and Brazil), Mexico has not targeted its participation in the international division of labour on exploiting, processing and selling natural resources. Its participation in the world market is similar to that of Central American and Caribbean countries, in that its industrialization process is unfolding almost exclusively for the purpose of exporting goods to the United States. This operates through the maquila system, which is based essentially on low wage costs and apparently precarious employment relationships (Arceo, 2001). One of the main policy tools for promoting the development of the maquila industry is the creation of zones offering tariff exemptions on industrial inputs imported from abroad, with a view to promoting free trade for foreign firms (Ordóñez and Bouchain, 2011).

In contrast, the Indian economy displayed a degree of autarchy until the early 1990s. This was organized through centralized planning inspired in Soviet socialism; and it aimed to achieve development through industrialization (Kniivilä, 2007). Under these arrangements, the State controlled industrial production through its firms and the establishment of “raj licenses”,¹³ while it exercised a monopoly on foreign trade in strategic sectors.

This system, which had been in force for several decades, began to be redefined during the 1980s, when the Indian Government started to rethink its economic policy with a view to granting greater trade flexibility in pursuit of modernization (Bhat, 2013). The move to an economy with capitalist features was achieved through a progressive withdrawal of the State from its interventionist role. However, although centralized planning was rejected, this did not mean industrial planning was abandoned; and, in fact, the country turned towards indicative planning (Singh, 2008).

As part of this course change, deregulation and privatization saw the State gradually abandon its interference in trade and production, although the growth of the Indian economy had been gathering pace prior to the introduction of free trade policies (Agarwal and Whalley, 2013). This dynamic was mainly led by industry and the service sector. In addition, agriculture has lost its leading role in recent decades. On the demand side, growth was driven by the increase in both industrial exports and the outsourcing of services. Meanwhile, the most dynamic sectors are linked to software and the pharmaceutical industry.

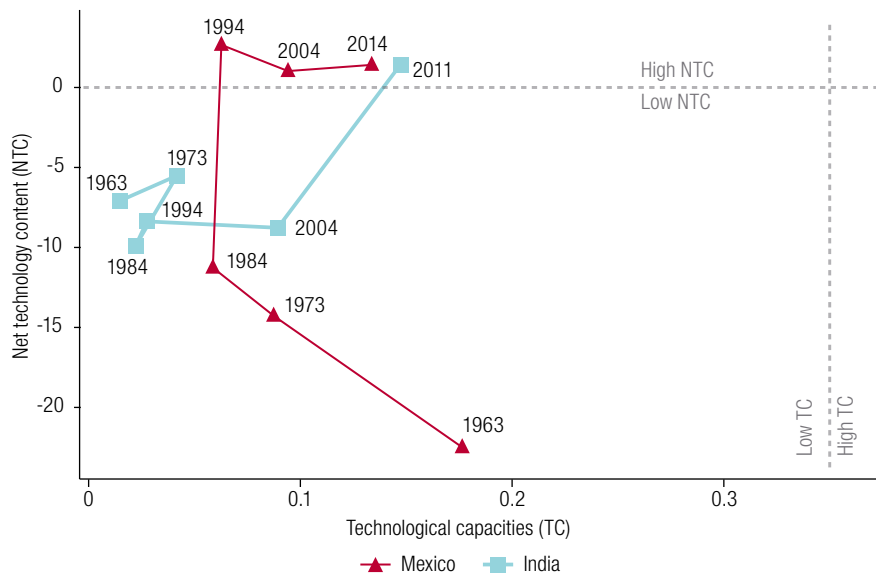
In terms of the national paths travelled in recent decades by the two countries, the information contained in figure 5 allows several conclusions to be drawn. From the standpoint of production capacities reflected in net technology content, Mexico and India display both similarities and differences. Whereas in India, the high-tech share of its exports grew from 0.5% in 1963 to 10.0% in 2014, the high-tech share of Mexican exports increased from just over 1.0% to nearly 19.0% in that period. The commodity share in Mexico’s exports decreased from 55.6% in 1963 to 14.3% in 2014, while the share of medium-high tech goods expanded from 4.6% to 41.6%. India, in contrast, grew its share of medium-low tech exports from 3% in 1963 to 25.5% in 2014. On the import side, the share of commodities in India’s imports has grown significantly in recent decades, from 13.4% in 1984 to 48.8% in 2014. Meanwhile, as a result of the development of the maquila system, the medium-high-tech share of Mexico’ imports declined, and the high-tech share increased (from 52.5% to 36.5% and from 11.6% to 22% between 1963 and 2014, respectively).

This relative progress in production enabled both economies to ascend to the northwest quadrant of figure 5. This also made it possible for them to rise above the neutral level; in other words, they are now net exporters of technology. In 1963, however, both economies were well below this level. Mexico, in particular, was below India in terms of its techno-productive capacities, but in the 1990s it became a net exporter of technology. India, in contrast, was late in surpassing the neutral level, and it was not until the decade of 2000 that it was able to make a relative jump.

Owing to their subordinate status, neither economy was able to increase its technological capacities, because they did not undertake a functional improvement process by acquiring new or superior functions in the value chains. In the 1980s, the Indian Government created EEZs to benefit private investment by providing infrastructure. As a result, a relatively technologically advanced cluster policy was consolidated. Moreover, the population’s command of English due to the country’s colonial past, in conjunction with wage levels that were low by international standards, favoured India’s integration into business and academic networks linked to the economic powers, thereby giving a boost to the service sector (Delgado, 2015).

¹³ These licences allowed the private sector to participate in the various branches of the industrial sector.

Figure 5
India and Mexico: net technology content of the trade balance and technological capacities (production path) of two newly industrializing countries with low technological capacities, 1963–2014

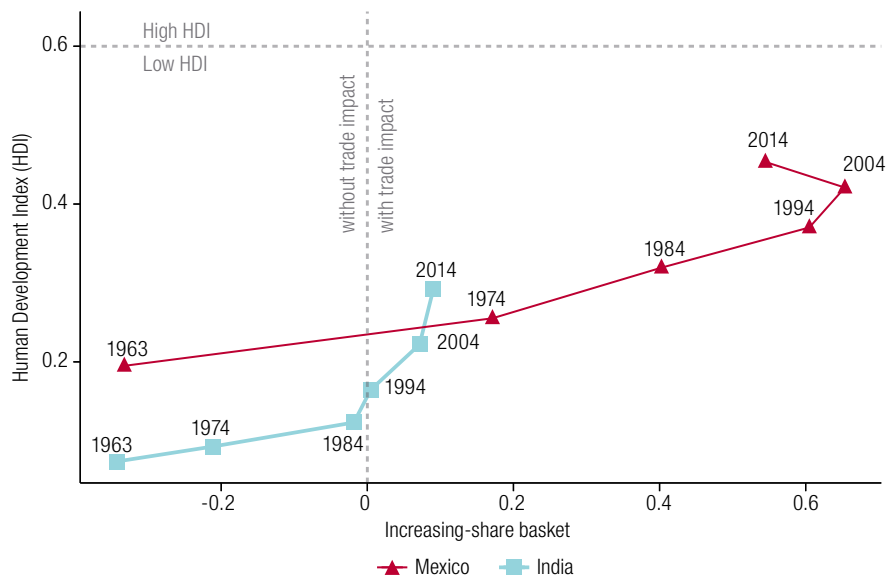


Source: Prepared by the authors, on the basis of United Nations, “UN Comtrade Database”, 2017 [online database] <https://comtrade.un.org/>; United States Patent and Trademark Office (USPTO), “Extended year set - patent counts by country, state, and year utility patents (December 2015)”, 2020 [online] https://www.uspto.gov/web/offices/ac/ido/oeip/taf/cst_utilh.htm; Organization for Economic Cooperation and Development (OECD), “Gross domestic spending on R&D”, 2020 [online database] <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm>; National Science Foundation (NSF), “Recent trends in U.S. R&D performance”, 2018 [online database] <https://www.nsf.gov/statistics/2018/nsb20181/report/sections/research-and-development-u-s-trends-and-international-comparisons/recent-trends-in-u-s-r-d-performance>; Ibero-American Network on Science and Technology Indicators (RICYT), “Comparatives”, 2020 [online database] <http://www.ricyt.org/en/category/indicators/>; United Nations Educational, Scientific and Cultural Organization (UNESCO), “Science, technology and innovation: Gross Domestic Expenditure on R&D (GERD), GERD as a percentage of GDP, GERD per capita and GERD per researcher”, 2020 [online database] <http://data.uis.unesco.org/index.aspx?queryid=74>, and World Bank, “Research and development expenditure (% of GDP)”, 2020 [online database] <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>.

In terms of how successful their performance path has been, both India and Mexico are currently in the southeast quadrant. The latter country’s increasing-share basket index is lower, but relatively similar to that of the successful cases of industrialization (see figure 6). India lags far behind Mexico; that is, its basket scarcely guarantees an increase in the global share of its exports. While in the 1970s Mexico had already managed to cross the neutrality threshold in terms of its exports’ increasing-share basket, India did not achieve this until the new millennium.

In terms of the living standards measured by HDI, India did not achieve take-off until the 1990s. Consequently, it could be considered a country with a low quality of life. Meanwhile, Mexico’s standard of living increased throughout the series. Whereas in the 1960s its HDI was barely higher than that of the Republic of Korea, it is now at levels similar to those of Brazil; that is, of an economy with an average quality of life. Both economies are far from the HDI median line.

Figure 6
India and Mexico: increasing-share basket and human development index
(performance path) of two recently industrialized countries
with low technological capacities, 1963–2014



Source: Prepared by the authors, on the basis of United Nations, “UN Comtrade Database”, 2017 [online database] <https://comtrade.un.org>; J. Bolt and J. van Zanden, “Maddison Project Database, version 2013”, 2014 [online] <http://www.ggdc.net/maddison/maddison-project/home.htm>; R. Barro and J. Lee, “A new data set of educational attainment in the world, 1950-2010”, *Journal of Development Economics*, vol. 104, September, 2013; World Bank, “Research and development expenditure (% of GDP)”, 2020 [online database] <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>; World Bank, “Population, total”, 2020 [online database] <https://data.worldbank.org/indicator/SP.POP.TOTL>, and United Nations Development Programme (UNDP), *Human Development Report 2015: Work for Human Development*, New York, 2015.

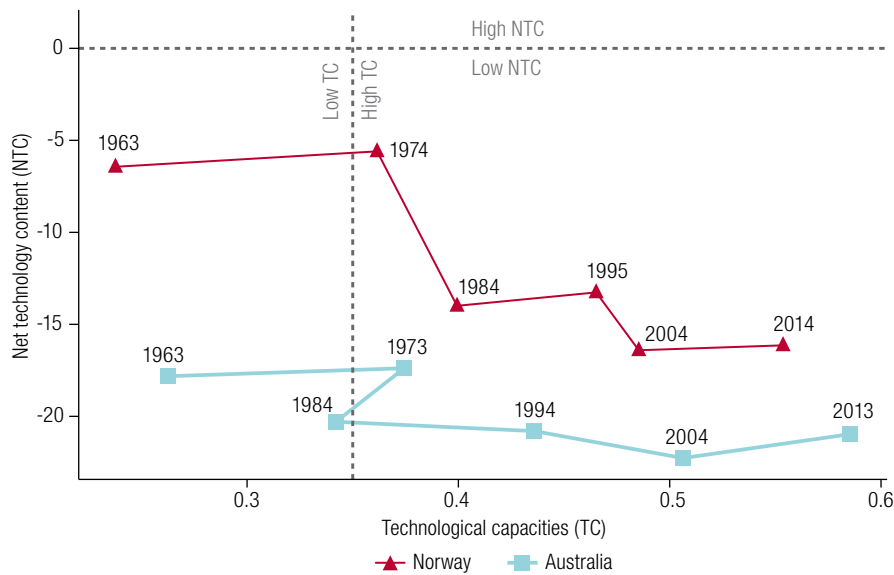
2. (Re)primarized countries

(a) Countries with technological capacities

This category includes Australia and Norway, which share the privilege of being the two countries with the best quality of life in the world, according to the HDI prepared by the United Nations (UNDP, 2015). Norway also has the highest natural capital per capita, and Australia is ranked seventh (Hamilton and others, 2009). Consequently, both economies are located in the southeast quadrant of the production path (see figure 7).

Norway’s privileged development path is linked to the discovery of a huge oil field on its continental shelf in the late 1960s. By then, Norway was already a rich, industrialized country with diversified production and an exporter of differentiated goods. The export share of primary and low-tech products, which in 1962 was 52%, had fallen to 40% by 1974, while the share of products with medium and high technology content increased from 48% to 60% in the same period. As can be seen in figure 7, by 1974, Norway had a slightly negative technological trade balance, quite close to the neutral level. In that year, Norwegian exports were distributed between primary products 13%, low-tech goods 27%, medium-low-tech 36%, medium-high-tech 20% and high-tech 4%. The same figure shows that, a few years before 1974, Norway rapidly increased its technological capacities, in line with the process described above.

Figure 7
Australia and Norway: net technology content of the trade balance and technological capacities (production path) of two primarized countries with growing technology capacities, 1963–2014



Source: Prepared by the authors, on the basis of United Nations, “UN Comtrade Database”, 2017 [online database] <https://comtrade.un.org/>; United States Patent and Trademark Office (USPTO), “Extended year set - patent counts by country, state, and year utility patents (December 2015)”, 2020 [online] https://www.uspto.gov/web/offices/ac/ido/oeip/taf/cst_utlh.htm; Organization for Economic Cooperation and Development (OECD), “Gross domestic spending on R&D”, 2020 [online database] <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm>; National Science Foundation (NSF), “Recent trends in U.S. R&D performance”, 2018 [online database] <https://www.nsf.gov/statistics/2018/nsb20181/report/sections/research-and-development-u-s-trends-and-international-comparisons/recent-trends-in-u-s-r-d-performance>; Ibero-American Network on Science and Technology Indicators (RICYT), “Comparatives”, 2020 [online database] <http://www.ricyt.org/en/category/indicators/>; United Nations Educational, Scientific and Cultural Organization (UNESCO), “Science, technology and innovation: Gross Domestic Expenditure on R&D (GERD), GERD as a percentage of GDP, GERD per capita and GERD per researcher”, 2020 [online database] <http://data.uis.unesco.org/index.aspx?queryid=74>, and World Bank, “Research and development expenditure (% of GDP)”, 2020 [online database] <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>.

Following Schteingart (2017), most of the oil exploitation was initially associated with foreign capital, which had the necessary know-how; but it was subject to strong State regulation that sought to generate backward linkages, appropriate most of the oil rent and transfer technology to local actors. A State-owned enterprise was created to keep oil exploitation under national control and to connect it to the science and technology system. In order to mitigate the effects of Dutch disease, Norway set up a State fund that appropriated part of the foreign exchange generated by oil exports to reduce exchange-rate appreciation.

As a result of the oil boom, the net technology content of Norway’s economy declined significantly, but its technological capacities continued to increase. In 2014, 71% of Norwegian exports were primary products and the rest were distributed as follows: low-tech goods 6%, medium-low tech 13%, medium-high tech 7% and high tech 4%. The export boom also facilitated growth free from external restrictions. Norway’s high per capita GDP is largely explained by the comprehensive social protection provided by a broad-based welfare state developed during the post-World War II period.

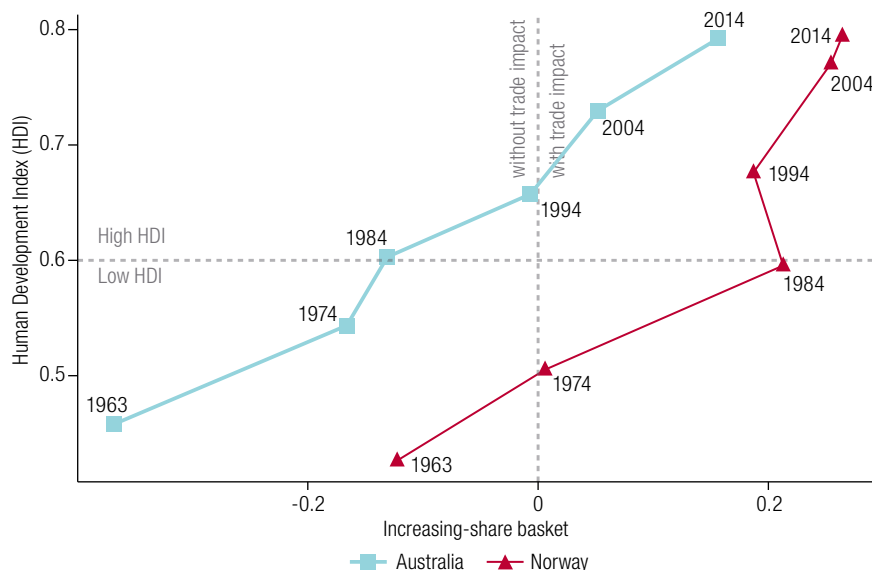
The Australian economy, for its part, is primarily structured around agriculture and mining, which has enabled it to develop a number of metal processing and capital goods industries for mining, along with a variety of associated services. Its membership of the Commonwealth gave it priority in supplying the United Kingdom with raw materials and even some industrialized goods (mainly weapons), which fostered the creation of research institutes and investment in education.

The data reported in figure 7 show that, in 1963, Australia's net technology content was very deficient. Consequently, it concentrated on the exploitation of natural resources and related activities, without seeking to consolidate the expansion of the manufacturing sector. At the start of the period analysed, primary products and low-technology goods accounted for 92% of Australia's total exports; and, although the share trended down until the early 1970s, it always remained above 60%. At the same time, high-tech exports, which in 1963 represented less than 1% of the total, now account for nearly 4%. In 2014, the Australian export basket was structured as follows: primary products 68%, low-tech goods 10%, medium-low-tech goods 14%, medium-high-tech goods 5% and high-tech goods 3%. Throughout the period under review, Australia's technology dependency has deepened, as reflected in the growing deficit in its net technology content.

The State also played an active role in modernizing infrastructure and spending on education and research. Investment in infrastructure — particularly the railways — was mainly based on national initiatives, rather than with European firms at the forefront. Investment in research and development, which was already high in the 1970s, grew steadily throughout the period, as reflected in the country's shift to the right in figure 7.

For geopolitical and trade specialization reasons, Australia managed to circumvent the external constraint and experience sustained long-term growth. Its geographical proximity to East Asia favoured exports of its raw materials to newly industrialized countries, especially as from the middle of the last century (Scheingart and Coatz, 2015). As shown in figure 8, the level of Australia's increasing-share basket rose continuously over the period analysed. Lastly, as a consequence of this economic performance and a State that historically invested in social protection, particularly in education and health, Australia maintained one of the highest HDI rankings in the world throughout the period. Thus, while both Norway and Australia were in the southwest quadrant of the performance path during the 1960s, in recent decades they have succeeded in reaching the northeast quadrant.

Figure 8
Australia and Norway: increasing-share basket and human development index
(performance path) of two primarized countries
with increasing capacities, 1963–2014



Source: Prepared by the authors, on the basis of United Nations, "UN Comtrade Database", 2017 [online database] <https://comtrade.un.org>; J. Bolt and J. van Zanden, "Maddison Project Database, version 2013", 2014 [online] <http://www.ggdc.net/maddison/maddison-project/home.htm>; R. Barro and J. Lee, "A new data set of educational attainment in the world, 1950-2010", *Journal of Development Economics*, vol. 104, September, 2013; World Bank, "Research and development expenditure (% of GDP)", 2020 [online database] <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>; World Bank, "Population, total", 2020 [online database] <https://data.worldbank.org/indicator/SP.POP.TOTL>, and United Nations Development Programme (UNDP), *Human Development Report 2015: Work for Human Development*, New York, 2015.

(b) Countries with low technological capacities

This category includes Argentina, Brazil and Chile — countries that also pursued a strategy based on the exploitation, production and sale of goods based on their abundant natural resource reserves. Unlike Norway and Australia, however, they did not generate high technological capacities and thus achieved a lower standard of living.

These economies are in the southwest quadrant of the production path and far from the neutrality line in terms of both net technology content and technological capacities (see figure 9).

Figure 9

Argentina, Brazil and Chile: net technology content of the trade balance and technological capacities (production path) of three reprimerized countries with low technological capacities, 1963–2014

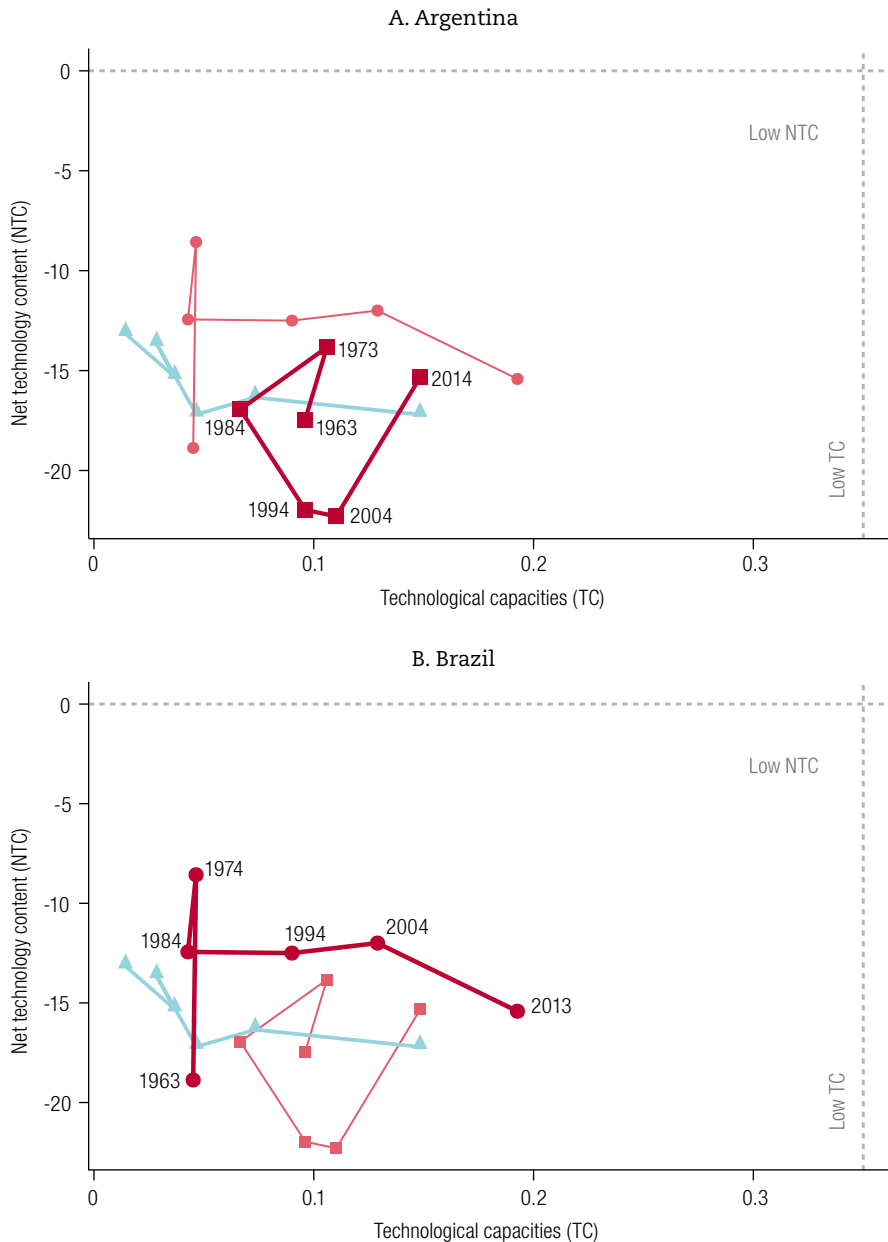
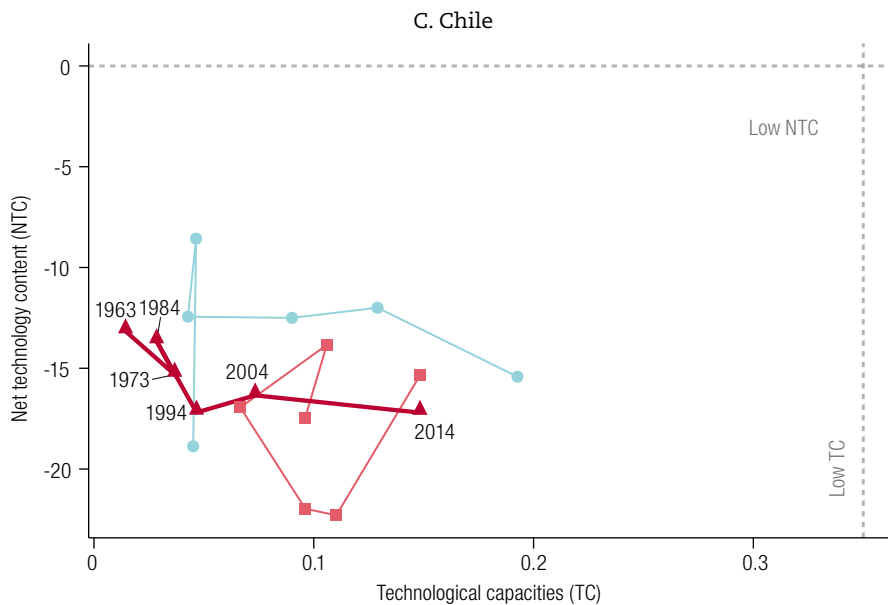


Figure 9 (concluded)



Source: Prepared by the authors, on the basis of United Nations, “UN Comtrade Database”, 2017 [online database] <https://comtrade.un.org/>; United States Patent and Trademark Office (USPTO), “Extended year set - patent counts by country, state, and year utility patents (December 2015)”, 2020 [online] https://www.uspto.gov/web/offices/ac/ido/oeip/taf/cst_utl.htm; Organization for Economic Cooperation and Development (OECD), “Gross domestic spending on R&D”, 2020 [online database] <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm>; National Science Foundation (NSF), “Recent trends in U.S. R&D performance”, 2018 [online database] <https://www.nsf.gov/statistics/2018/nsb20181/report/sections/research-and-development-u-s-trends-and-international-comparisons/recent-trends-in-u-s-r-d-performance>; Ibero-American Network on Science and Technology Indicators (RICYT), “Comparatives”, 2020 [online database] <http://www.ricyt.org/en/category/indicators/>; United Nations Educational, Scientific and Cultural Organization (UNESCO), “Science, technology and innovation: Gross Domestic Expenditure on R&D (GERD), GERD as a percentage of GDP, GERD per capita and GERD per researcher”, 2020 [online database] <http://data.uis.unesco.org/index.aspx?queryid=74>, and World Bank, “Research and development expenditure (% of GDP)”, 2020 [online database] <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>.

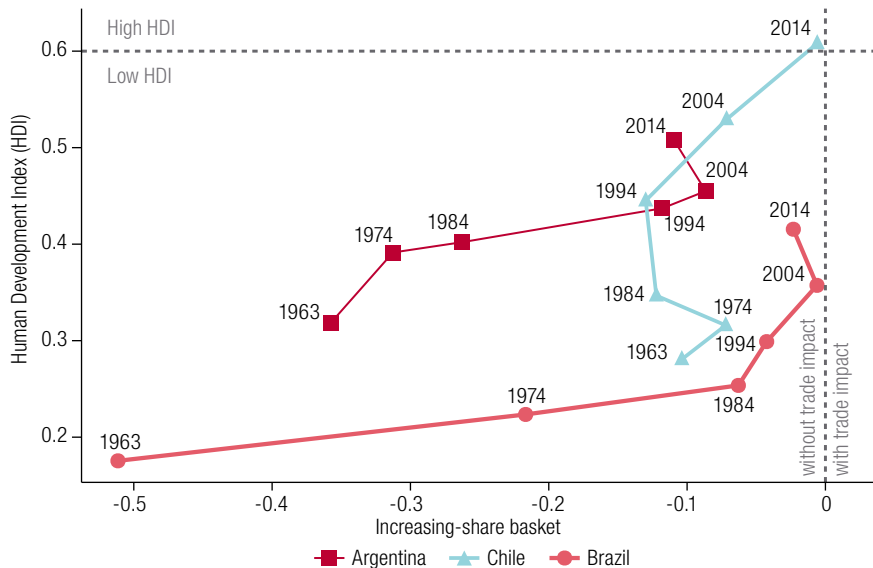
At the start of the period analysed, Argentina’s industrialization was based mainly on light industry using imported technology and imported industrial inputs (Ferrer, 2004). Its external account balance therefore continued to depend on the export of primary products, as evidenced by the negative net technology content and low technological capacities in 1963. In that year, 43% of Argentina’s export basket consisted of primary products, and 52% were low-technology products. High-tech exports represented just 1% and those of medium-high technology about 2%. In contrast, almost 50% of its imports were medium-high-tech products.

In the ensuing years, investments in heavy industry and intermediate goods matured, which were promoted in a context of developmentalism, in which FDI was decisively deployed (Azpiazu, 1986). This generated a relative improvement in net technology content, which, around 1975, was at its highest level of the entire period analysed. Moreover, the quality of life, as measured by HDI, also improved significantly (see figure 10).

After 1976, the coup d’état in Argentina launched a neoliberal period which involved the opening up of the economy, in conjunction with a trend of domestic currency appreciation that produced an avalanche of imported industrialized goods, drastically increased the technology content deficit and destroyed technological capacities (Azpiazu and Schorr, 2010). The imports that grew most rapidly were those of medium-high and high technology content. Meanwhile, the HDI indicator flatlined during this period. In the decade following the end of the military dictatorship, the only significant change in trade integration was an increase in the share of manufactures based on primary, agricultural and

energy products, to the detriment of unprocessed raw materials. Although these are low-tech products, there was an improvement in the increasing-share basket, as their share in world trade outgrew that of commodities (see figure 10).

Figure 10
Argentina, Brazil and Chile: increasing-share basket and human development index (performance path) of three reprimarized countries with low technological capacities, 1963–2014



Source: Prepared by the authors, on the basis of United Nations, “UN Comtrade Database”, 2017 [online database] <https://comtrade.un.org>; J. Bolt and J. van Zanden, “Maddison Project Database, version 2013”, 2014 [online] <http://www.ggd.net/maddison/maddison-project/home.htm>; R. Barro and J. Lee, “A new data set of educational attainment in the world, 1950–2010”, *Journal of Development Economics*, vol. 104, September, 2013; World Bank, “Research and development expenditure (% of GDP)”, 2020 [online database] <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>; World Bank, “Population, total”, 2020 [online database] <https://data.worldbank.org/indicator/SP.POP.TOTL>, and United Nations Development Programme (UNDP), *Human Development Report 2015: Work for Human Development*, New York, 2015.

In the 1990s, a new wave of liberalization further increased the deficit in net technology content. Owing to rising unemployment, a regressive income distribution and the deep economic crisis of 2001, the quality of life improved very little in this decade.

From 2004 onwards, the deficit in net technology content declined, and in 2014 it reached its lowest level since the mid-1970s (albeit without regaining the pre-dictatorship levels). Nonetheless, this occurred without any significant changes in the industrial specialization profile (Schorr, 2018). On the import side, the primary product share grew to 15%, largely owing to an increase in the energy deficit. Technological capacities improved rapidly thanks to the growth of public investment and in science and technology; and the country’s HDI also rose, driven by economic growth and improved income distribution.

Brazil pursued a similar strategy of international engagement to that of Argentina, based on a light industrialization serving the domestic market (Furtado, 1962). In 1963, 75% of the Brazilian export basket consisted of commodities, and 17% was low-tech goods. In the ensuing years, Brazil went through a rapid-growth phase and substantially altered its trade profile, mainly owing to a government policy that encouraged foreign firms either to set up business or to expand already established subsidiaries.

By 1974, the Brazilian export basket had been substantially reshaped, largely owing to the processing of raw materials for export, which is reflected in the increase in the share of low-tech goods, which grew to 40%, while the commodity share fell to 34%. At the same time, medium-high-technology goods more

than doubled their share in the export basket to 21%. Thus, the weight of goods in the Brazilian export basket in which world trade was growing also increased (see figure 9). However, this change in external participation was not matched by an improvement in technological capacities. The manufacturing share of GDP grew to over 33% in 1974 and continued to increase, reaching a peak of 34% in 1982.

In the 1980s, a period of neoliberal policies began, in which the priority was to stabilize prices and consolidate the balance of payments. The aim was to meet external debt payments through orthodox policies of squeezing demand and downsizing the role of the State. The reforms were intensified in the 1990s and included trade opening, exchange-rate liberalization, tax reforms to reduce spending and privatizations, among other measures (Abreu, 2004).

The result of these policies was a significant decline in net technology content in the early 1980s, which then stabilized until the mid-1990s; at the same time, technological capacities grew rapidly. During that period, the share of imports of high-technology products increased from 11% in 1974 to 17% in 1984.

By the 1990s, the trade surplus had turned into a large deficit, which compromised industrial development and aggravated the external vulnerability of the economy (Kupfer, Ferraz and Carvalho, 2009). This culminated in a current account crisis in 1999. In terms of the composition of foreign trade, high-tech share of imports continued to increase —from 15% in 1994 to 20% in 2003— as also did their share of exports, which grew from about 3% in 1994 to 7% in 2003.

When the Workers' Party (PT) came to power in 2003, the government did not reverse the foundations of the neoliberal economic model, although it did oversee a significant period of rapid economic growth and a major transformation of social policy that improved the living standards among the population (see figure 10). The rise in commodity prices as from 2003, in the context of neoliberal economic regulations, led to the reprimarization of exports: commodities, which had represented 23% of the export basket in 2003, accounted for 41% in 2014 (see figure 9). However, technological capacities improved notably, driven by State investment.

In Chile, the phase of forced import substitution continued, thanks to the deliberate industrial promotion policies implemented by the various progressive governments that held office during the 1940s; and this continued until 1973. In 1974, Chilean exports were 62.3% medium-low technology goods (mainly copper) and 20% commodities. This specialization in the export of low-tech goods was mainly focused on mining products (copper) and fish, whose share in world trade has grown in recent decades (see figure 10). This was a significant divergence from the specialization patterns of Argentina and Brazil: and it would later allow Chile to grow faster, taking advantage of much more favourable terms of trade.

The 1973 coup d'état in Chile triggered a major upheaval in economic policies, including indiscriminate opening up to imports, the elimination of price controls, liberalization of the financial market, privatization of public enterprises, State downsizing, union repression, a regressive tax reform and the liberalization of international capital flows (Ffrench-Davis, 2002). At the same time, the State partially withdrew funding for science and technology, which led to a decline in the country's technological capacities (see figure 9).

The consequence was a deepening of the profile of Chile's trade specialization. The adjustment of domestic demand and the opening up of imports meant that manufacturing industry, which in 1973 represented 27% of GDP, by 1981 accounted for just 22%. The 1982 external debt crisis induced the military government to make changes that mitigated the aforementioned effects on the import basket. Successive devaluations were accompanied by a partial restoration of tariff protection, while credits and subsidies were granted to the private sector.

The technology content of Chilean exports trended ambiguously in this period, despite changes in basket composition: the share of commodities increased, as did that of medium-high- and low-technology manufactures. By 1990, the commodity share of the export basket had grown to 31%, driven mainly by copper ore and grapes, but also with diversification towards other goods such as salmon, wood and fruits.

The return to democracy in 1990 ushered in a period of rapid and sustained economic growth. Chile tried to prevent its currency from appreciating too much to ensure external balance; and it benefited from the high international price of copper, capital inflows attracted by high interest rates and the income from natural resources (Ffrench-Davis, 2002). The growth of GDP made it possible to improve the population's quality of life, despite the persistence of very high levels of inequality. Chile moved above the HDI median line in the first decade of the new millennium. However, its increasing-share basket is very close to the neutral level (see figure 10). Chile's trade specialization remained within its historical pattern; and, in 2014, the commodity share of exports (copper ore) was 37%; the share of low-tech goods (paper, frozen fish and wine) was 22%, and that of medium-low-tech goods (copper) 34%. Nonetheless, over the last decade, Chile has made significant progress in generating technological capacities, thanks to the State's promotion of science and technology.

IV. Conclusions

The different national development paths that have been analysed indicate the existence of two major specialization vectors. First, there are countries on the periphery that developed dynamic advantages in industries with state-of-the-art technology and here, therefore able to move up to the highest value added links in production chains. These countries performed well, both in terms of the average quality of life of their inhabitants and in their impact on international trade. An example is the Republic of Korea. China, meanwhile, is clearly in a process of transition towards becoming a capitalist power.

Second, there are cases of specialization in comparative advantages, both in the export of products assembled in the country with intensive use of cheap labour (such as Mexico and, in certain respects, China and India, although the latter through outsourcing) and in the export of raw materials (for example, Argentina, Australia, Brazil, Chile and Norway). The peripheral nations that are specialized in assembly achieved an increasing participation in trade, but did not take advantage of this industrial base to climb to the higher value added links, so they did not achieve high standards of living. This is because the actors that project themselves as hegemonic do not intend a structural transformation of the different production matrices; instead, they seek to exploit the reduction in wages internationally.

Norway and Australia are specialized in raw materials and have high standards of living. Both countries have predominantly mineral or hydrocarbon resources (as opposed to more agriculturally-oriented countries such as Argentina and Brazil). They also have sizeable world market shares in exports of their natural resources. Moreover, the fact that they have very large per capita resource endowments and relatively small populations, compared to the other countries analysed, allows them to maintain a natural-resource-based production structure that occupies a large proportion of the population. These countries were able to develop some knowledge-intensive industry and services based on backward linkages from natural resources. In spite of their natural resource specialization, they were able to form an export basket that gave them a growing influence in world trade.

The data presented show that, although the countries that performed successfully followed different specialization paths, many of them coincide in having used similar instruments to turn the chosen path into a virtuous one. In particular, and despite nuances, there is evidence of a deep and persistent State intervention aimed at modifying the composition of the production structure to favour selected sectors of industry and services and to reduce the technological gap that separates them from the more advanced countries. To this end, capital incentives were used, which were subordinated to the fulfilment of strict technological, production, or trade performance goals. In successful cases, the State developed more or less intense indicative planning at different levels.

As for the entrepreneurial actors involved in the development process, in some cases, the State promoted the consolidation of large national conglomerates (for example, the *Chaebol* in the Republic of Korea); and, in others, it adopted an entrepreneurial role itself, through the creation of public enterprises (examples include countries as different as China and Norway). Foreign direct investment was promoted intensely in some countries; usually subject to controls and performance requirements (for example, in terms of technology transfer).

Several important lessons can be drawn from the analysis of the different national paths outlined in this article. Nonetheless, it must always be remembered that there is no ideal path and that each case of development is unique for a number of reasons. Accordingly, the aim is not to reach a definitive conclusion on the path Argentina should follow, but instead to draw on certain aspects of other national experiences, to better understand the scope and constraints involved in the difficult and complex (but necessary) transition towards development.

It is difficult to see Argentina treading the path followed in the cases of recent industrialization, since it does not have the abundant cheap labour that those countries deployed to develop linkages based on the assembly of parts and components for subsequent export.

Nonetheless, the experience of both recently industrialized countries and many central countries provide important lessons for thinking about Argentina's development. All cases of recent industrialization prioritized an initial ascent towards the northwestern region of the production path, but only the successful ones later moved towards the northeast. Despite their differences, in these national areas a change in sectoral composition was achieved, based on industries selected by the State, which also played a fundamental role in promoting them.

At this point, transnational corporations could be a hindrance, since they place Argentina in the lowest-tech segments of global value chains and obstruct its advance into more complex niches. Accordingly, Argentina could find high- or medium-technology niches in which it would be possible to develop capacities and export at least on a regional scale. At the same time, a number of policy instruments can also be identified, without ignoring the fact that some countries based their performance on the availability of cheap labour.

Nor can the path followed by the successful natural-resource-based countries be seen as the only path for Argentina. Unlike those countries, Argentina has agricultural resources (not mining or oil) and a much smaller per capita endowment, so its potential would be insufficient to relax the external constraint. However, unlike Australia and Norway, the country does not make the most of the demand generated by raw-material-producing sectors to develop local suppliers in key sectors. As a result, many higher-tech inputs are imported. The successful countries have developed local suppliers through active and sustained State policies; and they have levied taxes on income from natural resources to finance lines of credit for development.

Bibliography

- Abreu, M. (2004), "The Brazilian economy, 1980-1994", *Texto para Discussão*, No. 492, Rio de Janeiro, Catholic University of Rio de Janeiro, January.
- Agarwal, M. and J. Whalley (2013), "The 1991 reforms, Indian economic growth, and social progress", *NBER Working Paper*, No. 19024, Cambridge, National Bureau of Economic Research (NBER), May.
- Amsden, A. (1993), "Trade policy and economic performance in South Korea", *Trade and Growth: New Dilemmas in Trade Policy*, M. Agosin and D. Tussie (eds.), London, The Macmillian Press Ltd.
- (1989), *Asia's Next Giant: South Korea and Late Industrialization*, New York, Oxford University Press.
- Araujo, R. and G. Lima (2007), "A structural economic dynamics approach to balance-of-payments-constrained growth", *Cambridge Journal of Economics*, vol. 31, No. 5.

- Arceo, E. (2001), "El ALCA: un nuevo pacto colonial", Instituto de Estudios y Formación de la Central de Trabajadores de la Argentina/Instituto de Estudios sobre Estado y Participación [online] <http://www.biblioteca.org.ar/bases/pdf/IDE00132.pdf>.
- Azpiazu, D. (1986), "La promoción industrial en la Argentina, 1973-1983: efectos e implicancias estructurales", *Working Paper*, No. 19 (INT-0455), Buenos Aires, Economic Commission for Latin America and the Caribbean (ECLAC).
- Azpiazu, D. and M. Schorr (2010), "La industria argentina en la posconvertibilidad: reactivación y legados del neoliberalismo", *Problemas del Desarrollo: Revista Latinoamericana de Economía*, vol. 41, No. 161, Mexico City, National Autonomous University of Mexico (UNAM).
- Barro, R. and J. Lee (2013), "A new data set of educational attainment in the world, 1950-2010", *Journal of Development Economics*, vol. 104, September.
- Bekerman, M. and P. Sirlin (1996), "La estrategia exportadora de Corea del Sur", *Comercio Exterior*, vol. 46, No. 6.
- Bértola, L., M. Hernández and S. Siniscalchi (2012), "Un índice histórico de desarrollo humano de América Latina y algunos países de otras regiones: metodología, fuentes y bases de datos", *Documento de Trabajo*, No. 28, Montevideo, University of the Republic.
- Bhat, T. (2013), "Growth and structural changes in Indian industry", *Working Paper*, No. 2013/02, New Delhi, Institute for Studies in Industrial Development, February.
- Bolt, J. and J. van Zanden (2014), "Maddison Project Database, version 2013" [online] <http://www.ggdc.net/maddison/maddison-project/home.htm>.
- Cassini L., G. García Zanotti and M. Schorr (2017), "Los caminos al desarrollo: trayectorias nacionales divergentes en tiempos de globalización", *Documentos de Investigación Social*, No. 29, San Martín, Instituto de Altos Estudios Sociales (IDAES).
- Castaldi, C. (2009), "The relative weight of manufacturing and services in Europe: an innovation perspective", *Technological Forecasting and Social Change*, vol. 76, No. 6, July.
- Chang, D. (2009), "The mystified state: explaining the state in the economic miracle", *Capitalist Development in Korea: Labour, Capital and the Myth of the Developmental State*, Abingdon, Routledge.
- Cimoli, M., G. Porcile and S. Rovira (2010), "Structural change and the BOP-constraint: why did Latin America fail to converge?", *Cambridge Journal of Economics*, vol. 34, No. 2, March.
- Cimoli, M. and others (2005), "Cambio estructural, heterogeneidad productiva y tecnología en América Latina", *Heterogeneidad estructural, asimetrías tecnológicas y crecimiento en América Latina*, Project Documents (LC/W.35), M. Cimoli (ed.), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), November.
- Dalum, B., K. Laursen and B. Verspagen (1999), "Does specialization matter for growth?", *Industrial and Corporate Change*, vol. 8, No. 2.
- Delgado, I. (2015), "Política industrial na China, na Índia e no Brasil: legados, dilemas de coordenação e perspectivas", *Texto para Discussão*, No. 2059, Brasília, Institute of Applied Economic Research (IPEA), March.
- De Vries, G. and others (2011), "Deconstructing the BRICs: structural transformation and aggregate productivity growth", *GGDC Working Papers*, vol. GD 121, Groningen, University of Groningen.
- Dosi, G., K. Pavitt and L. Soete (1990), *The Economics of Technical Change and International Trade*, New York, Harvester Wheatsheaf.
- ECLAC (Economic Commission for Latin America and the Caribbean) (2007), "Progreso técnico y cambio estructural en América Latina", *Project Documents* (LC/W.136), Santiago, October.
- Ferrer, A. (2004), *La economía argentina: desde sus orígenes hasta principios del siglo XXI*, Buenos Aires, Fondo de Cultura Económica.
- Ffrench-Davis, R. (2002), "Chile, entre el neoliberalismo y el crecimiento con equidad", *Revista de Economía Política*, vol. 22, No. 4.
- Furtado, C. (1971), *The Economic Growth of Brazil: A Survey from Colonial to Modern Times*, Berkeley, University of California Press.
- Gereffi, G. (2010), "China y México en la economía global: trayectorias de desarrollo divergentes en una era de crisis económica", *Foro Internacional*, vol. 50, No. 3-4 (201-202), Mexico City, El Colegio de México.
- Hamilton, K. and others (2006), *Where is the Wealth of Nations?: Measuring Capital for the 21st Century*, Washington, D.C., World Bank.
- Hausmann, R., J. Hwang and D. Rodrik (2007), "What you export matters", *Journal of Economic Growth*, vol. 12, No. 1, March.

- Hikino, T. and A. Amsden (1994), "Staying behind, stumbling back, sneaking up, soaring ahead: late industrialization in historical perspective", *Convergence of Productivity: Cross-national Studies and Historical Evidence*, W. Baumol, E. Wolff and R. Nelson (eds.), Oxford, Oxford University Press.
- Jaguaribe, A. (2015), "Capacidades estatais comparadas: China e a reforma do sistema nacional de inovações", *Texto para Discussão*, No. 2085, Brasília, Institute of Applied Economic Research (IPEA), April.
- Kniivilä, M. (2007), "Industrial development and economic growth: implications for poverty reduction and income inequality", *Industrial Development for the 21st Century: Sustainable Development Perspectives*, New York, United Nations.
- Kupfer, D., J. Ferraz and L. Carvalho (2009), "50 años en 50: el largo y sinuoso camino del desarrollo industrial de Brasil", *Boletín Informativo Techint*, No. 330.
- Lavopa, A. (2015), "Structural transformation and economic development: can development traps be avoided?", doctoral thesis, Maastricht, Maastricht University.
- Lugones, G., D. Suárez and N. Le Clech (2007), "Conducta innovativa y desempeño empresarial", *Documentos de Trabajo*, No. 33, Buenos Aires, Centro de Estudios sobre Ciencia, Desarrollo y Educación Superior.
- Lugones, G., D. Suárez and S. Gregorini (2007), "La innovación como fórmula para mejoras competitivas compatibles con incrementos salariales: evidencias en el caso argentino", *Documentos de Trabajo*, No. 36, Buenos Aires, Centro de Estudios sobre Ciencia, Desarrollo y Educación Superior.
- Marín, A. (2016), "Las industrias de recursos naturales como plataforma para el desarrollo de América Latina", *Nuevos enfoques para el desarrollo productivo: Estado, sustentabilidad y política industrial*, Mexico City, Friedrich Ebert Stiftung.
- Mariña, A. and S. Cámara (2014), "The particularities of the world crisis in Mexico: a story of a subordinated integration into neoliberal globalization", document presented at the 2014 Annual Meeting of the Eastern Economic Association, Boston, 6-9 March.
- Moncaut, N. and D. Vázquez (2017), "El sendero de desarrollo chino y sus particularidades: incidencia e implicancias para los países sudamericanos", *Realidad Económica*, No. 305, Buenos Aires, Instituto Argentino para el Desarrollo Económico.
- Ordóñez, S. and R. Bouchain (2011), "Cómo se ubica México en el capitalismo del conocimiento y la nueva división internacional del trabajo", *Capitalismo del conocimiento e industria de servicios de telecomunicaciones en México*, Mexico City, National Autonomous University of Mexico (UNAM)/Institute of Economics Research.
- Pérez, C. (2010), "Technological dynamism and social inclusion in Latin America: a resource-based production development strategy", *CEPAL Review*, No. 100 (LC/G.2442-P), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).
- _____(2001), "Technological change and opportunities for development as a moving target", *CEPAL Review*, No. 75 (LC/G.2150-P), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).
- Rodrik, D. (2006), "What's so special about China's exports?", *China & World Economy*, vol. 14, No. 5.
- Schorr, M. (coord.) (2018), *Entre la década ganada y la década perdida: la Argentina kirchnerista, ensayos de economía política*, Buenos Aires, Batalla de Ideas.
- Schteingart, D. (2017), "Especialización productiva, capacidades tecnológicas y desarrollo económico: trayectorias nacionales comparadas y análisis del caso noruego desde mediados del siglo XX", doctoral thesis, National University of San Martín (UNSAM).
- _____(2014), "Estructura productivo-tecnológica, inserción internacional y desarrollo económico: hacia una tipología de senderos nacionales", master's thesis, National University of San Martín (UNSAM).
- Schteingart, D. and D. Coatz (2015), "¿Qué modelo de desarrollo para la Argentina?", *Boletín Informativo Techint*, No. 349.
- Singh, A. (2008), "The past, present and future of industrial policy in India: adapting to the changing domestic and international environment", *Working Paper*, No. 376, Cambridge, Centre for Business Research, December.
- Thirlwall, A. and J. McCombie (2004), *Essays on balance of payments constrained growth*, London, Routledge.
- UNDP (United Nations Development Programme) (2015), *Human Development Report 2015: Work for Human Development*, New York.
- Verspagen, B. (2000), "Growth and structural change: trends, patterns and policy options", *Research Memorandum*, No. 15, Maastricht, Maastricht University.
- Wang, L. and A. Szirmai (2008), "Productivity growth and structural change in Chinese manufacturing, 1980-2002", *Industrial and Corporate Change*, vol. 17, No. 4, August.

Greening small businesses in small States: the case of Barbados

Winston Moore and Christopher Kinch

Abstract

Barbados has embarked on a bold initiative to green its economy and has already made significant progress in some economic sectors (e.g. energy). This study investigates the extent to which small- and medium-sized enterprises (one of the largest segments of economic activity) on the island have adopted green initiatives and the factors that have prompted them to do so. A probit model is estimated using a firm-level database extracted from the Productivity, Technology and Innovation in the Caribbean (PROTEqIN) database maintained by Compete Caribbean. The results suggest that small and medium-sized enterprises (SMEs) have lagged behind larger firms in adopting green strategies. One of the key constraints was found to be the limited availability of technical skills and support within such enterprises. The study concludes that, if the island is to have any success in greening its SMEs, technical support will need to be made more accessible for these enterprises.

Keywords

Green economy, economic development, sustainable development, small enterprises, medium enterprises, corporate strategies, Barbados

JEL classification

Q56; C25; H25; M21

Author

Winston Moore is Deputy Principal of the Cave Hill campus de la University of the West Indies, Barbados. winston.moore@cavehill.uwi.edu.

Christopher Kinch is an economist in the Research and Economic Analysis Department of the Central Bank of Barbados. christopher.kinch@centralbank.org.bb.

I. Introduction

The definition of a small enterprises varies significantly from country to country as well as from industry to industry. For example, in agriculture, “small” is defined as a business with sales of US\$ 750,000 or less and fewer than 500 employees, while, in retail trade, the sales and staffing thresholds are US\$ 38.5 million and approximately 200 employees (SBA, n/d). In Europe, a small business or microenterprise is defined as one that has 50 or fewer employees and a turnover of less than €10 million (European Commission, n/d). A small business in Barbados, in contrast, is defined as any company with paid-up capital of not more than 1 million Barbados dollars (BDS\$), sales of not more than BDS\$ 2,000,000 and not more than 25 employees (Barbados, 1999).

Despite its limitations in terms of size, Barbados has set itself the very bold objective of becoming the greenest economy in Latin America and the Caribbean (Moore and others, 2012). If the island is to meet its targets for greening the economy, SMEs will have to play a leading role. In most countries, SMEs are a key part of the economy, and Barbados is no exception. SMEs account for large shares of total value added, employment and tax revenues (Barrow and Greene, 1979).

The concept of a green economy shifts the debate away from a dichotomy between economic growth and environmental sustainability to a discussion of two essentially complementary and necessary conditions. This convergence of the concepts of a green economy and a sustainable development process is evident in the various working definitions of a green economy used by the United Nations Environment Programme (UNEP):

“One that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” (UNEP, n/d).

“A green economy is a system of economic activities related to the production, distribution and consumption of goods and services that results in improved human well-being over the long term, whilst not exposing future generations to significant environmental risks and ecological scarcities” (ROLAC, 2010, quoted in Moore and others, 2014, p. 48).

Most small States have narrow domestic production bases, as they tend to focus on the production of just a few goods and/or services (Commonwealth Secretariat, 1997). In addition, the types of goods that small island developing States (SIDS) export are generally not unique but are instead produced by a number of other countries around the world (Easterly and Kraay, 2000). The greening of their economies therefore represents an opportunity for these States not only to diversify their production base but also to reduce their dependence on imported inputs (e.g. fossil fuels). It is therefore not surprising that many small States have been exploring options for greening their economies (Smith, Halton and Strachan, 2014).

This study investigates the extent to which Barbadian firms have adopted green initiatives and the factors that have prompted them to decide to do so. It contributes to the literature in three main ways. First, it provides an assessment of the extent to which firms in Barbados are greening their operations. Second, using a probit model of the decision to adopt green initiatives, it also offers an assessment of the main determinants of the decision to green these businesses. Finally, it also makes a number of recommendations concerning ways to enhance support for the greening of the Barbadian economy, most of which would be relevant for other small island developing economies as well.

The remainder of this study is structured as follows. Section II provides a brief summary of the previous literature on greening small businesses. Section III then gives an assessment of the green initiatives available to small businesses in Barbados. Section IV explores the factors that motivate firms in Barbados to adopt green initiatives, while section V offers some recommendations for encouraging SMEs to adopt green business practices. Section VI concludes this study with a summary of the main findings and policy recommendations.

II. Literature review

The goal of greening small businesses ties in with the broader literature on the corporate social responsibility of small firms. Given the close linkages between small businesses and the community, Besser (1999) and Campbell and Park (2017) argue that small businesses should have a greater incentive to make decisions aligned with the best interests of their community. However, small business owner-managers often cite a lack of time and resources as key constraints on environmentally-friendly behaviour and community involvement, as well as saying that they see little to gain from such activities (Hitchens and others, 2005; Tilley, 1999). The remainder of this section provides a summary of the key factors that have been found to influence the environmental awareness of small businesses and/or their willingness to green their operations.

1. Small businesses and greening

Individually, small businesses have a very small environmental footprint. Many of them may not be subject to environmental legislation and/or may believe that, because their environmental footprint is small, they do not need to regard environmental management activities and practices as important. Gadenne, Kennedy and McKeiver (2009) examine the internal and external factors that influence firms' level of environmental awareness. Contrary to their a priori expectations, they find that many SME owner-managers are very aware of their environmental impact and the future benefits of sustainable practices for their business. Despite this high level of awareness, only a few of these businesses had actually implemented proactive environmentally sustainable practices, mainly because of the cost of adopting green practices. Brammer, Hojmosse and Marchant (2012) find that SMEs tend not to implement green practices when there are weaknesses in their business strategies, and Aragón-Correa and others (2008) find that SMEs that have unique strategic strengths (shorter lines of communication and more interaction, a founding vision, flexible external relationships and an entrepreneurial orientation) are more likely to adopt green processes. In addition, the financial performance of firms that adopt innovative environmental practices tends to be stronger. This finding suggests that while the upfront costs of greening may be prohibitive, the long-run benefit for most firms is quite significant.

Buyer requirements can also be an important determinant of whether or not small businesses adopt green initiatives. For example, small businesses that are part of a global supply chain may come under pressure from other firms to adopt greener and more sustainable business practices in order to enhance product quality, facilitate marketing and reduce costs. Lee (2008), using a database of 855 Korean SMEs and a hierarchical linear regression analysis, investigates the willingness of suppliers to participate in green supply chain initiatives. That study finds that buyers' environmental requirements are a key determinant of the decision to adopt green strategies and practices. In addition, factors such as government involvement and supplier readiness also appear to be important determinants of the decision to adopt green business practices. Tzschentke, Kirk and Lynch (2008) note the importance of consumer demands in the case of small hospitality firms as well, but they also underscore the significance of the personal, sociocultural and situational characteristics of the organization in question.

Many owner-managers of small businesses are also aware of the potential cost savings of greening their operations that can accrue from recycling, energy savings and different shipping options, among other measures. Revell, Stokes and Chen (2010) note that the results from a cross-sector survey of 220 SMEs in the United Kingdom suggest that such companies are motivated to adopt green practices, not only by regulations, but also by the prospect of reducing costs, attracting new customers, increasing staff retention and generating favourable publicity for their firms. In addition, respondent companies noted that the transition to a low-carbon economy could create business opportunities for them. On the basis of in-depth interviews

of SMEs in the electronics industry, Lee (2009) also finds that many SME owner-managers are aware of the potential cost savings of greening their businesses. He suggests, however, that these organizations can also green their businesses by making strategic organizational changes.

2. Regulations and green business practices

Regulations tend to be a key driver for greening by SMEs, but they can also hinder a firm's day-to-day operations or put a halt to them altogether on account of the firm's environmental performance (Delmas and Toffel, 2004). Hoogendoorn, Guerra and van der Zwan (2015) use a database on almost 8,000 SMEs across 12 industries in 36 countries to investigate the factors that drive companies to engage in more environmentally-sound practices. They use two indicators of greening: to capture engagement in greening processes, they look at the level of investment in resource efficiency as a percentage of annual turnover and, to gauge the greenness of what a firm offers its clients or customers, they measure the percentage of annual turnover composed of green products and services. Applying an ordered logit model, they report that there appears to be an inverted U-shaped relationship between greening processes and firm size, with medium-sized enterprises (both in terms of employees and turnover) more likely to engage in green production and services than smaller companies. Overall, they find that the smallest enterprises in terms of turnover are less likely to be involved in any greening their product and service offerings. In addition to firm size, they find that business-to-business companies and firms that operate in industries with weak environmental regulations are also the least likely to engage in green practices. Similar results are also reported by Testa and others (2016), who note that external pressures and entrepreneurs' attitudes are the most important predictors of environmental proactivity for both small and microenterprises.

In addition to environmental regulations, incentives such as tax exemptions have also been identified as a useful policy intervention for encouraging firms to adopt green business practices. The case for "going green" seems relatively clear for small businesses but, given the technical and resource demands of greening processes, the benefits for small firms of doing so are somewhat less evident. Clemens (2006), however, finds that green economic incentives not only encourage firms to green their businesses, but also have a positive impact on the financial performance of small firms. Given the benefits of these incentives for businesses as well as for the environment, such incentives seem to be a win-win proposition for policymakers. Nevertheless, Zee, Stotsky and Ley (2002) recommend that these kinds of tax incentives should primarily be aimed at speeding up the recovery of investment costs if they are to lead to tangible results.

Regulatory and cost-saving instruments can also be powerful motivations for firms to green their businesses based on ethical, competitive or relational considerations. Gonzalez-Benito and Gonzalez-Benito (2005) assess the decisions of 184 Spanish manufacturers to pursue International Organization for Standardization (ISO) 14001 certification. Their results suggest that these companies have a high level of environmental awareness and commitment and are more likely to believe that better environmental management will give them competitive advantages. They do not, however, find any evidence that these businesses pursued environmental certification to enhance their relationships with other institutions and groups.

Doran and Ryan (2012) find that consumer demands can also heavily influence the decisions of firms to pursue green business practices. They estimate a modified innovation production function to assess the impact of regulation, consumer expectations and voluntary agreements on the likelihood of firms engaging in eco-innovation. In line with previous research, they find that regulations and customer perceptions are key drivers of a firm's decision to engage in eco-innovation. Given the positive relationship between eco-innovation and firm profitability, these findings suggest that regulators can stimulate growth by introducing green regulations and create a greener society.

3. Green practices and firm performance

In more developed economies, small firms have adopted a range of environmental strategies, mainly in response to regulatory demands, and have obtained benefits from those innovations. Aragón-Correa and others (2008) examine the case of 108 SMEs in the automotive repair sector in southern Spain. The authors find that, in keeping with their a priori expectations, most SMEs tend to be reactive in adopting environmental practices. However, those firms that did take a more proactive approach outperformed their peers. Aragón-Correa and others also note that these more proactive companies usually have shorter lines of communication, a strong founder's vision, flexibility in managing external relationships and an entrepreneurial orientation.

The benefits of greening, as reflected in environmental certification, are particularly strong in some industries (for example, tourism). Segarra-Oña and others (2012) examine the comparative economic performance of Spanish hotels that have adopted environmental standards (ISO 14001). Using a database of 2,116 hotels and various measures of economic performance, they find that receiving ISO 14001 certification is usually associated with improved economic performance. However, size had a significant impact on the benefits obtained, with larger hotels reporting comparatively greater economic benefits. These results suggest that small firms may not have as much access as larger businesses have to the teams of specialists required to fully leverage the benefits of certification. Having an appropriate team of skilled persons when adopting green standards thus appears to be an important aspect of leveraging the full benefits of greening for small businesses.

Testing for the differences in motivational indicators such as corporate environmental strategies and green practices, Paulraj (2009) reports that a firm's strategy, together with environmental legislation and considerations relating to corporate environmental responsibility, have prompted companies to incorporate green business practices. These practices tend to reduce waste and the cost of inputs while minimizing a company's impact on the environment (Cordano, 1993).

III. Green business practices in Barbados

Much of the data used in this study are taken from the Productivity, Technology and Innovation in the Caribbean (PROTEqIN)¹ database maintained by Compete Caribbean (Compete Caribbean, 2015). This database contains information on 123 Barbadian firms in both the manufacturing and services industries. Those firms were surveyed using a stratified random sampling approach, and the results are therefore based on a representative sample of the business establishments in the country.

As noted earlier, there are many programmes that promote greening in Barbados. The survey database covers two aspects of greening: environmental impact and reduced energy costs. The companies that were surveyed were asked to indicate if they had undertaken any initiatives to reduce their environmental impact or if they had adopted any strategies to reduce their energy costs. These two variables were combined to produce a single dummy variable indicator that takes a value of 1 if the company has undertaken any strategies to reduce its environmental impact or energy cost and 0 if it has not.

In general, in Barbados SMEs are less likely to pursue green initiatives than larger companies are. Table 1 disaggregates the companies in the database by number of employees and by whether or not they were pursuing green initiatives. Of the 45 companies employing 20 persons or fewer, none had pursued any initiative to green its operations. However, 45% of the other 78 companies (i.e. those

¹ See [online] <http://competecaribbean.org/proteqin/>.

employing 21 persons or more) were attempting to green their businesses. This is a fairly high ratio for the larger enterprises, but the relatively poor performance of the SMEs in pursuing green initiatives suggests that there is still some work to be done in order to green the corporate sector in Barbados.

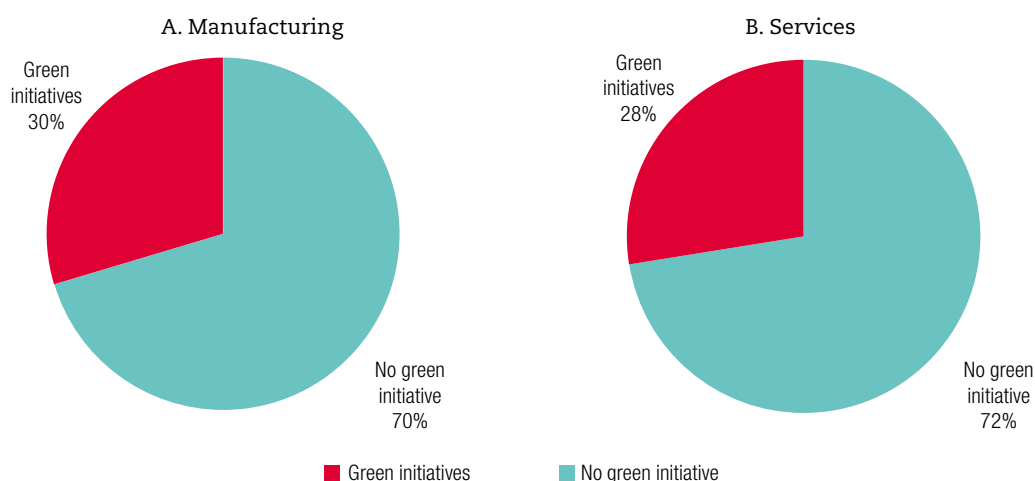
Table 1
Barbados: greening and company size

Number of employees	Number of companies pursuing green initiatives	Total number of companies	Percentage
0-20	0	45	0
21-40	14	27	52
41-60	4	11	36
61-80	3	5	60
81-100	2	2	100
101-120	4	11	36
121-140	5	9	56
141-160	1	4	25
More than 160	2	9	22

Source: Compete Caribbean, "Productivity, Technology, Innovation in the Caribbean", 2016 [online database] <https://publications.iadb.org/en/productivity-technology-innovation-caribbean>.

On average, roughly the same percentages (approximately one third) of manufacturing and service companies were pursuing green initiatives (see figure 1).

Figure 1
Barbados: companies pursuing green initiatives, by industry
(Percentages)



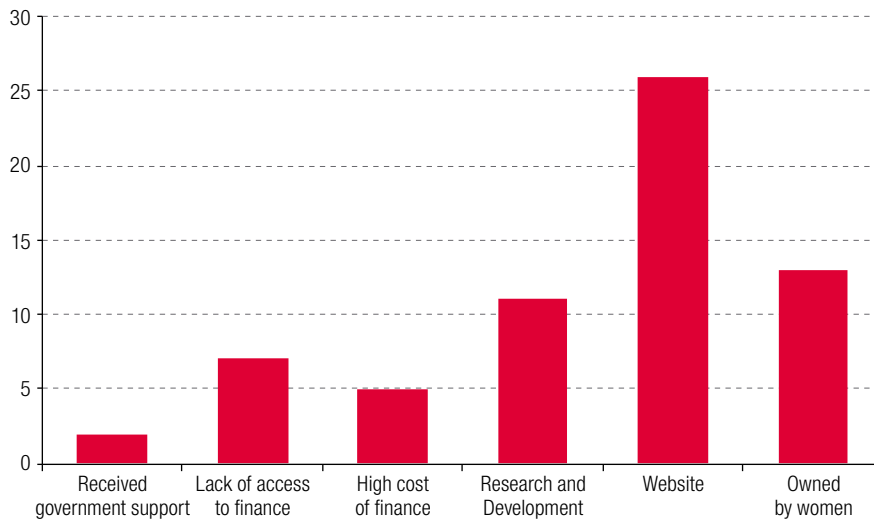
Source: Compete Caribbean, "Productivity, Technology, Innovation in the Caribbean", 2016 [online database] <https://publications.iadb.org/en/productivity-technology-innovation-caribbean>.

Of the companies attempting to green their operations, approximately one fifth had a website and just over 10% had engaged in research and development aimed either at devising new products or at reducing costs (see figure 2). Sarkis (2003) notes that many of these companies tend to undertake environmental plans as a means of gaining a competitive advantage over rivals.

In addition to demonstrating the importance of technological variables, the results reported in figure 2 suggest that women-owned enterprises are less likely to pursue green business initiatives. This finding could be associated with many factors other than a difference in the decision-making practices of female business owners. Carter and Allen (1997), for example, argue that the characteristics of

women-owned businesses are largely determined by their access to financial resources. This finding runs counter to the bulk of the literature on the subject, which indicates that women are willing to pay more for environmentally friendly products (Laroche, Bergeron and Barbaro-Forleo, 2001), and other studies on the issue of green purchasing (Schaper, 2002). There is some evidence of financing constraints limiting the ability of firms to pursue green initiatives, but only a small number of companies have cited the “high cost of finance” or a “lack of access to finance” as a key obstacle to the pursuit of initiatives for reducing their environmental impact.

Figure 2
Barbados: characteristics of companies adopting green initiatives
(Number of companies)



Source: Compete Caribbean, “Productivity, Technology, Innovation in the Caribbean”, 2016 [online database] <https://publications.iadb.org/en/productivity-technology-innovation-caribbean>.

IV. The decision to adopt green business practices

1. Modelling decisions to adopt green business practices

One of the shortcomings of using descriptive statistics to draw inferences about a particular sample group is the potential effect of third variables that are not accounted for in the bivariate analysis. This issue can be addressed by estimating a probit regression of the decision to adopt green business practices. This approach is useful when the dependent variable is dichotomous, i.e. has only two values (Cameron and Trivedi, 2006), as — in the case of our model — when we are looking at whether firms have pursued some type of green initiative or not. If we let p_i be an indicator of whether the firm pursued some type of green initiative, then our probit model takes the form of:

$$p_i = Pr[y_i = 1 | x] = \phi(x_i'\beta) \quad (1)$$

where $y_i = 1$ when the firm pursues some type of green initiative, $\phi(\cdot)$ is the cumulative distribution function of a normal distribution, β represents coefficient vectors and x_i' is a vector of possible explanatory variables. Assuming that the errors from the model are independent and identically distributed normal variables with a zero mean, the equation is computed using maximum likelihood estimation techniques.

Based on the literature highlighted in section II, the explanatory variables used here include firm size (measured by the number of employees), participation in export markets, foreign ownership share, foreign customers, part of a larger supply chain, access to finance, proportion of highly skilled employees, degree of market competition and industry dummies (see table 2).

Table 2
Expected signs for explanatory variables

Variables	Potential sign	Literature
Firm size	-	Aragón-Correa and others (2008); Segarra-Oña and others (2012); Hoogendoorn, Guerra and van der Zwan (2015)
Participation in export markets	+	Lee (2008)
Foreign ownership share	+/-	Lee (2008)
Foreign customers	+/-	Lee (2008); Tzschentke, Kirk and Lynch (2008)
Part of a larger supply chain	+	Lee (2008); Tzschentke, Kirk and Lynch (2008)
Access to finance	-	Aragón-Correa and others (2008)
Proportion of highly skilled employees	+	Segarra-Oña and others (2012)
Degree of market competition	+	Paulraj (2009)
Industry dummies	+/-	Hoogendoorn, Guerra and van der Zwan (2015)

Source: Prepared by the authors.

Clemens (2006) and Aragón-Correa and others (2008) argue that firm performance should improve as a result of the adoption of green initiatives because proactive environmental practices enhance the competitiveness of small firms. For example, suppliers that pursue ISO 14001 or Eco-Management and Audit Scheme (EMAS) certification tend to be more competitive internationally, regardless of size (Bellesi, Lehrer and Tal, 2005). The ISO 14001 certification demonstrates that a firm operates at the highest international standard and that it is reducing its costs by having waste management systems in place. Such firms have a marketing advantage and reduce both the risks and potential costs of litigation.

Corporate greening initiatives tend to have an effect on investors' perceptions of companies' performance in the future (Gilley and others, 2000). This is because investors react more to product-driven green initiatives than to process-driven ones. The introduction of new green products by a firm enhances its overall reputation and boosts its sales. In terms of the explanatory variable of access to financing, Haselip, Desgain and Mackenzie (2014) argue that the lack of access to credit from financial institutions such as banks has been a major barrier to the commercial viability of energy SMEs in Ghana and Senegal. This finding is in line with that of Kauffman (2005), who affirms that SMEs in Africa have very limited access to finance because of the high risk of default and a lack of financial facilities.

2. Results

The results of the regression analysis are reported in table 3. Column 2 provides the results from the ordinary least squares (OLS) estimation of the empirical model (also known as a linear probability model), while columns 3 and 4 show the results obtained from the probit model and the associated marginal effects of a change in each regressor on the probability that the dependent variable will take a value of 1 (pursuing green initiatives) as evaluated on the basis of the sample means. The model estimated using OLS is provided for comparison purposes only, as the OLS estimator could yield predicted probabilities greater than 1 (Cameron and Trivedi, 2006). Information on all of the variables used in the regression model was available for only 116 of the full sample of 123 firms, and the resulting number is therefore smaller than it would otherwise be.

Table 3
Barbados: determinants of the adoption of green business practices

	OLS	Probit	Marginal effects of probit regression
Age	0.003 (0.007)	0.011 (0.026)	0.002 (0.005)
Age squared	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Employment	0.002 (0.002)	0.049 (0.017)***	0.009 (0.002)***
Employment squared	-0.000 (0.000)	-0.000 (0.000)***	-0.000 (0.000)***
Services	-0.040 (0.114)	-0.294 (0.559)	-0.055 (0.104)
Subsidiary	-0.136 (0.148)	-0.399 (0.500)	-0.075 (0.092)
Corporation	-0.204 (0.106)*	-0.958 (0.531)*	-0.179 (0.099)*
Sole proprietorship	-0.262 (0.105)**	-1.769 (0.682)***	-0.331 (0.124)***
Foreign-owned	-0.000 (0.002)	-0.003 (0.006)	-0.001 (0.002)
Women-owned	0.140 (0.089)	0.603 (0.332)*	0.113 (0.061)
Women-managed	-0.165 (0.089)*	-1.000 (0.777)	-0.187 (0.146)
Website	0.093 (0.095)	0.183 (0.439)	0.034 (0.082)
Customers: individuals	-0.339 (0.185)*	-2.611 (0.869)***	-0.489 (0.145)***
Customers: small businesses	-0.322 (0.191)*	-2.203 (0.802)***	-0.413 (0.137)***
Number of competitors	0.080 (0.106)	0.493 (0.506)	0.092 (0.092)
Innovation	0.093 (0.152)	0.572 (0.524)	0.107 (0.099)
Technical employees	1.825 (1.146)	16.430 (6.884)**	3.077 (1.185)***
Access to skilled employees	-0.144 (0.074)	-0.469 (0.356)	-0.088 (0.065)
Cost of finance	-0.072 (0.122)	-0.528 (0.469)	-0.099 (0.088)
Access to finance	-0.067 (0.116)	-0.159 (0.434)	-0.030 (0.081)
Government support	-0.114 (0.170)	-0.182 (0.780)	-0.034 (0.146)
Awareness of programmes	-0.198 (0.098)**	-1.052 (0.409)***	-0.197 (0.071)***
Technical assistance	0.024 (0.123)	0.123 (0.530)	0.023 (0.099)
Intercept	0.373 (0.502)	-1.483 (2.341)	-
R-squared/pseudo R-squared	0.329	0.429	
F-statistic(23,91) or Wald chi-square (23)	2.990 [0.000]	47.280 [0.000]	
No. of observations	116	116	

Source: Prepared by the authors.

Note: Standard errors are shown in parentheses and p-values in square brackets below the corresponding coefficients. Significant at 1% (***), significant at 5% (**) and significant at 10% (*).

The empirical model explains about 43% more of the variation in the dependent variable than a model that only uses a constant (as indicated by the pseudo R-squared). In addition, the statistical significance of the chi-square statistic suggests that all the slopes cannot be set to zero.

Classification tests also suggest that the model does an adequate job of classifying companies into those that do and those that do not pursue green initiatives, correctly classifying 83% of the companies in the database.

Since the model performs adequately in accounting for decisions to adopt green initiatives, it can be used to identify the most important covariates and their impact on greening decisions. The covariates that were significant at normal levels of testing included company size (proxied by employment), ownership structure, customer characteristics, composition of staff and awareness of technical assistance or programmes to support greening.

In line with the literature (Hitchens and others, 2005; Tilley, 1999), the marginal effect of the size variable suggests that larger companies are more likely to green their enterprises. To evaluate the possibility of a non-linear relationship between size and greening, the size-squared term was also included to account for the likelihood that very large firms might find it too expensive to green their operations. For both the size and the size-squared term, however, the marginal effects were quite small.

The effects of size may also be reflected in the coefficient for the ownership dummy for sole proprietorships. In the sample, sole proprietorships were 30% less likely to engage in initiatives to green their enterprises. Many factors are usually associated with the limited decision-making space of small businesses, including liquidity constraints (Holtz-Eakin, Joulfaian and Rosen, 1994), the inaccessibility of economies of scale and differences in organizational structures (Variyam and Kraybill, 1993). One of the other difficulties that sole proprietorships may face has to do with owners' time constraints, which may reduce their ability to leverage incentives for the adoption of green initiatives and to plan effectively (Gaskill, Van Auken and Kim, 2015).

In line with the literature reviewed earlier, the types of consumer and business interactions were found to be key predictors of whether or not a firm would engage in green initiatives. On average, companies for which most of their customers were either individuals or small businesses were 40% less likely to undertake initiatives to green their businesses. This finding is in keeping with that of Lee (2008), who finds that global supply chains tend to be a more important driver of green initiatives. This also suggests that policymakers in Barbados may want to focus on educating the public about the societal benefits of purchasing goods from companies with green credentials. Such initiatives could enhance the performance of companies that have greened their businesses or products and could provide a greater incentive for other companies, once they have the necessary resources and skills, to also consider greening their businesses.

Companies with a larger proportion of employees with technical skills were significantly more likely to pursue green initiatives than their peers. Reducing a company's environmental footprint is usually accomplished by streamlining business practices and/or making technological improvements. Companies whose staff include a large proportion of employees with technical skills will find it easier not only to identify bottlenecks in the production process but also to identify and implement potential solutions (Murillo-Luna, Garcés-Ayerbe and Rivera-Torres, 2011). This kind of company was three times more likely to be pursuing green initiatives than its more low-tech peers. Given the potential benefits of greening in terms of improved firm performance, as discussed earlier, it is clear that employees with technical skills are generating a significant return on investment for the companies that employ them.

In keeping with the results of the study conducted by Gadenne, Kennedy and McKeiver (2009), our findings also indicate that many businesses are aware of the existence of facilities that can provide technical assistance for the implementation of green initiatives. Given the relatively low adoption rate of SMEs as a whole, this implies that these companies do not see the benefit of drawing on such assistance to green their enterprise. Therefore, to ensure that more businesses make use of green strategies, it may be necessary to provide more targeted forms of technical assistance.

V. Additional institutional mechanisms for supporting the greening of businesses

While the magnitude of the size coefficient is relatively small, the empirical results discussed earlier suggest that the constraints posed by size are nonetheless a significant hurdle for the greening of businesses in Barbados. Overcoming this obstacle will therefore be of key importance if policymakers are to achieve their objectives for the greening of the economy, particularly in view of the important role in the domestic economy played by small businesses. Given the resource constraints encountered by the smallest businesses, it is important for these initiatives to be simple, relatively easy to implement and suited to the time constraints experienced by the owners of these enterprises.

One approach that may prove useful would be to utilize existing networks (Preisendörfer and Brüderl, 1998). Encouraging small business owners to network would help them to share knowledge and information, discuss alternative approaches to greening their businesses and possibly tap into green market opportunities. These networks already exist in Barbados thanks to the Small Business Association of Barbados, the Barbados Coalition of Service Industries and the Barbados Chamber of Commerce and Industry. Facilitating small businesses' use of these channels to network and share knowledge about greening their businesses might prove to be a low-hanging fruit that could be easily picked with the support of both the private and public sectors.

One of the most important drivers of the adoption of green strategies among Barbadian businesses is the technical skill composition of firms' employees. Companies whose personnel include a larger proportion of staff possessing technical expertise are more likely to adopt green initiatives. This finding speaks to the importance of providing training opportunities, as well as the role of educational institutions. Policymakers could achieve significant gains by supporting the expansion of training opportunities for employees in areas relating to the green economy. This kind of training would enable employees not only to support the implementation of green initiatives at their company but also to do so at the industry level as they move from job to job.

Educational institutions in Barbados may wish to consider introducing specific courses or programmes on the greening of business enterprises and exposing students in various disciplines to this concept. This would help to ensure that new employees would be sufficiently versed in green economy concepts to support further greening of the business where they are employed. It should be noted, however, that, as argued by Perron, Côté and Duffy (2006), while the importance of employee awareness of green initiatives should be acknowledged, organizations should evaluate the efficiency of their training investments to ensure that the anticipated benefits are indeed being generated.

VI. Conclusions

The greening of the economy has become a key objective of policymakers in Barbados. To date, many of the country's green initiatives have targeted the issue of reducing the island's dependence on fossil fuels. Given the importance of small businesses in the domestic economy, however, any such initiatives need to be designed to increase the propensity of SMEs to green their businesses. To this end, this study has provided a review of current incentives for the greening of small businesses and identifies the key determinants of their propensity to adopt green business strategies.

Although small businesses face a number of difficulties in implementing green initiatives owing to their size, the Government of Barbados provides a number of tax incentives and facilitates access to funding through such mechanisms as the Energy Smart Fund. In addition, through such organizations

as the Barbados Renewable Energy Association (BREA), firms have access to various networks for sharing information on cost-effective and efficient models for greening their day-to-day operations and/or products. In the future, the authors hope to broaden the scope of this study with a view to determining whether financial performance is positively associated with SME greening innovations in Barbados.

Bibliography

- Aragón-Correa, J. and others (2008), "Environmental strategy and performance in small firms: a resource-based perspective", *Journal of Environmental Management*, vol. 86, No. 1, January.
- Barbados (1999), "Chapter 318C", *Small Business Development Act* [online] <https://www.investbarbados.org/legislations/small-business-development-act-cap-318c/> [accessed on: 30 May 2016].
- Barrow, C. and J. Greene (1979), *Small Business in Barbados: A Case of Survival*, Bridgetown, Institute of Social and Economic Research - Eastern Caribbean.
- Bellesi, F., D. Lehrer and A. Tal (2005), "Comparative advantage: the impact of ISO 14001 environmental certification on exports", *Environmental Science & Technology*, vol. 39, No. 7.
- Besser, T. (1999), "Community involvement and the perception of success among small business operators in small towns", *Journal of Small Business Management*, vol. 37, No. 4.
- Brammer, S., S. Hoøjmoose and K. Marchant (2012), "Environmental management in SMEs in the UK: practices, pressures and perceived benefits", *Business Strategy and the Environment*, vol. 21, No. 7, November.
- Cameron, A. and P. Trivedi (2005), *Microeconometrics: Methods and Applications*, New York, Cambridge University Press.
- Campbell, J. and J. Park (2017), "Extending the resource-based view: effects of strategic orientation toward community on small business performance", *Journal of Retailing and Consumer Services*, vol. 34, January.
- Carter, N. and K. Allen (1997), "Size determinants of women-owned businesses: choice or barriers to resources?", *Entrepreneurship & Regional Development: An International Journal*, vol. 9, No. 3.
- Clemens, B. (2006), "Economic incentives and small firms: does it pay to be green?", *Journal of Business Research*, vol. 59, No. 4, April.
- Commonwealth Secretariat (1997), *A Future for Small States: Overcoming Vulnerability*, London.
- Compete Caribbean (2016), "Productivity, Technology, Innovation in the Caribbean" [online database] <https://publications.iadb.org/en/productivity-technology-innovation-caribbean>.
- Cordano, M. (1993), "Making the natural connection: justifying investment in environmental innovation", *Proceedings of the International Association for Business and Society*, vol. 4.
- Delmas, M. and M. Toffel (2004), "Stakeholders and environmental management practices: an institutional framework", *Business Strategy and the Environment*, vol. 13, No. 4.
- Doran, J. and G. Ryan (2012), "Regulation and firm perception, eco-innovation and firm performance", *European Journal of Innovation Management*, vol. 15, No. 4.
- Easterly, W. and A. Kraay (2000), "Small States, small problems? Income, growth, and volatility in small States", *World Development*, vol. 28, No. 11, November.
- European Commission (n/d), "Internal market, industry, entrepreneurship and SMEs" [online] http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition/index_en.htm [accessed on: 30 May 2016].
- Gadenne, D., J. Kennedy and C. McKeiver (2009), "An empirical study of environmental awareness and practices in SMEs", *Journal of Business Ethics*, vol. 84, No. 1, January.
- Gaskill, L., H. Van Auken and H. Kim (1994), "Impact of operational planning on small business retail performance", *Journal of Small Business Strategy*, vol. 5, No. 1.
- Gilley, K. and others (2000), "Corporate environmental initiatives and anticipated firm performance: the differential effects of process-driven versus product-driven greening initiatives", *Journal of Management*, vol. 26, No. 6.
- González-Benito, J. and O. González-Benito (2005), "An analysis of the relationship between environmental motivations and ISO14001 certification", *British Journal of Management*, vol. 16, No. 2.
- Haselip, J., D. Desgain and G. Mackenzie (2014), "Financing energy SMEs in Ghana and Senegal: outcomes, barriers and prospects", *Energy Policy*, vol. 65, January.
- Hitchens, D. and others (2005), "Environmental performance, competitiveness and management of small businesses in Europe", *Journal of Economic and Social Geography*, vol. 96, No. 5, December.

- Holtz-Eakin, D., D. Joulfaian and H. Rosen (1994), "Entrepreneurial decisions and liquidity constraints", *The RAND Journal of Economics*, vol. 25, No. 2.
- Hoogendoorn, B., D. Guerra and P. van der Zwan (2015), "What drives environmental practices of SMEs?", *Small Business Economics*, vol. 44, No. 4, April.
- Kauffman, C. (2005), "Financing SMEs in Africa", *OECD Development Centre Policy Insights*, No. 7, Paris, Organization for Economic Cooperation and Development (OECD).
- Laroche, M., J. Bergeron and G. Barbaro-Forleo (2001), "Targeting consumers who are willing to pay more for environmentally friendly products", *Journal of Consumer Marketing*, vol. 18, No. 6.
- Lee, K. (2009), "Why and how to adopt green management into business organizations?: The case study of Korean SMEs in manufacturing industry", *Management Decision*, vol. 47, No. 7, July.
- Lee, S. (2008), "Drivers for the participation of small and medium-sized suppliers in green supply chain initiatives", *Supply Chain Management: An International Journal*, vol. 13, No. 3.
- Moore, W. and others (2014), *Green Economy Scoping Study: Barbados*, Oistins, Government of Barbados/United Nations Environment Programme (UNEP)/University of the West Indies (UWI).
- (2012), *Green Economy Scoping Study Synthesis Report: Barbados*, Oistins, Government of Barbados/United Nations Environment Programme (UNEP)/University of the West Indies (UWI).
- Murillo-Luna, J., C. Garcés-Ayerbe and P. Rivera-Torres (2011), "Barriers to the adoption of proactive environmental strategies", *Journal of Cleaner Production*, vol. 19, No. 13, September.
- Paulraj, A. (2009), "Environmental motivations: a classification scheme and its impact on environmental strategies and practices", *Business Strategy and the Environment*, vol. 18, No. 7, November.
- Perron, G., R. Côté and J. Duffy (2006), "Improving environmental awareness training in business", *Journal of Cleaner Production*, vol. 14, No. 6-7.
- Preisendörfer, P. and J. Brüderl (1998), "Network support and the success of newly founded businesses", *Small Business Economics*, vol. 10, No. 3.
- Revell, A., D. Stokes and H. Chen (2010), "Small businesses and the environment: turning over a new leaf", *Business Strategy and the Environment*, vol. 19, No. 5.
- Sarkis, J. (2003), "A strategic decision framework for green supply chain management", *Journal of Cleaner Production*, vol. 11, No. 4, June.
- SBA (Small Business Administration) (n/d), "Size standards" [online] <https://www.sba.gov/contracting/getting-started-contractor/make-sure-you-meet-sba-size-standards> [accessed on: 30 May 2016].
- Schaper, M. (2002), "Small firms and environmental management: predictors of green purchasing in Western Australian pharmacies", *International Small Business Journal: Researching Entrepreneurship*, vol. 20, No. 3, August.
- Segarra-Oña, M. and others (2012), "Does environmental certification help the economic performance of hotels?: Evidence from the Spanish hotel industry", *Cornell Hospitality Quarterly*, vol. 53, No. 3.
- Smith, N., A. Halton and J. Strachan (eds.) (2014), *Transitioning to a Green Economy: Political Economy of Approaches in Small States*, London, Commonwealth Secretariat.
- Testa, F. and others (2016), "Factors affecting environmental management by small and micro firms: the importance of entrepreneurs' attitudes and environmental investment", *Corporate Social Responsibility and Environmental Management*, vol. 23, No. 6.
- Tilley, F. (1999), "The gap between the environmental attitudes and the environmental behaviour of small firms", *Business Strategy and the Environment*, vol. 8, No. 4.
- Tzschentke, N., D. Kirk and P. Lynch (2008), "Going green: decisional factors in small hospitality operations", *International Journal of Hospitality Management*, vol. 27, No. 1, March.
- UNEP (United Nations Environment Programme) (n/d), "Green economy" [online] <https://www.unenvironment.org/pt-br/node/23750#:~:text=The%20UN%20Environment%20Programme%20has,in%20carbon%2C%20resource%20efficient%20and>.
- Variyam, J. and D. Kraybill (1993), "Small firms' choice of business strategies", *Southern Economic Journal*, vol. 60, No. 1, July.
- Zee, H., J. Stotsky and E. Ley (2002), "Tax incentives for business investment: a primer for policy makers in developing countries", *World Development*, vol. 30, No. 9, September.

Labour productivity and Central American economic integration: the case of El Salvador

Luis René Cáceres¹

Abstract

This paper seeks to identify the variables that determine labour productivity in El Salvador. The results show that the extreme openness of the Salvadoran economy, combined with the decline in its investment rate since the mid-1990s, have dampened labour productivity growth —as also has happened in other Central American countries. The study also finds that a country's productivity is positively influenced by the vitality of quality employment and investment in neighbouring countries. This article concludes by advocating the restoration of protection to the subregion's production sectors, the promotion of quality education, technology and the acquisition of knowledge and skills.

Keywords

Employment, labour market, labour productivity, measurement, economic growth, investments, economic integration, educational quality, productivity statistics, El Salvador

JEL classification

D62, E26, F15, F43, O18, R11

Author

Luis René Cáceres holds a PhD in Economics from the University of Utah (United States).
Email: luisrenecaceres@gmail.com.

¹ For Raquel Eva Virginia Rosario, my daughter, a tenacious Salvadoran.

I. Introduction

Recent studies have noted the persistently declining trend of labour productivity in Latin American countries since the mid-1970s, having grown rapidly between 1950 and 1970. From 2000 to 2015, labour productivity grew by an average of just 0.6% per year, the lowest rate of all regions in the world. In conjunction with annual employment growth averaging 2.3%, this explains El Salvador's meagre average economic growth rate of 3% per year, which is also the lowest of all regions (OECD, 2016; McKinsey, 2017).

The driving role of employment growth is expected to weaken in the future, as it falls to 1.1% per year, owing to population aging and a declining fertility rate. Unless productivity increases dramatically, economic growth is likely to drop to almost half of its 2000–2015 rate (OECD, 2016; McKinsey, 2017).

This study investigates the determinants of labour productivity in El Salvador. Section II presents a brief review of the recent literature on productivity in Latin American countries, and Section III discusses the data and their statistical properties. Section IV reports the results of the estimation of cointegration equations that express annual productivity growth in El Salvador and other Central American countries in terms of independent variables associated with investment, the labour market, the external sector and the performance of the subregion's other economies. Section V analyses how education quality makes productivity levels interdependent among the Central American countries, and it discusses the implications of this. Section VI sets forth a number of conclusions and recommendations to close the study.

II. Selected literature review

Studies on labour productivity in the Latin American countries concur that labour productivity has fallen sharply since the 1970s; but they offer different explanations for this.² The following paragraphs review selected studies of labour productivity in Latin American countries.

Cole, Ohanian and Riascos (2005) performed a production function decomposition exercise to explain economic growth, which found that the size of the labour force relative to the population was not the cause of stagnant per capita income, since this ratio averages around 70% of its level in the United States. Moreover, the capital/labour ratio has been roughly within 10% of the United States level. The authors explain that human capital is also not the cause of this stagnation, since, between 1960 and 1990 human capital, measured as the average of school enrolment rates at the primary, secondary and tertiary levels, increased by 19%. Based on these data, they find that total factor productivity (TFP) explains 66% of the productivity gap.

These authors use data from the 1950s and 1960s to argue that barriers to imports and competition have undermined productivity; yet labour productivity was higher in that period than in the years after the countries implemented drastic import tariff reductions and other measures to stimulate competition.

Daude and Fernández-Arias (2010) used a production function model to analyse Latin America's income per capita gap relative to that of the United States, in terms of gaps in capital per worker, human capital, labour market participation and TFP. The authors show that the contribution of physical capital to the income per capita gap has remained constant average, while the contributions of human capital and labour intensity have declined. Conversely, the contribution of TFP to the income per capita gap doubled over the period, to reach a level of 37% in 2005.

² Syverson (2011) provides a comprehensive review of the literature on productivity.

Palma (2011) has argued that the sharp drop in productivity since 1980 is explained by the fall in the investment rate, which has been influenced by the collapse of public investment in all countries. This author also notes that another cause of the fall in labour productivity is the shrinking of the manufacturing sector in Latin American countries. One consequence has been a reduction in the percentage of the labour force employed in manufacturing since 1980, in contrast to the growth of employment in this sector that occurred in the previous 30 years. This decline is associated with external openness and other liberal policies in vogue since the 1980s.

The author argues that “together with low rates of investment (including in services and infrastructure) and lack of upward export capacity diversification, there is little doubt that the remarkable neglect of manufacturing since economic reforms lies at the heart of LA’s productivity problem, especially its long-term sustainability” (Palma, 2011).

Rodrik and McMillan (2011) developed a model to argue that labour productivity can be increased in two ways: the first is by increasing investments in human capital and technological change in the different sectors, which they call the “within” component of productivity growth; the second is by reallocating labour from low to high productivity sectors, which they refer to as “structural change”. The authors emphasize that, between 1950 and 1975, the region experienced rapid productivity growth of 4%, half of which originated in structural change. But since then productivity has trended differently: the variation in productivity in the periods 1950–1975 and 1975–2005 due to change within sectors was the same, 1.8% per year; but the variation attributable to the structural component turned negative in the second period (-0.2% per year). They also note that this change occurred despite increased macroeconomic stability and greater openness to foreign trade, together with privatization and more market-oriented policies.

According to these authors, the fall in labour productivity in Latin America is explained by the reallocation of labour from manufacturing to the service sector, which occurred as a consequence of the abrupt opening to international trade. This also led to the contraction of the manufacturing sector, which until then had made a large contribution to productivity. In addition to mentioning the costs that premature deindustrialization impose on economy-wide productivity, the authors argue that “Import competition has caused many industries to contract and release labour to less-productive activities, such as agriculture and the informal sector. One important difference among countries may be the degree to which they are able to manage downsides. A notable feature of Asian-style globalization is that it has had a two-track nature: many import-competing activities have continued to receive support, while new, export-oriented activities were spawned” (Rodrik and McMillan, 2011).

Sosa, Tsounta and Kim (2013) apply the growth accounting method through a production function to determine the causes of economic growth in a sample of Latin American countries in 1980–2012. They find that, between 2003 and 2012, factor accumulation explains 3.75 percentage points of annual economic growth, while TFP explains 0.75 points. The authors conducted exercises to project potential economic growth rates for 2013–2017 and found that the past momentum is unlikely to be sustainable, owing to constraints on increasing labour force participation (including that of women), deficiencies in the quality of education and population ageing.

Cavalcanti Ferreira, de Abreu Pessoa and Veloso (2014) applied a methodology to decompose the sources of growth for 18 Latin American countries on the basis of a production function, in order to quantify the contributions to productivity made by the different inputs. The results showed that TFP grew at an average rate of 0.82% per year in 1960–1975. However, between 1980 and 2007, it declined at an annual rate of 0.88%. The authors noted the apparent contradiction in the fact that productivity in the region has fallen persistently since the adoption of pro-market policies, after growing vigorously in the 1960s and 1970s under an import substitution regime.

Cáceres and Cáceres (2017) used a vector autoregressive (VAR) model with panel data from seven Latin American countries to analyse the labour productivity response to shocks to certain variables. The results showed that productivity grew in response to increases in investment, human capital, wages, quality employment and exports; but it declined in response to increases in inequality, the poverty rate, part-time employment and self-employment. The authors explain the negative relation between the Gini coefficient and TFP growth by arguing that inequality fosters self-employment and reduces quality jobs.

Except for the models applied by Rodrik and MacMillan (2011) and Cáceres and Cáceres (2017), those discussed above are based on the measurement of TFP, which raises several questions. First, one must keep in mind the opinion expressed by Solow, and recently emphasized by Syverson (2011), that TFP is the residual of a regression equation and, thus, is a “measure of our ignorance”. Moreover, the studies included in the literature review do not explicitly discuss the problems inherent in measuring productivity through TFP. These may be significant given the suboptimal quality of the data used, and, in particular, the existence in Latin America of climate factors that affect GDP and its components, which could have an impact on the residuals of the regression equations.

1. The model

An equation for labour productivity based on a Cobb-Douglas production function is derived below. As a starting point it is assumed that gross domestic product, Y , is given by:

$$Y = AK^aL^{(1-a)}$$

In this expression, A represents total factor productivity (TFP), K is the amount of physical capital and L the amount of labour. Dividing through by L gives the following expression for labour productivity:

$$\frac{Y}{L} = A\left(\frac{K}{L}\right)^a$$

$$\text{A logarithmic transformation of this equation gives: } \text{Log}\left(\frac{Y}{L}\right) = \text{Log}(A) + a\text{Log}\left(\frac{K}{L}\right)$$

Which shows that higher labour productivity results from increases in TFP and in the amount of capital per worker.

If a human capital variable (H) is introduced in the production function, gross domestic product is then given by:

$$Y = AK^aH^{(1-a)}$$

Expressing human capital as the size of the labour force multiplied by its average education level, h , gives:

$$Y = AK^a(hL)^{(1-a)}$$

Hence, labour productivity can be expressed as:

$$\frac{Y}{L} = A\left(\frac{K}{L}\right)^a h^{(1-a)}$$

Or, in logarithmic form:

$$\text{Log}\left(\frac{Y}{L}\right) = \text{Log}(A) + a\text{Log}\left(\frac{K}{L}\right) + (1-a)\text{Log}(h)$$

Differentiating this last expression shows that the growth rate of labour productivity is determined by the growth rates of TFP, the amount of capital per worker and the level of education in the country.

In estimating this equation, the key issue is how TFP growth is to be measured, for which several authors have studied the identification of potential proxy variables. Isaksson (2007) classified the determinants of TFP under four headings. The first relates to knowledge creation, which is associated with research and development activities, as well as knowledge transmission through foreign trade and foreign direct investment. The second relates to human capital, physical infrastructure and the existence of an efficient financial system. The third covers institutional aspects, integration with the rest of the world and geography. The fourth relates to aspects of competition and the social situation.

Blyde and Fernández-Arias (2006) identify the following variables as important determinants of TFP: average number of years of education, life expectancy at birth, openness to foreign trade, the terms of trade, imports of machinery and equipment, institutional quality, credit to the private sector as a percentage of GDP, government consumption as a share of GDP, the inflation rate and the exchange rate spread in the unofficial foreign exchange market.

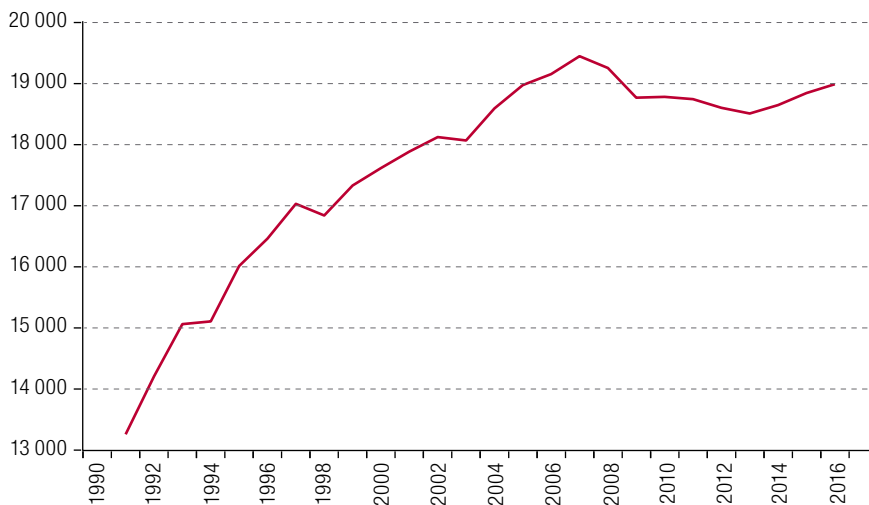
The model estimated in this study is based on the Cobb-Douglas production function with human capital, as discussed above, with TFP growth being proxied by some of the variables that have been identified as indirect indicators of labour productivity growth.

III. The data and their characteristics

The main data source for this study is the World Bank's World Development Indicators. Unit root tests were performed on the variables; the results of the adjusted Dickey-Fuller test indicated that all were integrated of order 1 at the 5% level.³

The path of labour productivity in El Salvador,⁴ in constant 2010 prices, is shown in figure 1.

Figure 1
El Salvador: labour productivity, 1990–2016
(US\$ million at 2010 prices)



Source: Prepared by the author.

³ The results of the adjusted Dickey-Fuller test, along with the mean values and standard deviations of the variables, are available from the author upon request.

⁴ The labour productivity data refer to observed employment and are expressed in terms of 2010 prices.

This variable started to trend down in 2006 before staging a recovery in 2012; but its level in 2016 was still below its 2006 peak. This could be explained by the adverse impact of the 2008–2009 global financial crisis, compounded by the declining trend of national saving and the reduction in import tariffs that occurred from the mid-1980s onwards, which led to deindustrialization (Cáceres, 2017 and 2018a). The extreme openness of the economy has led to lower-quality employment and an increase in self-employment, in other words employment in the informal sector as defined by Loayza (1997).

IV. The model and its estimations

The model proposed to estimate labour productivity growth is based on a Cobb-Douglas production function with human capital, as specified above. The Rodrik (2013) methodology is also used to estimate labour productivity in Brazil, in which productivity growth increases with investment, labour quality and TFP. Thus, the equations to be estimated reflect the following model:

Annual growth of labour productivity = F (investment, labour quality indicators, TFP growth).

The role of investment in determining productivity has been supported in several studies, especially Jorgenson, Ho and Stiroh (2004), who showed that physical investment was the main determinant of productivity in the United States. Accordingly, this variable, in both its public and its private versions, will be used in the estimations performed in this study. Labour quality will be measured by the self-employment and quality-employment rates, which Cáceres and Cáceres (2017) found to be important determinants of labour productivity. It is further assumed that TFP growth is associated with the independent variables that various studies have identified as its determinants, as discussed in the foregoing paragraphs.

All of the equations were estimated with data for 1990–2016 using the fully modified least squares methodology, developed by Phillips and Hansen (1990), to account for the fact that some variables were non-stationary and that all variables were endogenous. The first of three sets of estimations to explain El Salvador's labour productivity growth is presented in table 1.

Table 1
El Salvador: variables explaining labour productivity growth, 1992–2016

Independent variables	Equations				
	(1)	(2)	(3)	(4)	(5)
Constante	-0.0078 (0.22)	-2.0405 (3.76)	-0.9760 (0.40)	67.8085 (5.45)	88.6800 (6.64)
Gini	-0.3100 (4.21)	-0.3740 (3.50)	-0.3893 (4.83)	-0.8322 (10.16)	-0.9835 (10.95)
lpriv	1.1000 (5.48)	0.6576 (3.25)	0.6892 (4.22)		
lpriv(-2)				0.4042 (4.21)	0.7006 (5.67)
lpub(-2)	2.0201 (5.20)	1.6261 (3.34)	0.9859 (2.35)	1.3651 (5.46)	1.5571 (5.68)
Remesas	-0.2273 (2.08)				
Población		0.6101 (2.74)			
TT			0.0826 (3.54)		
Tarifa			-0.2658 (2.40)		

Table 1 (concluded)

Independent variables	Equations				
	(1)	(2)	(3)	(4)	(5)
Serv				-0.9248 (5.15)	-1.2554 (6.71)
Manu				0.9756 (10.11)	0.8115 (7.79)
Apertura(-1)				-0.1241 (5.32)	
Crédito				0.1156 (2.20)	0.1213 (2.12)
Balanza					-0.2071 (3.89)
R-squared	0.60	0.58	0.61	0.83	0.81

Source: Prepared by the author.

Note: *lpriv*: private investment rate; *lpriv(-2)*: private investment rate with a two-year lag; *lpub(-2)*: public investment rate with a two-year lag; *Remesas*: ratio of remittances to GDP; *Población*: percentage of total population residing in the country's capital; *TT*: terms of trade index; *Tarifa*: average tariff on imports; *Serv*: services sector share of GDP; *Manu*: manufacturing share of GDP; *Apertura(-1)*: sum of the ratios of exports and imports to GDP with a one-year lag; *Crédito*: ratio of bank lending to the private sector relative to GDP; *Balanza*: trade deficit as a percentage of GDP.

Equation (1) in table 1 shows that the coefficient of the Gini variable is negative and highly significant, which indicates that inequality undermines productivity growth. Inequality has been declining in most of the region's countries since the early years of the 2000 decade, which several authors have explained in terms of increases in social spending (González and Martner, 2012). In El Salvador, the Gini coefficient has fallen steadily in recent years, from 46.7 in 2007 to 40.0 in 2016, which has helped prevent further deteriorations in productivity. Cáceres (2017) found that, in Latin American countries, inequality is positively associated with self-employment (in other words precarious employment), while Chong and Gradstein (2004) concluded that inequality led to growth of the informal economy (self-employment), which is likely to diminish productivity.

The coefficient of the private sector investment rate is positive and significant, while that of public investment was only significant when it entered the equation with a two-year lag. This could mean that public investment needs an "incubation" period for its effect on labour productivity growth to be felt. However, the coefficient of public investment is three times greater than that of private investment, which suggests that the argument that the state should be downsized to increase productivity is without merit.

The ratio of remittances to GDP (*Remesas*) has a negative and significant coefficient, which could reflect the fact that a lack of jobs and quality social services motivates people to migrate.⁵

The percentage of the total population living in the capital city (*Población*) is included in equation (2) and has a positive and significant coefficient. This variable can be interpreted as an indicator of the agglomeration economies that the capital city offers to firms in terms of facilities for hiring skilled labour and forging complementarity relationships with other firms. A study by Carlino and Voith (1992), for the United States, identified the main determinants of state labour productivity as the corresponding levels of education and population density. Decker, Thompson and Wohar (2009) showed that productivity in these states was mainly determined by the percentage of the state population with a college degree and by the percentage of the population living in metropolitan areas. Florida, Mellander and Stolarik (2016) showed, also for the United States, that firms perform better in metropolitan areas, owing to the abundance of human capital in cities with high population densities.

⁵ This contrasts with the positive productivity impact that migration has in developed countries: a 1 percentage point increase in the proportion of a country's population that is migrant results, in the long run, in a 2% increase in that country's per capita growth rate, mainly through productivity growth. See Jaumotte, Koloskova and Saxena (2016).

Equation (3) includes two additional variables: the terms of trade index (TT) and the average import tariff (*Tarifa*). Their coefficients are both significant, positive for the former and negative for the latter. The first result is consistent with the literature regarding the important role played by the terms of trade in the business cycle; in contrast, the negative coefficient of the external tariff underscores the finding that trade liberalization has resulted in reductions in labour productivity growth, which is consistent with the results reported by Palma (2011) and by Rodrik and McMillan (2011).

Equations (4) and (5) present the results when the independent variables include some related to the external sector. In these equations, the private investment rate enters with a lag of two years to reduce the high correlation it has with manufacturing activity. The GDP shares of the services sector (*Serv*) and manufacturing (*Manu*) display significant coefficients, the former negative and the latter positive. The coefficient of the ratio of bank lending to the private sector relative to GDP is positive and significant. The estimation of equation (4) is particularly important since the coefficient of openness, measured as the sum of the ratios of exports and imports to GDP with a one-year lag (*Apertura* (-1)) is negative and significant.

In the literature, the openness variable is considered a determinant of economic “efficiency”, on the grounds that the higher it is, the less are the “distortions” caused by protection. Yet, far from promoting efficiency, openness has resulted in diminished labour productivity.

Equation (5) introduces the trade deficit relative to GDP (*Balanza*) as an independent variable; its coefficient is negative and significant.

A large trade deficit would mean that the current account deficit would also tend to be large, implying significant demand for external funding. This could impose a limit on total investment, with adverse consequences for productivity and economic growth. In the Salvadoran economy, this situation becomes critical given its low national saving rate of around 8% in recent years; so keeping the current account deficit below 4% requires total investment not to exceed 12%. This provides another explanation for El Salvador’s slow economic growth: this cap on the investment rate is 10 percentage points lower than that prevailing in the 1970s, when the import substitution model was in force.

The Gini coefficient is the variable with the highest *t*-statistic in all the equations presented in table 1, which would imply that inequality constitutes the framework through which the other variables affecting productivity interact; and it also highlights the role of inequality in undermining economic efficiency (ECLAC, 2018).

Table 2 presents the results with independent variables that include labour market indicators. Equations (1) and (2) show that the female and male participation rates have negative and significant coefficients. This could be explained by the fact that the Salvadoran labour force mainly works informally in the low-quality services sector, where no special skills or abilities are required. These results should be compared with those reported by Peterson, Mariscal and Ishi (2017) in a study for Canada, which found that the increased labour supply of highly educated women had fuelled productivity growth, for which the existence of childcare networks had played an important role. In addition, Cáceres (2017), using a cross-sectional sample of data from Latin American countries, finds that as per capita social spending increases, the quality employment rate also rises while self-employment declines, with a consequent positive impact on productivity.

In equations (3) and (4) the female and male self-employment rates show negative and positive coefficients, respectively; the former is marginally significant, and the latter is not significant. Equations (5) and (6) show that the coefficients of the female and male industrial employment rates, with lags of one and two years, respectively, are both positive and significant. The coefficient of the second of these rates is larger than that of the first (0.4266, compared to 0.2640), implying that male industrial employment has twice the impact of female employment in that sector, in terms of its contribution to labour productivity growth. This reflects the fact that there are differences between the type of industrial jobs held by women and men, revealing the existence of gender-segregated labour markets and gender discrimination.

Table 2
El Salvador: variables explaining labour productivity growth rate,
including labour market indicators, 1992–2016

Independent variables	Equations					
	(1)	(2)	(1)	(4)	(1)	(6)
Constante	23.6236 (2.89)	37.1976 (2.84)	-6.4960 (1.56)	2.0010 (0.41)	0.4638 (0.18)	-10.3361 (3.46)
Gini	-0.4050 (4.83)	-0.4409 (6.28)	-0.3495 (4.54)	-0.3742 (4.35)	-0.5157 (5.44)	-0.4742 (4.96)
lpriv	0.7771 (2.16)	0.6091 (4.18)	0.6740 (4.51)	0.6371 (3.38)	0.5917 (3.53)	0.7573 (4.54)
lpub(-2)	0.9365 (2.15)	0.9757 (2.67)	0.9796 (2.55)	0.8996 (2.00)	0.9811 (2.38)	1.2831 (3.15)
TT	0.0595 (2.20)	0.1072 (5.09)	0.0804 (3.74)	0.0860 (3.45)	0.0876 (3.80)	0.1112 (4.28)
Tarifa	0.1411 (1.16)	0.3782 (3.82)	0.2136 (2.00)	0.2829 (2.36)	0.2278 (2.05)	
Participación femenina	-0.4816 (3.02)					
Participación masculina	-0.4700 (2.84)					
Auto femenino	-0.0813 (1.70)					
Auto masculino	0.0848 (0.80)					
Industrial femenino (-1)	0.2640 (2.16)					
Industrial masculino (-2)	0.4266 (2.91)					
R-squared	0.70	0.66	0.62	0.61	0.64	0.67

Source: Prepared by the author.

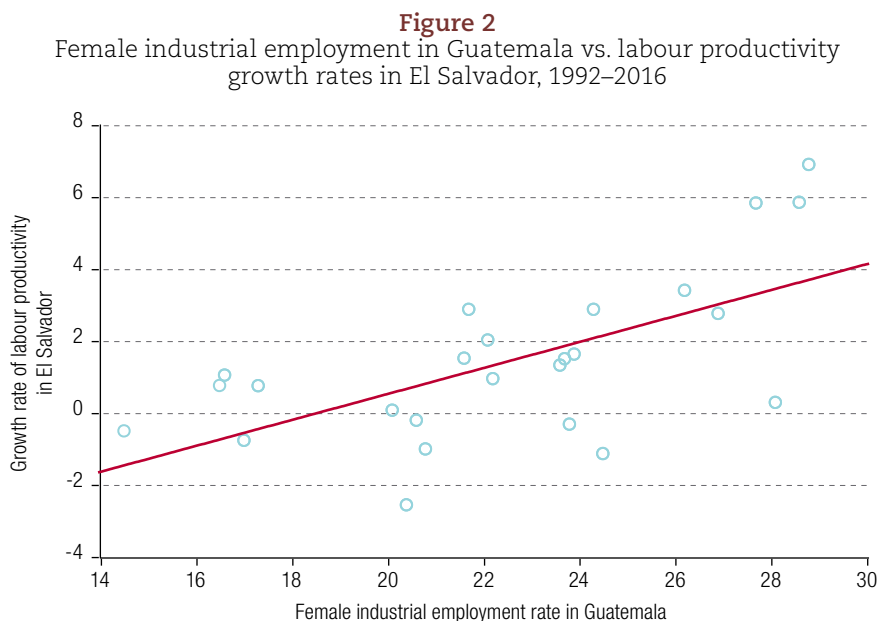
Note: *Gini*: Gini coefficient; *lpriv*: private investment rate; *lpub (-2)*: public investment rate with two-year lag; *TT*: terms of trade index; *Tarifa*: average tariff applied to imports; *Participación femenina*: female labour participation rate; *Participación masculina*: male labour participation rate; *Auto femenino*: female self-employment rate; *Auto masculino*: male self-employment rate; *Industrial femenino (-1)*: female industrial employment rate; *Industrial masculino (-2)*: male industrial employment rate.

1. Labour productivity and Central American economic integration

Agglomeration economies at the national level provide firms with access to ample supplies of labour and technical services, giving rise to a “pool” of specialized inputs, related either to industrial facilities and equipment or to knowledge. It can also be argued that the Central American countries benefit from regional agglomeration economies, since firms in one country can access the labour and technical services of other countries.⁶ Crespi and others (2008) have presented conclusive evidence that firms obtain knowledge from other firms with which they have frequent contacts, such as producers of their inputs and competitors. In other words, the Central American environment is a place for the acquisition of knowledge and good practices that are available to national firms for selection and implementation. This would increase national labour productivity by more than if firms were to imitate only the good practices of their own country.

⁶ In Central America, the national private sectors keep themselves informed through the Federation of Chambers of Commerce of Central America and the Dominican Republic (FECAMCO), among other channels; and there are several financial and economic management publications with regional coverage.

Figure 2 shows the relationship between Guatemala's female industrial employment rate and El Salvador's labour productivity growth.



Source: Prepared by the author.

In order to detect the existence of regional agglomeration economies, equations were estimated for labour productivity growth in El Salvador, including among the independent variables those corresponding to Guatemala, Honduras and Costa Rica. These equations also include El Salvador's manufacturing production, to control for the increase in Salvadoran exports to the other countries in response to the increase in investment or the increase in industrial employment in those countries. Thus, the impacts of the coefficients of public and private investment in those countries have been purged from the increase in their aggregate demand.

Table 3 presents the results with variables for Guatemala, Honduras and Costa Rica. Equations (1) and (2) show that private investment in Guatemala with a one-year lag (*Guapriinvest(-1)*) and public investment in that country with a two-year lag (*Guapubinvest(-2)*) have positive and significant coefficients. This indicates that the effects of investment in Guatemala spill over to productivity in El Salvador. This could be interpreted as the result of a mechanism whereby Salvadoran firms learn the techniques incorporated in new private investment in Guatemala; another explanation could be that Guatemalan private investment "forces" Salvadoran firms to make greater efforts to increase their productivity and thus be able to respond to Guatemalan competition more effectively.

The positive impact of public investment could be interpreted as a consequence of improved physical infrastructure in Guatemala, resulting from its additional public investment. This would help reduce the cost of transporting goods between countries.

Equation (3) shows that the coefficient of Guatemala's one-year lagged male industrial employment rate (*Guaempleoindustrialmas(-1)*) is positive and significant. This could mean that Salvadoran firms recognize that the increase in industrial employment in Guatemala could cause them to lose market share, so they take steps to enhance their productivity.

Table 3
El Salvador: variables explaining labour productivity growth rate,
the role of Central American economic integration

Independent variables	Equations					
	(1)	(2)	(3)	(4)	(5)	(6)
Constante	9.2031 (3.10)	10.2771 (3.04)	0.5569 (0.14)	6.7234 (2.16)	7.2784 (2.56)	5.0682 (1.95)
Gini	-0.5320 (7.86)	-0.4491 (6.10)	-0.5463 (7.27)	-0.5387 (7.30)	-0.5600 (8.68)	-0.5631 (12.96)
<i>lpriv</i>		0.5393 (2.95)				
<i>lpriv(-2)</i>	0.5475 (4.77)		0.3314 (2.10)	0.5579 (4.40)	0.4980 (4.37)	
<i>lpriv(-1)</i>						0.3886 (3.56)
<i>lpub(-2)</i>	1.8616 (6.05)	1.8098 (4.35)	0.8458 (1.82)	0.9550 (2.02)	1.5817 (5.30)	1.1084 (4.87)
<i>Manu</i>	0.6607 (4.91)	0.4793 (2.71)	1.0677 (6.41)	0.8651 (7.20)	0.8959 (8.20)	0.6500 (7.54)
<i>Apertura</i>	-0.2003 (7.12)	-0.1826 (6.04)	-0.1273 (3.66)	-0.1910 (6.43)	-0.1952 (7.24)	-0.2740 (11.96)
<i>Guapriinvest(-1)</i>	0.2413 (2.88)					
<i>Guapubinvest(-2)</i>		0.4725 (2.02)				
<i>Guaempleoindustrialmasc(-1)</i>			0.1904 (2.42)			
<i>Hopriinv</i>				0.0945 (2.66)		
<i>Hoempleoindustrialmasc</i>					0.1128 (3.64)	
<i>CRempleoindustrialmasc</i>						0.7146 (6.66)
R-squared	0.80	0.72	0.78	0.77	0.81	0.88

Source: Prepared by the author.

Note: Where no country is mentioned, the variables correspond to El Salvador. *lpriv*: private investment rate; *lpriv(-2)*: private investment rate with a two-year lag; *lpriv(-1)*: private investment rate with a one-year lag; *lpub(-2)*: public investment rate with a two-year lag; *Manu*: share of manufacturing in GDP; *Apertura*: sum of the ratios of exports and imports to GDP; *Guapriinvest(-1)*: Guatemala's private investment rate with one-year lag; *Guapubinvest(-2)*: Guatemala's public investment rate with two-year lag; *Guaempleoindustrialmasc(-1)*: Guatemala's male industrial employment rate with one-year lag; *Hopriinv*: Honduras' private investment rate; *Hoempleoindustrialmasc*: Honduras' male industrial employment rate; *CRempleoindustrialmasc*: Costa Rica's male industrial employment rate.

Equation (4) shows that the private investment rate in Honduras (*Hopriinv*) has a positive and significant coefficient; in equation (5), the coefficient of the male industrial employment rate of Honduras (*Hoempleoindustrialmasc*) is also positive and significant; and, in equation (6), the coefficient of Costa Rica's male industrial employment rate (*CRempleoindustrialmasc*) is positive and significant. However, the coefficients of the female industrial employment rates of Honduras and Costa Rica were found to be non-significant. This could be interpreted as conclusively indicating that cross-country productivity transmission occurs mainly through quality male labour market variables.

The results reported in table 3 show the existence of economies of “emulation” or “replication” at the regional level. It should be noted that the Organization for Economic Cooperation and Development (OECD, 2016) has advised Latin American firms to promote and take advantage of the diffusion of

knowledge that can come from firms operating at the technological frontier, which are usually multinationals. In Central America, this diffusion of knowledge and its exploitation occurs in firms and gives rise to Central American regional economic spaces.

The results presented in table 3 suggest that a “cold shower” phenomenon (Scitovsky, 1957) could be operating in the Central American countries, whereby competition forces firms to upgrade their procedures and management techniques, in the context of Leibenstein’s (1966) X-efficiency theory.

The equations in table 3 show that the independent variables for El Salvador continue to be significant and that the coefficient with the highest *t*-statistic is the Gini index, followed by the share of manufacturing industry in GDP (*Manu*).

The web of productivity impacts is a result that may be exclusive to countries located in the same geographical region, such as those of Central America. In contrast, a country that chooses unilateral opening could face obstacles such as differences in language and customs, distance, and possible ethnic prejudices, which could frustrate the exchange of techniques and knowledge with the countries from which it imports. Moreover, the latter countries might not be interested in sharing their techniques and good management practices with the importing country. Economic integration has been described as a process of reciprocal exchange of markets, but it could be argued that this reciprocity, which is integration’s most valuable feature, goes beyond markets and also involves the sharing of knowledge.

2. Labour productivity in other Central American countries

Equations for labour productivity growth were also estimated for two other Central American countries, Costa Rica and Guatemala.⁷ The results are shown in table 4.

Table 4
Costa Rica and Guatemala: variables explaining labour productivity growth rates

	Costa Rica	Guatemala
Constante	21.2400 (3.40)	-0.2704 (5.14)
CRManu	1.300 (3.62)	
CRApertura(-1)	-0.1192 (2.94)	
CRTarif	-0.1800 (0.47)	
CRTT	-0.2800 (5.14)	
ESemploymentwagefemen	0.0050 (5.41)	0.4562 (3.95)
Quali		-8.1761 (12.88)
GUAPreinv		0.6184 (5.42)
GUEmpleosalariofeme		0.5639 (10.01)

⁷ No labour productivity equations were estimated for Honduras and Nicaragua owing to data limitations.

Table 4 (concluded)

	Costa Rica	Guatemala
GUManu(-1)		9.8160 (9.28)
GUTax		3.4090 (3.16)
GUApertura		-0.9571 (6.28)
R-squared	0.51	0.98

Source: Prepared by the author.

Note: *CRManu*: share of manufacturing in Costa Rica's GDP; *CRApertura(-1)*: sum of the ratios of exports and imports to Costa Rica's GDP with a one-year lag; *CRTarif*: average import tariff applied by Costa Rica; *CRTT*: Costa Rica's terms of trade index; *ESempleosalariofemen*: El Salvador's female wage and salary employment rate; *Cuali*: qualitative variable that takes the value of one in 2006 and 2009, when Guatemala's labour productivity fell significantly, and zero in the other years; *GUApreinv*: Guatemala's private investment rate; *GUEmpleosalariofeme*: Guatemala's female wage employment rate; *GUManu(-1)*: share of manufacturing in Guatemala's GDP with a one-year lag; *GUTax*: ratio of tax revenue to Guatemala's GDP; *GUApertura*: sum of the ratios of exports and imports to Guatemala's GDP.

In both equations, the respective openness indicator has negative and significant coefficients, while those of the GDP share of manufacturing are positive and significant. El Salvador's female wage earner employment rate has a positive and significant coefficient in both equations. The coefficient of Costa Rica's tariff is not significant, while that of its terms of trade is negative and significant, which can be explained in terms of Funke, Granziera and Iman's (2008) analysis of the impact of the terms of trade on economic growth. In the equation for Guatemala, the qualitative variable *Cuali* represents the high negative values of labour productivity growth in 2006 and 2009; and its private investment and female wage earner employment rates both display positive and significant coefficients. The coefficient of the ratio of tax revenue to GDP in Guatemala is positive and significant; in other words fiscal effort would contribute to labour productivity growth, especially by supporting public investment and social spending.

3. Productivity spillovers between Central American countries

The results reported in tables 3 and 4 mean that one can postulate the existence of economies of integration, that is, economies that arise from an integrated regional economic space. They show that Central American countries "share" their productivity, through the spillovers that occur as a consequence of the growth of investment and the industrial labour force in each country. This concept has not been recognized in the theoretical literature on economic integration. Another implication is that countries that participate in an economic integration mechanism will tend to have higher labour productivity and rates of wage growth than in the absence of integration. This is another issue that has not been recognized in the relevant literature.

In contrast, there is an extensive literature on the productivity spillovers that a foreign firm produces on other firms in the country in which it is located (Syverson, 2011). These spillovers can originate in the purchase of domestic inputs by the foreign firm; in the access gained by domestic firms to modern technology and procedures; and in the movement from the foreign firm to domestic firms of personnel bringing advanced knowledge of managerial and production techniques with them (Gorg and Strobl, 2001 and 2005). This literature is exclusively concerned with the effect of foreign investment on the aggregate domestic productivity of the host country, but the phenomenon of transnational productivity spillovers, as is the case in Central America, has been neglected.

V. The interdependence of labour productivity among Central American countries transmitted through education quality

Hanushek and Woessmann (2007) have demonstrated the important role played by education quality, measured by scores attained on national or international standardized tests, in the behaviour of various economic and social variables. This has also been reported by Cáceres (2018b) in the case of Latin American countries. This section demonstrates that education quality also generates interdependence among Central American countries.

Based on equation (4) in table 3, the variation in El Salvador's labour productivity growth can be expressed in terms of the increase in Honduras' private investment rate:

$$D(\text{ES productivity growth}) = 0.0945 D(\text{HO private investment})$$

Where D represents the first difference of the variable in parentheses.

Using cross-sectional data from Latin American countries, equations were estimated for their private investment as a function of their respective third-grade reading scores, obtained from the Third Regional Comparative and Explanatory Study on Education Quality (TERCE) (UNESCO, 2016), and public spending on education as a percentage of GDP:

$$\text{Prinvest} = -39.2766 + 0.0801 (\text{Third grade reading score}) \quad R^2 = 0.59$$

(2.68) (2.55)

$$\text{Prinvest} = 5.7559 + 2.1946 (\text{Public expenditure on education}) \quad R^2 = 0.71$$

(1.36) (2.55)

Thus, the increases in El Salvador's labour productivity growth rates, given increases in Honduras' third grade reading scores and public spending on education are, respectively:

$$D(\text{ES productivity growth}) = 0.0076 D(\text{Third grade reading score} - \text{Honduras})$$

$$D(\text{ES productivity growth}) = 0.2074 D(\text{Public expenditure on education} - \text{Honduras})$$

These two equations indicate that if Honduras' third grade reading score were to increase by 33 percentage points, which is equivalent to attaining the level prevailing in Colombia, El Salvador's labour productivity growth rate would increase by 0.24 of a percentage point. Similarly, increasing public expenditure on education in Honduras by 1 percentage point would increase El Salvador's labour productivity growth rate by 0.21 of a percentage point.

In addition, equation (1) in table 3, which expresses El Salvador's labour productivity growth in terms of a set of independent variables that includes Guatemala's private investment rate, gives rise to the following equations, which express the change in the growth rate of Salvadoran labour productivity in terms of increases in Guatemala's third grade reading score and public spending on education:

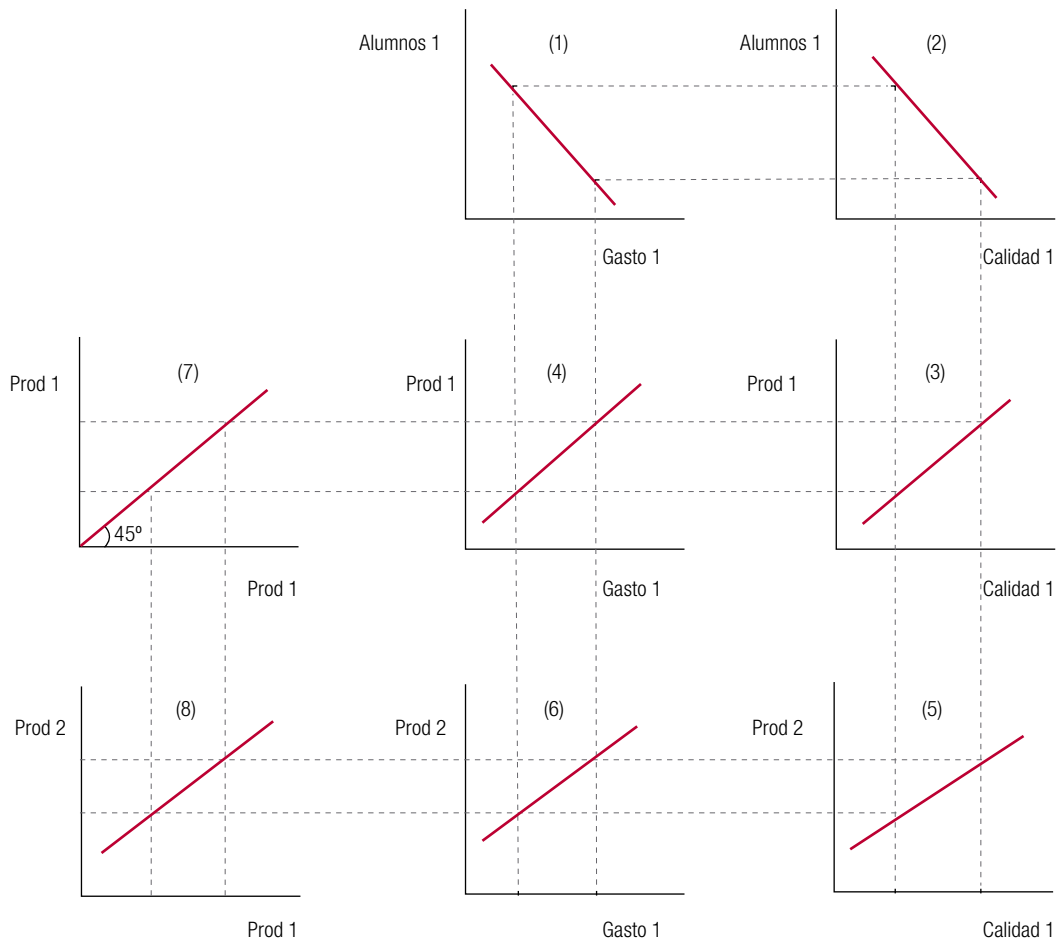
$$D(\text{ES productivity growth}) = 0.0193 D(\text{Third grade reading score} - \text{Guatemala})$$

$$D(\text{ES productivity growth}) = 0.5300 D(\text{Public expenditure on education} - \text{Guatemala})$$

This last equation indicates that if Guatemala's public spending on education were to increase by 1.6 percentage points, in other words to the level prevailing in Ecuador, El Salvador's annual labour productivity growth rate would increase by 0.85 of a point. These results imply that there are regional externalities of labour productivity growth driven by education quality.

Figure 3 shows that education quality spillovers from one Central American country to another fuel synchronous regional productivity growth.

Figure 3
Economic interdependence through education quality



Source: Prepared by the author.

Note: The variables refer to two countries that are members of an integration mechanism, identified as 1 and 2. *Alumnos*: the number of pupils per teacher in the country; *Gasto*: public expenditure on education as a percentage of GDP; *Calidad*: the quality of education as measured by third grade reading scores; *Prod*: labour productivity.

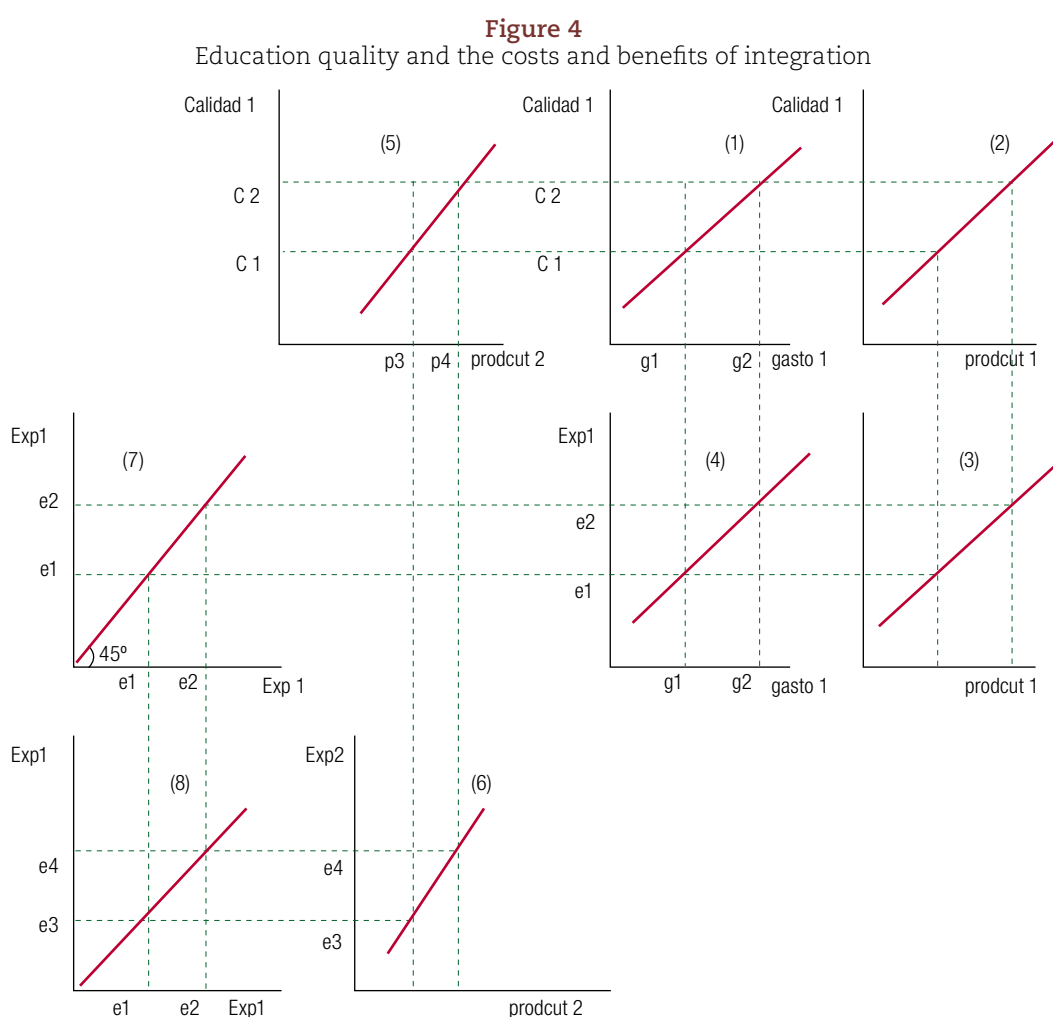
Quadrant (1) shows the negative relation between education expenditure and the number of pupils per teacher in country 1, while quadrant (2) indicates that a reduction in the number of pupils per teacher leads to an increase in education quality.⁸ Quadrant (3) shows the positive relation between education quality and labour productivity growth in country 1. Quadrant (3) and quadrant (1) combine to show the positive relation between education expenditure and labour productivity in country 1 that is plotted in quadrant (4). Quadrant (5) shows that education quality in country 1 boosts labour productivity in country 2; and increased spending on education in country 1 leads to increased labour productivity in country 2 (quadrant (6)). Using the 45-degree line of quadrant (7), quadrant (8) reveals a positive relationship between increases in labour productivity in the two countries. In other words, there is harmony or synchrony between national labour productivities within the economic integration zone. This means that, in an integration mechanism such as the Central American one, public expenditure on education would generate much larger increases

⁸ The relationship between the number of students per teacher and scores on international mathematics and reading tests is analysed by Cáceres (2018b).

in labour productivity than would occur in the absence of integration. In other words, integration makes national education spending more “efficient”, or more “productive”, thanks to regional labour productivity spillovers.⁹

1. Labour productivity and the distribution of the costs and benefits of integration

The results reported above have implications for the distribution of the costs and benefits of integration: the relatively more developed member countries could lend to those with low levels of development, for investments that increase education quality. This would lead them to increase their productivity and, hence, their exports, which could result in a more balanced distribution of intra-regional trade. Figure 4, below, analyses the implications of education quality for the distribution of the costs and benefits of integration.



Source: Prepared by the author.

Note: The variables refer to two countries, identified as 1 and 2, that are members of an integration mechanism. *Calidad*: education quality as measured by third grade reading scores; *Prod*: labour productivity, *Gasto*: public expenditure on education as a percentage of GDP; *Exp*: the country's exports.

⁹ The specific effect of integration on productivity can be estimated with cross-sectional data in an equation expressing labour productivity growth in terms of certain independent variables, including a dummy variable that takes the value 1 for countries that are members of integration mechanisms.

Quadrant (1) describes the relation between country 1's education expenditure (*Gasto 1*) and its education quality (*Calidad 1*); and quadrant (2) displays the positive association between country 1's education quality and its labour productivity (*Prod 1*), as demonstrated in Cáceres (2018b). Quadrant (3) expresses the positive relation between country 1's labour productivity and its exports (*Exp 1*). Quadrants (1) and (3) are combined, in quadrant (4), to infer a positive relation between country 1's education expenditure and its exports.

Suppose that country 1 exports small amounts of goods and services to its partner in the integration programme (country 2) compared to what it imports from it; and, as a result, country 1 expresses discontent with the unbalanced nature of the integration framework.

In response, country 2 grants country 1 an annual transfer that enables country 1 to increase its spending on education from $g1$ to $g2$. Consequently, country 1's education quality increases from $c1$ to $c2$ and its productivity rises from $p1$ to $p2$; as a result, its exports to country 2 increase from $e1$ to $e2$.

It should be noted that the productivity of country 2 rises from $p3$ to $p4$ following the increase in country 1's education quality (as shown in quadrant (5) of figure 3); this productivity increase is represented in quadrant (5) of figure 4. Using this quadrant and the 45-degree line in quadrant (7), quadrant (8) shows a positive relationship between the growth of exports in the two countries.

Quadrant (8) shows that the difference between the exports of countries 1 and 2, that is $e4-e2$, is smaller than it was before ($e3-e1$); so, the disparity in export performance has been reduced.

The macroeconomic benefits for country 2 are equal to the growth in its exports, in other words $e4-e3$, multiplied by the Keynesian multiplier, which for Central American countries is around 2.5. The multiplier impact —in other words the increase in output— could exceed the amount of the original transfer, especially considering that, when country 1 attains a certain level of development it will be in a position to assume the additional education expenses that were financed with the transfer it received; and that country 2 will then receive the additional boost to its exports at no cost, which would undoubtedly compensate for its original outlays in transfers to country 1. There would also be other benefits from having an integration zone with more skilled labour available, which would undoubtedly help to attract additional domestic and foreign investment.

VI. Conclusions

The results of this study, presented in tables 1, 2 and 3 explain the reduction in El Salvador's labour productivity by simultaneous declines in investment and manufacturing industry, and by the loss of good jobs in the manufacturing sector. The negative effects of tariff reductions and large trade deficits have also played a role in this scenario. This result is repeated in the cases of Costa Rica and Guatemala (see table 4). The harmfulness of extreme openness in Central American countries has been partly mitigated, because remittances increase the supply of imported consumer goods, thereby potentially creating a mirage of prosperity.¹⁰

The productivity decline in El Salvador has been attenuated by the downward trend of income inequality and by positive spillovers of variables from the other Central American countries, such as male industrial employment and investment (see table 3). The existence of these spillovers means that Central American countries act as mutual "shock absorbers", in mitigating negative national productivity trends.

¹⁰ In some Latin American countries that also implemented "structural" reform programmes in the 1990s, booming prices for their commodities generated an economic bonanza; however, once prices fell back, the countries slipped into recession. This economic contraction could not be countered by the "efficiency" that economic liberalization was supposed to bring to the region's economies.

One conclusion of this study is the desirability of restoring import protection to domestic production in order to foster growth in the manufacturing sector and industrial employment. In 2016, El Salvador and the other Central American countries had import tariffs averaging around 2%, compared to a Latin American average of 12%. Reducing extreme external openness would contribute towards reindustrialization and, therefore, boost productivity-friendly structural change as labour shifts out of low-quality service sectors and into manufacturing.

In this context, historical data on today's developed countries show that, in their initial stages of development, they did not implement the reforms that Latin American countries carried out in the 1990s; on the contrary, they implemented protectionist practices which persist in various forms to this day. The discourse of economic liberalization has no historical basis, and its theoretical support is questionable at best, as Rodrik (2006) has shown. Moreover, there is evidence that the "efficiency" and "welfare" losses incurred by a country when its trade policies depart from the dictates of comparative advantage are imperceptible; and that countries which diverge from their comparative advantage tend to export manufactured goods (Lectard and Rougier, 2018).

Nonetheless, reinstating protection would be an arduous task in El Salvador and in other countries in the region, since their economies have become import-oriented, and there are vested interests in that status persisting.¹¹

Another measure to increase labour productivity in El Salvador is to substantially improve education quality. In this regard, given the productivity spillovers from one country to another, stemming from the improvement of education quality, as shown in previous paragraphs, it would be advisable for Central America to adopt national commitments to achieve specific medium-term goals, related to increased spending on education, a reduction of the number of students per teacher, improvements in the physical infrastructure of schools and technology services, and improvements in the results achieved on national and international standardized tests. This measure would generate larger integration externalities and benefits than if the measures were adopted only at the national level, without regional coordination and commitments. For these purposes, it is important to adopt national fiscal covenants, as part of a regional commitment, which would include a decision to allocate additional funding to education and health, thereby further energizing intra-regional trade and economic growth. It should be noted that in Latin American countries there is a positive relation between productivity and tax revenues relative to GDP (Cáceres, 2018a).

According to the model represented in figure 4, by improving education quality in an integration zone, it is possible to boost the exports of the relatively less developed countries, so that intraregional trade flows would become more balanced; and, in addition, productivity spillovers would lead to an improvement in the export capacity of all member countries. This is a benefit that would not be obtained from unilateral opening.

A notable finding reported by Rodrik and McMillan (2011) is that larger Latin American countries tend to retain their labour force in higher-productivity sectors than smaller countries. The authors argue that, when a regional average that sums up value added and employment in the same sector across countries is computed, giving more weight to larger countries, the negative structural change component turns very slightly positive in Latin America, indicating that labour flows in the larger Latin American countries have not gone as much in the wrong direction as they have in the smaller ones.

¹¹ On the opposition to business and government transparency, competition and investments in human capital, OECD (2016) notes that "Vested interests in the *status quo* can unduly influence or capture policy making in order to oppose these reforms to maintain their rents. Indeed, some costs can be the result of a conscious design to create rents by capturing regulations and policies. The problem is compounded by the historically high inequality and the concentration of political and economic power in Latin American countries" (p. 11).

This reveals another important role played by regional economic integration: the fact that it boosts national labour productivity as a result of economies of scale derived from the expanded market and productivity spillovers between countries. The share of intra-Latin American exports in the region's total exports declined from 32% in 1998 to 22% in 2010.¹² Hence the imperative need to boost integration as a way to counteract the region's declining productivity trends.

Bibliography

- Blyde, J. and E. Fernández-Arias (2006), "Why does Latin America grow more slowly?", *Seminar Papers*, No. S-856, Washington, D.C., Inter-American Development Bank (IDB).
- Cáceres, L. R. (2018a), "La productividad laboral en América Latina", *Estudios Centroamericanos*.
- (2018b), "Hechos estilizados sobre la calidad de la educación en América Latina", unpublished.
- (2017), *Shadow Economies in Latin America*, Lambert Academic Publishers.
- Cáceres, L. R. and S. Cáceres (2017), "Labor productivity and social policy in Latin America", *Journal of Developing Areas*, vol. 51, Nashville, Tennessee, State Tennessee University.
- Carlino, G. A. and R. Voith (1992), "Accounting for differences in aggregate State productivity", *Regional Science and Urban Economics*, vol. 22, Amsterdam, Elsevier.
- Cavalcanti Ferreira, P., S. de Abreu Pessoa and F. A. Veloso (2014), "On the evolution of total factor productivity in Latin America", *Economic Inquiry*, vol. 51, New York, John Wiley.
- Chong, A. and M. Gradstein (2004), "Inequality, Institutions, and Informality", *Working Paper*, 5/6, Washington, D.C., Inter-American Development Bank (IDB).
- Cole, H. L., L. E. Ohanian and A. Riascos (2005), "Latin America in the rear mirror", *Research Department Staff Report*, No. 351, Minneapolis, Federal Reserve Bank of Minneapolis.
- Crespi, G. and others (2008), "Productivity growth, knowledge flows, and spillovers", *Working Paper*, No. 13959, Cambridge, Oficina Nacional de Investigaciones Económicas (NBER).
- Daude, Ch. and E. Fernandez-Arias (2010), "On the role of productivity and factor accumulation in economic development in Latin America", *Working Paper*, No. 155, Washington, D.C., Inter-American Development Bank (IDB).
- Decker, Ch. S., E. C. Thompson and M. E. Wohar (2009), "Determinants of labor productivity: the changing role of density", *Regional Analysis and Policy*, vol. 39, Jacksonville, Mid-Continent Regional Science Association.
- ECLAC (Economic Commission for Latin America and the Caribbean) (2018), *La ineficiencia de la desigualdad* (LC/SES.37/3-P), Santiago, May.
- Florida, R., Ch. Mellander and K. Stolarick (2016), "Human Capital in Cities and Suburbs", *Annals of Regional Science*, vol. 57, Springer.
- Funke, N., E. Granziera and P. Iman (2008), "Terms of trade shocks and economic recovery", *Working Paper*, No. 08/36, Washington, D.C., Fondo Monetario Internacional (FMI).
- González, I. and R. Martner (2012), "Overcoming the 'empty box syndrome'. Determinants of income distribution in Latin America", *CEPAL Review*, No. 108 (LC/G.2549-P), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).
- Gorg, H. and E. Strobl (2005), "Spillovers from foreign firms through worker productivity: an empirical investigation", *The Scandinavian Journal of Economics*, vol. 107, Wiley.
- (2001), "Multinational companies and productivity spillovers: a meta analysis", *The Economic Journal*, vol. 111, Wiley.
- Hanushek, E. A. and L. Woessmann (2007), *Education Quality and Economic Growth*, Washington, D.C., World Bank.
- Isaksson, A. (2007), "Determinants of total factor productivity: a literature review", *Research and Statistics Branch Staff Working Paper*, No. 02/2007, Vienna, United Nations Industrial Development Organization (UNIDO).
- Jaumotte, F., K. Koloskova and S. C. Saxena (2016), "Impacto of migration on income levels in advanced economies", *Spillover Notes*, No. 8, Washington, D.C., Fondo Monetario Internacional (FMI).

¹² The very high labour productivity of member countries of the Association of Southeast Asian Nations (ASEAN) could be related to the fact that 50% of their total external trade takes place within the Association.

- Jorgenson, Dale W., Mun S. Ho and Kevin J. Stiroh (2004), "Will the U.S. productive resurgence continue?", *Current Issues in Economics and Finance*, vol. 10, New York, Federal Reserve Bank of New York.
- Lectard, P. and E. Rougier (2018), "Can developing countries gain from defying comparative advantage? distance to comparative advantage, export diversification and sophistication, and the dynamics of specialization", *World Development*, vol. 102, Amsterdam, Elsevier.
- Leibenstein, H. (1966), "Allocative efficiency vs X efficiency", *American Economic Review*, vol. 56, Nashville, American Economic Association.
- Loayza, N. (1997), "The economics of the informal sector. A simple model and some empirical evidence from Latin America", *Working Paper*, No. 1727, Washington, D.C., Banco Mundial.
- Mckinsey Global Institute (2017), "Where will Latin America's growth come from?" [online] <http://www.fundacionmicrofinanzasbbva.org/revistaprogreso/en/where-will-latin-americas-growth-come-from/>.
- OECD (Organization for Economic Cooperation and Development) (2016), "Promoting productivity for inclusive growth in Latin America", *Better Policies Series*, Paris.
- Palma, J. G. (2011), "Why has productivity growth stagnated in most Latin American countries since the neo-liberal reforms?", *Cambridge Working Papers in Economics (CWPE)*, No. 1030, Cambridge University.
- Peterson, B., R. Mariscal and K. Ishi (2017), "Women are key for future growth: evidence from Canada", *IMF Working Paper*, No. 17/166, Washington, D.C., International Monetary Fund (IMF).
- Phillips, P. C. B. and B. E. Hansen (1990), "Statistical inference in instrumental variables regressions with I(1) processes", *Review of Economic Studies*, vol. 57, Oxford, Oxford University Press.
- Rodrik, D. (2013), "Productivity growth: lessons for Brazil from other countries" [online] <https://drodrik.scholar.harvard.edu/files/dani-rodrik/files/productivity-growth-lessons-for-brazil-from-other-countries.pdf>.
- _____(2006), "Goodbye Washington Consensus, hello Washington confusion", *Journal of Economic Literature*, vol. 44, Nashville, American Economic Association.
- Rodrik, D. and M. McMillan (2011), "Globalization, structural change and productivity growth", *Working Paper*, No. 17143, Cambridge, National Bureau of Economic Research (NBER).
- Scitovsky, T. (1957), *Economic Theory and Western European Integration*, London, Allen & Unwin.
- Sosa, S., E. Tsounta and H. S. Kim (2013), "Is the growth momentum in Latin America sustainable?", *Working Paper*, No. 13/109, Washington, D.C., International Monetary Fund (IMF).
- Syverson, Ch. (2011), "What determines productivity?", *Journal of Economic Literature*, vol. 49, Nashville, American Economic Association.
- UNESCO (United Nations Educational, Scientific and Cultural Organization) (2016), *Reporte técnico. Tercer Estudio Regional Comparativo y Explicativo (TERCE)*, Santiago.

Production fragmentation, foreign trade and structural complexity: a comparative analysis of Brazil and Mexico¹

Kaio Glauber Vital da Costa, Marta Reis Castilho and Martín Puchet Anyul

Abstract

Starting in the 1980s, Brazil and Mexico adopted diverging trade and production strategies, which had significant effects on their respective production and trade structures. This study investigates how the two countries' different patterns of trade specialization affected the complexity of their respective production structures between 1995 and 2011. Although the foreign trade profiles of Brazil and Mexico differ mainly in their export structures, the processes of trade liberalization and integration into global value chains made the network of interrelationships between the different sectors less complex. Since these are Latin America's two largest economies, a reduction in the complexity of their production structures not only has repercussions on the dynamics of their respective national economies, but also affects those of other countries in the region.

Keywords

Economic development, development strategies, foreign trade, trade policy, specialization of production, productivity, exports, imports, comparative analysis, Brazil, Mexico

JEL classification

F1, O14, C67, F14, O54

Author

Kaio Glauber Vital da Costa is Assistant Professor and research fellow at the Industry and Competitiveness Group of the Economics Institute of the Federal University of Rio de Janeiro. Email: kaio.economia@gmail.com.

Marta Reis Castilho is Associate Professor and Coordinator of the Industry and Competitiveness Group of the Institute of Economics of the Federal University of Rio de Janeiro. Email: castilho@ie.ufrj.br.

Martín Puchet Anyul is Professor of Quantitative Methods at the Faculty of Economics, Autonomous National University of Mexico (UNAM). Email: anyul@unam.mx.

¹ The authors gratefully acknowledge comments made by an anonymous contributor to *Cepal Review*, which greatly enhanced this version of the article. The underlying research was part-funded by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), an agency of the Brazilian Ministry of Education (MEC), through its National Post-Doctoral Programme (PNPD), of which Kaio Costa was a scholarship holder; and by the Visiting Professor Abroad Programme (PVEx), which financed Marta Castilho's stay at Universidad Complutense de Madrid during the 2018/19 academic year.

I. Introduction

Sustained economic growth requires the production structure to evolve consistently with trends in domestic demand and developments in international trade. This means that a country's production structure must have the capacity to adapt to the changes occurring both at home and abroad (Chenery, 1980). Over the past two decades, the production structures and international trade profiles of Brazil and Mexico, Latin America's two largest economies, have undergone profound changes. These directly affected the organization and intensity of intersectoral linkages, such that both countries' production structures lost structural complexity from the mid-1990s onwards (Coutinho, 1997; Britto, 2002; Moreno-Brid and Ros, 2009).

Since the 1980s, the exhaustion of the import substitution industrialization model, which was founded on domestic market growth, has led the Latin American economies to seek new profiles of production and foreign trade specialization. As a result, two major specialization models have consolidated. The first has its epicentre in the Southern Cone, with countries (such as Brazil) specializing predominantly in commodity-processing industries, which are also capital-intensive sectors. The second is represented by Mexico and other Central American countries, which have an alternative specialization model, based on the electronics, automotive and textile industries, mainly serving the United States market (Katz, 2000).

Despite their different specialization profiles, the foreign trade of Latin America's two largest economies displays a number of similarities. Both Brazil and Mexico are increasingly dependent on imported intermediate inputs, while their exports have relatively little capacity to generate employment and income (Ruiz-Nápoles, 2004; Fujii and Cervantes, 2013; Kupfer and others, 2013). The large increase in imported inputs in the 1990s and throughout the 2000 decade can be explained by trade liberalization processes, in conjunction with a persistent appreciation of the exchange rate and the microeconomic strategies pursued by transnational corporations when deciding where to locate their industrial plants.

The fragmentation of production and the resulting formation of global value chains appear to have exacerbated both countries' trade specialization patterns. Despite their different positions in global value chains and different levels of participation (Hermida, 2016; Boddin, 2016), the way they have each entered these chains has failed to alter their foreign trade patterns (Medeiros and Trebat, 2017). The traditional export sectors — commodity-based (capital-intensive) in Brazil and maquila (labour-intensive) in Mexico— have reinforced the contribution made to their total exports and trade balance by their respective dominant sectors. At the same time, sectors with a higher technological content have run increasing deficits and become dependent on imported intermediate inputs (Katz, 2000).

Since the mid-1980s, the emergence of global and regional production and value chains has dramatically altered the organization of the global production of goods and services (Baldwin, 2011), with further reaching and longer lasting effects on international trade and investment patterns. The international division of production has long been part of international trade, as countries import manufactured goods to incorporate into their exports (Athukorala and Menon, 2010). However, the fall in transport and communication costs, in conjunction with the rapid spread of technological progress (which has generated more shared and flexible production processes) and the lowering of economic and political barriers to trade have provided additional opportunities for production to become more internationally fragmented. The change in the governance of industrial enterprises from the 1980s onwards, which involved their financialization, “encouraged” this movement by viewing it as a way to reduce costs and thereby increase profits and dividends (Sarti and Hiratuka, 2018).

In this context, greater fragmentation of production, with developing countries becoming increasingly involved, has redefined the international division of labour, which is changing the geography of production, as certain industries move their operations offshore. This process is driven mainly by two factors: (i) trade liberalization policies, including the signing of regional agreements; and (ii) advances in

information and communication technologies. The first factor resulted in the reduction of tariffs and the lowering of barriers to foreign direct investment (FDI). The second reduced transport costs and made it less expensive to coordinate and monitor activities within transnational corporations. As a result, those corporations started to refocus their industrial location strategies according to the characteristics of each region or country, such as labour costs, the size of the domestic market or regulatory and institutional conditions. The reduction in the costs of locating abroad, due to the internationalization of production, has led transnational firms to move some plants from highly developed countries to developing ones where production costs are lower.

This article aims to analyse the complexity of production structures in Brazil and Mexico in a context of fragmented production processes. In this study, a more complex structure means greater interdependence between sectors and, hence, greater circularity in the flows of goods and services in the economies in question. The use of a structural complexity indicator spanning the entire network of direct and indirect interrelationships between sectors affords a better understanding of the production structures of Latin America's two largest economies. As comparative studies of the Brazilian and Mexican economies are few, this analysis also contributes to comparative research on the two economies.

The article is divided into three sections, in addition to this introduction. Section II develops the concepts involved in the fragmentation of production and in structural complexity. Section III presents the results.

II. Fragmentation of production and structural complexity: literature review and conceptual issues

The trade liberalization processes that Brazil and Mexico embarked upon in the 1980s and 1990s gave rise to two distinct patterns of trade specialization. Brazil and the other South American countries are specialized in exporting commodity-based products; in contrast, Mexico has an export profile centred on industrial maquilas destined largely for the United States (Katz, 2000). In addition to its effect on exports, trade liberalization triggered industrial restructuring processes in both countries, which resulted in nearly all sectors becoming increasingly reliant on imported intermediate inputs. The increase in imported parts, pieces and components reflects defensive strategies deployed by domestic firms to counter foreign competition, and the use of the foreign supplier network by transnational corporations (Britto, 2002; Kupfer, 2005; Fujii and Cervantes, 2013).

The likely consequence of increased reliance on imported inputs is a steady weakening of the production structure, with links in several production chains being lost, and a reduction in the density of the matrix of industrial interrelationships. If this matrix is envisioned as a network of exchanges between n sectors, in which the sectors (vertices) are interconnected by arcs (flows of goods and services), the reduced density can be understood as the disappearance of several of these arcs or flows. In this analogy with graph theory, when an economy becomes more complex, in the sense that each sector's production relies increasingly on inputs supplied by other sectors, intermediate demand grows as a proportion of total output; and the probability of finding trajectories or paths that collapse in the circuits also grows. In other words, the weakening of the production structure is associated with less interdependence between sectors.

As noted by Romero, Dietzenbacher and Hewings (2009), two cases need to be considered when analysing the effects of the spatial fragmentation of production, since some areas (regions or countries) may lose certain stages, tasks, activities or links that make up the production process, while

others may attract them. In countries that lose these stages, fragmentation could make their production systems less complex, as a few, or maybe several, domestic linkages are transferred to other countries. The consequences of this fragmentation in countries with relatively advanced levels of industrialization could be significant and possibly lead to a “hollowing out” process (Hewings and others, 1998; Guo, Hewings and Sonis, 2005). Fragmentation makes these countries rely increasingly on inputs imported from the rest of the world.

In contrast, in the countries that gain these production stages, production fragmentation could increase structural complexity. For this to happen, however, fragmentation would need to be accompanied by the creation of linkages between newly established firms, usually transnational corporations, and domestic ones. In an extreme case of “enclave sectors”, where the intermediate demand generated by the new firms is mainly for imported inputs, thus generating few linkages with the domestic economy, the hypothesis that fragmentation could increase structural complexity may not be valid. Enclave sectors operate in developing countries for the purpose of undertaking specific, highly technology-intensive, phases of production processes. The necessary intermediate inputs are purchased abroad, and the output is used in a succession of manufacturing activities in plants located in other countries.

1. Structural complexity as a specific feature of interindustry linkage

A modern economy is characterized by a network of intrinsically interconnected sectors or production units, which are increasingly dependent on intermediate inputs supplied by various sectors of the economy. The complexity of an economy will be considered conceptually as the result of a “process of development that extends the multiplicity of economic interactions within the economic system” (Sonis and Hewings, 1998). This perspective is closely related to the analyses performed by structuralist authors such as Albert Hirschman, Hollis Chenery, Celso Furtado and Arthur Lewis, among others. For these authors, a country’s development process can be characterized by the increase in interactions that take place between an economy’s sectors of production. In other words, economic development is seen as accompanied by an intensification of interactions between productive sectors, and not just by the allocation of resources among them.

Complexity is a multidimensional phenomenon for which there are several approaches and multiple definitions, which will not be discussed in detail in this section (Adami, 2002). The notion of complexity, which originated in physics and biology, has been extended to the analysis of social and economic systems (Arthur, 1999; Rosser, 1999; Durlauf, 2005). As Fontana (2008) notes, the complexity perspective applied to economics implies a perception of the nature of economic phenomena that is radically different from the dominant view of orthodox or conventional economics. This is because a complex system is characterized by the presence of a large number of heterogeneous agents interacting with each other, the absence of a global controller, adaptation through learning and evolution, and the importance of disequilibrium analysis. Moreover, according to Sonis and Hewings (1998), although the notion of complexity may have emerged from the analysis of non-linear dynamics in natural science, the concept can provide a useful conceptual framework for analysing aspects of the countries’ economic development, even in the case of economic analyses involving systems of linear equations, as in the input-output approach.

Simon’s (1962) definition of a complex system is shared by several authors who analyse the complexity of economies. He defines a complex system as one consisting of a large number of parts that interact in a non-simple way. In such systems, the whole is more than the sum of the parts in the sense that, given the properties of the parts and the laws governing their interactions, it is not a trivial matter to infer the properties of the whole structure. In the approach developed by Simon (1962), a complex

system consists of subsystems which themselves have their own systems, and so on successively. This means that complexity is also characterized by hierarchies between subsystems, as different subsystems affect the overall dynamics of the system in different ways. In the analysis of complexity as applied to the economy, these characteristics are of fundamental importance.

The indicators listed in table 1 show how the phenomenon of a country's structural or economic complexity is approached using different methodologies. The interdependence or connectivity between the various sectors of production is a crucial feature of economic analysis. Various proposals have been made for measuring this, starting with the classical measures of direct interdependence developed by Chenery and Watanabe (1958) and the measures of total linkages (forward and backward) developed by Hirschman (1961) and Rasmussen (1957). Contributions that are particularly useful for studying complexity in a structure include those that provide summary or "holistic" measures that capture the multiplicity of connections or interdependencies between sectors in a single number. These facilitate historical and international (or interregional) comparisons of different economies' production structures.

Table 1
Indicators of complexity

Peacock and Dosser (1957)	$\frac{100}{n^2} i'Ki$
Chenery and Watanabe (1958)	$\frac{i'Ax}{i'x}$
Rasmussen (1957) and Hirschman (1961)	$\frac{1}{n} i'(I-A)^{-1} i$
Yan and Ames (1965)	$\frac{100}{n^2} \sum_{ij} \frac{1}{0.9^{ij}}$
Lantner (1972 and 1974)	$\frac{(I-\Delta)}{\Delta}$
Robinson and Markandya (1973)	$T_{ij} = \begin{cases} t_j & \text{if } A_{ij} \neq 0 \\ 0 & \text{if } A_{ij} = 0 \end{cases}$
Finn (1976) and Ulanowicz (1983)	$\frac{i'Xi}{i'y}$
Jensen and West (1980)	$\frac{1}{n} i'Ai$
Dietzenbacher (1992)	$\lambda = \text{dominant eigenvalue}$
Romero, Dietzenbacher and Hewings (2009)	$L(L-1)$
Amaral, Dias and Lopes (2007)	$G(A)H(A) e G(L)H(L)$
Hausmann and others (2014)	$k_{c,0} = \sum_{p=1}^{N_p} M_{cp}$ (diversification) and $k_{p,0} = \sum_{c=1}^{N_c} M_{cp}$ (ubiquity)

Source: Prepared by the authors, on the basis of J. Amaral, J. Dias and J. Lopes, "Complexity as interdependence in input-output systems", *Environment and Planning A: Economy and Space*, vol. 39, No. 7, 2007.

where:

A : technical coefficients matrix

x : production vector

i : sum vector

n : number of sectors

I : identity matrix

K : boolean matrix

Δ : determinant of matrix $(I-A)$

- o_{ij}^{YA} : order matrix
 λ : dominant eigenvalue of matrix A
 y : final demand
 L : Leontief inverse matrix
 T_{ij} : transactions rounds matrix

One of the first examples is the percentage of non-zero technical coefficients, developed by Peacock and Dosser (1957). The interdependency indices of Yan and Ames (1965) and the transaction rounds matrix of Robinson and Markandya (1973) are more elaborate attempts to quantify interdependency in this way. As a measure of connectivity, Jensen and West (1980) suggested the mean sums of rows or columns of the technical coefficient matrix, A . Building on these initial studies, a number of authors (Finn, 1976; Ulanowicz, 1983) constructed other indicators to analyse ecological systems, which were later applied to economic analysis. Subsequently, Basu and Johnson (1996) proposed a new measure based on directed graph theory and structural path analysis using input-output tables; and Sonis and Hewings (1998) used a similar method. Lastly, Romero, Dietzenbacher and Hewings (2009) developed an indicator of the structural complexity of economies, based on the mean-length-of-propagation method, which seeks to measure the length of the sectors' production chain or their distance from final demand.

More recent studies have put structural change back at the centre for understanding a country's economic development (Hausmann and Hidalgo, 2011). Differences in the capacity of countries to upgrade their production structure and diversify their exports into more complex products seem to help explain differences in their development levels (McMillan and Rodrik, 2011).² According to Hausmann and Hidalgo (2011), a country's economic growth capacity reflects the diversity of its capacities, since different types of capacities are needed to move towards new higher-productivity activities. A well-established empirical result is that countries specializing in more sophisticated products grow faster (Rodrik, 2006; Hausmann, Hwang and Rodrik, 2007).

The product space methodology developed by Hidalgo and others (2007) studies changes in the countries' historical position within the evolving product space, which represents the distances between the structures of international trade flows for all products. The historical positioning of countries in this product space uses specific indices of revealed comparative advantages. The authors insert these indices into a theoretical argument based on the notion of country capacity: the complexity of the national production structure determines a country's potential to further its own development. However, the indicators they use are based on the characteristics of the countries' exports, which may be inappropriate or inaccurate in the case of countries whose export structures differ greatly from their production structure.^{3 4}

Recently, Lantner and Carluer (2004) and Lantner and Lebert (2013 and 2015) took a different path, using the properties of Leontief matrix determinants to develop a "summary" measure of interdependence, based on the work of Wong (1954) and Bott and Mayberry (1954). Within this approach to analysing the economic and structural complexity of the countries, Wong (1954) suggests that the determinant of the technical coefficients matrix, $\Delta=(I - A)$, is a relative measure of the net volume of production and the complexity of the production system. The approach proposed by Lantner (1972 and 1974) also

² The role of capacities as a precondition for long-term growth is central to the work of Hirschman (1958), Lewis (2006), Rostow (1959) and Kaldor (1967). These authors described economic development essentially as a process of structural transformation and productivity growth, driven by the progressive strengthening of productive capacities.

³ Hausmann and others (2014) propose to evaluate economic sophistication through two characteristics of exports: the ubiquity (or exclusivity) of the products exported by a country and the diversity of the products exported.

⁴ In a study of the Brazilian economy in the 2000 decade, Torracca (2017) shows how export and production structures can differ, particularly in economies that are natural-resource rich and display relatively advanced structural complexity.

starts by interpreting the determinants of the $(I - A)$ matrix, but is based on the theorems put forward by Bott and Mayberry (1954). Drawing on the study of the determinants of the matrix of interindustry or commercial relations, Lantner (1972 and 1974), Gazon and Nihon (1976) and Lantner and Lebert (2013 and 2015) develop the concept of structural circularity. The structural circularity index is used to measure the degree of interdependence of a set of industries in an economic system, or of a group of countries and regions in international trade.

From a quantitative standpoint, the determinant has the advantage of being a synthetic indicator that demonstrates the internal organization of the structure of sectors of production, or of the trade links between regions or countries; in other words the position and intensity of the connections between the sectors or countries. Qualitatively, the determinant makes it possible to interpret the complexity of production structures as a result of a gradual expansion of the network of hierarchical interdependencies between the different sectors of the economy. It is also possible to perform a structural decomposition analysis by calculating the determinants, in order to calculate the economies' rates of interdependence, dependency and autarchy.

The circularity or structural complexity index is defined formally as $ice = \frac{(I - \Delta)}{\Delta}$. The structural complexity index is an indicator of the number of feedback loops that exist between the different sectors of an economy. The presence of such loops indicates that the relationships between the productive sectors are dense and that the sectors are mutually integrated. The production structure becomes more complex and more highly developed as the number of feedback loops increases in relation to all the loops linking all the sectors (Puchet, 1996).

When a production structure becomes more complex, in the sense that each sector depends increasingly on the other sectors to supply inputs for its own production, then intermediate demand increases as a proportion of total output, and feedback effects between sectors proliferate. According to Aroche Reyes (1993), the structural complexity index does not depend on the size of the technical coefficients, but on the complexity of the production structure —as defined by the presence of feedback loops between the sectors, or the degree of integration between them. The structural complexity index is constructed from the matrix of exchanges between an economy's sectors of production. This approach affords a better understanding of the degree of interdependence that exists between the sectors of an economy, or of their structural complexity, since it sheds light on the level of interaction present in the production structure.

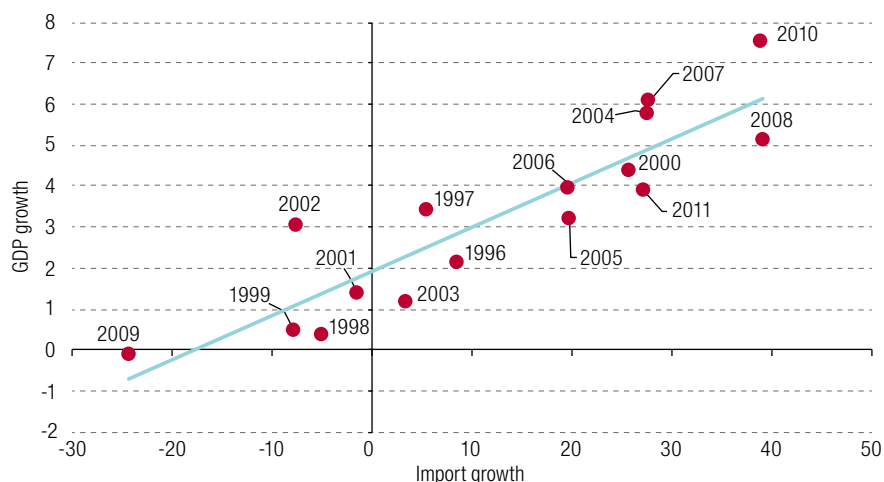
III. Entry into global value chains and evolution of the structural complexity of the Brazilian and Mexican economies between 1995 and 2011

Throughout the 1990s, the trade profile and participation of the Latin American countries, mainly Brazil and Mexico, developed against a backdrop of growing geographical dispersion of production. An initial observation is that Mexico applied wider ranging and faster measures in its economic liberalization process, than Brazil. This is not only because their implementation began in 1986, when Mexico joined the General Agreement on Tariffs and Trade (GATT), but also because of the speed and intensity with which both tariffs and non-tariff protection measures were lowered —a trend that was reinforced by the signing of the North American Free Trade Agreement (NAFTA) in 1994.

Although occurring at different times, the period following trade liberalization and entry into global value chains is characterized by a strong positive relationship between the rate of growth of gross domestic product (GDP) and import growth in the two countries. In 2004–2010, which corresponds to

the commodity boom period, Brazil experienced an import surge. Figure 1 shows a large concentration of points precisely between these two years. One of the factors noted was the persistent appreciation of the real exchange rate from 2003 onwards, as part of the macroeconomic policy implemented to control inflation and raise workers' real wages.

Figure 1
Brazil: annual growth of gross domestic product (GDP) and imports, 1996–2011
(Percentages)



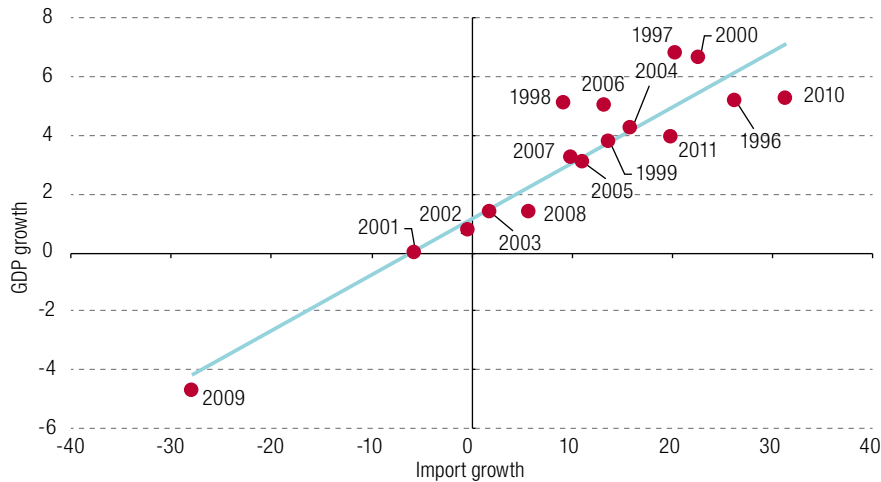
Source: Prepared by the authors, on the basis of European Commission (EC), World Input-Output Database, 2013 [online] <http://www.wiod.org/home>, and Economic Commission for Latin America and the Caribbean (ECLAC), CEPALSTAT, 2020 [online database] <https://estadisticas.cepal.org/cepalstat/portada.htm?idioma=english>.

It can be seen that the trade liberalization process, which began in the late 1980s and deepened throughout the 1990s, served to make the Brazilian economy structurally dependent on imports — structurally dependent because the inputs imported in the cyclical upswings of the Brazilian economy tend increasingly to close the intermediate demand circuits of the different sectors of the national economy. The result of this greater dependency would be a further weakening of the production structure, in the sense that intersectoral linkage effects would tend to diminish.

Mexico displays a quite similar pattern to that of Brazil, with a strong relations between GDP and import growth rates (see figure 2). However, unlike Brazil, the points are more widely dispersed over time. The signing of NAFTA in 1994 and the appreciation of the real exchange rate in 1995 (López, 1998) combined to deepen a historically well-established dependency on imports, sourced in particular from the United States. For authors such as López (1998) and Ros (2015), the weak growth of the Mexican economy in the period reviewed is associated with a rise in the import coefficient. This would have caused demand to leak out of the domestic market and thereby dampen the autonomous expenditure multiplier.

According to Moreno-Brid and Ros (2009), Mexico's foreign trade was one of the fastest-growing in the region and also globally, particularly in the 1990s. This growth was seen in exports, but also in the weight of imported components and inputs, which outpaced export growth. As a result, the country had trade surpluses with the NAFTA countries, but growing deficits with other countries, mainly those in Asia. The overall effect was the emergence of persistent current account deficits and additional pressures on the balance of payments (Moreno-Brid and Ros, 2009).

Figure 2
Mexico: annual growth of gross domestic product (GDP) and imports, 1996–2011
(Percentages)



Source: Prepared by the authors, on the basis of European Commission (EC), World Input-Output Database, 2013 [online] <http://www.wiod.org/home>, and Economic Commission for Latin America and the Caribbean (ECLAC), CEPALSTAT, 2020 [online database] <https://estadisticas.cepal.org/cepalstat/portada.html?idioma=english>.

An analysis of Brazil's export and import patterns reveals that, while imports are more diversified, its exports have become increasingly concentrated in a small group of sectors. A synthetic way to analyse the evolution of these two patterns is by calculating each sector's contribution to the growth of total imports and exports.⁵ Table 2 shows that roughly 45% of the growth in exports was generated in just three sectors: food, beverages and tobacco (18%), plant extraction (15%) and agriculture, hunting, forestry and fishing (12%). In contrast, imports are more widely dispersed across sectors. This indicates that import penetration in the Brazilian economy has been more widespread since the trade liberalization process in 1994 and throughout the period of integration into global value chains in the 2000s.

Table 2
Brazil: main sectors contributing to the growth of total imports and exports, 1995–2011
(Percentages)

Imports	Exports	Exports	
Transport equipment	9	Food, beverages and tobacco	18
Coke, refined petroleum and nuclear fuel	8	Plant extraction	15
Chemicals and chemical products	7	Agriculture, hunting, forestry and fishing	12
Plant extraction	6	Transport equipment	8
Electrical and optical equipment	6	Basic metals and fabricated metal	7
Agriculture, hunting, forestry and fishing	6	Chemicals and chemical products	5
Construction	5	Coke, refined petroleum and nuclear fuel	4
Basic metals and fabricated metal	5	Hotels and restaurants	3
Food, beverages and tobacco	4	Pulp, paper, printing and publishing	2
Machinery n.e.c.	3	Land transport	2

Source: Prepared by the authors, on the basis of European Commission (EC), World Input-Output Database, 2013 [online] <http://www.wiod.org/home>.

⁵ According to Britto (2002), the sectoral contribution is calculated as follows: $\frac{(m_{2011}^i - m_{1995}^i)}{(m_{2011}^i - m_{1995}^i)} * 100$.

Imports achieved greater penetration even in the agriculture and construction sectors (where production chains are vertically integrated). Also notable is the role played seven sectors as major contributors to both import and export growth. While these results suggest a relative increase in intrasectoral trade; they also reveal the existence of trade imbalances in certain sectors, such as transport equipment, coke and refined petroleum, and chemicals and chemical products.

In the Mexican economy, sector contributions to both exports and imports are more highly concentrated. The largest sector contributions to import growth were electrical and optical equipment (21%), transport equipment (14%) and construction (9%); while the largest contributions to the growth of exports were also in transport equipment (25%), electrical and optical equipment (21%) and plant extraction (18%) (see table 3). These results show that, unlike the Brazilian case, Mexico's foreign trade profile is highly complementary, in the sense that it is based on exports and imports in the same sectors.

Table 3

Mexico: main sectors contributing to the variation in total imports and exports, 1995–2011
(Percentages)

Imports		Exports	
Electrical and optical equipment	21	Transport equipment	25
Transport equipment	14	Electrical and optical equipment	21
Construction	9	Plant extraction	18
Basic metals and fabricated metal	7	Machinery n.e.c.	3
Land transport	4	Food, beverages and tobacco	3
Electricity, gas and water	4	Wholesale trade	3
Agriculture, hunting, forestry and fishing	3	Chemicals and chemical products	3
Plant extraction	3	Retail trade	2
Sale, maintenance and repair of motor vehicles	3	Other manufactures	2
Retail trade	2	Coke, refined petroleum and nuclear fuel	2

Source: Prepared by the authors, on the basis of European Commission (EC), World Input-Output Database, 2013 [online] <http://www.wiod.org/home>.

The way the foreign trade profiles of Brazil and Mexico have changed show how the two countries adopted different external integration strategies, both throughout the 1990s and in the 2000 decade. As Katz (2000) notes, these different patterns of external integration started to emerge as early as the 1980s, when both countries abandoned import substitution industrialization and adopted different development strategies, emphasizing trade liberalization through tariff and non-tariff reductions (Ros, 1994; Kume, 1996).

The industrial restructuring that followed trade liberalization in Brazil and Mexico between the 1980s and 1990s introduced a major structural component in imports, reinforcing the patterns of trade specialization and the production structures that had formed in the import substitution industrialization period (Coutinho, 1997; Ros, 2015). According to Coutinho (1997), Britto (2002) and Moreno-Brid and Ros (2009), this structural nature of imports of intermediate inputs reflects a progressive weakening of production structures. This took various forms, including a reduction in the value added of industrial chains, foreign suppliers replacing domestic supply, and the substitution of imported inputs for domestic production.

Tables 4 and 5 show the 10 leading intermediate inputs imported and exported by Brazil and Mexico, respectively, between 1994 and 2014.⁶ In the Brazilian economy, the range of intermediate inputs that are both imported and exported simultaneously has expanded. In 1994, only two intermediate inputs were both exported and imported. They correspond to codes 78433 and 78439 of the Standard International Trade Classification, Rev. 3 and belong to the Parts and accessories of motor vehicles category. In 2014, seven of the 10 leading intermediate inputs were both exported and imported, namely: 71491, 78439, 7478, 79295, 78432, 78434 and 78435. The data show that the categories corresponding to Parts and accessories of motor vehicles, Power-generating machinery and equipment and General industrial machinery represent a large share of Brazil's foreign trade in intermediate inputs. It is interesting to note that the electronic devices and equipment category accounts for a large share of imports, but not exports, making Brazil a net importer in this input category.

Table 4
Brazil: top ten intermediate inputs exported and imported, 1994 and 2014
(Percentages of total intermediate inputs)

Codes of the Standard International Trade Classification, Revision 3	1994	Codes of the Standard International Trade Classification, Revision 3	2014
Exports			
78439 - Parts and accessories of motor vehicles	16	71491 - Power-generating machinery and equipment	15
7611 - Telecommunication apparatus and equipment	7	78439 - Parts and accessories of motor vehicles	11
71391 - Power-generating machinery and equipment	7	7478 - General industrial machinery	5
71323 - Power-generating machinery and equipment	4	79295 - Other transport equipment	5
78434 - Parts and accessories of motor vehicles	4	71322 - Power-generating machinery and equipment	4
78433 - Parts and accessories of motor vehicles	4	71391 - Power-generating machinery and equipment	4
78425 - Parts and accessories of motor vehicles	4	78432 - Other transport equipment	4
78435 - Parts and accessories of motor vehicles	3	7169 - Power-generating machinery and equipment	4
79295 - Other transport equipment	3	78434 - Parts and accessories of motor vehicles	3
71481 - Power-generating machinery and equipment	2	78435 - Parts and accessories of motor vehicles	3
Imports			
78434 - Parts and accessories of motor vehicles	7	76493 - Telecommunication apparatus and equipment	9
7128 - Power-generating machinery and equipment	7	78439 - Parts and accessories of motor vehicles	7
78439 - Parts and accessories of motor vehicles	6	75997 - Office machines and automatic data processing machines	6
77641 - Electrical machinery and equipment	5	78434 - Parts and accessories of motor vehicles	6
76499 - Telecommunication apparatus and equipment	4	71491 - Telecommunication apparatus and equipment	5
76493 - Telecommunication apparatus and equipment	4	78432 - Parts and accessories of motor vehicles	4
75997 - Office machines and automatic data processing machines	4	79295 - Other transport equipment	3
77258 - Electrical machinery and equipment	4	78435 - Parts and accessories of motor vehicles	2
77611 - Electrical machinery and equipment	3	7478 - General industrial machinery	2
77643 - Electrical machinery and equipment	2	7484 - General industrial machinery	2

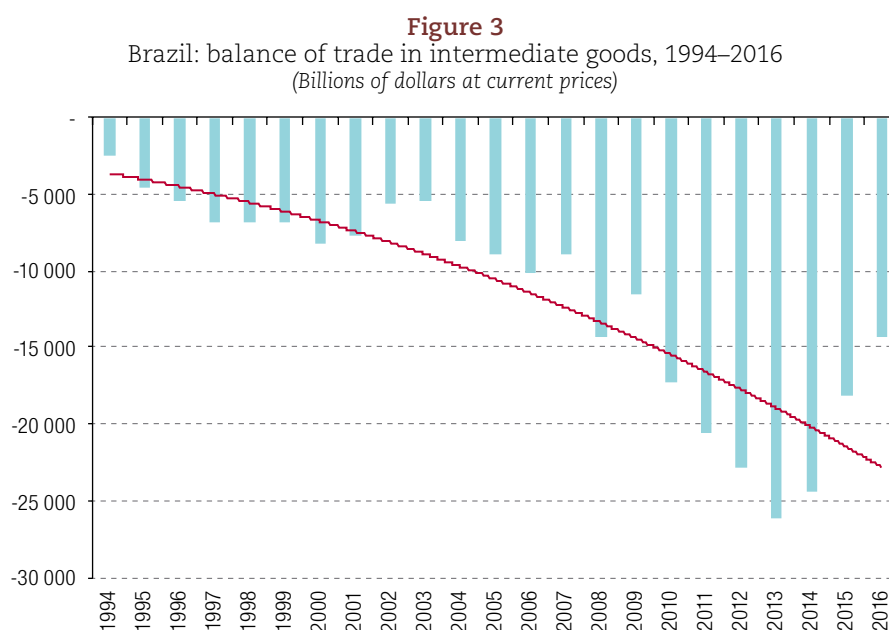
Source: Prepared by the authors, on the basis of United Nations, UN Comtrade - International Trade Statistics Database, 2017 [online] <https://comtrade.un.org/>.

Note: To highlight the product groups of the inputs, the descriptions of the product classifications are those given at the three-digit level, which are more general than those given for the five-digit classification of the main imported and exported inputs.

⁶ The fact that the data of the World Input-Output Database (WIOD) matrices are aggregated at a 35-sector level, makes it impossible to investigate the trend of the intermediate inputs exported and imported by Brazil and Mexico in greater detail. This problem was solved by using Standard International Trade Classification Rev3 [online] <https://unstats.un.org/unsd/tradekb/Knowledgebase/50085/Standard-International-Trade-Classification-Revision-3>, specifically the parts, pieces and components included in chapters 7 (Machinery and transport equipment) and 8 (Miscellaneous manufactured articles) at the four- and five-digit levels. For a complete list of intermediate inputs with their respective SICT Rev3 codes, see Athukorala and Menon (2010).

Four of the seven intermediate inputs that were simultaneously exported and imported in 2014 belong to the Parts and accessories of motor vehicles category. These are: Other parts and accessories of bodies (78432), Gearboxes (78434), Drive axles (78435) and Other parts and accessories (78439). This pattern of foreign trade in intermediate inputs reveals the existence of a large component of intraindustry trade, and also that Brazil's integration into the most dynamic stages of global value chains occurred predominantly through the Parts and accessories of motor vehicles category.⁷ As Souza and Castilho (2016) note, much of this trade takes place between the countries of the Southern Common Market (MERCOSUR) and with the United States.

An analysis of Brazil's balance of trade in intermediate goods reveals widening deficits between 1994 and 2014. As shown in figure 3, a deficit of roughly US\$ 2.5 billion in 1994 had grown to over US\$ 24 billion by 2014 (both figures at current prices). These results demonstrate that domestic production was unable to compete with imported inputs, from the time when the trade liberalization process consolidated in 1994 through to the period of greater integration into global value chains during the first decade of the twenty-first century. Thus, this pattern of trade specialization in intermediate goods, centred on the Parts and accessories of motor vehicles category, put further pressure on the trade deficits in the manufactured goods sector (Marconi, 2015).



Source: Prepared by the authors, on the basis of United Nations, UN Comtrade - International Trade Statistics Database, 2017 [online] <https://comtrade.un.org/>.

Table 5 displays data on Mexico's exports and imports of intermediate inputs between 1996 and 2014.⁸ The total trade flow (exports plus imports) of intermediate goods in the Mexican economy is more than three times that of Brazil — more than US\$ 160 million, compared to just over US\$ 46 million, respectively in 2014. It should be recalled that intermediate inputs are the parts, components and accessories included in chapters 7 and 8 of SITC Rev. 3, and that the highest rates of growth of intermediate inputs occurred among these items (Athukorala and Menon, 2010).

⁷ The category "Other parts of aeroplanes or helicopters" (79295) can also be included. These products are exported mainly by the Brazilian aeronautics firm, Empresa Brasileira de Aeronáutica, S.A. (EMBRAER), which participates actively in global value chains.

⁸ The analysis of Mexico's foreign trade in intermediate goods starts only in 1996, because 1994 and 1995 were years of balance of payments crisis, which would distort the analysis of foreign trade. This crisis became known as the "tequila crisis" (Ibarra and Moreno-Brid, 2001).

Table 5
Mexico: top ten intermediate inputs exported and imported, 1994 and 2014
(Percentages of total intermediate inputs)

Codes of the Standard International Trade Classification, Revision 3	1996	Codes of the Standard International Trade Classification, Revision 3	2014
Exports			
7611 - Telecommunication apparatus and equipment	21	7611 - Telecommunication apparatus and equipment	21
71322 - Power-generating machinery and equipment	14	77313 - Electrical machinery and equipment	9
76493 - Telecommunication apparatus and equipment	9	82119 - Furniture and parts thereof	7
77641 - Electrical machinery and equipment	6	78432 - Parts and accessories of motor vehicles	6
78439 - Parts and accessories of motor vehicles	5	77261 - Electrical machinery and equipment	5
77259 - Electrical machinery and equipment	4	71322 - Power-generating machinery and equipment	4
77255 - Electrical machinery and equipment	3	78435 - Parts and accessories of motor vehicles	4
74159 - General industrial machinery	3	71391 - Power-generating machinery and equipment	4
77812 - Electrical machinery and equipment	2	78434 - Parts and accessories of motor vehicles	3
71392 - Power-generating machinery and equipment	2	78433 - Parts and accessories of motor vehicles	2
Imports			
78432 - Parts and accessories of motor vehicles	8	78439 - Parts and accessories of motor vehicles	11
77611 - Electrical machinery and equipment	8	75997 - Office machines and automatic data-processing machines	7
77645 - Electrical machinery and equipment	7	78432 - Parts and accessories of motor vehicles	6
77259 - Electrical machinery and equipment	5	71323 - Power-generating machinery and equipment	5
7722 - Electrical machinery and equipment	5	78434 - Parts and accessories of motor vehicles	5
77643 - Electrical machinery and equipment	4	77282 - Electrical machinery and equipment	4
71391 - Power-generating machinery and equipment	4	77259 - Electrical machinery and equipment	4
76493 - Telecommunication apparatus and equipment	4	7611 - Telecommunication apparatus and equipment	3
75997 - Office machines and automatic data-processing machines	3	71391 - Power-generating machinery and equipment	3
78435 - Parts and accessories of motor vehicles	3	78435 - Parts and accessories of motor vehicles	3

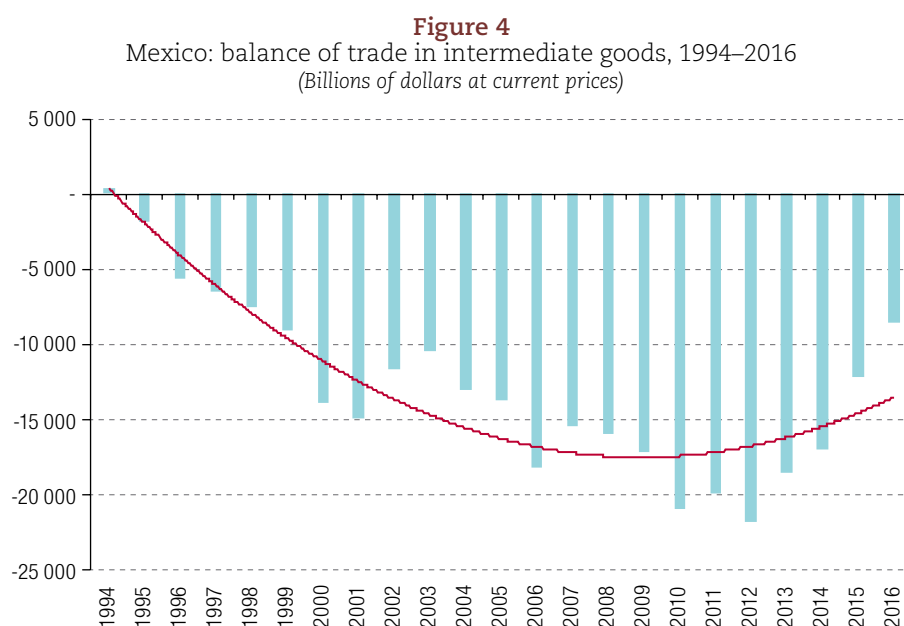
Source: Prepared by the authors, on the basis of United Nations, UN Comtrade - International Trade Statistics Database, 2017 [online] <https://comtrade.un.org/>.

Note: To highlight the product groups of the inputs, the descriptions of the product classifications are those given at the three-digit level, which are more general than those given for the five-digit classification of the main imported and exported inputs.

Table 5 further shows that Mexico's imports and exports of intermediate inputs are both concentrated in fewer products than those of Brazil. In the case of exports, the largest share corresponds to Telecommunications apparatus and equipment (7611), which accounted for 21% of total exports of intermediate inputs. The share of exports of Power-generating machinery and equipment fell by 10% between 1996 and 2014. The largest increase was recorded in the Parts and accessories of motor vehicles category, which had a 5% share in 1996 and was based on exports of Other parts and accessories (78439). In 2014, exports of Parts and accessories of motor vehicles accounted for 15%, given the increases in export shares of Other body parts and accessories (78432), Brakes and parts thereof (78433), Gearboxes (78434) and Drive axles (78435). The Other vehicle parts and accessories segment accounted for a 12% share in 2013, indicating a sharp increase in its exports by 2014. Thus, unlike Brazil, where the Parts and accessories of motor vehicles category saw its share decline, Mexico's foreign trade in intermediate inputs started to depend increasingly on the dynamics of these five product groups.

The sudden process of deregulation and the rapid elimination of tariff and non-tariff barriers to trade, which characterized the economic development strategy adopted by Mexico in the 1980s, led to an abrupt change in its trade pattern. The new foreign trade profile, based on exports and imports of inputs in the form of parts, pieces and components of the transport equipment and electrical and optical equipment sectors, fuelled the country's trade deficits throughout the 1990s. Another worrying feature of this pattern of foreign trade is the increase in the import content of intermediate inputs in Mexican exports (Fujii and Cervantes, 2013), which tends to put further pressure on the economy's balance of payments.

Figure 4 shows that, after NAFTA was signed in 1994, Mexico's balance of trade in intermediate goods started to deteriorate. According to Moreno-Brid and Ros (2009), Mexico's participation in NAFTA had apparently contradictory effects on its trade balance: while the surplus with its NAFTA trading partners grew, its trade balance with Asian countries, particularly China, deteriorated. The overall and sectoral result for intermediate goods saw the emergence of trade deficits. Since mid-2000s, these deficits in intermediate goods trade have been partly reversed by an increase in trade surpluses with the United States, which have more than offset the widening deficits with China.



Source: Prepared by the authors, on the basis of United Nations, UN Comtrade - International Trade Statistics Database, 2017 [online] <https://comtrade.un.org/>.

It is with these different foreign trade profiles that Brazil and Mexico participate at quite different levels in global value chains. Medeiros and Trebat (2017) describe these different patterns of participation in global value chains among peripheral countries as highly asymmetric. The asymmetry arises from the growing concentration and centralization of power over the value created in global value chains, in which countries such as Brazil and Mexico participate in different stages of the production processes. The asymmetry is even greater in terms of the capacity of peripheral countries to appropriate the value created in those chains.

The hierarchical nature of the new international division of labour promotes fierce competition in production stages that have less capacity to generate value added, such as raw materials processing (Brazil). These generate lower wages for workers and smaller profit margins for firms. At the top of the hierarchy there is another pattern of competition, centred on the capacity to direct the flows of goods and services and innovation; and it is characterized by higher wages and higher profit margins for workers and firms, respectively (Medeiros and Trebat, 2017).

Table 6 shows that the foreign content of Brazilian and Mexican exports generally increased between 1995 and 2011. In Brazil, the value added content of exports increased by 3 percentage points, from 7.8% to 10.8%. According to the studies by Hermida (2016), Côrrea (2016) and Castilho, Torracca and Freitas (2019), this Brazilian share is relatively small compared to that of developed and peripheral countries. Although this percentage still shows the country's scant participation in global value chains, there is significant growth in the shares of certain sectors. These are concentrated sectorally in automotive vehicle manufacturing (7.2%), rubber and plastics (6.7%), machinery and electrical equipment (6.6%), other transport equipment (6.5%) and electrical and optical equipment (6.5%). As a result, the share of imported value added in domestic manufacturing exports increased by 4.2% between 1995 and 2011.

Table 6
Brazil and Mexico: foreign value added contained in exports, 1995 and 2011
(Percentages of total exports)

Sectors	Brazil			Mexico		
	1995	2011	(percentages)	1995	2011	(percentages)
Total	7.8	10.8	3.0	27.3	31.7	4.4
Agriculture, hunting, forestry and fishing	4.9	9.5	4.6	5.3	10.7	5.4
Extractive industries and mining	10.1	9.9	-0.2	3.3	4.3	1.0
Total manufacturing	10.1	14.3	4.2	38.6	43.5	4.9
Food, beverages and tobacco	7.4	9.8	2.4	15.0	16.8	1.8
Textiles and textile products	6.0	8.9	2.9	31.6	37.5	5.9
Wood and products of wood and cork	5.2	9.2	4.0	10.1	18.2	8.0
Pulp, paper, articles of paper, printing and publishing	7.8	9.6	1.8	21.9	31.6	9.7
Coke, refined petroleum and nuclear fuel	18.2	21.4	3.2	6.2	25.5	19.3
Rubber and plastics	10.7	17.4	6.7	25.6	40.0	14.4
Other non-metallic minerals	9.3	12.3	3.0	13.6	18.6	5.0
Basic metals	13.6	15.8	2.2	20.6	16.6	-4.0
Fabricated metal	9.7	13.1	3.4	41.0	45.8	4.8
Other manufactures; recyclable articles	5.2	8.5	3.3	38.9	48.6	9.6
Machinery and equipment	10.6	16.2	5.6	32.5	37.2	4.8
Chemical products	11.4	15.8	4.5	14.8	26.3	11.5
Electrical machines and appliances	13.3	19.9	6.6	54.8	58.3	3.5
Manufacture of motor vehicles, trailers and semi-trailers	12.7	19.9	7.2	40.8	49.6	8.8
Other transport equipment	12.0	18.5	6.5	24.5	33.2	8.7
Electrical and optical equipment	17.6	24.1	6.5	62.0	64.1	2.1
Electricity, gas and water	2.1	5.9	3.8	7.6	15.3	7.8
Construction	6.3	8.9	2.6	11.3	11.3	0.0
Wholesale and retail trade; repairs	1.0	3.2	2.3	4.9	4.3	-0.6
Hotels and restaurants	4.1	6.2	2.2	3.5	4.0	0.5
Transport and storage	6.0	10.0	4.1	5.6	8.6	3.0
Postal and telecommunications services	5.2	5.9	0.8	7.0	12.2	5.2
Financial intermediation	1.9	3.3	1.4	2.2	3.5	1.3
Real estate activities	0.5	0.7	0.3	1.4	1.0	-0.4
Rental of machinery and equipment	6.8	7.5	0.8	4.7	5.6	0.9
Information technology and related activities	2.9	7.0	4.0	3.4	2.8	-0.6
Research and development and other business activities	3.7	4.8	1.1	5.0	3.2	-1.9

Sectors	Brazil			Mexico		
	1995	2011	(percentages)	1995	2011	(percentages)
Public administration and defence; compulsory social security	3.0	4.2	1.2	1.5	1.4	-0.1
Education	2.6	3.3	0.7	4.8	4.7	-0.1
Health and social work	5.1	6.8	1.7	5.9	5.4	-0.5
Other community, social and personal service activities	5.6	6.5	0.9	35.0	37.0	2.1

Source: Prepared by the authors, on the basis of European Commission (EC), World Input-Output Database, 2013 [online] <http://www.wiod.org/home>.

The Mexican economy's participation in global value chains was almost three times greater than that of Brazil, rising from 27.3% to 31.7% between 1995 and 2011. In manufacturing, the difference is even greater, since in 2011 the foreign value added contained in each country's manufacturing exports was 43.5% in Mexico but just 14.3% in Brazil. Within Mexico's manufacturing sector, the largest sectoral increases were recorded in coke, refined petroleum products and nuclear fuel (+19.3%), rubber and plastics (+14.4%) and chemicals (+11.5%).

Divergent patterns of trade specialization and integration into value chains have tended to reinforce Brazil's upstream participation, that is in the early stages of production processes through raw material exports. In contrast, Mexico's participation is more intensive and is located in the later stages of the value chains, with the country processing intermediate inputs for subsequent export. Despite the different reasons for Brazil's weak capacity to integrate into these networks — such as the “excessive” industrial vertical integration inherited from the import substitution period (Canuto, Fleischhaker and Schellekens, 2015)— the recent increase in the use of imported intermediate inputs has undoubtedly led to changes in intersectoral linkages.

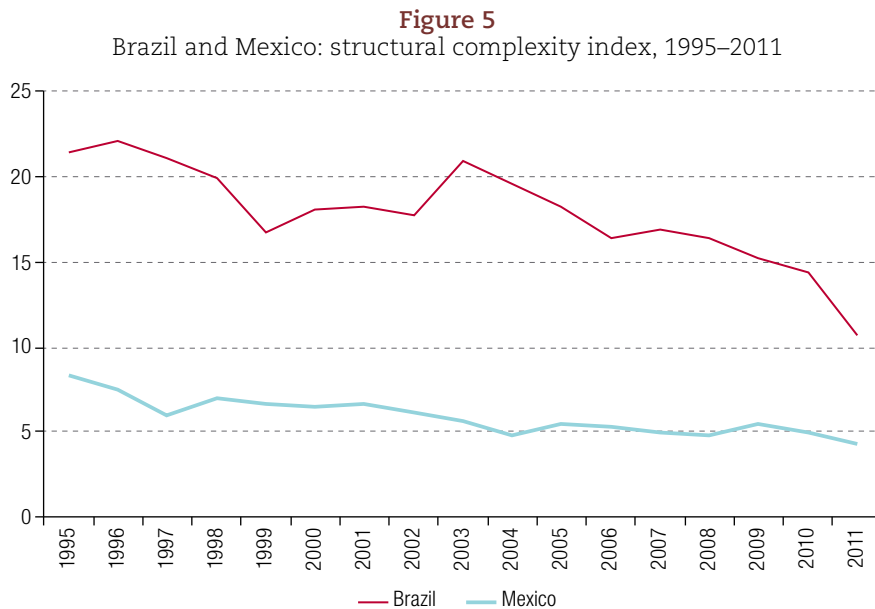
Mexico's high degree of integration into global value chains did not forge strong linkages between the export manufacturing sector and the domestic production structure. According to Ruiz-Nápoles (2004) and Fujii and Cervantes (2012 and 2017), Mexico's membership of NAFTA and its more active participation in value chains failed to trigger a dynamic structural reform process generating income and more highly skilled jobs.⁹ The large import content of Mexico's manufacturing exports — and the resulting delinkage between the manufacturing export sector and the rest of the economy— is identified as one of the reasons for the country's slow growth since becoming part of NAFTA (Moreno-Brid and Ros, 2009). This disconnect dampened the effect of the export multiplier on economic growth (Ruiz-Nápoles, 2004). The far reaching changes observed in Mexican exports — from a pattern concentrated in oil exports in the 1980s to concentration in more technology-intensive products— failed to elicit structural changes in the sense described above. In fact, this export-import pattern actually accentuated the rigidity of exports and the structural dependency on imported inputs.

The two countries' production structures responded differently to the changes occurring in foreign trade. However, the result common to both countries was what is conventionally referred to as a loss of density or complexity in intersectoral linkage (Coutinho, 1997; Britto, 2002; Marconi, 2015). Studies show that this loss of complexity generally goes hand-in-hand with a smaller manufacturing share in value added (Marconi, 2015), a reduction in the value of backward and forward linkages, or a loss of linkages in various parts of the production chains (Coutinho, 1997; Kupfer, 2005). An analysis of complexity based on the determinants of input-output matrices affords a complementary reading of the indicators analysed above.

As figure 5 shows, the structural complexity index declined in both countries during the period under review; and Brazil's production structure was more complex than Mexico's. The structural complexity index fell by 10.8, from 21.5 to 10.7, in Brazil and by 3.9, from 8.3 to 4.4 in Mexico.

⁹ According to Katz (2000).

Although the two economies' international integration strategies differ in intensity, and the two countries participate in different stages of global value chains, both Brazil and Mexico have seen their production structures become less complex.



Source: Prepared by the authors, on the basis of European Commission (EC), World Input-Output Database, 2013 [online] <http://www.wiod.org/home>.

The various reasons identified for this loss of complexity include the increased dependency of domestic production on imported intermediate inputs, which seems to have been due to a combination of greater trade openness and the microeconomic behaviour of domestic and transnational firms based in the countries in question. Greater integration meant a general increase in the import content of the intersectoral linkage. Although to different degrees, the integration of Brazil and Mexico into global production and value networks during the 2000 decade appears to have reinforced the trade specialization patterns inherited from the previous decade. This is because both countries started to rely increasingly on imports of parts, components and accessories, which, in turn, tended to make their export patterns more rigid. Brazil and Mexico needed their traditional export sectors to grow more strongly, to generate trade surpluses and thus contain the deficits in current transactions.

The results show how the differences in the two economies' external integration models made both of them more reliant on imported inputs. Throughout the 2000s, Mexico's trade profile reflected the intensification of economic policies that provided incentives to maquila firms (Moreno-Brid and Ros, 2009), with a high input content imported from the various subsidiaries of transnational corporations. In contrast, the Brazilian trade profile followed a path of greater reprimarization, and the import content of its production increased. This led to foreign trade structures that diverged progressively on the export side, but not in terms of imports, as discussed at the start of this section.¹⁰ While Mexican exports were concentrated in manufactured goods with high levels of economic complexity and technological content, in the Brazilian case the share of agricultural and industrial commodities in exports increased sharply on the back of the commodity boom, one of the characteristics of which is a low level of economic or technological complexity.

¹⁰ The divergence between the Mexican and Brazilian export structures can be seen in the evolution of the economic complexity indices estimated in the Atlas of Economic Complexity, coordinated by Hausmann (see [online] <http://atlas.cid.harvard.edu/rankings/2010?country=chi>). As noted above, this is based on the composition of the countries' exports. In the case of Mexico, the economic complexity index increased and its ranking improved. In Brazil, the opposite happened, as both deteriorated between 1995 and 2010.

As noted at the start of this section, an analysis on the import side revealed a growing trade deficit in intermediate inputs in both economies. This persistent deficit indicates that the demand circuits for intermediate goods, which were previously served by domestic producers, were gradually replaced by foreign suppliers.¹¹ According to Medeiros, Freitas and Passoni (2019), Marcato and Ultremare (2018) and Fujii and Cervantes (2013), increased import penetration caused the demand for intermediate inputs to leak abroad, thereby reducing the density of the domestic production structure.

These findings are important because they show how, in the Mexican maquila model, the economic complexity of its exports increased while its production structure became less complex. In contrast, in the Brazilian model the indicators of economic and structural complexity both declined. Thus, although the two countries differed in the external integration models they adopted, they shared a common outcome: a loss of complexity in their production structures. It is striking that structural complexity of the two economies declined while they became more dependent on imported inputs. This sheds light on the role played in these economies by imported inputs, which may be replacing the intermediate demand circuits previously served by domestic producers (Costa, Castilho and Puchet, 2018).

IV. Conclusions

This article has analysed the effects of trade specialization patterns on the production structures of Brazil and Mexico between 1995 and 2011, in an environment of fragmentation of production. The study seeks not only to elucidate processes of structural change in Brazil and Mexico, but also, from an analytical and methodological perspective, to contribute to the analysis of the complexity of the two economies using the structural complexity index. This index shows how the sectors interact, and makes it possible to determine the effects of exports and imports on the level and pattern of interdependence between sectors; in other words, it sheds light on the relationships that exist between structural change and foreign trade.

A comparative study of these two economies is justified for a number of reasons —in particular, the similarity of the two countries' industrial sector, in terms of both size and diversification; and the fact that they are the two largest economies in Latin America, which gives them an important role in the dynamics of the region's other economies. Brazil became more specialized in exporting natural-resource-based products, while on the import side it became increasingly dependent on foreign sourced intermediate inputs, mainly machinery and transport equipment. In contrast, Mexico's exports have become more concentrated in export-oriented manufacturing maquilas, particularly in the machinery, and transport equipment and electrical equipment sectors; and its imports have been concentrated in intermediate inputs for those same sectors.

The two countries' integration into global value chains tended to further deepen the trade patterns established during the 1990s. Brazil strengthened its participation in the early stages of value chains —that is in the initial stages of production processes— by exporting raw materials. Mexico, in contrast, participated more intensively in those chains, positioning itself in the later stages, where it processes imported intermediate inputs for subsequent export. Despite its more intensive participation in global value chains, it has been unable to forge strong linkages between the export manufacturing sector and the domestic production structure, which could have generated dynamic structural reform processes. This, at least partly, explains the relative lack of complexity of the Mexican economy. In the period analysed, both economies lost complexity, as the imported content of intermediate goods grew.

¹¹ Costa (2017) calculates the structural complexity index for both economies, based on the difference between the domestic and total matrices (domestic intermediate demand plus imported intermediate demand). This calculation revealed that an increasing proportion of intermediate demand circuits were being closed by foreign suppliers through imports.

For Mexico, membership of NAFTA and deeper integration into global value chains were two closely related phenomena, which had weaker effects on income, employment and the generation of national value added than had been expected in the early 1990s.

In terms of import structure, the coincidence between the main importing sectors in 1995 and 2011 suggests a degree of rigidity in the two economies' production profiles. In this connection, regional agreements (MERCOSUR and NAFTA) and global value chain participation seem to have intensified the characteristics inherited from the import substitution industrialization period. One of these is the inability of the domestic supply of intermediate goods to satisfy demand at times of robust economic growth, which increases reliance on imported intermediate inputs. This greater presence of imported inputs has suggested the occurrence of a process of deindustrialization or loss of density in the Brazilian production structure, and a reduction in the capacity of Mexican maquilas to generate spillover effects in the domestic economy. The persistent decline in both economies' structural complexity indices shows that the increased presence of imported inputs, which have replaced domestically produced inputs in the intermediate demand circuits, seems to have reduced structural complexity in both countries.

Bibliography

- Adami, C. (2002), "What is complexity?", *BioEssays*, vol. 24, No. 12, December.
- Amaral, J., J. Dias and J. Lopes (2007), "Complexity as interdependence in input–output systems", *Environment and Planning A: Economy and Space*, vol. 39, No. 7.
- Aroche Reyes, F. (1993), "Economic structures in Brazil, Mexico and South Korea: an input-output application", doctoral thesis, London, Queen Mary University of London.
- Arthur, W. (1999), "Complexity and the economy", *Science*, vol. 284, No. 5411, Washington, D.C., American Association for the Advancement of Science (AAAS).
- Athukorala, P. and J. Menon (2010), "Global production sharing, trade patterns, and determinants of trade flows in East Asia", *Working Papers Series on Regional Economic Integration*, No. 41, Mandaluyong, Asian Development Bank (ADB), January.
- Baldwin, R. (2011), "Trade and industrialisation after globalisation's 2nd unbundling: how building and joining a supply chain are different and why it matters", *NBER Working Paper*, No. 17716, Cambridge, National Bureau of Economic Research (NBER), December.
- Basu, R. and T. Johnson (1996), "The development of a measure of intersectoral connectedness by using structural path analysis", *Environment and Planning A: Economy and Space*, vol. 28, No. 4.
- Boddin, D. (2016), "The role of newly industrialized economies in global value chains", *IMF Working Paper*, No. 16/207, Washington, D.C., International Monetary Fund (IMF), October.
- Bott, R. and J. Mayberry (1954), "Matrices and trees", *Economic Activity Analysis*, O. Morgenstern (ed.), New York, John Wiley & Sons.
- Britto, G. (2002), "Abertura comercial e reestruturação industrial no Brasil: um estudo dos coeficientes de comércio", master's thesis in Economic Sciences, Campinas, State University at Campinas.
- Canuto, O., C. Fleischhaker and P. Schellekens (2015), "The curious case of Brazil's closedness to trade", *Policy Research Working Paper*, No. 7228, Washington, D.C., World Bank, April.
- Castilho, M., J. Torracca and F. Freitas (2019), "The competitiveness of Brazilian manufacturing in both domestic and international markets", *International Integration of the Brazilian Economy*, E. Grivoyannis (ed.), New York, Palgrave Macmillan.
- Chenery, H. (1980), "Interactions between industrialization and exports", *World Bank Reprint Series*, No. 150, Washington, D.C., World Bank.
- Chenery, H. and T. Watanabe (1958), "International comparisons of the structure of production", *Econometrica: Journal of the Econometric Society*, vol. 26, No. 4, October.
- Côrrea, L. (2016), "Trajetórias dos países em desenvolvimento nas cadeias globais de valor: upgrading, estágio produtivo e mudança estrutural", doctoral thesis in Economics, Rio de Janeiro, Rio de Janeiro's Federal University.

- Costa, K. (2017), “Entre similaridades e diferenças nos padrões de comércio exterior e de estrutura produtiva do Brasil e do México: uma análise multissetorial a partir de matrizes de insumo-produto”, doctoral thesis in Economics, Rio de Janeiro, Rio de Janeiro's Federal University.
- Costa, K., M. Castilho and M. Puchet (2018), “Structure productive et effet d'entraînements productifs à l'ère des chaînes globales de valeur: une analyse input-output”, *Revue d'Économie Industrielle*, vol. 3, No. 163.
- Coutinho, L. (1997), “A especialização regressiva: um balanço do desempenho industrial pós-estabilização”, *Brasil: desafios de um país em transformação*, J. Velloso (coord.), Rio de Janeiro, José Olympio Editora.
- Dietzenbacher, E. (1992), “The measurement of interindustry linkages: key sectors in the Netherlands”, *Economic Modelling*, vol. 9, No. 4, October.
- Durlauf, S. (2005), “Complexity and empirical economics”, *The Economic Journal*, vol. 115, No. 504, June.
- Finn, J. (1976), “Measures of ecosystem structure and function derived from analysis of flows”, *Journal of Theoretical Biology*, vol. 56, No. 2.
- Fontana, M. (2008), “The complexity approach to economics: a paradigm shift”, *Working Paper*, No. 2008/01, Torino, Centro di Studi sulla Storia e i Metodi dell'Economia Politica “Claudio Napoleoni” (CESMEP).
- Fujii, G. and R. Cervantes (2017), “The weak linkages between processing exports and the internal economy: the Mexican case”, *Economic Systems Research*, vol. 29, No. 4.
- (2013), “Mexico: value added in exports of manufactures”, *CEPAL Review*, No. 109 (LC/G.2556-P), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).
- (2012), “The Mexican trade liberalization process and its net effects on employment: 1988-2004”, *EconoQuantum*, vol. 9, No. 2.
- Gazon, J. and M. Nihon (1976), *Transmission de l'influence économique, une approche structurale*, Paris, Sirey.
- Guo, D., G. Hewings and M. Sonis (2005), “Integrating decomposition approaches for the analysis of temporal changes in economic structure: an application to Chicago's economy from 1980 to 2000”, *Economic Systems Research*, vol. 17, No. 3.
- Hausmann, R. and C. Hidalgo (2011), “The network structure of economic output”, *Journal of Economic Growth*, vol. 16, No. 4, December.
- Hausmann, R., J. Hwang and D. Rodrik (2007), “What you export matters”, *Journal of Economic Growth*, vol. 12, No. 1, March.
- Hausmann, R. and others (2014), *The Atlas of Economic Complexity: Mapping Paths to Prosperity*, Cambridge, The MIT Press.
- Hermida, C. (2016), “Padrão de especialização comercial e crescimento econômico: uma análise sobre o Brasil no contexto da fragmentação da produção e das cadeias globais de valor”, doctoral thesis in Economics, Uberlândia, Federal University of Uberlândia.
- Hewings, G. and others (1998), “The hollowing-out process in the Chicago economy, 1975-2011”, *Geographical Analysis*, vol. 30, No. 3.
- Hidalgo, C. and others (2007), “The product space conditions the development of nations”, *Science*, vol. 317, No. 5837, Washington, D.C., American Association for the Advancement of Science (AAAS).
- Hirschman, A. (1958), *The Strategy of Economic Development*, Yale Studies in Economics, vol. 10, New Haven, Yale University Press.
- Ibarra, D. and J. Moreno-Brid (2001), “Currency boards and monetary unions: the road ahead or a cul de sac for Mexico's exchange rate policy?”, *Mexico beyond NAFTA: Perspectives for the European Debate*, M. Puchet and L. Punzo (eds.), London, Routledge.
- Jensen, R. and G. West (1980), “The effect of relative coefficient size on input-output multipliers”, *Environment and Planning A: Economy and Space*, vol. 12, No. 6.
- Kaldor, N. (1967), *Strategic Factors in Economic Development*, Ithaca, ILR Press.
- Katz, J. (2000), *Reformas estructurales, productividad y conducta tecnológica en América Latina*, Santiago, Fondo de Cultura Económica/Economic Commission for Latin America and the Caribbean (ECLAC).
- Kume, H. (1996), “A política de importação no plano real e a estrutura de proteção efetiva”, *Texto para Discussão*, No. 423, Rio de Janeiro, Institute for Applied Economic Research (IPEA), May.
- Kupfer, D. (2005), “A indústria brasileira após a abertura”, *Brasil em desenvolvimento: economia, tecnologia e competitividade*, A. Castro and others (eds.), Rio de Janeiro, Civilização Brasileira.

- Kupfer, D. and others (2013), "Different partners, different patterns: trade and labour market dynamics in Brazil's post-liberalization period", *OECD Trade Policy Papers*, No. 149, Paris, Organization for Economic Cooperation and Development (OECD).
- Lantner, R. (1974), *Théorie de la dominance économique*, Paris, Dunod.
- (1972), "L'analyse de la dominance économique", *Revue d'économie politique*, vol. 82, No. 2.
- Lantner, R. and D. Lebert (2015), "L'input-output est mort? Vive l'analyse structurale!: Dominance et amplification des influences dans les structures linéaires", *Économie Appliquée*, vol. 68, No. 3.
- (2013), "Dominance, dependence and interdependence in linear structures: a theoretical model and an application to the international trade flows", *CES Working Papers*, No. 43, Paris, University of Paris.
- Lantner, R. and F. Carluer (2004), "Spatial dominance: a new approach to the estimation of interconnectedness in regional input-output tables", *The Annals of Regional Science*, vol. 38, No. 3, September.
- Lewis, W. (2006), *The Theory of Economic Growth*, London, Routledge.
- López, J. (1998), *La macroeconomía de México: el pasado reciente y el futuro posible*, Ciudad de México, Miguel Ángel Porrúa.
- Marcato, M. and F. Ultrmare (2018), "Produção industrial e vazamento de demanda para o exterior: uma análise da economia brasileira", *Economia e Sociedade*, vol. 27, No. 2, Campinas, State University at Campinas.
- Marconi, N. (2015), "Estrutura produtiva e desenvolvimento econômico", *Indústria e desenvolvimento produtivo no Brasil*, N. Barbosa and others (coords.), Rio de Janeiro, Elsevier.
- McMillan, M. and D. Rodrik (2011), "Globalization, structural change and productivity growth", *NBER Working Paper*, No. 17143, Cambridge, National Bureau of Economic Research (NBER), June.
- Medeiros, C. and N. Trebat (2017), "Finance, trade, and income distribution in global value chains: implications for developing economies and Latin America", *Discussion Paper*, No. 002, Rio de Janeiro, Rio de Janeiro's Federal University, January.
- Medeiros, C., F. Freitas and P. Passoni (2019), "Structural change and the manufacturing sector in the Brazilian economy: 2000-2014", *The Manufacturing Sector in Argentina, Brazil, and Mexico: Transformations and Challenges in the Industrial Core of Latin America*, Palgrave Studies in Latin American Heterodox Economics, J. E. Santarcangelo (ed.), Cham, Palgrave Macmillan.
- Moreno-Brid, J. and J. Ros (2009), *Development and Growth in the Mexican Economy: A Historical Perspective*, New York, Oxford University Press.
- Peacock, A. and D. Dosser (1957), "Input-output analysis in an underdeveloped country: a case study", *The Review of Economic Studies*, vol. 25, No. 1, October.
- Puchet, M. (1996), "Análisis de la integración económica: aspectos del caso EUA-México", *La inserción internacional del MERCOSUR: ¿mirando al Sur o mirando al Norte?*, L. Bizzozero and M. Vaillant (eds.), Montevideo, Arca.
- Rasmussen, P. (1957), *Studies in Inter-Sectoral Relations*, Amsterdam, North-Holland.
- Robinson, S. and A. Markandya (1973), "Complexity and adjustment in input-output systems", *Oxford Bulletin of Economics and Statistics*, vol. 35, No. 2, Oxford, Basil Blackwell.
- Rodrik, D. (2006), "What's so special about China's exports?", *China & World Economy*, vol. 14, No. 5.
- Romero, I., E. Dietzenbacher and G. Hewings (2009), "Fragmentation and complexity: analyzing structural change in the Chicago regional economy", *Revista de Economía Mundial*, No. 23.
- Ros, J. (2015), *Grandes problemas: ¿cómo salir de la trampa del lento crecimiento y alta desigualdad?*, Ciudad de México, El Colegio de México/National Autonomous University of Mexico (UNAM).
- (1994), "Mexico's trade and industrialization experience since 1960: a reconsideration of past policies and assessment of current reforms", *Trade Policy and Industrialization in Turbulent Times*, G. Helleiner (ed.), New York, Routledge.
- Rosser, J. (1999), "On the complexities of complex economic dynamics", *The Journal of Economic Perspectives*, vol. 13, No. 4.
- Rostow, W. (1959), "The stages of economic growth", *The Economic History Review*, vol. 12, No. 1.
- Ruiz-Nápoles, P. (2004), "Exports, growth, and employment in Mexico, 1978-2000", *Journal of Post Keynesian Economics*, vol. 27, No. 1.

- Sarti, F. and C. Hiratuka (2018), "Desempenho recente da indústria brasileira no contexto de mudanças estruturais domésticas e globais", *Para além da política econômica*, R. Carneiro, P. Baltar and F. Sarti (coords.), São Paulo, Editora Unesp.
- Simon, H. (1962), "The architecture of complexity", *Proceedings of the American Philosophical Society*, vol. 106, No. 6, December.
- Sonis, M. and G. Hewings (1998), "Economic complexity as network complication: multiregional input-output structural path analysis", *The Annals of Regional Science*, vol. 32, No. 3, August.
- Souza, K. and M. Castilho (2016), "Integração produtiva e acordos comerciais: o caso dos países da Aladi", *Economia e Sociedade*, vol. 25, No. 1, Campinas, State University at Campinas.
- Torracca, J. (2017), "Coevolução das estruturas de produção e comércio exterior da indústria brasileira: convergência ou desarticulação?", doctoral thesis, Rio de Janeiro, Rio de Janeiro's Federal University, May.
- Ulanowicz, R. (1983), "Identifying the structure of cycling in ecosystems", *Mathematical Biosciences*, vol. 65, No. 2, August.
- Wong, Y. (1954), "Some mathematical concepts for linear economic models", *Economic Activity Analysis*, O. Morgenstern (ed.), New York, John Wiley & Sons.
- Yan, C. and E. Ames (1965), "Economic interrelatedness", *The Review of Economic Studies*, vol. 32, No. 4, October.

Inequality and social polarization in Chilean municipalities

Jessica Candia Cid, José Merino Escobar,
Claudio Bustos and David Martínez

Abstract

The social inequality associated with the current pattern of income distribution in Chile remains a subject of interest, as much remains to be learned about the trends in this connection in differing contexts. The aim of this study is to analyse the existing degrees of inequality and social polarization at the municipal (*comuna*) level arising from the current pattern of income distribution in the country. The measurements used for this purpose are autonomous per capita income and total per capita income. Seventy-eight municipalities in five regions of northern, central and southern Chile were studied. The results confirm the existence of a significant degree of inequality in terms of income distribution and a marked degree of polarization at the municipal level. These findings underscore the need for targeted income redistribution policies at this level to address inequality and polarization, both of which have been linked to social discontent stemming from the conflicts and social injustices that are created and intensified by these phenomena.

Keywords

Economic conditions, social conditions, income distribution, equality, poverty, social conflict, data analysis, economic indicators, Chile

JEL classification

D31, D63

Author

Jessica Candia, Psychiatry and Mental Health Department of the University of Concepción and School of Psychology of San Sebastián University, Chile.
Email: jecandia@udec.cl.

José Merino Escobar, School of Sociology of the University of Concepción, Chile.
Email: jmerino@udec.cl.

Claudio Bustos, School of Medicine of the University of Concepción, Chile.
Email: clbustos@udec.cl.

Dr. David Martínez, School of Psychology of San Sebastián University, Chile.
Email: david.martinez@uss.cl.

I. Introduction

The reduction of inequality is one of the 17 Sustainable Development Goals agreed upon by the countries of the world when they adopted the 2030 Agenda for Sustainable Development at the United Nations General Assembly in 2015 (UNDP, 2017). Some experts have argued that the world's significant and persistent social inequalities need to be addressed by means of social policies specifically designed for that purpose (Alvaredo and others, 2018). Income distribution within a society is a fundamental aspect of broader equality or inequality issues (Wilkinson, 2005; Uribe López, 2009; Amarante and Colacce, 2018) and is currently a focus of interest owing to the vast body of empirical evidence that links income gaps with certain adverse psychosocial effects (Wilkinson and Pickett, 2009; Campos-Arias and Herazo, 2015; Quijada and others, 2018; Navarro Yáñez and Pérez Yruela, 2000) and widespread discontent (UNDP, 2017), although it is recognized that the link between the social inequality resulting from uneven resource distribution and people's discontent may be mediated or moderated by other social variables. At the macro level, the stigma associated with inequality is negatively reflected in a wide variety of ways, including financial status, material assets, capacities, opportunities, access to well-being, social relations and respect for people's rights. This is all connected with the fact that inequality hinders people from making full use of their capacities, delegitimizes political activity and undermines democracy and tolerance while setting the stage for conflict (ECLAC, 2018).

In recent decades, as scholars try to gain a better understanding of social inequality and of how it affects people and society, the concept of polarization has come to the fore as an explanation for the level of inequality-driven conflict (Wolfson, 1997; Esteban and Ray, 1994). Although the social phenomena of inequality and polarization are related, the concept of polarization entails an aspect that the idea of inequality does not, as it refers to the extent to which the population is clustered into a few disparate yet internally homogenous groups and to the growing social tensions between those groups (Vergara, 2011) along with mounting feelings of discontent at the individual level. A recent study in Spain has concluded that levels of satisfaction resulting from improved living conditions among the general population may mask and even feed into the polarization of society into one group of people who have unmet needs but still say that they are satisfied with their situation and another group that is well off and whose members are satisfied with themselves but not with the State or with the society in which they live (Navarro Yáñez and Pérez Yruela, 2000).

A considerable number of studies highlight how unequal and socially polarized Chilean society is. Most of these studies have offered analyses and comparisons at the country level and, in some cases, at the regional level (Contreras, 1999; Schatan, 2005; Raventós, 2005; Conte, 2008; Vergara, 2011; Silva Burgos, 2013; UNDP, 2017). Less research has been done on inequality at the level of municipalities (*comunas*) using data from the National Socioeconomic Survey (CASEN) (1992–2003) and from censuses (Ruiz-Tagle, 1999; Vergara, 2011). One of these studies shows how inequality at the municipal level hinders poverty reduction efforts and plays a role in the emergence of social problems that impede the country's development (Agostini and Brown, 2007). Another focuses on the existence of areas where income distribution is better and others in which it is worse and demonstrates how distribution dynamics have been shifting since at least the 1990s (Ramírez, Tartakowsky and Modrego, 2009). Carpentier (2011) examines inequality at the municipal level based on education-related variables and concludes that higher average levels of schooling and women's participation in the labour market are helping to reduce income inequality at the municipal level.

The literature does not, however, contain studies that provide a conclusive explanation of how the phenomenon of inequality links up with social polarization at more disaggregated territorial levels. This article will therefore focus on the following question: how are the inequality and social polarization created by uneven income distribution exhibited at the municipal level in Chile? The starting assumption is that the sharp, persistent inequality evidenced at the regional and national level is also repeated — and

may even be more intense— in some municipalities, resulting in polarization at that territorial level as well. This is reflected in the presence of a few highly concentrated, internally homogenous groups that are socially distanced from one another.

In an effort to answer this research question, this study will: (i) analyse income distribution inequality in the country's municipalities; and (ii) examine the social polarization resulting from income distribution patterns at the municipal level.

This study is structured as follows. In order to provide context and contribute to an understanding of why so little progress has been made in terms of increasing social equality or reducing inequality that is driven by income distribution, the analysis starts out with a description of the main social advances brought about in Chile since the 1990s by social policies and economic growth (section II). This is followed by a discussion of the conceptual basis for the Gini coefficient as a measure of inequality and for the polarization index used to identify the presence of disparate groups, or poles, and the distance separating them as a consequence of the existing pattern of income distribution (section III). This leads into a description of the methodology employed to analyse inequality and polarization in 78 municipalities in 5 different regions of Chile (section IV). The results of this analysis are then presented. These findings confirm the existence of a significant degree of inequality in income distribution and a marked extent of polarization at the municipal level (section V). Finally, a comparative analysis of Gini coefficients based on measurements of autonomous per capita income and Gini coefficients based on total per capital income draws attention to the as yet insufficient effectiveness of cash transfers as a tool for reducing inequality and the need to put in place public policies that address this specific issue at the municipal level (section VI).

II. Background information on social policy in Chile and the main advances

Starting in the 1990s when the military dictatorship came to an end, Chile embarked on a development model “with equity” in a bid to reduce its high poverty levels by opening up the country to international markets and steadily increasing public social spending (Cleary, 2007).¹ And indeed, the upswing in social spending, which climbed from 11.6% of gross domestic product (GDP) in 2011 to 13.9% in 2016 (OECD, 2018), succeeded in lowering poverty indicators from 22.2% (14.1% non-extreme poverty and 8.1% extreme poverty) in 2011 to 8.6% (6.3% non-extreme poverty and 2.3% extreme poverty) in 2017 (Ministry of Social Development, 2018). The tax system has also been reformed to make it more progressive, and social programmes have been expanded. These measures have also been aimed at improving indirect indicators of inequality by narrowing pay gaps between men and women. But the labour market's gender-based duality continues to be reflected in a highly unequal pattern of wage distribution (OECD, 2015).

This development model paved the way for economic growth rates of over 7% of GDP² during certain periods and for reductions in inflation and in public and external debt levels. It also allowed the economy to stave off the negative effects of macroeconomic crises and to become an attractive market for foreign investment. In addition, the country succeeded in improving some of its indicators —including the coverage of basic and intermediate education and the length of compulsory school attendance, life expectancy, literacy rates, nutrition standards, and maternal and child mortality rates— to the point where they were on a par with developed-country levels (Araya Rosales and Gallardo Altamirano, 2015; ECLAC, 2017). Even while the economy has been growing rapidly, however, the level of inequality has remained high, giving rise to other social constraints and barriers to social mobility (OECD, 2015).

¹ The heading of social spending includes spending on education, health and social protection (OECD, 2018).

² GDP at purchasers' prices is the sum of the gross value added of all resident products plus the taxes on those products, minus subsidies, at a given point in time. This value may be regarded as an indicator of a country's economic power.

Yet social policy has not been specifically aimed at reducing inequality. While some social policy mechanisms, such as cash transfer policies targeting poor households (mainly those experiencing income poverty), have addressed this problem indirectly, these mechanisms do not constitute a tool for State action aimed specifically at redistribution (Pizarro, 2005; OECD, 2014; Araya Rosales and Gallardo Altamirano, 2015). This becomes even more evident if Chile's Gini coefficient is compared to those of other high-income countries belonging to the Organization for Economic Cooperation and Development (OECD) (see table 1). The fact that Chile's Gini coefficient has remained closer to those of low- and middle-income countries shows that, while the level of wealth has increased,³ mechanisms have not been put in place to distribute income more equally (OECD, 2014; Vivanco Muñoz and others, 2015).

Table 1
Gini coefficients of selected countries, by income level

High- and middle-income member countries of the Organization for Economic Cooperation and Development (OECD)	Gini coefficient	Year	Upper-middle-income and lower-middle-income countries	Gini coefficient	Year	Low-income countries	Gini coefficient	Year
Austria	0.31	2014	Armenia	0.32	2015	Benin	0.48	2015
Belgium	0.28	2014	Belarus	0.27	2015	Burundi	0.39	2015
Chile	0.48	2015	Bolivia (Plurinational State of)	0.46	2015	Comoros	0.45	2012
Czechia	0.26	2014	Brazil	0.51	2015	Madagascar	0.43	2013
Denmark	0.29	2014	Colombia	0.51	2015	Niger	0.34	2013
Spain	0.36	2014	Costa Rica	0.48	2015	Rwanda	0.50	2013
Slovenia	0.26	2014	Ecuador	0.47	2015	Togo	0.43	2014
Finland	0.27	2014	Egypt	0.32	2015			
Italy	0.35	2014	El Salvador	0.41	2015			
Iceland	0.26	2014	Philippines	0.40	2015			
Norway	0.27	2014	Honduras	0.50	2015			
Sweden	0.27	2014	Panama	0.51	2015			
Uruguay ^a	0.42	2015	Paraguay	0.48	2015			
			Peru	0.44	2015			

Source: Prepared by the authors, on the basis of data from World Bank, "Indicators", undated [online] <https://data.worldbank.org/indicator>.

Note: The World Bank classifies countries as low-, lower-middle-, upper-middle- and high-income countries based on their per capita gross national income (GNI) using the Atlas method. The thresholds for these categories are denominated in dollars. For more information on the World Bank thresholds, see World Bank, World Bank Blogs, undated [online] <https://blogs.worldbank.org/>.

^a Uruguay is not a member of OECD.

The available data indicate that the OECD member countries' Gini coefficients have ranged from 0.27 to 0.48, for an average of around 0.30, with 67% of those 12 countries having a coefficient below that average; Chile's, on the other hand, is the highest of them all (see table 1).

According to Pizarro (2005), the rollback of the welfare State has led to the shrinkage of social protection systems and a downplaying of aspirations for equality of opportunity because State regulation of the economy has been relaxed to the point where the capitalist economic model is being allowed to self-regulate. Consequently, the State has been relegated to a subsidiary role in which government action is primarily confined to channeling resources to households in the lower-income quintiles through

³ Chile's GDP has been rising steadily, climbing from US\$ 33.114 billion in 1990 to US\$ 77.86 billion in 2000, US\$ 218.53 billion in 2010 and US\$ 250.03 billion in 2016 (World Bank, n/d).

cash transfer programmes. The country's economic growth and the fruits of that growth are not, however, being used to reduce inequality to acceptable levels. Instead, those levels have held more or less steady, with Gini coefficients for autonomous income of 0.49 and for monetary income of 0.48 in 2015 (Ministry of Social Development, 2017), which puts Chile among the countries with the highest levels of inequality in the world (Solimano and Torche, 2008) (see table 2).

Table 2
Chile: Gini coefficient, 2006–2015

	2006	2009	2011	2013	2015
Gini coefficient for autonomous income (GAI)	0.50	0.51	0.50	0.50	0.49
Gini coefficient based on monetary income (GMI)	0.49	0.49	0.49	0.49	0.48

Source: Prepared by the authors, on the basis of Ministry of Social Development, *Informe de Desarrollo Social 2017*, Santiago, 2017 [online] http://www.desarrollosocialyfamilia.gob.cl/storage/docs/Informe_de_Desarrollo_Social_2017.pdf.

III. Background information on the Gini coefficient and social polarization

Numerous studies on inequality in income distribution have used the Gini coefficient to measure this variable and to help determine how it ties in with a variety of social problems (Kennedy, Kawachi and Prothrow-Stith, 1996; Nagel, 1974; Vergara, 2011; Campos-Arias and Herazo, 2015; Gatica and others, 2017). Studies have also been done that have contributed to the identification and understanding of some of the sets of circumstances in which social inequality arises and intensifies (Schatan, 2005; Silva Burgos, 2013).

The Gini coefficient is a calculation of the income differentials existing between all individuals and the aggregation of all the absolute differentials. The result of these calculations is expressed as a value between 0 and 1, with a value of 1 corresponding to maximal inequality and a value of 0 corresponding to a totally equal income distribution (Esteban and Ray, 1994).

According to the Pigaou-Dalton (Vergara, 2011) transfer principle, a transfer from one individual with more resources to an individual with fewer resources reduces inequality. It follows that economic inequality derives from the degree of income dispersion around a reference value (average income) that represents perfect equality, which is when everyone has the same level of income. Various indices are used to measure this, with each such index having a different level of sensitivity to the transfers made at the various points along the distribution. The Gini coefficient is most sensitive to transfers that occur near the centre of the distribution.

While there is general agreement that this index has certain limitations (Escobar, 1998; Contreras, 1999; Ortiz and Cummins, 2011), some of these shortcomings are not entirely a statistical issue but are instead a consequence of the diversity and quality of the household income data, both at a local level and in international comparisons, used to calculate it. Many authors also argue, however, that the Gini coefficient has a great deal of predictive power and can be used in conjunction with other indicators (the Palma index, the Theil index, income quintile ratios and the Atkinson index, among the most commonly used ones) to conduct a more nuanced analysis of the behaviour of income distribution within a given society.

The polarization index is used to understand the negative impacts of the distribution or concentration of resources in a society (Duclos, Esteban and Ray, 2004; Cárdenas, 2011; Villalobos and Valenzuela, 2012) and to explain some of the relationships between the distribution of resources and the creation

of internally homogenous poles” or clusters of persons or households that are very different from one another. For example, if the consumption habits of people are analysed on the basis of the quintile to which they belong, it may be found that the members of the first income quintile share certain product preferences, payment systems and purchase points that differ from the shared preferences of members of the fifth income quintile. The existence of these disparate groups or poles sets the stage for the emergence of social conflicts between these socially distanced clusters (Gradín and Rossi, 2002; Cárdenas, 2011; Huesca Reynoso, 2003; Villalobos and Valenzuela, 2012).

The equation proposed by Duclos, Esteban and Ray (2004) for calculating the degree of polarization has been used here because it does not require an a priori definition of these clusters’ members in each case, as other methods do. This indicator therefore uses the continuous income distribution to estimate the probability that one person will have an income similar to the incomes of other persons. Therefore, if the level of income in a given case is equally likely as the level of income in another, then the degree of polarization will be equal to the Gini coefficient (uniform distribution); when dealing with very different income groups, however, the degree of polarization will be higher even though the Gini coefficient may be the same.

Theoretically, the minimum degree of polarization is 0 (when the Gini coefficient is also 0) and the maximum is infinite. It is important to remember that the calculation of the degree of polarization will depend on what alpha value is chosen. With a low alpha value, the value of polarization will be close to the Gini coefficient, while higher alpha values (close to 1) will tend to heighten the polarization differentials to the point where they become as large as the differentials between individuals, independently of the clusters.

The polarization formula is as follows:⁴

$$P_{\alpha}(f) \equiv \iint f(x)^{1+\alpha} f(y) |y-x| dy dx \quad (1)$$

where $\alpha \in [0.25; 1]$.

According to Esteban and Ray (1994), polarization increases as inter-cluster dissimilarity and intra-cluster similarity rise and the smaller the number of clusters and the larger the size of those clusters. These last two factors are what differentiates polarization from inequality, since, as the degree of intra-cluster similarity rises, inequality declines and polarization increases (Huesca Reynoso, 2003; Conte, 2008; Vergara, 2011). This is because isolated individuals have less of an influence on the polarization index than they do on the indicators used to measure inequality, and in order for inequality to increase, there must be greater heterogeneity among all the observations as a whole.

IV. Methodology

The sample was composed of a total of 78 municipalities⁵ (23% of all the municipalities in the country) in 5 regions in the northern, central and southern parts of Chile.⁶ The size of the sample n is between 33.3% and 50% of the total number of municipalities in each region: 5 out of 15 in the Coquimbo Region; 13 out of 38 in the Region of Valparaíso, 19 out of 54 in the Biobío Region, 15 out of 32 in

⁴ Duclos, Esteban and Ray (2004).

⁵ All the municipalities represented in the 2015 CASEN in each region were used.

⁶ The 2015 CASEN was based on the 15 regions that existed in Chile at that time. On 12 July 2017, the Biobío Region was divided in two, creating a sixteenth region (the Ñuble Region).

La Araucanía and 26 out of a total of 52 in the Metropolitan Region. Autonomous per capita income⁷ and total per capita income⁸ were used to calculate the Gini coefficients, and the municipal expansion factor was applied.⁹

In analysing the data, four moments were calculated. The first moment was calculated using the following indices for the 78 municipalities covered by the analysis: the Gini coefficient based on autonomous per capita income (GAI),¹⁰ the Gini coefficient based on total per capita income (GTI),¹¹ the polarization index based on autonomous per capita income (PAI)¹² and the polarization index based on total per capita income (PTI).¹³ In calculating the polarization indices, different values for alpha were tried out, and when they were bootstrapped, a considerable bias was found to exist with alphas over 0.5 in municipalities with high Gini coefficients, such as Traiguén, so an alpha of 0.25 was ultimately used. The ordering of the cases (which, in this study, correspond to municipalities) based on their polarization is independent of the selected alpha value, as the ordering is unaffected by that value. For the second moment, Student's test for dependent samples was used to determine the differences between the GAI and the GTI and between the PAI and the PTI. For the third moment, descriptive analyses were undertaken in order to track the behaviour and trends of the variables under study in the 78 municipalities. Finally, a Pearson correlation coefficient was computed in order to determine the relationship between inequality and polarization (see table 3).

Table 3
Pearson correlation between the Gini coefficient and the polarization index for 78 municipalities

	Polarization index based on autonomous per capita income	Polarization index based on total per capita income
Gini coefficient based on autonomous per capita income	0.77**	0.73**
Gini coefficient based on for total per capita income	0.81**	0.81**

Source: Prepared by the authors.

Note: *: $p < .05$; **: $p < .01$.

V. Results

1. Calculation and analysis of Gini coefficients and polarization indices for 78 municipalities

The Gini coefficients for these municipalities covered a wide spectrum, with the GAI ranging from 0.36 and 0.81 (for a mean (M) of 0.46 and a standard deviation (SD) of 0.06) and a GTI of between 0.29 and 0.74 (M : 0.39; SD : 0.06) (see table 4). The municipality with the lowest level of inequality is Cerro Navia, in the Santiago Metropolitan Region, and the municipality with the greatest inequality is Traiguén, in the Region of La Araucanía.

⁷ Autonomous per capita household income is the sum of all payments received by members of a household deriving from labour, ownership and assets, including monetary and in-kind wages, the proceeds from independent work, self-provision of goods produced by the household, rents, interest earned, dividends, profit withdrawals, retirement and other pensions and current transfers, divided by the number of household members.

⁸ Total per capita household income is the sum of autonomous income plus the monetary subsidies received by household members, excluding the income of live-in domestic service workers, divided by the number of household members.

⁹ The expansion factor is a statistical measure that allows the input from each sample observation to be increased to reflect the corresponding share of the study population.

¹⁰ The GAI was calculated on the basis of autonomous per capita household income.

¹¹ The GTI was calculated on the basis of total per capita household income.

¹² The PAI was calculated on the basis of autonomous per capita household income.

¹³ The PTI was calculated on the basis of total per capita household income.

Table 4
Descriptive statistics: Gini coefficients and polarization indices of 78 municipalities

	N	Lowest	Highest	Mean	Median	Standard deviation (SD)
Gini coefficient based on autonomous per capita income (GAI)	78	0.36	0.81	0.46	0.45	0.06
Gini coefficient based on total per capita income (GTI)	78	0.29	0.74	0.39	0.38	0.06
polarization index based on autonomous per capita income (PAI)	78	0.15	5.05	0.25	0.19	0.55
polarization index based on total per capita income (PTI)	78	0.15	4.18	0.24	0.19	0.45

Source: Prepared by the authors, on the basis of Ministry of Social Development and Family, "Encuesta CASEN 2015", Observatorio Social, Santiago [online] http://observatorio.ministeriodesarrollosocial.gob.cl/casen-multidimensional/casen/casen_2015.php.

The polarization indices cover an even wider range than the Gini coefficients, with PAIs between 0.15 and 5.05 (*M*: 0.19; *SD*: 0.55) and PTIs between 0.15 and 4.18 (*M*: 0.24; *SD*: 0.45). Traiguén, in the Region of La Araucanía, is the municipality with the highest PAI (1.86; confidence interval (*CI*): 0.40–2.74) and the highest PTI (1.60; *CI*: 0.33–2.54), while the municipalities with the lowest PAI and PTI (0.30; *CI*: 0.29–0.32; and 0.25; *CI*: 0.25–0.31) are Conchalí and Cerro Navia, respectively, both of which are in the Santiago Metropolitan Region.

Thus, the most unequal and most socially polarized municipality out of the 78 that were studied is Traiguén, in La Araucanía, while the least unequal and least socially polarized municipality is Cerro Navia, in the Santiago Metropolitan Region.

The municipalities in the Region of Coquimbo have GAIs of between 0.42 and 0.51 (*M*: 0.47; *SD*: 0.03) and GTIs of between 0.35 and 0.42 (*M*: 0.39; *SD*: 0.02). The municipality with the highest GAI is Illapel, at 0.51 (*CI*: 0.43–0.56), and the municipality with the highest GTI is La Serena, at 0.42 (*CI*: 0.40–0.43). Ovalle has both the lowest GAI (0.42; *CI*: 0.39–0.42) and the lowest GTI (0.35; *CI*: 0.33–0.37).

These municipalities' PAIs are between 0.33 and 0.43 (*M*: 0.38; *SD*: 0.03) and their PTIs are between 0.28 and 0.34 (*M*: 0.32; *SD*: 0.02). Coquimbo has the highest PAI and Vicuña has the highest PTI; Ovalle has the lowest PAI and the lowest PTI (see table 5).

Table 5
Region of Coquimbo: Gini coefficients and polarization indices, with confidence intervals

Municipality	Total population	GAI (<i>CI</i> : 95%)	GTI (<i>CI</i> : 95%)	PAI (<i>CI</i> : 95%)	PTI (<i>CI</i> : 95%)
Coquimbo	257 931	0.46 (0.43–0.49)	0.39 (0.36–0.42)	0.43 (0.39–0.50)	0.34 (0.31–0.41)
Illapel	32 964	0.51 (0.43–0.57)	0.40 (0.33–0.46)	0.41 (0.38–0.56)	0.33 (0.30–0.43)
La Serena	237 433	0.48 (0.45–0.50)	0.42 (0.39–0.44)	0.38 (0.37–0.44)	0.33 (0.33–0.38)
Ovalle	127 072	0.42 (0.38–0.44)	0.35 (0.32–0.37)	0.33 (0.33–0.39)	0.28 (0.28–0.32)
Vicuña	27 069	0.49 (0.42–0.53)	0.41 (0.36–0.45)	0.39 (0.37–0.49)	0.34 (0.33–0.42)

Source: Prepared by the authors, on the basis of Ministry of Social Development and Family, "Encuesta CASEN 2015", Observatorio Social, Santiago [online] http://observatorio.ministeriodesarrollosocial.gob.cl/casen-multidimensional/casen/casen_2015.php.

Note: GAI: Gini coefficient based on autonomous per capita income; GTI: Gini coefficient based on total per capita income; PAI: Polarization index based on autonomous per capita income; PTI: Polarization based on total per capita income.

The municipalities in the Region of Valparaíso have GAIs ranging from 0.42 and 0.53 (*M*: 0.46; *SD*: 0.03) and GTIs between 0.34 and 0.48 (*M*: 0.39; *SD*: 0.03). The municipality with the highest GAI and GTI is Viña del Mar, at 0.53 (*CI*: 0.50–0.56) and 0.48 (*CI*: 0.45–0.51), respectively. San Antonio has the lowest GAI and GTI, at 0.42 (*CI*: 0.38–0.44) and 0.35 (*CI*: 0.32–0.37), respectively.

These municipalities' PAIs are between 0.34 and 0.85 (*M*: 0.43; *SD*: 0.16), and their PTIs are between 0.28 and 0.75 (*M*: 0.36; *SD*: 0.12). The municipality with the highest PAI and PTI is Viña del Mar, and those with the lowest PAI and PTI are El Quisco and La Ligua, respectively (see table 6).

Table 6

Region of Valparaíso: Gini coefficients and polarization indices, with confidence intervals

Municipality	Total population	GAI (<i>CI</i> : 95%)	GTI (<i>CI</i> : 95%)	PAI (<i>CI</i> : 95%)	PTI (<i>CI</i> : 95%)
Concón	55 805	0.49 (0.44–0.53)	0.43 (0.38–0.46)	0.38 (0.38–0.52)	0.34 (0.34–0.44)
El Quisco	14 479	0.43 (0.39–0.47)	0.35 (0.31–0.38)	0.34 (0.32–0.40)	0.28 (0.27–0.33)
La Calera	56 067	0.46 (0.38–0.51)	0.39 (0.33–0.44)	0.39 (0.37–0.52)	0.35 (0.32–0.46)
La Ligua	33 803	0.43 (0.38–0.47)	0.34 (0.30–0.37)	0.34 (0.32–0.39)	0.28 (0.26–0.32)
Limache	46 870	0.44 (0.40–0.47)	0.38 (0.35–0.41)	0.37 (0.34–0.49)	0.34 (0.32–0.55)
Los Andes	69 609	0.44 (0.39–0.47)	0.38 (0.34–0.42)	0.36 (0.35–0.46)	0.32 (0.32–0.42)
Quillota	99 063	0.48 (0.41–0.53)	0.41 (0.35–0.45)	0.40 (0.38–0.54)	0.35 (0.34–0.47)
Quilpué	181 831	0.47 (0.42–0.51)	0.41 (0.36–0.44)	0.42 (0.35–0.51)	0.33 (0.31–0.21)
San Antonio	98 299	0.42 (0.38–0.45)	0.35 (0.31–0.38)	0.34 (0.33–0.43)	0.28 (0.28–0.34)
San Felipe	76 103	0.47 (0.43–0.49)	0.40 (0.37–0.43)	0.35 (0.35–0.41)	0.32 (0.31–0.36)
Valparaíso	295 916	0.48 (0.44–0.52)	0.43 (0.39–0.47)	0.72 (0.37–0.82)	0.41 (0.33–0.69)
Villa Alemana	155 527	0.45 (0.41–0.47)	0.40 (0.37–0.43)	0.37 (0.37–0.45)	0.33 (0.32–0.39)
Viña del Mar	330 898	0.53 (0.49–0.57)	0.48 (0.44–0.51)	0.85 (0.48–0.95)	0.75 (0.42–0.83)

Source: Prepared by the authors, on the basis of Ministry of Social Development and Family, "Encuesta CASEN 2015", Observatorio Social, Santiago [online] http://observatorio.ministeriodesarrollosocial.gob.cl/casen-multidimensional/casen/casen_2015.php.

Note: GAI: Gini coefficient based on autonomous per capita income; GTI: Gini coefficient based on total per capita income; PAI: Polarization index based on autonomous per capita income; PTI: Polarization based on total per capita income.

The Biobío Region's municipalities have GAIs of between 0.40 and 0.56 (*M*: 0.47; *SD*: 0.053) and GTIs of between 0.32 and 0.50 (*M*: 0.38; *SD*: 0.05). At 0.56 (*CI*: 0.52–0.58), San Pedro de la Paz has the highest GAI, and it also has the highest GTI (0.50; *CI*: 0.47–0.53). Hualpén has the lowest GAI and the lowest GTI, at 0.40 (*CI*: 0.35–0.43) and 0.32 (*CI*: 0.28–0.34), respectively.

These municipalities' PAIs are between 0.34 and 0.92 (*M*: 0.42; *SD*: 0.13) and their PTIs range from 0.27 to 0.78 (*M*: 0.33; *SD*: 0.11). The municipality with the highest PAI and the highest PTI is Chillán, with 0.92 (*CI*: 0.46–1.11) and 0.78 (*CI*: 0.36–0.95), respectively. Curanilahue has both the lowest PAI and the lowest PTI, with 0.34 (*CI*: 0.33–0.40) and 0.27 (*CI*: 0.26–0.032), respectively (see table 7).

In the Region of La Araucanía, the municipalities' GAIs range from 0.45 to 0.81 (*M*: 0.52; *SD*: 0.087) and their GTIs vary between 0.35 and 0.74 (*M*: 0.41; *SD*: 0.095). Traiguén has the highest GAI, at 0.81 (*CI*: 0.46–0.90), and it also has the highest GTI (0.74; *CI*: 0.37–0.85). Freire and Padre Las Casas have the lowest GAI (0.45; *CI*: 0.39–0.49; and 0.45; *CI*: 0.41–0.48), respectively, and Freire also has the lowest GTI (0.33; *CI*: 0.28–0.36).

The PAIs for these municipalities are between 0.36 and 1.86 (*M*: 0.49; *SD*: 0.37), and their PTIs are between 0.28 and 1.60 (*M*: 0.40; *SD*: 0.33). The highest PAI and the highest PTI are for Traiguén (1.86; *CI*: 0.40–2.74 and 1.60; *CI*: 0.33–2.54), respectively. Padre Las Casas has the lowest PAI (0.36; *CI*: 0.35–0.43) and Freire has the lowest PTI (0.28; *CI*: 0.26–0.34) (see table 8).

Table 7

Biobío Region: Gini coefficients and polarization indices, with confidence intervals

Municipality	Total population	GAI (<i>CI</i> : 95%)	GTI (<i>CI</i> : 95%)	PAI (<i>CI</i> : 95%)	PTI (<i>CI</i> : 95%)
Arauco	38 521	0.46 (0.41–0.50)	0.33 (0.29–0.36)	0.41 (0.40–0.53)	0.30 (0.29–0.37)
Cañete	34 214	0.51 (0.47–0.53)	0.41 (0.37–0.43)	0.38 (0.37–0.43)	0.31 (0.30–0.35)
Chiguayante	104 382	0.44 (0.40–0.46)	0.36 (0.32–0.38)	0.35 (0.35–0.42)	0.29 (0.29–0.35)
Chillán	182 622	0.55 (0.48–0.61)	0.46 (0.39–0.53)	0.92 (0.46–1.11)	0.78 (0.36–0.95)
Chillán Viejo	36 553	0.45 (0.36–0.51)	0.37 (0.28–0.43)	0.41 (0.37–0.58)	0.32 (0.30–0.50)
Concepción	228 779	0.51 (0.47–0.53)	0.44 (0.40–0.46)	0.47 (0.46–0.57)	0.39 (0.37–0.49)
Coronel	120 729	0.41 (0.37–0.43)	0.33 (0.30–0.35)	0.34 (0.33–0.42)	0.27 (0.27–0.32)
Curanilahue	35 157	0.43 (0.39–0.46)	0.34 (0.30–0.37)	0.34 (0.33–0.40)	0.27 (0.26–0.32)
Hualpén	114 833	0.40 (0.35–0.43)	0.32 (0.28–0.34)	0.35 (0.35–0.44)	0.28 (0.28–0.35)
Laja	24 079	0.56 (0.46–0.64)	0.43 (0.32–0.52)	0.53 (0.42–0.73)	0.35 (0.29–0.50)
Lebu	26 791	0.55 (0.45–0.62)	0.47 (0.38–0.53)	0.46 (0.41–0.65)	0.38 (0.35–0.52)
Los Ángeles	202 214	0.48 (0.46–0.50)	0.42 (0.39–0.43)	0.40 (0.39–0.45)	0.32 (0.31–0.35)
Lota	46 241	0.42 (0.37–0.47)	0.34 (0.29–0.39)	0.34 (0.33–0.43)	0.27 (0.26–0.34)
Mulchén	30 354	0.47 (0.39–0.53)	0.35 (0.28–0.40)	0.38 (0.36–0.51)	0.29 (0.27–0.40)
Nacimiento	28 699	0.46 (0.40–0.51)	0.37 (0.32–0.41)	0.37 (0.36–0.45)	0.30 (0.29–0.37)
Penco	52 695	0.42 (0.36–0.48)	0.34 (0.29–0.39)	0.35 (0.34–0.48)	0.29 (0.29–0.41)
San Pedro de la Paz	153 562	0.56 (0.51–0.59)	0.50 (0.46–0.53)	0.45 (0.43–0.55)	0.39 (0.38–0.47)
Talcahuano	179 670	0.44 (0.41–0.47)	0.38 (0.34–0.40)	0.37 (0.36–0.45)	0.30 (0.30–0.38)
Tomé	55 760	0.44 (0.37–0.49)	0.36 (0.30–0.41)	0.37 (0.35–0.50)	0.31 (0.30–0.41)

Source: Prepared by the authors, on the basis of Ministry of Social Development and Family, "Encuesta CASEN 2015", Observatorio Social, Santiago [online] http://observatorio.ministeriodesarrollosocial.gob.cl/casen-multidimensional/casen/casen_2015.php.

Note: GAI: Gini coefficient based on autonomous per capita income; GTI: Gini coefficient based on total per capita income; PAI: Polarization index based on autonomous per capita income; PTI: Polarization based on total per capita income.

Table 8
Region of Araucanía: Gini coefficients and polarization indices, with confidence intervals

Municipality	Total population	GAI (<i>Ci</i> : 95%)	GTI (<i>Ci</i> : 95%)	PAI (<i>Ci</i> : 95%)	PTI (<i>Ci</i> : 95%)
Angol	56 563	0.48 (0.43–0.51)	0.38 (0.34–0.41)	0.37 (0.36–0.46)	0.30 (0.29–0.34)
Carahue	26 276	0.58 (0.45–0.69)	0.44 (0.31–0.56)	0.48 (0.38–0.74)	0.35 (0.29–0.58)
Collipulli	24 875	0.52 (0.46–0.56)	0.42 (0.36–0.46)	0.39 (0.36–0.46)	0.32 (0.30–0.38)
Cunco	18 724	0.50 (0.42–0.57)	0.35 (0.28–0.41)	0.39 (0.36–0.53)	0.28 (0.26–0.36)
Curacautín	16 907	0.55 (0.45–0.63)	0.41 (0.33–0.51)	0.47 (0.37–0.63)	0.32 (0.28–0.47)
Freire	23 867	0.45 (0.39–0.49)	0.33 (0.28–0.37)	0.37 (0.35–0.46)	0.28 (0.26–0.34)
Lautaro	37 952	0.49 (0.45–0.53)	0.39 (0.35–0.43)	0.40 (0.39–0.48)	0.32 (0.31–0.39)
Nueva Imperial	33 976	0.47 (0.42–0.51)	0.35 (0.31–0.38)	0.38 (0.37–0.46)	0.28 (0.28–0.34)
Padre Las Casas	98 459	0.45 (0.40–0.49)	0.36 (0.32–0.40)	0.36 (0.35–0.43)	0.30 (0.28–0.36)
Pitrufquén	25 184	0.51 (0.45–0.55)	0.40 (0.34–0.45)	0.38 (0.36–0.46)	0.31 (0.29–0.38)
Pucón	29 991	0.48 (0.43–0.52)	0.39 (0.34–0.43)	0.39 (0.38–0.51)	0.33 (0.32–0.40)
Temuco	298 974	0.50 (0.46–0.53)	0.43 (0.39–0.46)	0.46 (0.43–0.58)	0.39 (0.36–0.49)
Traiguén	19 473	0.81 (0.48–0.90)	0.74 (0.39–0.86)	1.86 (0.40–2.74)	1.60 (0.33– 2.54)
Victoria	34 674	0.52 (0.47–0.55)	0.44 (0.39–0.47)	0.37 (0.36–0.43)	0.33 (0.31–0.38)
Villarrica	57 753	0.51 (0.46–0.54)	0.40 (0.35–0.44)	0.38 (0.37–0.48)	0.32 (0.31–0.40)

Source: Prepared by the authors, on the basis of Ministry of Social Development and Family, "Encuesta CASEN 2015", Observatorio Social, Santiago [online] http://observatorio.ministeriodesarrollosocial.gob.cl/casen-multidimensional/casen/casen_2015.php.

Note: GAI: Gini coefficient based on autonomous per capita income; GTI: Gini coefficient based on total per capita income; PAI: Polarization index based on autonomous per capita income; PTI: Polarization based on total per capita income.

The municipalities in the Santiago Metropolitan Region have GAIs between 0.36 and 0.60 (M 0.42; SD : 0.088) and GTIs between 0.29 and 0.53 (M : 0.37; SD : 0.061). Talagante has the highest GAI and GTI, at 0.60 (Ci : 0.44–0.69) and 0.53 (Ci : 0.39 and 0.62), respectively. Cerro Navia is the municipality with the lowest GAI (0.36; Ci : 0.32–0.39) and the lowest GTI (0.29; Ci : 0.26–0.31).

The PAIs of these municipalities range from 0.34 to 0.85 (M : 0.43; SD : 0.16), and their PTIs are between 0.28 and 0.75 (M : 0.36; SD : 0.12). Talagante has both the highest PAI and the highest PTI (0.87; Ci : 0.47–1.15 and 0.53; Ci : 0.41–0.98), respectively. At the other end of the spectrum, the municipalities with the lowest polarization indices are Conchalí, with a PAI of 0.30 (Ci : 0.29–0.32), and Cerro Navia, with a PTI of 0.25 (Ci : 0.25–0.31) (see table 9).

Table 9
Santiago Metropolitan Region: Gini coefficients and polarization indices,
with confidence intervals

Municipality	Total population	GAI (Cf: 95%)	GTI (Cf: 95%)	PAI (Cf: 95%)	PTI (Cf: 95%)
Cerro Navia	158 670	0.36 (0.32–0.39)	0.29 (0.25–0.31)	0.31 (0.30–0.37)	0.25 (0.25–0.31)
Colina	140 475	0.38 (0.33–0.42)	0.34 (0.29–0.38)	0.35 (0.34–0.48)	0.29 (0.30–0.41)
Conchalí	140 988	0.40 (0.37–0.41)	0.33 (0.31–0.34)	0.30 (0.29–0.32)	0.26 (0.25–0.27)
El Bosque	196 166	0.41 (0.38–0.43)	0.34 (0.32–0.36)	0.31 (0.31–0.36)	0.27 (0.26–0.29)
Estación Central	148 400	0.37 (0.32–0.40)	0.32 (0.28–0.34)	0.32 (0.33–0.43)	0.29 (0.29–0.36)
La Florida	390 403	0.43 (0.39–0.46)	0.37 (0.33–0.40)	0.40 (0.40–0.52)	0.34 (0.35–0.45)
La Granja	144 260	0.37 (0.32–0.40)	0.32 (0.28–0.35)	0.32 (0.32–0.40)	0.28 (0.27–0.36)
La Pintana	217 034	0.37 (0.33–0.39)	0.31 (0.28–0.34)	0.32 (0.32–0.39)	0.27 (0.27–0.33)
Las Condes	290 869	0.45 (0.42–0.47)	0.40 (0.37–0.42)	0.34 (0.34–0.40)	0.32 (0.32–0.37)
Macul	125 855	0.53 (0.40–0.62)	0.50 (0.34–0.62)	0.52 (0.39–0.79)	0.52 (0.34–0.85)
Maipú	571 632	0.40 (0.37–0.42)	0.35 (0.33–0.37)	0.40 (0.41–0.51)	0.34 (0.35–0.43)
Melipilla	123 669	0.45 (0.39–0.49)	0.37 (0.32–0.41)	0.43 (0.41–0.56)	0.32 (0.32–0.44)
Nuñoa	242 287	0.51 (0.47–0.56)	0.47 (0.42–0.51)	0.41 (0.38–0.53)	0.36 (0.34–0.48)
Pedro Aguirre Cerda	122 600	0.40 (0.36–0.43)	0.33 (0.29–0.35)	0.32 (0.31–0.37)	0.28 (0.27–0.32)
Peñalolén	246 871	0.49 (0.45–0.53)	0.44 (0.39–0.47)	0.51 (0.46–0.78)	0.44 (0.41–0.65)
Providencia	155 166	0.45 (0.42–0.48)	0.41 (0.38–0.43)	0.34 (0.34–0.41)	0.32 (0.31–0.38)
Pudahuel	244 395	0.40 (0.36–0.42)	0.34 (0.31–0.36)	0.40 (0.36–0.51)	0.32 (0.31–0.43)
Puente Alto	647 428	0.41 (0.39–0.42)	0.36 (0.34–0.37)	0.36 (0.33–0.44)	0.33 (0.30–0.39)
Quilicura	248 306	0.37 (0.33–0.41)	0.34 (0.30–0.38)	0.42 (0.34–0.60)	0.35 (0.30–0.54)
Quinta Normal	117 930	0.39 (0.34–0.42)	0.35 (0.29–0.40)	0.35 (0.34–0.46)	0.32 (0.29–0.46)
Recoleta	172 820	0.44 (0.41–0.47)	0.39 (0.35–0.41)	0.37 (0.36–0.45)	0.32 (0.31–0.38)
Renca	155 465	0.38 (0.34–0.40)	0.31 (0.28–0.33)	0.32 (0.32–0.38)	0.27 (0.28–0.32)
San Bernardo	312 169	0.45 (0.39–0.49)	0.40 (0.35–0.44)	0.43 (0.41–0.57)	0.36 (0.35–0.49)
San Miguel	122 562	0.50 (0.47–0.53)	0.45 (0.41–0.47)	0.39 (0.39–0.45)	0.36 (0.35–0.41)
Santiago	430 114	0.43 (0.39–0.46)	0.42 (0.38–0.44)	0.41 (0.40–0.54)	0.39 (0.39–0.52)
Talagante	73 748	0.60 (0.44–0.69)	0.53 (0.39–0.62)	0.87 (0.47–1.15)	0.53 (0.41–0.98)

Source: Prepared by the authors, on the basis of Ministry of Social Development and Family, “Encuesta CASEN 2015”, Observatorio Social, Santiago [online] http://observatorio.ministeriodesarrollosocial.gob.cl/casen-multidimensional/casen/casen_2015.php.

Note: GAI: Gini coefficient based on autonomous per capita income; GTI: Gini coefficient based on total per capita income; PAI: Polarization index based on autonomous per capita income; PTI: Polarization based on total per capita income.

In the course of the analysis based on computations of the Gini coefficient, the municipality of Traiguén emerged as an atypical case in that its GAI of 0.81 and its GTI of 0.74 are both outliers. The reason for this plausibly has to do with the fact that the 2015 CASEN respondents in this municipality may have included some very rich households. Traiguén is located in the Region of La Araucanía, where 25% of its population of 20,000 people is made up of persons who fall into the category of income poverty and another 25% come under the heading of multidimensional poverty (Ministry of Social Development, 2015). Given the traits associated with a small population in a municipality such as this, in the far south of the country, the information on income provided by a small number of high-income households may have had a disproportionate impact on the resulting Gini coefficient.

The differential between the GAI and GTI coefficients is significant ($t(77)=24.10$; $p<0.001$). This would appear to be a reflection of the effect which the State's social policies on monetary subsidies for households may have had on income distribution, inasmuch as they have diminished the extent of inequality that is measured by the Gini coefficient.

The three municipalities in which the differential between the GAI and the GTI is the widest are Cunco, Carahue and Curacautín, all of which are located in the Region of La Araucanía. Those with the smallest differentials are Santiago, Quilicura and Macul, all of which are in the Santiago Metropolitan Region (see table 10). This is attributable to the fact that social cash transfer programmes target poor and extremely poor groups in the population, and the Region of La Araucanía has the highest poverty rates anywhere in the country. Households in that area are therefore the ones to which the State channels its cash transfers.

Table 10

Municipalities with the largest and smallest differentials between Gini coefficients based on autonomous per capita income (GAI) and Gini coefficients based on total per capita income (GTI)

	Region	Municipality	GAI	GTI	Differential
Largest differentials	La Araucanía	Cunco	0.50	0.35	0.15
	La Araucanía	Carahue	0.58	0.44	0.14
	La Araucanía	Curacautín	0.55	0.41	0.13
Smallest differentials	Metropolitan	Quilicura	0.37	0.34	0.03
	Metropolitan	Macul	0.53	0.50	0.03
	Metropolitan	Santiago	0.43	0.42	0.02

Source: Prepared by the authors.

The results of the analysis of social polarization were quite different, as no significant differential between PAIs and PTIs was observed. The analysis of the relationship between inequality and polarization did turn up any statistically significant correlations, however.

VI. Concluding observations

An analysis of the Gini coefficients for 78 municipalities indicates that, although those coefficients vary a great deal, the level of inequality is high in all of them. The Gini coefficient based on autonomous per capita income (GAI) ranges from 0.36 to 0.81, and 27% of the municipalities have values above the national average (0.49). The Gini coefficients based on total per capita income (GTI) were slightly lower, ranging from 0.29 to 0.74, with 5% of these municipalities registering coefficients above the

national average (0.48). A comparison between these levels and the mean Gini coefficient for the OECD countries (0.30) shows that nearly 100% of the municipalities under study have GAIs and GTIs above that average, however.

This corroborates the finding of a number of other studies (Contreras, 1999; Schatan, 2005; Vergara, 2011; UNDP, 2017) that, although Chile has experienced steady economic growth and has improved many of its social indicators to the point that they are on a par with developed-country levels, it has not improved its income distribution.

In market economies such as Chile's, efforts to achieve a more equal distribution of income and—in particular— of wealth should be driven by a government policy that includes not only targeted subsidization policies but also mechanisms for regulating wealth accumulation (Schatan, 2005). The population's well-being can be increased by narrowing inter-group social differences generated by highly polarized forms of social stratification. Research has shown that more egalitarian societies tend to create a more enabling environment for the development of empathy for others, which facilitates harmonious interpersonal relations (Jahoda, 1958), and, in general, the formation of positive bonds between people and between groups (Ryff, 1989). Other researchers have shown that when people see themselves as being of a lower social status or class than a more privileged reference group, they may suffer physical and psychological ill effects (Osafo Hounkpatin and others, 2015; Quijada and others, 2018).

In an economy that, on the one hand, has strong growth indicators and yet, on the other, high levels of inequality, cash transfer programmes have fulfilled an important public policy role. Clearly, however, the main purpose of these kinds of transfers is not to reduce inequality but rather to improve certain quality-of-life indicators. Be that as it may, the results of this study point to some significant effects—effects that merit further analysis— based on a comparison of Gini coefficients calculated on the basis of autonomous income and those calculated on the basis of total income. Significantly, a higher level of inequality was observed in all the municipalities when inequality was measured on the basis of autonomous household income. This appears to be a reflection of the impact of cash transfers in diminishing inequality and bears out the findings reported in government statements (Ministry of Social Development, 2017). However, it is important to remember that these kinds of results do not improve these indicators at the national level, as Chile remains one of the most unequal countries in the world (OECD, 2015). What is more, the redistributive impact of cash transfers appears to be three times greater in the OECD countries as a group than it is in Chile (Martner, 2008; Aguirre Briones, 2009).

The results of the analysis of polarization indices are quite different, since no significant differentials were found when polarization based on measurements of autonomous per capita income (PAI) was compared to polarization calculated on the basis of total per capita income (PTI). As noted earlier, the term “polarization” refers to the existence of distinct groups that are very different from one another but that are internally very homogeneous. As in the case of inequality, the problem of polarization should be addressed with cash transfer policies, but in order for this to be an effective approach, the transfers would need to be considerably larger than they are at present and would need to be conducted differentially on the basis of households' positions within the existing distribution. They would then do more than simply improving national averages, which often tend to conceal the existence of situations at both extremes of the spectrum (Vergara, 2011). An illustration of this type of case is provided, for example, at the high end of the income distribution, by municipalities in the Region of Traiguén with GAIs and GTIs of 0.81 and 0.74, respectively, and the Region of Talagante, with GAIs and GTIs of 0.60 and 0.53, respectively, and, at the low end, the municipality of Cerro Navia, where the GAI and GTI stand at 0.36 and 0.29, respectively.

Consequently, while cash transfers do make the income distribution less unequal, that reduction in inequality is not large enough to bring about a change in the structure of the distribution, much less a change in the formation of socially distanced clusters or groups. The existence of these clusters fuels

conflict, as studies have shown that social polarization is associated with a deterioration in the security of property and contractual rights (Keefer and Knack, 2002) and with an increased likelihood of socially harmful crimes (Vergara, 2011).

This analysis of inequality and social polarization demonstrates that the highly unequal nature of income distribution seen at the national and regional level is replicated at the municipal level. This underscores the need for targeted income redistribution policies that have been designed for application at the level of the municipality, since inequality and social polarization can have both direct and indirect impacts on the population's perception of well-being. In Chile, one of the main ways in which efforts have been made to support the advancement of the poorest territorial units has been to modify the structure of political/administrative divisions to form new municipalities, provinces and regions (Pressacco, 2009). These measures have not, however, been coupled with decentralized development policies aimed at improving inequality and social integration indicators (Pérez, 2011) and reducing the negative impacts of the social distancing resulting from existing levels of inequality.

In closing, it is important to take note of the limitations of this study, which include the difficulties involved in working with household-reported income data (Schatan, 2005; Ortiz and Cummins, 2011; Atkinson, Piketty and Saez, 2011) owing, in particular, to the difficulty of gaining access to wealthier households, which tend not to participate in this type of research or, if they do, to underreport their incomes. In Chile, economic resources are concentrated in a very small group of families or economic groups that are largely inaccessible for researchers (Atria and others, 2017). It is therefore highly probable that household income inequality is greater than the levels that are reported by the government and the levels estimated in studies based on information from official national surveys such as CASEN. Cross-cutting and longitudinal studies are needed that can draw on other supplementary sources of information on hard-to-reach households (whether because of their social status or because they are located in remote areas of the country) to help researchers arrive at more accurate estimates of existing levels of inequality and polarization. The effects of polarization in different demographic and territorial contexts are another area that warrants further study.

Bibliography

- Agostini, C. A. and P. H. Brown (2007), "Desigualdad geográfica en Chile", *Economic Analysis Review*, vol. 22, No. 1, Santiago, Alberto Hurtado University, June.
- Aguirre Briones, A. (2009), "Social policy and distributive indicators: elements for a characterization of the Chilean social policy model", *Polis: Revista Latinoamericana*, No. 22, Santiago, Centre for Regional Development and Public Policy Studies (CEDER).
- Alvaredo, F. and others (coords.) (2018), *World Inequality Report 2018*, World Inequality Lab [online] <http://wir2018.wid.world/files/download/wir2018-full-report-english.pdf>.
- Amarante, V. and M. Colacce (2018), "More unequal or less? A review of global, regional and national income inequality", *CEPAL Review*, No. 124 (LC/PUB.2018/5-P), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), April.
- Araya Rosales, A. and M. Gallardo Altamirano (2015), "The Chilean Model seen from an ethics of justice and of equal human opportunities", *Polis: Revista Latinoamericana*, No. 40, Santiago, Centre for Regional Development and Public Policy Studies (CEDER).
- Atkinson, A. B., T. Piketty and E. Saez (2011), "Top incomes in the long run of history", *Journal of Economic Literature*, vol. 49, No. 1, Nashville, American Economic Association, March.
- Atria, J. and others (2017), "Researching the economic elite: lessons and challenges from the Chilean case", *CUHSO*, vol. 27, No. 2, Temuco, Catholic University of Temuco, December.
- Campos-Arias, A. and E. Herazo (2015), "Association between inequality and suicide rate in Colombia (1994–2013)", *Revista Colombiana de Psiquiatría*, vol. 44, No. 1, Elsevier España, January–March.
- Cárdenas, E. (2011), "Polarización and conflicto social", *Revista de Economía Institucional*, vol. 13, No. 24, Bogotá, University Externado de Colombia.

- Carpentier, N. (2011), "Determinantes de la desigualdad a nivel comunal: el rol de la mujer and la educación", undergraduate thesis, Santiago, University of Chile.
- Cleary, E. (2007), "Chile: between the image of success and the ghosts of underdevelopment", *Polis: Revista Latinoamericana*, No. 18, Santiago, Centre for Regional Development and Public Policy Studies (CEDER).
- Conte, A. (2008), "Desigualdad, polarización and conflicto social", *Documentos de Investigación del Programa de Doctorado de Economía Aplicada*, Bellaterra, Autonomous University of Barcelona.
- Contreras, D. (1999), "Distribución del ingreso en Chile: nueve hechos and algunos mitos", *Revista Perspectivas en Política, Economía and Gestión*, vol. 2, No. 2, Santiago, University of Chile, May.
- Duclos, J., J. Esteban and D. Ray (2004), "Polarization: concepts, measurement, estimation", *Econometrica*, vol. 72, No. 6, The Econometric Society, November.
- ECLAC (Economic Commission for Latin America and the Caribbean) (2018), *The Inefficiency of Inequality (LC/SES.37/3-P)*, Santiago, May.
- (2017), "Life tables", *Demographic Observatory, 2017 (LC/PUB.2017/20-P)*, Santiago, November.
- Escobar, M. (1998), "Desviación, desigualdad, polarización: medidas de la diversidad social", *Reis: Revista Española de Investigaciones Sociológicas*, No. 82, Madrid, Centro de Investigaciones Sociológicas (CIS), April–June.
- Esteban, J. and D. Ray (1994), "On the measurement of polarization", *Econometrica*, vol. 62, No. 4, The Econometric Society, July.
- Gatica, L. and others (2017), "Psychosocial and psycho-political predictors of social inequality justification", *Revista de Psicología*, vol. 35, No. 1, Lima, Editorial Fund.
- Gradín, C. and M. Rossi (2002), "Polarización and desigualdad salarial en Uruguay, 1986–97", *El Trimestre Económico*, vol. 67, No. 267, Mexico City, Fondo de Cultura Económica, July–September.
- Huesca Reynoso, L. (2003), "Análisis de la polarización del ingreso de los hogares en México durante 1984–2000", *Investigación Económica*, vol. 62, No. 246, Mexico City, National Autonomous University of Mexico, October–December.
- Jahoda, M. (1958), "Current concepts of positive mental health", *Joint Commission on Mental Illness and Health. Monograph Series*, No. 1, New York, Basic Books.
- Keefer, P. and S. Knack (2002), "Polarization, politics and property rights: links between inequality and growth", *Public Choice*, vol. 111, No. 1–2, Springer, March.
- Kennedy, B. P., I. Kawachi and D. Prothrow-Stith (1996), "Income distribution and mortality: cross sectional ecological study of the Robin Hood index in the United States", *British Medical Journal*, vol. 312, No. 7037, BMJ, April.
- Martner, R. (2008), "El pacto fiscal and los sistemas tributarios en América Latina: versión preliminar", Santiago, Latin American and Caribbean Institute for Economic and Social Planning (ILPES).
- Ministry of Social Development (2018), *Informe de Desarrollo Social 2018*, Santiago [online] http://www.desarrollosocialyfamilia.gob.cl/storage/docs/Informe_de_Development_Social_2018.pdf.
- (2017), *Informe de Desarrollo Social 2017*, Santiago [online] http://www.desarrollosocialyfamilia.gob.cl/storage/docs/Informe_de_Development_Social_2017.pdf.
- (2015), "Resultados Encuesta CASEN 2015" [en línea] http://observatorio.ministeriodesarrollosocial.gob.cl/casen-multidimensional/casen/casen_2015.php.
- Nagel, J. (1974), "Inequality and discontent: a nonlinear hypothesis", *World Politics*, vol. 26, Cambridge University Press, April.
- Navarro Yáñez, C. J. and M. Pérez Yruela (2000), "Calidad de vida and cambio social: de la polarización social a la axiológica en la sociedad andaluza", *Revista Internacional de Sociología (RIS)*, vol. 58, No. 26, Higher Council for Scientific Research, May–August.
- OECD (Organization for Economic Cooperation and Development) (2018), *OECD Economic Surveys: Chile*, Paris, OECD Publishing, February.
- (2015), *OECD Economic Surveys: Chile*, Paris, OECD Publishing, November.
- (2014), *Society at a Glance 2014. OECD Social Indicators: The Crisis and its Aftermath*, Paris, OECD Publishing.
- Ortiz, I. and M. Cummins (2011), *Global Inequality: Beyond the Bottom Billion. A Rapid Review of Income Distribution in 141 Countries*, New York, United Nations Children's Fund (UNICEF), April.
- Osafo Hounkpatin, H. and others (2015), "Why does income relate to depressive symptoms? Testing the income rank hypothesis longitudinally", *Social Indicators Research*, vol. 124, No. 2, Springer, November.
- Pérez, M. A. (2011), "The emergence of gated communities in the poor periphery: reflections on the new urban segregation and social integration in Santiago, Chile", *Berkeley Planning Journal*, vol. 24, No. 1, Berkeley, University of California.

- Pizarro, R. (2005), "Inequality in Chile: economic, ethical, and political challenge", *Polis: Revista Latinoamericana*, No. 10, Santiago, Centre for Regional Development and Public Policy Studies (CEDER).
- Pressacco, C. F. (2009), "Regional decentralizing Chilean: progress and "remaining subjects", *Papel Político*, vol. 14, No. 2, Bogotá, Pontifical Javerian University, July–December.
- Quijada, Y. and others (2018), "Social inequality and mental health in Chile, Ecuador, and Colombia", *Latin American Perspectives*, vol. 46, No. 6, Latin American Perspectives Inc./SAGE, October.
- Ramírez, E., A. Tartakowsky and F. Modrego (2009), "La importancia de la desigualdad geográfica en Chile", *Documento de Trabajo*, No. 30, Santiago, Latin American Centre for Rural Development (RIMISP).
- Raventós, D. (2005), "Property, republican freedom and Citizenship Basic Income", *Polis: Revista Latinoamericana*, No. 10, Santiago, Centre for Regional Development and Public Policy Studies (CEDER).
- Ruiz-Tagle, J. (1999), "Chile: 40 años de desigualdad de ingresos", *Documentos de Trabajo*, Santiago, University of Chile.
- Ryff, C. D. (1989), "Happiness is everything, or is it? Explorations on the meaning of psychological well-being", *Journal of Personality and Social Psychology*, vol. 57, No. 6, American Psychological Association (APA).
- Schatan, J. (2005), "Income distribution and poverty in Chile", *Polis: Revista Latinoamericana*, No. 11, Santiago, Centre for Regional Development and Public Policy Studies (CEDER).
- Silva Burgos, L. M. (2013), "Cambios observados en la jefatura de hogar en Chile entre los años 1990 and 2009", *Mujeres, su participación económica en la sociedad*, G. G. Macías González and E. L. Parada Ruiz (coords.), Guadalajara, Editorial Universitaria/University of Guadalajara.
- Solimano, A. and A. Torche (2008), "La distribución del ingreso en Chile 1987–2006: análisis and consideraciones de política", *Working Papers*, No. 480, Santiago, Central Bank of Chile, August.
- UNDP (United Nations Development Programme) (2017), *Desiguales: orígenes, cambios and desafíos de la brecha social en Chile*, Santiago, June.
- Uribe López, M. (2009), "Soft goals and hard targets in the Human Development approach", *Polis: Revista Latinoamericana*, No. 23, Santiago, Centre for Regional Development and Public Policy Studies (CEDER).
- Vergara, J. (2011), "Desigualdad, polarización and conflicto en Chile", master's thesis, Valencia, University of Valencia.
- Villalobos, C. and J. P. Valenzuela (2012), "Polarization and social cohesion in the Chilean school system", *Economic Analysis Review*, vol. 27, No. 2, Santiago, Alberto Hurtado University, October.
- Vivanco Muñoz, R. and others (2015), "Perpetration and victimization of violence in young couples studying higher education in the city of Osorno, Chile", *Polis: Revista Latinoamericana*, No. 40, Santiago, Centre for Regional Development and Public Policy Studies (CEDER).
- Wilkinson, R. G. (2005), *The Impact of Inequality: How to Make Sick Societies Healthier*, New York, The New Press, January.
- Wilkinson, R. G. and K. Pickett (2009), *Desigualdad: un análisis de la (in)felicidad colectiva*, Madrid, Turner.
- World Bank (n/d), "World Bank Open Data" [online] <https://data.worldbank.org/>.
- Wolfson, M. (1997), "Divergent inequalities: theory and empirical results", *Review of Income and Wealth*, vol. 43, No. 4, December.

The effect of the economic crisis on the labour market for women in Mexico, 1987–2016

Reyna Elizabeth Rodríguez Pérez
and Mona Zelinda Aguilar Arredondo

Abstract

The goal of this study is to analyse the impact of the economic crisis in Mexico on the labour market for women. The analysis is carried out using data from the National Urban Employment Survey (ENEU) and the National Survey of Occupation and Employment (ENOE) for 1987–2016 and applying the decomposition of wage differentials technique proposed by Juhn, Murphy and Pierce (1991 and 1993). Key findings include persistent gender wage gaps in the country, albeit with a slight downward trend, explained largely by unobservable factors, with countercyclical patterns.

Keywords

Economic conditions, economic crisis, employment, women, labour market, women's employment, wages, gender-based discrimination, wage surveys, employment statistics, Mexico

JEL classification

J1, J16, D63

Author

Reyna Elizabeth Rodríguez Pérez is a Doctor of Science and full-time Lecturer and Researcher at the Faculty of Economics of the Autonomous University of Coahuila (Mexico). Email: reynarodriguez@uadec.edu.mx.

Mona Zelinda Aguilar Arredondo is an undergraduate in Economics of the Faculty of Economics of the Autonomous University of Coahuila (Mexico). Email: zelindaaguilar@uadec.edu.mx.

I. Introduction

Globally, gender inequality persists in most economic and social areas. Within the labour market in particular, men and women have different work opportunities. According to information published by the International Labour Organization (ILO, 2016b), gender inequality in terms of labour participation has only decreased 0.6 percentage points in the last 25 years worldwide and Mexico is no exception to this trend.

In Mexico, the labour force participation rate differs from one group to the other: in the second quarter of 2016, according to the National Women's Institute (2017), it was 43.4% for women, whereas for men it was 77.6%. In addition, the gender wage gap is 18% to the detriment of women, which, according to the Organization for Economic Cooperation and Development (OECD) and the National Women's Institute (OECD, 2017), puts Mexico above average for OECD members. This is explained by factors such as education, discrimination or occupational segregation, which affect income distribution.

Furthermore, the changes caused by globalization either accentuate or reduce gender inequalities, depending on the point in the business cycle. In fact, Sánchez, Salas and Nupia (2003) state that the same business cycle can affect men and women differently. This is because, as Murillo and Simón (2014) note, each group may have different interactions within the labour market. Therefore, economic fluctuations affect the labour market differently for men and women.

A number of theories and hypotheses attempt to explain the gender wage gap and its relationship with the business cycle. For example, Park and Shin (2005) affirm that the gender wage gap behaves procyclically, as it tends to narrow in recessions and widen during expansions. In addition, Stephens (2002) explains that in recessions, more women join the labour market in response to declines in family income, owing to rises in male unemployment, producing the “added worker” effect. However, Rubery (1988) challenges this view, stating that women act as a flexible reserve that is indispensable in recessions, unlike men.

Some studies have addressed this issue. At the international level, Sabogal (2012) observed that the gender wage gap in Colombia behaves procyclically. Piazzalunga and Di Tomasso (2016) find the opposite to be true for Italy, since the labour structure of the country is different. Meanwhile, for Mexico, Freije, López-Acevedo and Rodríguez-Oreggia (2011) identify declines in inequality during contractions that vary according to economic sector and region of the country.

In turn, Castro, Rodríguez and Brown (2018) and Rodríguez and Germán-Soto (2021), find for Mexico procyclical behaviour of the gender wage gap, although their results vary by region and economic sector. However, the empirical literature for Mexico does not seek more detailed results for comparative periods, and there is a scarcity of studies that cover a larger portion of the business cycle in the country.

In this regard, this study will focus on investigating whether the gender wage gap in Mexico behaves in a procyclical (positive) or countercyclical (negative) manner during expansions and recessions. This raises certain questions: how does the wage gap behave during different economic booms and recessions? Do more women join the labour market during recessions? Is the gender wage gap explained to a greater extent by unobservable factors?

The goal of this study is to analyse the impact of economic crises in Mexico on the labour market for women. For the analysis, this research uses data from the National Urban Employment Survey (ENEU) and the National Survey of Occupation and Employment (ENOE) for 1987–2016 and the decomposition of wage differentials technique proposed by Juhn, Murphy and Pierce (1991 and 1993), which enables measurement of changes in wage gaps over certain periods of time and the determination of explanatory variables in terms of productive characteristics (Q) and wages (P).

The hypothesis to be tested is that the gender wage gap tends to narrow in recessions and widen in expansions. As previously mentioned, this may be caused by more women joining the labour market during recessions, as a response to decreases in household income because of increased unemployment of men.

One of the key results shows that the gender wage gap persists in Mexico, and follows a countercyclical pattern. By verifying that many of the unobservable factors represent important explanatory elements, it is clear that the endowment of productive characteristics for women is not matched by their wages in the labour market.

This article is composed of six sections besides the introduction. In the second section, there is a review of the literature on the subject, which addresses the concepts of wage inequality and business cycles and examines some empirical studies. The third section characterizes the labour market for women in Mexico and the fourth provides some economic context. The fifth section presents the data and methodology. The sixth section presents the results of the decomposition of wage differentials carried out using the method proposed by Juhn, Murphy and Pierce (1991 and 1993) and the seventh presents the conclusions of the study.

II. The literature and concepts

1. Gender wage gaps

Women have not entered the labour market on an equal footing with men, owing to issues such as professional training, time spent on production activities and even social stereotypes. In this respect, it is very important to examine the meaning of inequality.

According to Antón (2015), in the field of social sciences, inequality is a comparative concept. It is defined as the existence of differences in opportunities, access, possession, control and enjoyment of resources and power, arising from differences in individuals' conditions, situations and experiences. Antón (2014) affirms that inequality refers to social relations of advantages or privileges as opposed to disadvantages or discrimination, and also includes patterns of domination, exploitation and oppression of certain segments or levels of society by other groups within society, by means of mechanisms of subordination and subjugation. Inequality can take a variety of forms. It can appear in any social, educational or work environment or by gender. In the case of employment, wage inequality can be related to the different remuneration that workers receive in an occupation.

The *Global Wage Report 2016/17* (ILO, 2016a) states that the gender pay gap is the percentage shortfall in the average wage of women, relative to the average wage of men. Gender wage inequality is therefore expressed as this gender pay gap or gender wage gap. It is important to clarify the point, as this research focuses on the widening and narrowing of the gender wage gap. Any discrimination or segregation that may be identified will be considered potential causes of the gap. A dynamic vision must also be employed in the analysis, as the behaviour of the gap is not necessarily set in stone. In fact, the wage gap may vary from one period to the next.

2. Business cycles and wage inequality

Understanding patterns in economic activity is crucial to explaining an economy's development and growth over time. However, equilibrium and positive performance of economic activity are by no means permanent. In fact, they are determined by repetitive behaviours that tend to occur periodically and cause fluctuations in all macroeconomic variables. These periods are normally known as business cycles.

Samuelson and Nordhaus (2005) describe business cycles as economy-wide fluctuations in output, income and employment, usually lasting 2 to 10 years. The length of business cycles has always been a matter of discussion among researchers. Three types of cycles can be distinguished: short, medium and long.

These different cycles can put an economy in various situations that can lead to specific wage patterns. In the economic literature two viewpoints can be found regarding wage patterns in business cycles. According to Mankiw (2009), the position of Keynes, one of the most influential exponents on the subject, is that wages follow a rigid downward pattern, and adjust relatively slowly even if there is economic change, or do not adjust at all. In contrast, the classic position suggests that wages readjust when new conditions arise in the market, meaning that they are flexible.

Interestingly, these theories on wage patterns do not take into account any distinctions between workers. Although either may be closer to the truth, how wages are allocated to groups in terms of gender may follow an entirely opposite pattern. In fact, according to Sánchez, Salas and Nupia (2003), the business cycle affects men and women differently, so dissimilar effects on variations in their wages should be expected. According to Murillo and Simón (2014), this is because the two sexes have different characteristics, and interact in different ways in the labour market.

For example, as regards recessions and crises, authors such as Stephens (2002) argue that in those periods a gradual inclusion of more women in the labour market should be observed, as falls in family income caused by lower male participation lead to greater female participation to offset lost purchasing power, giving rise to the “added worker” effect. To some degree, a more pronounced wage gap in favour of men can be expected to be seen, since, as a result of households’ strategy in response to temporary drops in income, women join the labour force. Conversely, during booms women’s participation would be expected to be lower than men’s.

However, not all authors agree with this idea. For example, Goodman, Antczak and Freeman (1993) dispute this theory. They state that in the downturns there is less loss of female employment, but this is because the contractionary period of the cycle affects male-dominated sectors. This means that the labour segregation of women into certain sectors has a positive effect in such periods; however, this does not mean that women receive higher wages.

With respect to expansive phases, from a feminist standpoint, Rubery (1988) affirms that women can act as a flexible reserve or buffer that joins the labour market in periods of growth and is dispensable in recessions, meaning that female employment behaves procyclically and real wages tend to decline for women during booms. In a hypothesis that falls within the Marxist feminist vision, Milkman (1976) asserts that perpetuation of gender roles plays a crucial role in this model: women’s unemployment is considered flexible and interchangeable for domestic work, unlike men’s work.

In short, there is a multitude of theoretical proposals regarding the gender-related aspects of wage distribution and business cycles. Therefore, the scope of the described theories must be specified, in order to provide different hypotheses. These hypotheses will be contrasted in this research, to demonstrate how the gender wage gap behaves in expansions and contractions. Particular attention will be paid to the “added worker” theory, which relates to increased participation by women in the labour market, to compensate for loss of household income. However, examining different hypotheses will give a better picture and enrich the research.

3. Empirical studies

There are almost no empirical studies that seek to describe the behaviour of the gender wage gap during economic expansions or recessions in Mexico. Very few authors have addressed the relationship between these topics. However, certain studies have provided some input for analysis of the gender wage gap.

The research of Esquivel and Rodríguez (2003) is one study that does not focus on examining business cycles, but which was able to provide an overview of the gap in a given period. The study examines the period from 1988 to 2000. It finds an increase in the wage gaps for skilled and unskilled workers. To some degree, it confirms human capital theory, and considers specialization of workers to be an important contributing factor to the gap. Moreover, it is assumed that conclusive evidence of this can be found in the widening of the wage gap following the entry into force of treaties to liberalize the economy, overlapping several times with recessions in the Mexican economy. Although the gender wage gap was not examined in the study, Meza González (2001) analyses the same period and finds, paradoxically, empirical information that confirms that before 1996 the wage gap for the entire country increased, but the gender gap decreased. The author explains this phenomenon on the basis of factors such as an increase in women's participation in the labour market and an increase in their educational level.

Campos-Vázquez, Esquivel and Lustig (2014) conducted a follow-up to the study by Esquivel and Rodríguez (2003), in the form of an extension, covering the period from 1989 to 2010. Their research uses the Oaxaca-Blinder methodology and a decomposition of the Gini coefficient. As in the previous case, they observed a significant increase in the wage gap in the first period up to 2000, and a percentage reduction thereafter. The explanation lies in the relationship between the labour market and trade liberalization and certain policies that were implemented, such as the North American Free Trade Agreement (NAFTA). This work also underscores the importance of the production capacities that are needed for the new labour structure, which caused the gap to increase at first and then start to decrease. However, this study does not apply the gender perspective in its analysis. To date, no research has attempted to incorporate a gender perspective into the work of Campos-Vázquez, Esquivel and Lustig (2014); nonetheless it remains important to understand the behaviour of the overall gap, to enable later comparisons.

One study that addresses the three issues mentioned (wage gap, gender and economic crises) is the one carried out by Skoufias and Parker (2006). Their work addresses the behaviour of households during Mexico's 1995 peso crisis. Using a panel method, it finds an "added worker" effect that tends to increase women's participation in the labour market when unfavourable environments emerge. However, it is not clear what the income differential between men and women is. Popli (2008) complements this information with data from a period after the crisis. Her study showed that, after the 1994 recession, the gender wage gap varied according to whether work was formal or informal. In particular, the gap increased in favour of formal jobs. In addition, overall, the gender wage gap narrowed in the period from 1996 to 2006. This, according to Popli, could be explained by the differences between the economic sectors in which men and women tend to work.

Another study that focuses on how business cycles affect the gender wage gap is that of Freije, López-Acevedo and Rodríguez-Oreggia (2011). Using econometric regressions, the research studies different periods, from 2007 to 2010. The result of the analysis is that, overall, the wage gap is systematically decreasing in this phase of 2007 to 2010. The explanation includes several factors. Firstly, they point to geographical location, which is to say how each region was affected differently by the 2008 crisis. Sectors of activity can also be an important factor; for example, manufacturing was the hardest hit during the economic downturn.

Castro, Rodríguez and Brown (2018) conducted a study for the states on the northern border of Mexico, with data from the 2005, 2009 and 2013 National Survey of Occupation and Employment (ENOE), applying the methodology of DiNardo, Fortin and Lemieux (1996). The results indicate that for three different points in time, including 2009 (a year marked by a recession), the gender wage gap shows a downward trend, characterized by a relative fall in men's real hourly wage during the crisis and a continuation in subsequent years. Thus, during the 2005–2013 period, the gender wage gap was indeed affected by the economic environment, especially during the recession, which seems to indicate procyclical behaviour, since it narrowed when economic activity contracted, but no increase in the wage gap is observed during the expansion.

In a more recent study, Rodríguez and Germán-Soto (2021) analyse the cyclical relationship of wages and the gender wage gap with six macroeconomic variables of the Mexican manufacturing sector from January 1993 to March 2017. Their hypothesis suggests that the wage gap narrows in recessions and widens during the expansionary phase of the cycle (procyclical). The methodology used is the Hodrick-Prescott filter (Hodrick and Prescott, 1997), with which they measure the cycle, and the Oaxaca-Blinder methodology, with which they estimate the wage gap. The data they use are from the National Urban Employment Survey (ENEU, 1993–2004) and the National Occupation and Employment Survey (ENOE, 2005–2017). The results they obtain indicate that wages and wage gaps are procyclical with respect to production, investment, exports and unit costs, but are more volatile and undergo longer-lasting fluctuations. Moreover, they are countercyclical with respect to labour productivity and inflation.

Lastly, the limited conclusive information available confirms the assumptions of human capital theory. The wage gap is not always explained by the same productive characteristics of men and women. As evidence of this, a number of researchers have concluded that education is not generally an explanatory variable for wage differences. But valuable information has been collected on other variables to be considered. Some of them suggest phenomena such as occupational discrimination or segregation, which could explain gender pay inequalities more eloquently. Other authors have highlighted more specific factors, to understand the cause of such differentials. The region in which the economy is located and structural conditions over time have contributed to income potentially undergoing different variations. Other more specific factors also have an impact on worker productivity, such as experience.

It should also be noted that, in the case of Mexico, the empirical information found from 2003 to 2011 for studying the gender wage gap that compares different periods of time, focuses only on a specific phase or on random periods of time, not covering a business cycle as such. Recently, from 2018 to 2021, the evidence indicates that there is a narrowing of the gender wage gap during contraction phases, which varies by sector and region, and its behaviour has been procyclical. Therefore, there is an opportunity to continue to research and make new contributions to the subject. This empirical gap allows us to focus on a comparative analysis of economic booms and recessions. As a starting point, the macroeconomic context will first be examined, forming a firm foundation for the research.

III. Labour market conditions and women's inclusion in the market

The Mexican labour market has undergone different transformations. The increase in female labour participation since the beginning of the century twentieth, can be explained by market development, technical transformations at work and changes in social customs.

It was from 1930 onward, with the shift to an inward-oriented industrialization model, that the social and labour structure in Mexico began to change, causing diversification into different occupational opportunities for men and women; for example, service activities initially performed by women gradually became more male-dominated. Similarly, the expansion of the education system, health services, commerce and office work created more employment opportunities for women, although domestic service persisted (Brown and Domínguez, 2010).

It was not until 1950 when, according to these same authors, an upward phase of the accumulation cycle began, marking the start of a process of tertiarization of employment in the country. Agricultural activities, which accounted for 60% of employment at the beginning of the twentieth century but declined steadily to just 13% in 2015, were left behind and the tertiary sector increased in importance, with its employment increasing from 16% to 61% in the same period.

During this same phase of stabilization, from 1950 to 1980, there was an increase in women's participation in the labour force, which, according to Hernández Licona (2000) grew at a rate of 64%, while for men participation decreased by 23%. Table 1 shows a continuous increase in the labour force participation of women during this period and a slight decrease for men, confirming the aforementioned pattern.

Table 1
Mexico: labour force participation rate by sex, 1950–2015
(Percentages)

Year	Total	Men	Women
1950	49.5	88.2	13.1
1960	46.5	78.7	15.4
1970	44.9	73.0	17.6
1979	45.7	71.3	21.5
1991	53.6	77.7	31.5
1995	55.6	78.2	34.5
2000	57.8	79.5	38.3
2005	59.7	80.4	41.6
2010	59.0	78.1	41.7
2015	60.0	78.2	44.3

Source: Secretariat of Economic Affairs, Séptimo Censo General de Población, 6 de junio de 1950: resumen general, Mexico City, 1953; Secretariat of Industry and Commerce, *IX Censo General de Población, 1970, 28 de enero de 1970: resumen general*, Mexico City, 1972; O. Altimir, "La medición de la población económicamente activa de México: 1950-1970", *Estudios Demográficos y Urbanos*, vol. 8, No. 1, Mexico City, El Colegio de México, 1974; Secretariat of Programming and the Budget (SPP), *Encuesta Continua sobre Ocupación*, series 1, vol. 7, Mexico City, 1980; National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Empleo 1991*, Aguascalientes, 1993; National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Empleo: edición 1995*, Aguascalientes, 1996; National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Empleo 2000*, Aguascalientes, 2001; National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Ocupación y Empleo 2005*, Aguascalientes, 2005; National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Ocupación y Empleo ENOE 2010*, Aguascalientes, 2011; National Institute of Statistics and Geography (INEGI), "Encuesta Nacional de Ocupación y Empleo 2015", 2018 [online] <https://www.ilo.org/surveyLib/index.php/catalog/1859/related-materials>.

The increase in female labour force participation during this phase is explained by different factors. Brown and Domínguez (2010) highlight the emerging diversification of the productive fabric during those years. This occurred since the increase in the service sector benefited occupations that were considered socially "suited for women". Furthermore, as mentioned by Rojas-Gómez and Sotelo Peralta (2003), during this same period, equal rights and duties became consolidated for both sexes, supported by the Mexican Constitution, resulting in greater employment benefits and wider access to political participation for women. Although attitudes concerning the activities that women were expected to perform remained antiquated, these changes laid the foundations for the inclusion of women.

The change in the economic panorama at the beginning of the 1980s further increased the labour participation of women, which rose from 21.5% in 1979 to 31.5% in 1991, while the rate for men rose from 71.3% to 77.7% (see table 1). This is contrary to what might be expected, owing to the different crises that occurred during this period. However, according to Hernández Licona (2000), this increase in women's participation along with that of men may be explained by the crises that forced families and individuals to redouble their work efforts.

The processes of productive restructuring that began in the 1980s were not necessarily accompanied by job creation. Although the participation rate increased, the proportion of women in the economically active population decreased between 1980 and 1991 from 27.8% to 23.5%, as shown in table 2. It was

not until the further productive restructuring took place in the 1990s that labour dynamics for women improved. As the economy became outward-oriented, the sectors that produced for the internal market were notably abandoned to sell products in the international market (Balderas Arrieta, 2006).

Table 2
Mexico: economically active population, by sex, annual series 1980–2015
(Numbers and percentages)

	Total	Men	Rate (percentages)	Women	Rate (percentages)
1980	22 066 084	15 924 806	72.17	6 141 278	27.83
1991	24 063 283	18 418 695	76.54	5 644 588	23.46
2000	40 161 543	26 418 355	65.78	13 743 188	34.22
2005	42 863 703	26 993 388	62.97	15 870 315	37.03
2010	45 911 934	28 768 675	62.66	17 143 259	37.34
2015	51 568 519	31 757 776	61.58	19 810 743	38.42

Source: Prepared by the authors, on the basis of Secretariat of Programming and the Budget (SPP), *Información sobre ocupación*, No. 11, trimester 1, Mexico City, 1980; National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Empleo 1991*, Aguascalientes, 1993; National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Empleo 2000*, Aguascalientes, 2001; National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Ocupación y Empleo 2005*, Aguascalientes, 2005; National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Ocupación y Empleo ENOE 2010*, Aguascalientes, 2011; National Institute of Statistics and Geography (INEGI), "Encuesta Nacional de Ocupación y Empleo 2015", 2018 [online] <https://www.ilo.org/surveyLib/index.php/catalog/1859/related-materials>.

Note: The information refers to the population aged 15 and over (for 2005, 2010 and 2015), according to the National Survey of Occupation and Employment (ENOE), and to the population aged 12 and over, according to *Información sobre ocupación* (1980) and the National Employment Survey (for 1991 and 2000).

Thus, employment became concentrated in an export structure based on products from the automotive and maquiladora sectors and oil, according to Balderas Arrieta (2006). Rendón and Maldonado (2005) state that this increase in industrial employment benefited women in particular. In addition, the commerce and service sectors, which expanded more, account for some of the main employment activities of women. Table 2 shows an increase in the proportion of women in the economically active population, from 23.5% in 1991 to 34.2% in 2000. Table 3 confirms that the industrial and tertiary sectors have been the most favoured, accounting for the majority of the employed population, both female and male. In the tertiary sector, the fastest growing sector, the number of women in employment increased from 6.46 million in 1991 to 15.63 million in 2015. These figures show how female employment in this sector was 2.41 times higher by 2015.

Overall, evidence has been provided that participation by women in the labour market in Mexico has increased and is continuing to do so. However, this does not mean that the wages women receive are converging with men's. In fact, a significant wage gap still exists, which is the subject of this research.

Some authors attribute this wage inequality to the occupational positioning of each sex. Many women are employed in segments with lower wages, according to Macías Vázquez (1990). However, other authors argue that the gap may vary according to other factors, including marital status and working hours. What is clear is that wage gaps have behaved differently in different time periods. Therefore, in continuing the analysis of the context, is essential to focus attention on output patterns and the main phases of national contraction and expansion.

Table 3
Mexico: employed population, by sex and sector of economic activity, 1991–2015
(Thousands of persons employed)

Year	Sex	Total	Primary	Secondary	Tertiary	Not specified
1991	Total	30 534.1	8 189.8	7 046.4	15 112.5	185.4
	Men	21 256.9	7 185.9	5 271.4	8 647.7	151.8
	Women	9 277.2	1 003.8	1 774.9	6 464.8	33.6
2000	Total	39 502.2	7 129.6	10 568.5	21 640.0	164.0
	Men	26 011.2	6 158.4	7 579.7	12 146.6	126.5
	Women	13 490.9	971.2	2 988.8	9 493.4	37.5
2005	Total	40 791.8	6 059.8	10 405.8	24 078.0	248.2
	Men	25 853.1	5 332.4	7 599.8	12 749.4	171.4
	Women	14 938.7	727.4	2 806.0	11 328.5	76.8
2010	Total	45 911.9	6 530.7	10 943.8	28 137.6	299.8
	Men	28 768.7	5 805.7	8 172.0	14 595.1	195.9
	Women	17 143.3	725.0	2 771.8	13 542.6	103.9
2015	Total	51 568.5	6 896.0	12 743.2	31 628.1	301.2
	Men	31 757.8	6 092.7	9 452.9	16 002.5	209.7
	Women	19 810.7	803.2	3 290.3	15 625.6	91.6

Source: National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Empleo 1991*, Aguascalientes, 1993; National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Empleo 2000*, Aguascalientes, 2001; National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Ocupación y Empleo 2005*, Aguascalientes, 2005; National Institute of Statistics and Geography (INEGI)/Secretariat of Labour and Social Security, *Encuesta Nacional de Ocupación y Empleo ENOE 2010*, Aguascalientes, 2011; National Institute of Statistics and Geography (INEGI), "Encuesta Nacional de Ocupación y Empleo 2015", 2018 [online] <https://www.ilo.org/surveyLib/index.php/catalog/1859/related-materials>.

Note: Information for the second quarter of each year. Refers to the population aged 14 and over.

IV. Economic patterns and the main phases of the economy in Mexico

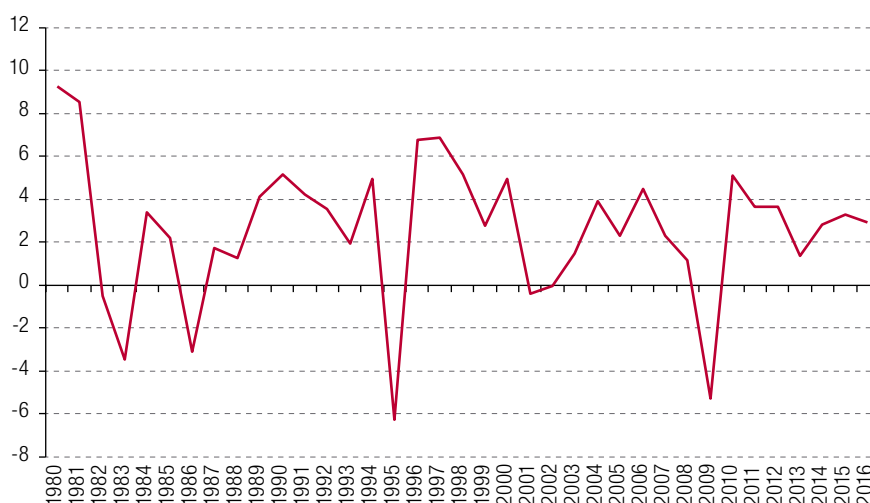
Economic activity in Mexico has been characterized by a number of distinct periods of variations. Describing these trends will give insight into the overall trend to then be able to focus on the booms and recessions that Mexico has experienced.

Gollás (2003) identifies a dramatic change from the 1970s onwards, linked to inward-oriented development policies. Populist rhetoric, private sector uncertainty and government overspending prevented sustained economic growth, which in previous years was around 6%.

From approximately 1980 onward, Mexico's economic performance became unstable. Volatility became more frequent, and has persisted from the 1980s to the present. Figure 1, based on World Bank data, shows annual GDP growth rates in the Mexican business cycle that ran from 1980 to 2016.

The data show successive slowdowns during the period. Many, like Velázquez Orihuela and Vargas Sánchez (2014), attribute the volatility from the 1980s onward to policies that were formulated to open the economy to the external market, but which shrank the domestic market. The reality is that a fragile economy and huge fiscal and monetary imbalances, resulting from mismanagement of previous governments, made a paradigm shift necessary to stimulate economic spillover. Thus, it was during this period that the economy was opened up to trade, a process that is considered a milestone in terms of understanding the patterns in economic fluctuations.

Figure 1
Mexico: gross domestic product (GDP) growth, 1980–2016
(Percentages)



Source: Prepared by the authors, on the basis of World Bank, "GDP growth (annual %) - Mexico", 2019 [online] <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=MX>.

Regarding the structure of the cycle, Loría and Salas (2014) define a business cycle as the passage from one peak to another. In their study of the period from 1980 to 2013, they identify six clear cycles, as listed in table 4: 1981–1985, 1985–1994, 1994–1998, 1998–2000 and 2000–2013.

Table 4
Mexico: occurrence and duration of peak-to-peak cycles, 1980–2013
(Quarters)

Period	Duration in quarters
1981–1985	15
1985–1994	36
1994–1998	14
1998–2000	9
2000–2008	32
2008–2013	22

Source: E. Loría and E. Salas, "Ciclos, crecimiento económico y crisis en México, 1980. 1-2013.4", *Estudios Económicos*, vol. 29, No. 2, 2014.

Loría and Salas also state that the cycles occurred during this period every three to five years. With respect to amplitude, they identify peaks in expansion as a percentage of potential GDP, the first being around 4%, with clearly smaller movements than before the 1980s. The authors specify two types of troughs: larger ones of -6.29% in 1995 and of -5.28% in 2009, and smaller ones in 1983 and 1986 of -3.48% and -3.07%, respectively.

The results show a short business cycle for Mexico, with six key troughs, reflecting the major economic crises in the country. Although the research of these authors does not completely encompass the period covered by this study, it does include the main slowdowns that are to be considered. In fact, this study will continue by focusing on just four of the six cycles corresponding to the period of analysis (1987–2016). The analysis will take 1987, 1995, 2001, 2009 and 2016 as troughs, and 1990, 1997, 2006 and 2012 as peaks of the cycles.

1. Main critical points of the economic cycles

As mentioned above, a series of GDP fluctuations began in the 1980s and have continued through to the present day. Two turning points in this decade were part of the 1981–1985 and 1985–1994 cycles. However, since the availability of data is limited to the information published by the National Institute of Statistics and Geography (INEGI), which begins in 1987, the explanation of the main critical phases will begin with the 1986 crisis. In addition, to provide some background, the major crises will be described, in order to contrast them with the peaks. To begin providing the context of the Mexican economic crises, we will draw on national and international history, to give an overview of the events.

After the Second World War, some countries introduced a new approach known as the import substitution model, as the most practicable strategy to respond to the external shock. In Mexico, this meant inward-oriented industrialization, justifying protectionism by the State, and encouraging domestic production, mainly in manufacturing, substituting foreign goods.

This initially led to the country entering a period of expansion in the 1950s, which continued through to the 1980s. However, different internal and external effects started to contribute significantly to the deterioration of the model (Aviña Montiel, 2014). Rural labour began to move to urban areas, leading to a change in the labour market, characterized by unemployment and low wages. In addition, subsidies, expansions of infrastructure and the nationalization of companies resulted in public overspending, which was financed with external loans.

In the 1970s this process became even more pronounced. However, the oil boom came, creating a “utopian mirage”, with disproportionate growth expectations for the economy. This encouraged further neglect of public finances and fiscal mismanagement. This was reflected most clearly in growth in foreign debt, which rose from just US\$ 4.263 billion at the end of 1970, equivalent to 12% of GDP, to US\$ 19.600 billion at the end of 1976, equivalent to 35% of GDP, according to Reyes-Heróles and Suárez Dávila (2009). This economic instability reached a crescendo in the early 1980s, when price rises, an imbalanced current account and the financing of public expenditure with foreign debt became unsustainable.

The first crisis of the 1980s erupted in 1982. Public debt grew as never before. In addition, towards the end of the López Portillo administration, radical measures were taken, such as nationalizing the banking system, further fuelling distrust in the business sector. Inevitably, there was a capital flight, which led to implementation of measures early in the presidency of Miguel de la Madrid, including policies to rein in wages, sizeable spending cuts and the beginning of an opening up of trade to encourage fresh private investment in the country. The 1982 crisis caused severe stagnation, austerity and inflation, which was brought under control with the first measures and agreements implemented by the new government. However, this stability was again undermined when oil prices hit a low.

As a result, an aftershock of the 1982 crisis came in 1986. The temporary stability evaporated, and the country underwent an abrupt economic slowdown (Lustig, 1998). In this crisis, GDP fell 3.07%. With the country's subsequent inability to meet financial obligations, the situation became even more difficult. In addition, the sharp drop in oil prices, the persistent fiscal deficit and above all an inability to pay debts led to the shock being absorbed entirely at the domestic level. The measures were severe, with even more restrictive policy, continued exchange rate devaluation and accelerated liberalization of trade. At the end of the year, in order to prevent the sharp fall in GDP from affecting foreign trade relations, emergency measures were implemented, as recommended by international institutions. Also, with the Baker Plan, which was introduced with the cooperation of the United States, Mexico obtained more financing, and the economy began to recover (Damm and Gutiérrez, 2005). In addition, economic liberalization was resumed with greater determination.

These measures seemed to produce results in the subsequent years, as GDP entered into a recovery that lasted until 1990, when GDP growth peaked. This growth in GDP, which reached 5%, is shown in figure 1. However, structural problems remained, and not merely those typical of developing countries, according to Reyes-Heróles and Suárez-Dávila (2009).

The combination of these domestic problems, an ongoing imbalance in the exchange rate, a persistent current account deficit and the depletion of international reserves ultimately triggered a new economic crisis, marking the end of the first business cycle.

The 1994 was the year of the most severe financial crisis the country has experienced. One year after the North American Free Trade Agreement (NAFTA) was signed, the national economy underwent an unparalleled collapse, which was the most severe crisis of that business cycle, with a massive capital flight owing to volatility and the economic outlook. The buoyancy seen in the economy was lost and GDP fell by 6% in 1995 (Reyes-Heróles and Suárez Dávila, 2009). This eroded standards of living and brought disproportionate inflation and a considerable increase in poverty. One of the measures taken to promote recovery was a free-floating exchange rate. In addition, a rescue package was made available by international institutions to prevent the crisis spreading internationally. A fresh restoration of economic stability thus began, lasting three years, until the pace of economic growth was again brisk. This peak was one of the highest in the period covered by this study, with a growth rate of close to 7% in 1997 (see figure 1). However, in the five subsequent years, GDP contracted.

However, a new slowdown hit the Mexican economy, in a context of global uncertainty on stock markets, mainly owing to a recession in the United States, a slowdown in Asia and political instability in Latin America, according to Banco de México (2002). In 2001, there was another economic crisis, although this slowdown had one of the smallest impacts, as GDP declined by 0.4% (see figure 1). Moreover, it coincided with the market entry of new emerging economies, which directly affected the Mexican economy's exports, and the spread of the crisis from the United States led to a severe drop in direct investment and a decrease in remittances. However, steps were quickly implemented by the United States to support the recovery from the ongoing global recession. Thus, over the following years there was a steady recovery until a peak was reached in 2006, when Mexico's GDP grew at a rate of almost 5%.

This phase did not last long, because in 2008 there was again one of the worst economic contractions, a global financial crisis, caused by a boom in lending by the different Federal Reserve Banks of the United States to finance mortgages in the country, fuelling a financial bubble so large that the fallout was worldwide. Globalization and the close relationship that had grown between Mexico and the United States over the previous decades meant that the crisis instantly spread to Mexico, with an immediate impact. In addition, because commodity prices were affected, oil prices once again contributed to a weakening of economic growth. According to World Bank (2019) data (see figure 1), GDP contracted by 5.28% in 2009. Furthermore, according to Damián (2012), unemployment increased by almost 6%, so a fall in income was one of the main features of the crisis. The economy later recovered. In fact, OECD (2011) confirmed that the Mexican economy recorded a strong recovery in 2011 after the crisis, returning to almost the same levels in the indicators that had deteriorated because of the slowdown. In 2012, growth was also around 4% (figure 1). However, the subsequent years have been characterized by a continued slowdown, leaving the growth rate at around 3% in 2016.

Gender relations in the Mexican labour market have shifted in tandem with economic, demographic, social and cultural changes. To fail to include all these aspects in our analysis would bias it by attributing a single cause to the transformations. In addition, it is important to identify the main turning points, in order to follow the changes in the patterns of the gender wage gap over time.

V. Data and methodology

This research combines two surveys published by INEGI that are considered suited to the 1987–2016 period studied: the National Urban Employment Survey (ENEU) for 1987–2004, and the National Survey of Occupation and Employment (ENOE) for 2005–2016. To process the microdata from the two surveys, the tables of sociodemographic, occupational and employment values for each of the years were concatenated. Specifically, for the empirical analysis, only the second quarters of each year were used, to produce a representative cross-section for the period analysed.

Also, the nature of this study requires that the focus be on people in the labour market who are in work or looking for it, the employed population being our main target population. Similarly, the focus will be on people aged 14 years or more.

The data collected in these two surveys will enable a more complete analysis, because they provide characteristics of the economically active and inactive population, their participation and working conditions, and other occupational indicators.

For monthly survey variables, the database was standardized for all years by means of two procedures. Firstly, zeros were removed for 1987–1994 (change from old to new pesos), so that the databases would match. Secondly, wage deflation was applied using August 2016 as the base date. The variable is thus expressed in real terms, allowing for a more objective and valid analysis.

The methodology proposed by Juhn, Murphy and Pierce (1991 and 1993) was used. This model allows for calculation of the exact gender wage gaps which will allow us to explain the wage differentials in economic booms and recessions. With the support of statistical data from the National Urban Employment Survey (ENEU) and the National Survey of Occupation and Employment (ENOE), information will be used on average salaries by sex, years of schooling, potential experience in the labour market and their square. The experience variable is obtained through the age of the individual and the years of formal education attained minus six, since this is the age at which the worker begins primary education. Experience squared is an approximation to the basic life-cycle model, where the concavity of the age-income profile is captured by the linear and quadratic term of experience, where diminishing returns to human capital are captured.

Thus, when applying the model, the starting point will be a Mincer equation, algebraically representing the average salary of men in the initial year, expressed as:

$$w_t^m = \bar{X}_t^m \hat{\beta}_t + \sigma_t \bar{\theta}_t^m \quad (1)$$

Where w_t^m is the average hourly wage for men, expressed in logarithms; \bar{X}_t^m is the mean values of the particular characteristics of men; $\hat{\beta}_t$ is the vector of parameters estimated jointly for males and females; σ_t is the standard deviation of the wage residuals for both sexes; and $\bar{\theta}_t^m$ is the standardized average wage residuals for men. The algebraic representation for women is similar.

Thus, when formulating the wage structure of both sexes for a given year, the average salary for the sample can be expressed as:

$$D_t = w_t^m - w_t^f = (\bar{X}_t^m - \bar{X}_t^f) \hat{\beta}_t + (\bar{\theta}_t^m - \bar{\theta}_t^f) \sigma_t = \Delta \bar{X}_t \hat{\beta}_t + \Delta \bar{\theta}_t \sigma_t \quad (2)$$

Where the operator Δ is the average difference for both sexes with regard to the aforementioned variable and the superscripts m and f indicate the male and female sexes, respectively.

In principle, equation (2) enables observation of the proportion of the gender wage gap in the initial year that is explained by differences in observable productive characteristics of men and women. It also shows the proportion of these unobservable factors that are part of the non-explanatory differentials due to productive factors. The first term resembles the standard Oaxaca-Blinder decomposition. The second term $(\hat{\theta}_t^m - \hat{\theta}_t^f)\sigma_t$ captures the essence of the standardized average wage residuals of the sexes, multiplied by the dispersion of the distribution of the residuals, in such a way that it is possible to observe the influence of unobservable factors on wages

Lastly, by means of certain algebraic modifications, to perform the annual comparison, the change in the gender wage gap between two different years is obtained, as follows:

$$D_t - D_{t-1} = (\Delta\bar{X}_t - \Delta\bar{X}_{t-1})\hat{\beta}_t + \Delta\bar{X}_t(\hat{\beta}_t - \hat{\beta}_{t-1}) + (\Delta\hat{\theta}_t - \Delta\hat{\theta}_{t-1})\sigma_t + \Delta\hat{\theta}_t(\sigma_t - \sigma_{t-1}) \quad (3)$$

In this regard, according to the expression in equation (3), changes in the size of the gender wage differentials between two different periods may be caused by four different factors, each of which is captured by the corresponding term of the decomposition. The first is modification of the observed productive characteristics of the sexes. The second is changes in the structure of wage differentials in the economy. The third is changes in the relative effect of unobserved factors that could bring the average wage residuals of the sexes closer together or push them further apart. The fourth is dispersion of standardized average residuals.

Of the factors mentioned above, the first and third can be said to be gender-specific characteristics, while the second and fourth are linked to general variables of the wage structure. Thus, the first two factors together correspond to the effect of factors related to observable production characteristics; and the third and fourth factors correspond to the effect of all the unexplained factors. Comparative information on cycle peaks is thus obtained.

VI. Decomposition of wage differentials according to the methodology of Juhn, Murphy and Pierce (1991 and 1993)

Applying the methodology of Juhn, Murphy and Pierce (1991 and 1993), the decomposition of the average wage differential by gender can be observed, as well as the pattern in the analysed period of 1987–2016. The analysis will focus on two fundamental areas when applying this method: the change in the gender differential at the main critical points of the cycles, and quantifying the importance of observable and unobservable factors, in order to explain the formation of the gender wage gap.

Table 5 shows the results for the overall total of the country's economic activity. At first glance, a downward trend can be seen across the cycles in the years studied. Nevertheless, when examining the detail of fluctuations in the cycles, specific patterns are seen that differ between the periods of the highest and lowest growth rates and the periods of more moderate rates.

Thus, examining the pairs formed by 1987 and 1990 and 2001 and 2006, and considering the first year of each as the trough of the cycle and the last year as the peak, it is revealed that there are falls in the wage differential of 0.02 and 0.04 log points, respectively, reflecting less inequality during expansion than during recessions. This would be consistent with Rubery (1988), whereby women are seen as a flexible reserve during recessions. The components of the decomposition confirm the position of the gap, since, for the first sample, men's relative wages generally benefited from education and

experience factors, favouring their pay. In contrast, for the second cycle, there was an improvement in the education-related endowments for women, although not to an extent sufficient to improve their situation with regards to the gap.

Table 5
Mexico: decomposition of the change in the average gender wage gap
from the overall total of economic activity, according to the Juhn,
Murphy and Pierce methodology, 1987–2016

	1987	1991	1995	1997	2001	2006	2009	2012	2016
Gender wage differential	-0.336	-0.320	-0.313	-0.321	-0.345	-0.306	-0.289	-0.291	-0.292
Observed characteristics	-0.006	-0.010	-0.027	-0.025	-0.001	0.0319	0.0378	0.0309	0.0396
Wage residuals	-0.330	-0.310	-0.286	-0.296	-0.344	-0.338	-0.327	-0.322	-0.332
Differences		0.0198	0.0071	-0.008	-0.023	0.0389	0.0172	-0.001	-0.001
Explained		-0.004	-0.016	0.0018	0.0243	0.0331	0.0059	-0.006	0.0087
- Education		-0.000	0.0025	0.0017	0.0140	0.0280	-0.003	-0.006	0.0018
- Experience		-0.004	-0.038	-0.001	0.0211	-0.013	0.0330	0.0119	0.0130
- Experience 2		0.0010	0.0195	0.0014	-0.010	0.0185	-0.023	-0.012	-0.006
Unexplained		0.0241	0.0239	-0.010	-0.047	0.0058	0.0113	0.0051	-0.010
Productive characteristics (Q)		-0.002	-0.007	0.0024	0.0217	0.0345	0.0070	-0.004	0.0137
Wages (P)		-0.001	-0.160	-0.000	0.0056	-0.000	-0.000	-0.002	-0.003

Source: Prepared by the authors, on the basis of National Institute of Statistics and Geography (INEGI), "National Urban Employment Survey (ENEU)", 2005 [online databases] <http://en.www.inegi.org.mx/programas/eneu/2004/?ps=microdatos>; National Institute of Statistics and Geography (INEGI), *Encuesta Nacional de Educación y Empleo 2006*, Aguascalientes, 2007; National Institute of Statistics and Geography (INEGI), *Encuesta Nacional de Ocupación y Empleo: ENOE 2009*, Aguascalientes, 2010; National Institute of Statistics and Geography (INEGI), "National Survey of Occupation and Employment (ENOE), population aged 15 years and older", 2020 [online databases] <http://en.www.inegi.org.mx/programas/enoe/15ymas/default.html#Microdata>.

Note: The methodology used is presented in C. Juhn, K. Murphy and B. Pierce, "Accounting for the slowdown in black-white wage convergence", *Workers and their Wages: Changing Patterns in the United States*, M. Kosters (ed.), Washington, D.C., The AEI Press, 1991.

In the 1995–1997 and 2009–2012 cycles, which included the most marked crises and booms of the Mexican economy, in both cases there were quantified average increases of 0.01 log points in the wage differential. This is evidence of a widening of the wage gap to the detriment of women in booms and of a narrowing in crises.

These results coincide with those documented by Park and Shin (2005), showing procyclical behaviour by the wage gap. Moreover, the wage residuals also show an increase in the share of the wage gap attributed to unobservable factors for the first comparison of cycles, while in the second it was largely unchanged. For some authors, such as Becker (1971), this is the implicit part that reflects the existence of discrimination in the wage differential. This would suggest that greater discrimination, or other factors that are not considered, are the main reasons for the gap. In terms of explanatory variables, in the 1995–1997 and 2009–2012 cycles, the combination of factors is very favourable to women, but the unexplained part attributable to wage discrimination counteracts their effect.

In general, the information presented suggests that, for all the years, the gender wage differential is not sufficiently explained by the variables related to production characteristics, because unobservable factors actively explain the differentials.

Consolidation of all this information shows that the gender wage gap in Mexico has followed a downward trend. However, it remains unfavourable to women. Despite this, descriptive statistics show a steady increase in women's labour force participation compared to men. However, this does not change higher wages being received by men. It can therefore be assumed that the lack of productive

characteristics endowments has maintained gender wage gaps. Nonetheless, we can see that the educational average for women has surpassed that for men. This indicates that factor endowment, in the case of Mexico, does not explain the persistent gender wage gap. Moreover, using the Juhn, Murphy and Pierce method (1991 and 1993) we can see that the gap is explained, above all, by unobservable factors, suggesting that these factors are strongly linked to wage discrimination in the labour market or to the need to consider other types of factors.

As to the overall growth in economic activity, there is no support for the theory of Park and Shin (2005), whereby the gap is expected to behave procyclically in all periods. In fact, in the cycles with smaller fluctuations, the gap behaved countercyclically, which would corroborate the theory of Rubery (1988), who hypothesized that women act as a flexible reserve during recessions.

VII. Conclusions

A thorough analysis of the possible influence that the business cycle could have on gender wage gaps, using the decomposition of wage differentials method proposed by Juhn, Murphy and Pierce (1991 and 1993), produced results that are similar to the findings of previous research on Mexico, whereby the gender wage gap has narrowed over time (Freije, López-Acevedo y Rodríguez-Oreggia, 2011). However, unobservable factors contributed significantly to the explanation of the gap.

These results provide an overview of the Mexican labour market, revealing persistent vulnerability in the absorption and consideration of the productive characteristics of men and women. Furthermore, they demonstrate a precariousness of wages, with no increases in payment amounts in most cases, as well as a greater risk of wage loss, due to the continuous economic crises that the country has suffered.

Castro, Rodríguez and Brown (2018) and Rodríguez and Germán-Soto (2021) indicate that there is a narrowing of the gender wage gap during contraction phases, which varies by sector and region and has behaved procyclically. Likewise, in this research, no support was found for procyclical behaviour of the gap for the periods taken as a whole. Nonetheless, the periods with the lowest troughs and highest peaks did follow a pattern in line with procyclical theory. In general, this research shows, by incorporating the situational aspect of gender wage gaps, that the patterns are not static. It also shows that the reasons for wage inequality do not always lie with economic growth. Instead, they may be linked to the occupational structure in a country, and to its economic and social context.

The Sustainable Development Goals (SDGs) on poverty and employment (1 and 8) and the Goal on gender equality (goal 5), aim to find solutions for countries to reduce social and gender gaps in labour participation, improve working conditions and income, and achieve reductions in poverty. These aims can be achieved by restructuring policies and programmes to create the right incentives for labour supply and demand, taking into account the gender distribution of paid and unpaid work.

Bibliography

- Antón, A. (2015), "Democracia social y desigualdad", paper presented at XI Jornadas de Pensamiento Crítico seminar, Madrid, Polytechnic University of Madrid, December.
- _____(2014), "La desigualdad social", revised version of the paper presented at X Jornadas de Pensamiento Crítico seminar, Leganés, University Carlos III of Madrid, December 2013 [online] <http://www.pensamientocritico.org/antant0114.pdf>.
- Aviña Montiel, N. (2014), "Los ciclos económicos de México y la crisis en la era del TLCAN", master's thesis, Tijuana, Colegio de la Frontera Norte.
- Balderas Arrieta, I. (2006), *Mujeres trabajadoras en América Latina: México, Chile y Brasil*, Mexico City, Plaza y Valdés.

- Banco de México (2002), *Annual Report 2001*, Mexico City.
- Becker, G. (1971), *The Economics of Discrimination*, Chicago, The University of Chicago Press.
- Brown, F. and L. Domínguez (coords.) (2010), *México: desigualdad económica y género*, Mexico City, National Autonomous University of Mexico (UNAM).
- Campos-Vázquez, R., G. Esquivel and N. Lustig (2014), "The rise and fall of income inequality in Mexico, 1989-2010", *Falling Inequality in Latin America: Policy Changes and Lessons*, A. Giovanni (ed.), Oxford, Oxford University Press.
- Castro, D., R. Rodríguez and F. Brown (2018), "La brecha salarial por género y recesión económica en la frontera norte de México", *Mercado laboral: México y frontera norte*, D. Castro and R. Rodríguez (coords.), Mexico, Universidad Autónoma de Coahuila/Ediciones de Laurel.
- Damián, A. (2012), "Crisis, empleo y pobreza", *La situación del trabajo en México, 2012: el trabajo en la crisis*, E. De la Garza Toledo (coord.), Mexico City, Plaza y Valdés.
- Damm, A. and A. Gutiérrez (coords.) (2005), *Las reformas estructurales que México necesita*, Mexico City, Compañía Editorial Continental (CECSA).
- DiNardo, J., N. Fortin and T. Lemieux (1996), "Labor market institutions and the distribution of wages, 1973-1992: a semiparametric approach", *Econometrica*, vol. 64, No. 5, September.
- Esquivel, G. and J. Rodríguez (2003), "Technology, trade, and wage inequality in Mexico before and after NAFTA", *Journal of Development Economics*, vol. 72, No. 2.
- Freije, S., G. López-Acevedo and E. Rodríguez-Oreggia (2011), "Effects of the 2008-09 economic crisis on labor markets in México", *Policy Research Working Paper*, No. 5840, Washington, D.C., World Bank.
- Gollás, M. (2003), *México: crecimiento con desigualdad y pobreza (de la sustitución de importaciones a los tratados de libre comercio con quien se deje)*, Mexico City, El Colegio de México.
- Goodman, W., S. Antczak and L. Freeman (1993), "Women and jobs in recessions: 1969-92", *Monthly Labor Review*, vol. 116, No. 7.
- Hernández Licona, G. (2000), "El empleo en México en el siglo XXI", *El Cotidiano*, vol. 16, No. 100, Mexico City, Autonomous Metropolitan University.
- Hodrick, R. and E. Prescott (1997), "Postwar U.S. business cycles: an empirical investigation", *Journal of Money, Credit and Banking*, vol. 29, No. 1, February.
- ILO (International Labour Organization) (2016a), *Global Wage Report 2016/17: Wage Inequality in the Workplace*, Geneva.
- (2016b), *Women at Work: Trends 2016*, Geneva.
- Juhn, C., K. Murphy and B. Pierce (1993), "Wage inequality and the rise in returns to skill", *Journal of Political Economy*, vol. 101, No. 3.
- (1991), "Accounting for the slowdown in black-white wage convergence", *Workers and their Wages: Changing Patterns in the United States*, M. Koster (ed.), Washington, D.C., The AEI Press.
- Loría, E. and E. Salas (2014), "Ciclos, crecimiento económico y crisis en México, 1980.1-2013.4", *Estudios Económicos*, vol. 29, No. 2.
- Lustig, N. (1998), *Mexico: the Remaking of an Economy*, Washington, D.C., Brookings Institution Press.
- Macías Vázquez, M. (1990), "El trabajo femenino en la industria mexicana: 1942-1984", bachelor's thesis, Mexico City, National Autonomous University of Mexico (UNAM).
- Mankiw, N. (2009), *Principles of Economics, Sixth Edition*, Mason, South-Western Cengage Learning.
- Meza González, L. (2001), "Wage inequality and the gender wage gap in Mexico", *Economía Mexicana Nueva Época*, vol. X, No. 2, Mexico City, Economic Research and Teaching Centre.
- Milkman, R. (1976), "Women's work and economic crisis: some lessons of the Great Depression", *Review of Radical Political Economics*, vol. 8, No. 1.
- Murillo, I. and H. Simón (2014), "La Gran Recesión y el diferencial salarial por género en España", *Review of Public Economics*, vol. 208, No. 1, Madrid, Institute of Fiscal Studies.
- National Women's Institute (2017), "Mujeres en cifras", *Boletín*, No. 3.
- OECD (Organization for Economic Cooperation and Development) (2017), *Building an Inclusive México: Policies and Good Governance for Gender Equality*, Paris.
- (2011), *OECD Economic Surveys: Mexico 2011*, Paris.
- Park, S. and D. Shin (2005), "Explaining procyclical male-female wage gaps", *Economics Letters*, vol. 88, No. 2, August.
- Piazzalunga D. and M. Di Tomasso (2016), "The increase of the gender wage gap in Italy during the 2008-2012 economic crisis", *IZA Discussion Paper*, No. 9931, Bonn, Institute of Labor Economics (IZA).

- Popli, G. (2008), "Gender wage discrimination in Mexico: a distributional approach", *Sheffield Economic Research Paper series*, No. 2008006, Sheffield, University of Sheffield.
- Rendón, T. and V. Maldonado (2005), "Evolución reciente del trabajo de hombres y mujeres en México", *Comercio Exterior*, vol. 55, No. 1, January.
- Reyes-Heroles, F. and F. Suárez Dávila (coords.) (2009), *La crisis: testimonios y perspectivas*, Mexico City, Fondo de Cultura Económica.
- Rodríguez, R. and V. Germán-Soto (2021), "Desigualdad salarial por género y ciclo económico en las manufacturas mexicanas", *Economía, Teoría y Práctica. Nueva Época*, No. 54.
- Rojas-Gómez, I. and J. Sotelo Peralta (2003), "La mujer mexicana a través de los años: repercusiones históricas y laborales como factores de empuje en la migración internacional", La migración de la mujer mexicana migrante: de la emancipación a la equidad de género, bachelor's thesis, Cholula, Universidad de las Américas Puebla (UDLAP).
- Rubery, J. (ed.) (1988), *Women and Recession*, London, Routledge/Kegan Paul.
- Sabogal, A. (2012), "Brecha salarial entre hombres y mujeres y ciclo económico en Colombia", *Coyuntura Económica: Investigación Económica y Social*, vol. XLII, No. 1.
- Samuelson, P. and W. Nordhaus (2005), *Economics, Eighteenth Edition*, Boston, McGraw Hill/Irwin.
- Sánchez, F., L. Salas and O. Nupia (2003), "Ciclos económicos y mercado laboral en Colombia 1984-2000: ¿quién gana más, quién pierde más?", *Documento CEDE*, No. 13 [online] https://economia.uniandes.edu.co/components/com_booklibrary/ebooks/D2003-13.pdf.
- Skoufias, E. and S. Parker (2006), "Job loss and family adjustments in work and schooling during the Mexican peso crisis", *Journal of Population Economics*, vol. 19, No. 1.
- Stephens, M. (2002), "Worker displacement and the added worker effect", *Journal of Labor Economics*, vol. 20, No. 3, July.
- Velázquez Orihuela, D. and J. Vargas Sánchez (2014), "El modelo neoliberal y su efecto en el crecimiento económico: el caso de la economía mexicana", *Boletín Científico de las Ciencias Económico Administrativas del ICEA*, vol. 3, No. 5, Hidalgo, Autonomous University of the State of Hidalgo.
- World Bank (2019), "GDP growth (annual %) - Mexico" [online] <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=MX>.

Why do conditional cash transfer programmes fail to target the poor? The case of urban areas in Mexico

Pierre Levasseur

Abstract

Given the limited financing capacity of developing countries, conditional cash transfer (CCT) programmes are an affordable means of providing a social safety net to vulnerable households. However, compliance with conditionalities may limit participation and increase dropouts, particularly when compliance-related constraints are high and cash incentives are relatively low. This empirical analysis determines how cash transfer amounts affect the probability that participating households will remain in a programme or drop out, looking at the case of Mexico, a developing country that has gradually expanded its CCT programme from rural to urban areas. Using longitudinal household surveys, this study finds that the poorest households are most likely to drop out of the programme. Interestingly, the level of cash transfers increases this probability for the poorest participants compared to the richest ones. It is concluded that the programme does not successfully retain the poorest households in the programme, because the cash incentives are too low in urban settings.

Keywords

Income, households, poverty mitigation, economic development, rural areas, urban areas, programmes of action, programme evaluation, case studies, Mexico

JEL classification

O15, I32, H23

Author

Pierre Levasseur is an associate researcher at the Sciences for Action and Development – Activities, Products, Territories (SAD-APT) unit of the French National Research Institute for Agriculture, Food and Environment (INRAE). Email: pierre.levasseur@inrae.fr.

I. Introduction

In developing countries, which are often over-indebted, budgetary and fiscal constraints limit the implementation of social protection systems. Many emerging countries such as Mexico have therefore opted for an alternative arrangement: conditional cash transfer (CCT) programmes. Since these programmes only target the poorest households, their cost is relatively low. The principle is simple: in exchange for cash allowances (or non-monetary benefits), participants agree to meet certain conditions (called conditionalities), with the overall aim of increasing public service demand (i.e. schools and health centres). Cash transfers are said to be “conditional” because participants who do not meet the conditionalities are excluded from the programme and stop receiving payments. The cash incentives have two main functions: (i) to encourage eligible households to take part in the programme; and (ii) to offset constraints related to the uptake of public services, such as direct costs (for example for enrolment fees, uniforms, equipment, consultations, transportation, medicines, injections) and indirect costs (including opportunity cost, loss of time). People living in poverty are particularly vulnerable to these constraints. Evidently, other factors limit poor populations’ demand for public services, such as a failure to prioritize health and education. This is theoretically attributable to limited nutritional and health knowledge, and to time inconsistency (a preference for immediate gratification over an uncertain future investment in human capital, (Banerjee and Duflo, 2011)).

The Mexican CCT programme, which was first called *Progres*a, then *Oportunidades*, and is now known as *Prospera*, is one of the most ambitious and successful in the world (Fiszbein and others, 2009). Initially, the purpose of the programme was to eradicate hunger and extreme poverty through action on education, nutritional deficiencies and infectious diseases. Since it was established in 1997 as part of a randomized controlled trial of a few marginalized rural areas, the programme has proved to have a positive impact on human capital indicators. In view of its conclusive results, the government extended the project to all marginalized rural areas between 1998 and 2000, and then to small urban areas in 2001 and to Mexico’s major cities in 2002. Since 2007, poor households from all marginalized communities of the country (both rural and urban areas) have been eligible for the programme.

Despite its success in rural areas of Mexico in terms of education, health and nutrition — especially for children (Hoddinott and Bassett, 2008) — the literature reveals that the expansion of the programme to urban areas since 2001 has been subject to several constraints. Indeed, the participation rate of eligible households (or take-up rate) has been limited in cities (around 50%). According to Angelucci, Attanasio and Di Maro (2012) and Behrman and others (2012), there are several reasons for the high level of exclusion errors in urban areas. Firstly, the process of self-selection by participants has led to a number of involuntary exclusions. Among the 40% of households who were eligible but did not apply for the programme, one third of them reported not being aware of its existence. Therefore, almost 30% of eligible urban households have voluntarily chosen not to enrol (i.e. self-exclusion). In addition, the annual dropout rate, mainly due to conditionality violations, is more than 7% in urban areas, compared to 3% in rural areas. Surprisingly, contrary to the self-targeting theory, the poorest urban households are more likely to drop out of the programme (González-Flores, Heracleous and Winters, 2012). In line with theory on take-up, eligible households appear to make a rational choice between the programme’s benefits and its enrolment costs. Therefore, in addition to not being aware of the programme and its eligibility criteria, an imbalance between the cash incentives and the cost of living in cities might explain the programme’s low take up and enrolment among the poorest eligible urban households (as well as its ability to retain them); the value of cash transfers are the same in rural and urban areas (Angelucci and Attanasio, 2009), although the cost of living is very different. Therefore, the cash incentives appear to be too low to encourage a substantial portion of eligible urban households to enrol and to offset conditionality-related constraints (direct and indirect costs, preference for immediate gratification, etc.).

Oddly, there have been no empirical studies of how cash transfers affect take-up and dropout rates. Be that as it may, the value of cash incentives is an adjustable variable that can more than proportionally improve both these rates (Atanasio, Meghir and Schady, 2010).

Using a quantitative design based on panel data from the Mexican Family Life Survey (MxFLS), this study seeks to better understand the determinants of the low take-up rate that characterizes the urban version of the Mexican CCT programme. More specifically, this is the first study to assess the direct influence of cash incentives on dropout risks by considering a large spectrum of take-up determinants. Identification of dropout determinants will be useful for programme administrators, enabling them to minimize exclusion errors. Indeed, exclusion errors are particularly high in cities: three quarters of dropouts from the programme are a result of failing to meet the conditions linked to health- and nutrition-related requirements, and to fulfil other procedural requirements (González-Flores, Heracleous and Winters, 2012).

The rest of the article is structured as follows: the Mexican CCT programme is summarized in section II; the existing literature that analyses the low take-up of the programme in urban areas is outlined in section III; in section IV the data is described and the empirical strategy is established; the results are discussed in section V; lastly, some conclusions are provided in section VI.

II. The Mexican conditional cash transfer (CCT) programme

1. Benefits

The Mexican programme offers two types of cash transfers: (i) basic aid to increase household food consumption; and (ii) optional grants to encourage school attendance. Each type of transfer is linked to specific conditionalities.

In exchange for basic food aid (the same amount is transferred to all participants), each household member must visit the nearest health centre every two months for medical check-ups. The person receiving the transfers (generally the mother) is also required to attend monthly public health training and preventive health or nutritional meetings (called *pláticas*, or chats). Every month, health centres report attendance to the programme administrators. Households that have not complied with these conditionalities for four consecutive months (or six non-consecutive months in one year) automatically lose their entitlement to all of the programme's benefits.

As regards the school grants, the transfer amount varies, as it is determined according to the number of school-age children in the household, their school year, and their gender (see table A1.1 in annex A1). The programme sets a maximum transfer threshold (Skoufias, 2005), presumably to avoid possible adverse fertility incentives. To benefit from a full grant, a student must enrol in a school approved by the Secretariat of Public Education (SEP) and attend at least 85% of classes in a month. Registration and attendance are reported by the school authority to the programme administrators. If school attendance is below 85% a proportional amount is deducted from the bimonthly payment. For example, if a student was absent from 50% of classes over the preceding two months, the household will receive 50% of the grant.

To conclude, unlike the basic food transfer, grant-related conditionalities do not necessarily lead to definitive exclusions, but rather to payment reductions (Álvarez, Devoto and Winters, 2008). This means that a household can enrol in part of the programme, provided that the health and nutrition component is met. However, if a household does not comply with the health and nutrition component, but continues to send its children to school, it will permanently lose entitlement to all of the programme's benefits.

2. The process of selecting beneficiaries

Under the Mexican CCT programme, the beneficiary targeting strategy includes a dual selection process. First, a geographical selection of the poorest communities was carried out. Since the level of concentration of poor households is very different between rural and urban areas, the geographic selection process is region-specific (Orozco and Hubert, 2005). Eligible households are located in preselected rural communities and urban blocks. In other words, only poor households belonging to poor communities are eligible.

In eligible selected rural communities, face-to-face interviews were conducted at potential beneficiaries' homes. Hence, a quasi-exhaustive census of the inhabitants of rural areas was conducted. Rural households that meet the eligibility criteria were in effect invited to enrol. However, for cost reasons, this process could not be replicated for eligible urban blocks; instead, a self-selection system was established. First, households living in eligible urban blocks were informed about the programme through announcements made from cars with loudspeakers driving around selected neighbourhoods, adverts and radio messages. Households that consider themselves eligible must go to the nearest temporary reception desk (located in health centres), where they are interviewed as part of the National Survey of Urban Households' Socioeconomic Characteristics (ENCASURB). The information is entered directly into a computer system and simultaneously checked against a multivariate poverty index (homogeneous at the national level since 2001) which generates a score (*puntaje*) (see Skoufias, Davis and De la Vega, 2001). Finally, for households that meet the eligibility criteria (a *puntaje* above 0.69), home visits are then performed to check the accuracy of the data provided during the interview. The programme administrators then perform a recertification process every three years to limit inclusion errors. During recertification, the *puntaje* is reassessed with updated household information. Households with a *puntaje* above 0.383 remain full beneficiaries, households with a *puntaje* below 0.077 are excluded entirely and households with a *puntaje* between 0.077 and 0.383 are transferred to a reduced version of the programme (called the Differentiated Support Scheme (EDA)) for an additional three years before being excluded. Households transferred to EDA continue to receive nutritional benefits, the basic health package and grants for secondary school students.

This system of self-selection has resulted in the exclusion of many eligible urban households. Angelucci, Attanasio and Di Maro (2012) estimate that around 50% of potentially eligible urban households do not benefit from the programme, in contrast to a rate of less than 10% for rural households. Behrman and others (2012) report that around one third of non-participating eligible urban households were not aware of the programme. In other words, more than two thirds of eligible non-participants freely chose not to enrol despite being able to do so. Although some eligible households were probably unsure whether they were eligible, many voluntarily decided to self-exclude, probably because programme payments are insufficiently attractive with regard to the cost of living in urban areas. It should be borne in mind that the value of cash allowances is identical in rural and urban areas, despite an evident difference in living costs.

III. Relevant literature

As discussed in the literature, the dropout rate is much higher in urban areas than in rural areas. While the annual dropout rate is 3% in rural settings, this rate is more than 7% in cities. Hence, the total dropout rate between 2002 and 2007 is around 43% in urban areas, compared to just 16% in rural settings (Álvarez, Devoto and Winters, 2008). González-Flores, Heracleous and Winters (2012) estimate that three quarters of people drop out because of choices they made, with 56% doing so

because they failed to meet the conditions linked to the health- and nutrition-related requirements, and 18% because they failed to fulfil other procedural requirements. Consequently, only one quarter of programme dropouts are attributable to the three-year recertification process (20%) and audits (6%) by the programme administrators to reduce inclusion errors.

According to self-targeting theory, the relationship between socioeconomic status and dropout probability should be positive and linear. Indeed, the constraints related to conditionalities compliance ought to act as a self-regulation mechanism (González-Flores, Heracleous and Winters, 2012). This means that less needy households should self-exclude themselves from the programme, given a relatively high opportunity cost and the existence of better alternatives (owing to better skills, higher migration opportunities, among other factors). However, the empirical findings from González-Flores, Heracleous and Winters (2012) refute the self-targeting hypothesis in the context of Mexican urban areas. Based on administration data, these authors describe a U-shaped relationship between the *puntaje* (poverty index) and dropout probability. In addition, the most vulnerable participants (such as single-parent families) are the most likely to drop out. This last finding suggests that the direct and indirect costs related to meeting the programme requirements, combined with poor understanding of the scheme and its benefits, have a very negative effect on the long-term participation of the poorest households. González-Flores, Heracleous and Winters (2016) also note that half of urban participants choose to forgo full grants, as they fail to comply with the requirement to send their children to school. This failure to comply with the educational component is particularly prevalent among the poorest households and mainly concerns high school grants. This conclusion highlights the fact that, for adolescents, the opportunity cost of studying rather than working is much higher in cities than in rural areas. According to Schultz (2004), the grants provided through the programme represent between half and one third of a full-time wage in Mexican cities.

González-Flores, Heracleous and Winters (2012) report that dropout probability is positively correlated with city size. They postulate that this may be partly due to the congestion that characterizes large Mexican cities, leading to higher direct (travel prices) and indirect (time spent in transportation) transport costs. Moreover, as living costs theoretically increase in line with city size, the purchasing power offered by cash transfers (which are the same in all areas) probably decreases with city size. In other words, in large cities, cash incentives may not offset the direct and indirect costs related to compliance with conditionalities. Lastly, González-Flores, Heracleous and Winters (2012) observe that dropout probability is negatively correlated with the level of community marginality (percentage of poor households in the community). The authors' suggest that a possible explanation for this is linked to network theory: since the density of participants is low in less marginal communities, poor people in those communities are less likely to obtain information about the programme.

IV. The data and empirical strategy

The data used in this study are from the Mexican Family Life Survey (MxFLS), the first survey with a representative sample of the Mexican population at the national, rural-urban and regional levels. Its sampling guidelines were drawn up by the National Institute of Statistics and Geography (INEGI). The survey contains information for a 10-year period, collected in three rounds. The first round was carried out in 2002, surveying 35,677 individuals from 8,440 households (living in 150 municipalities across 16 Mexican states). Given the longitudinal design of the survey, the second (2005/06) and third (2009–2012) rounds were based on the initial sample from 2002, with almost 90% of the original sampled households located and reinterviewed. The Survey includes data on programme take-up and the amount received yearly by participants through cash transfers, as well as detailed information on the socioeconomic and demographic characteristics of households and individuals.

The main goal of this study is to empirically assess the influence of cash incentives on programme dropout probability in urban areas of Mexico. Consequently, only urban households that were enrolled and received cash transfers in 2005 were examined. Those who continued to participate in the programme were then differentiated from those who dropped out, using treatment status information from the 2012 survey. Since MxFLS is representative at the rural-urban level, the households in the urban sample are assumed to be representative of enrolled households in all urban areas of Mexico. The reduced-form model based on urban participants takes the form of a probit binomial regression:

$$P(\text{Stayer}_j) = \alpha + \beta_1 X_j + \beta_2 \text{cash}_j + \varepsilon_j \quad (1)$$

Where $P(\text{Stayer}_j)$ is the probability of a household j remaining a participant between 2005 and 2012, rather than leaving the programme in that periods. X_j is a vector of control variables measured in 2005 that includes socioeconomic and demographic characteristics of the head of the household (age, gender, annual labour income, civil status, education and socio-professional status) and of the whole household (number of children by age group, percentage of girls, dependency ratio and owned assets). The vector X_j also includes a community factor to capture the size of cities and their level of urban development in 2005 (a composite index measuring the availability of infrastructure assets in the municipality). Finally, cash_j is the total value of the transfers (in pesos) that the household received in 2005. In theory, the households that received the most cash were those who were enrolled for longer in the programme or who accumulated more school grants (by having older or female school-age children, see table A1.1 in annex A1). For this reason, a control was included for the number of children by age group and the percentage of girls within each enrolled household. The cash transfers variable was analysed using two different approaches: linearly, using a logarithmic transformation of annual cash payments and non-linearly using a quartile categorization of the distribution. Outlier values are excluded according to reasonable thresholds of transfers based on the estimated values in table A1.1 in annex A1. The variables used in the model are described in table A1.2 in annex A1.

The purpose of equation 1 is to test the following hypotheses:

- H1 (self-targeting hypothesis): For enrolled households, if the relationship between socioeconomic status and the probability of staying in the programme is negative and linear, this means that less needy households self-exclude from the programme, owing to a relatively high opportunity cost and the existence of better alternatives. In this case, the self-targeting hypothesis is accepted and the efficiency of the programme is thus limited by inclusion errors. On the other hand, if there is an inverted-U or positive relationship between socioeconomic status and the probability of staying in the programme, the self-targeting hypothesis is rejected, and the efficiency of the programme is thus limited by exclusion errors.
- H2 (hypothesis of a lack of cash incentives): If cash transfers are not sufficient to retain the poorest households in the programme —households that are theoretically not concerned by self-targeting and recertification processes— one could assume that cash allowances do not offset the constraints linked to compliance with the programme's conditionalities. To test this hypothesis, an interaction term is included in an alternative specification of equation 1: the value of transfers is cross referenced with the income quartile of the head of the household.

In the interest of clarity and transparency, the robustness of the empirical model with regard to endogeneity problems must be properly discussed. Clearly, the time interval between the regressors and the outcome indicator dismisses the potential presence of reverse causality in the model; whether a participant is a “stayer” or a “leaver” in 2012 does not affect the value of cash payments made in 2005 or his or her socioeconomic status in 2005. However, the omission of factors that are simultaneously

correlated with the regressors and the unexplained variance of the probability of staying enrolled (ε_j) could bias the probit estimations (equation 1). For example, household members' concern about education and health and their cognitive skills are assumed to be positively and simultaneously correlated with the household's socioeconomic status (included in X_j), the accumulated value of grants (included in cash payments, $cash_j$) and the degree of programme involvement and understanding (and thus with $P(\text{Stayer}_j)$). Intuitively, such an omission might cause overestimation of the positive relationship between socioeconomic status and the probability of staying in the programme and, thus erroneously, result in rejection of the self-targeting hypothesis (H1). Regarding H2, these omitted factors might also cause overestimation of the positive relationship between cash transfers and the probability of staying in the programme. Unfortunately, these intuitions can only be partially tested, since such factors are often unobserved. However, this study attempts to capture these undesirable biases by including the highest cognitive skills score obtained by the adult household members in an alternative specification of equation 1.¹ Furthermore, as mentioned earlier, the number of children by age groups is taken into consideration to limit endogeneity biases. The omission of this factor could have resulted in an underestimation of the positive effect of cash incentives on the probability of staying enrolled in the programme (H2). Indeed, households with older children potentially received more through grants in 2005 (see table A.1) and thus have a higher dropout probability during a recertification process, owing to the possible coming of age of their children (because the *puntaje* is calculated using the number of minor children).

Another possible limitation of this study concerns the attrition of panel data between 2005 and 2012. However, there is no reason to assume that many of the households that no longer participated in the survey (for reasons such as migration) would have left the programme if they had continued to be included in the survey. Moreover, the potential programme dropouts who also left the survey are likely to have the same characteristics as the dropouts that remained in the survey. Therefore, we consider that panel attrition is not correlated with the probability of leaving the programme and thus does not affect the results.

V. Results

1. Descriptive statistics

As expected, the participation rate of households in the programme (based on the total samples) is significantly higher in rural areas than in urban communities (see table 1); while about one quarter of rural households enrolled in the programme in the 2002–2012 period, the participation rate of urban households increased from 3% in 2002 to 6% in 2012. This increase is probably related to the gradual expansion of the programme. While the participation rate in large cities (more than 100,000 inhabitants) tripled between 2002 and 2012, this rate only doubled in medium-sized cities (between 15,000 and 100,000 inhabitants) and increased by just 40% in small towns (between 2,500 and 15,000 inhabitants). In addition, the participation rate decreases as city size increases. In line with González-Flores, Heracleous and Winters (2012), this study concludes that implementation of the programme has proven difficult in major urban centres.

Table 2 shows that dropout rates from the programme are significantly higher in cities than in rural areas. One could conclude that this large gap is because poverty is less prevalent in urban areas than in rural ones. Nonetheless, several elements suggest that it might also be explained by the fact that urban cash incentives do not offset the constraints associated with compliance with conditionalities. Indeed, the cost of living differs significantly between rural and urban areas (see table A1.3 in annex A1).

¹ Cognitive skills scores are not included in the main model owing to the low number of observations for this variable.

Table 1
Household participation rates based on total samples, 2002, 2005/06, 2009–2012

	2002		2005/06		2009–2012	
	Number	Treated (percentages)	Number	Treated (percentages)	Number	Treated (percentages)
Urban areas	10 616	3	10 598	4	10 446	6
<i>more than 100 000 inhabitants</i>	6 812	1	6 639	2	6 475	3
<i>between 15 000 and 100 000 inhabitants</i>	1 863	3	1 849	5	1 866	6
<i>between 2 500 and 15 000 inhabitants</i>	1 941	9	2 110	10	2 105	13
Rural areas	7 834	25	7 969	26	8 304	26
Rural vs. urban mean-comparison test (p-value)		22 (0.000)		22 (0.000)		20 (0.000)

Source: Prepared by the author, on the basis of Ibero-American University (IBERO)/Center for Economic Research and Teaching (CIDE), “Mexican Family Life Survey” [online] <http://www.ennvih-mxfls.org/english/index.html>.

Table 2
Household dropout rates, 2005/06 and 2009–2012

	Enrolled in 2002		Enrolled in 2005/06	
	Number	Dropout rate in 2005/06 (Percentages)	Number	Dropout rate in 2009-2012 (Percentages)
Urban areas	269	64	401	55
<i>more than 100 000 inhabitants</i>	49	82	119	64
<i>between 15 000 and 100 000 inhabitants</i>	46	67	83	59
<i>between 2 500 and 15 000 inhabitants</i>	174	57	199	47
Rural areas	1 769	49	1 858	45
Rural vs. urban mean-comparison test (p-value)		15 (0.000)		9 (0.000)

Source: Prepared by the author, on the basis of Ibero-American University (IBERO)/Center for Economic Research and Teaching (CIDE), “Mexican Family Life Survey” [online] <http://www.ennvih-mxfls.org/english/index.html>.

In contrast, table 3 shows no significant payments gap between rural and urban areas in 2005. In addition, the distribution of cash transfers is similar in the two areas (see figure A1.1 in annex A1) and head of the household’s socioeconomic status does not substantially affect the value of cash incentives (see table A1.4 in annex A1). The lack of correlation between socioeconomic status and cash transfers indicates that the payment amounts are not proportional to the level of poverty, meaning that each beneficiary is entitled to the same amount. It also suggests that there is no significant corruption within the programme; there is no discernible group of richer participants who receive a disproportionately large portion of the cash payments.

Table 3
Annual cash transfers received by households in 2005/06
(Pesos)

	Number	Mean	Quartile I	Median	Quartile III
Urban areas	155	3 299	1 500	2 040	4 800
Rural areas	662	3 286	1 800	2 040	4 200
Rural vs. urban mean-comparison test (p-value)		12.23 (0.9596)			

Source: Prepared by the author, on the basis of Ibero-American University (IBERO)/Center for Economic Research and Teaching (CIDE), “Mexican Family Life Survey” [online] <http://www.ennvih-mxfls.org/english/index.html>.

2. Determinants of programme dropouts

Since the main objective of this study is to evaluate the impact of cash payments on the probability of participants staying in or dropping out of the Prospera programme, only households that were enrolled in the programme during the 2005/06 survey are analysed. As the next step, “stayers” and “leavers” were then identified using treatment status information from the 2012 survey. A probit regression was used to estimate the relationship between annual cash transfers received a year before the 2005/06 survey and the probability of staying in the programme rather than leaving between 2005/06 and 2009–2012 (see table 4). A control for the presence of heterogeneity between “stayers” and “leavers” was applied, using a comprehensive set of control variables collected during the 2005/06 survey. As discussed earlier, these control variables partially address the assumed endogeneity problems. These covariates include characteristics at the head of household level, at the household level and at the municipality level. Standard errors are clustered at the municipality level to correct for potential intracommunity correlation, such as specific enrolment facilities. The number of observations is relatively small owing to the low participation rate in Mexican cities. Hence, there are 98 enrolled households in the urban sample. However, the probit estimates are of suitable quality: the pseudo-R2s are high (between 45% and 58%).² Despite a small number of observations, the standard errors are not high and various explanatory variables are significant. This last point is not surprising, since all enrolled households have relatively homogeneous characteristics; both “stayers” and “leavers” are poor households.

Table 4
Determinants of the probability of staying compared to those of leaving
in urban areas, average marginal effects

Dependent variable	Staying versus leaving the programme between 2005 and 2012				
	(1)	(2)	(3)	(4)	(5)
Age of the head of the household (HH)	0.0385*** (2.980)	0.0352*** (3.011)	0.111*** (3.481)	0.0430*** (5.416)	0.0468*** (4.520)
Sex of HH (male)	-0.692*** (-3.396)	-0.713*** (-3.725)	-0.955*** (-3.333)	-0.515* (-1.804)	-0.689*** (-4.078)
Civil status of HH (in a couple)	0.625*** (3.880)	0.597*** (4.096)	0.797*** (3.246)	0.582*** (3.415)	0.621*** (3.945)
Number of young children (0–5 years old)	0.161* (1.872)	0.171* (1.946)	0.469*** (2.834)	0.0486 (0.527)	0.146* (1.768)
Number of older children (6–12 years old)	0.260*** (2.718)	0.260** (2.490)	0.501*** (3.529)	0.226** (2.406)	0.372*** (2.913)
Number of adolescents (13–15 years old)	-0.0152 (-0.146)	0.0150 (0.132)	0.0357 (0.253)	-0.0365 (-0.376)	-0.0684 (-0.522)
Percentage of girls (0–15 years old)	-0.00126 (-0.629)	-0.00117 (-0.553)	-0.000330 (-0.116)	0.000760 (0.348)	-0.00119 (-0.494)
Age-dependency ratio	-0.138 (-1.461)	-0.140 (-1.099)	-0.791*** (-3.005)	-0.0168 (-0.137)	-0.0573 (-0.465)
HH has no education	0.132 (0.787)	0.125 (0.809)	-0.180 (-0.768)	0.0340 (0.216)	0.275 (1.507)
Highest cognitive skills score obtained by adult household members			-0.00891* (-1.742)		
Informal salaried worker (HH) ^a	0.401** (2.512)	0.398** (2.448)	0.592** (2.391)	0.388* (1.713)	0.654*** (3.290)

² By running linear regressions of equation 1 (based on a linear least squares estimator), we observe that the R2s have similar values to the pseudo-R2s (not shown). This means that the variance of the selected regressors explains around 45%–60% of the variance in the probability of staying in the programme. The highest R2s and pseudo-R2s are found in the specification that includes the highest cognitive skills scores obtained by adult household members (see column 3 of table 4).

Table 4 (concluded)

Dependent variable	Staying versus leaving the programme between 2005 and 2012				
	(1)	(2)	(3)	(4)	(5)
Formal salaried worker (HH) ^a	0.472*	0.507*	0.749***	0.565**	0.589**
	(1.777)	(1.838)	(3.329)	(2.032)	(2.324)
Self-employed worker (HH) ^a	0.503***	0.545***	0.763***	0.577***	0.756***
	(3.940)	(4.078)	(3.199)	(3.080)	(4.303)
Labour income of HH-quartile I					1.000***
					(3.247)
Labour income of HH-quartile II	0.691**	0.673**	0.980***	-1.000***	
	(2.482)	(2.117)	(3.192)	(-2.582)	
Labour income of HH-quartile III	0.457	0.394	0.902***	-0.989**	
	(1.633)	(1.274)	(2.814)	(-2.534)	
Labour income of HH-quartile IV	0.521*	0.465	0.948***	-0.997**	
	(1.708)	(1.362)	(3.094)	(-2.252)	
Owned assets index	-1.017***	-1.020***	-1.319***	-0.859***	-1.501***
	(-3.229)	(-3.112)	(-3.406)	(-3.478)	(-3.456)
Square of owned assets index	0.159***	0.157***	0.197***	0.141***	0.222***
	(3.689)	(3.554)	(3.478)	(3.799)	(3.475)
Infrastructure development index	-0.210***	-0.221***	-0.295**	-0.164**	-0.188**
	(-3.374)	(-3.665)	(-2.303)	(-2.418)	(-2.144)
log(transfers)	0.228***			-0.479***	0.513***
	(3.049)			(-2.711)	(3.276)
Transfers-quartile II (1 500-2 040 pesos/year)		0.247	0.722**		
		(1.157)	(2.136)		
Transfers-quartile III (2 040-4 800 pesos/year)		0.127	0.256		
		(0.633)	(1.097)		
Transfers-quartile IV (>4 800 pesos/year)		0.548***	0.799***		
		(3.905)	(4.955)		
log(transfers)*Income quartile I					-1.107***
					(-3.660)
log(transfers)*Income quartile II				0.856***	
				(2.937)	
log(transfers)*Income quartile III				0.748***	
				(2.906)	
log(transfers)*Income quartile IV				0.639**	
				(2.519)	
Observations	98	98	89	98	98
Pseudo-R ²	44.84	46.91	58.37	47.70	54.42

Source: Prepared by the author, on the basis of Ibero-American University (IBERO)/Center for Economic Research and Teaching (CIDE), "Mexican Family Life Survey" [online] <http://www.ennvih-mxfls.org/english/index.html>.

Note: Cluster robust z-statistics (at the municipality level) are in brackets: *** p<0.01, ** p<0.05, * p<0.1.

^a The reference group comprises inactive, unemployed and unpaid heads of household.

Columns 1 and 2 of table 4 present the results of equation 1. The marginal effects of control variables are consistent with the results from González-Flores, Heracleous and Winters (2012). For instance, the greater the development of infrastructure in an urban municipality, the higher the dropout probability tends to be. It is likely that participants' concentration in the most marginalized communities leads to better dissemination and understanding of the programme. Moreover, as expected, having several young and preadolescent children in the household significantly increases the probability of staying enrolled between 2005/06 and 2009–2012. Interestingly, the percentage of girls has no impact on the probability of staying in the programme. One could have expected households with several girls receiving school grants to be more interested in staying enrolled, as the grants for girls are larger than those for boys (see table A1.1 in annex A1). In terms of the characteristics of heads of households, our

results support the findings of González-Flores, Heracleous and Winters (2012): when the head of the household is a woman, has a partner and is older, the probability of staying in the programme significantly increases. In contrast, heads of households who belong to a low occupational category (inactive, unemployed or unpaid) are at greater risk of dropping out. With regard to the head of the household's labour income, the richest 75% are more likely to stay in the programme than the poorest 25%. The probability of staying is particularly high for quartile II, compared to quartile I (67 to 69 percentage points higher). This non-linearity is extensively discussed by González-Flores, Heracleous and Winters (2012) who observe a U-shaped relationship between the poverty index (the *puntaje*) and dropout risk in urban areas. In short, in accordance with the seminal work of González-Flores, Heracleous and Winters (2012), our results highlight the difficulties in raising awareness of the programme among the most vulnerable participants (such as the inactive, unemployed and poor.) and encouraging them to enrol and remain in the programme.³ Since the poorest participants show a particularly high dropout probability, we can reject the self-targeting hypothesis (H1 rejected).

In column 1 of table 4, the annual cash transfers variable is expressed in a linear and logarithmic form. We find that the value of payments increases the probability of staying in the programme (significant at 1%). An extra unit of the logarithm of transfers raises the probability of staying in the programme by 23 percentage points. In column 2 of table 4, when the value of transfers is expressed in quartile categories, we note that households in quartile IV, which received more than 4,800 pesos in 2005, are more likely to stay in the programme than households in quartile I, which received less than 1,500 pesos. The gap between quartiles I and IV is around 55 percentage points (significant at 1%). However, there is no significant difference between the first three quartiles of cash transfers (quartiles I, II and III).

Column 3 of table 4 shows an alternative model specification that takes into account the highest cognitive skills score obtained by adult household members. Contrary to our expectations (see section IV), this factor reduces the probability of staying in the programme, although the fitted coefficient is only significant at 10%. It could be speculated that households comprised of adults with high cognitive skills are more likely to leave the programme because they better assess the imbalance between cash payments and conditionality-related costs. Moreover, this endowment of cognitive skills potentially increases the probability of finding more economically attractive opportunities than social cash transfers (e.g. employment opportunities), which is somewhat consistent with the self-targeting theory (see section II.2). So, somewhat counterintuitively, when cognitive skills are omitted from the equation (results in columns 1 and 2), the positive effects of the cash payments and head of household labour income on the probability of staying in the programme are underestimated. Indeed, cognitive skills are assumed to be positively correlated with cash payments and income but negatively correlated with programme participation. As explained in section IV, additional factors, such as level of concern about health and education, could remain unobserved, leading to bias in the results through overestimation of the positive effects of head of household income on the probability of staying in the programme. However, given the high significance and magnitude of the estimated coefficients in table 4, it is assumed that such omitted factors do not significantly bias the estimates.

Lastly, columns 4 and 5 of table 4 present alternative specifications that introduce interaction terms between head of household labour income and the level of the logarithm of transfers. A priori, the head of the household's labour income significantly affects the relationship between cash incentives and the probability of staying in the programme. More specifically, column 4 shows that cash transfers significantly increase the likelihood of staying in the programme for the households in the top three income quartiles (quartiles II, III and IV), compared to the poorest (quartile I). Similarly, column 5 indicates that

³ However, table 4 shows that households with the fewest assets and those with the most are more likely to stay compared to households with an intermediate number of assets. This U-shaped relationship between owned assets and the probability of staying is not consistent with our assumptions. Nevertheless, in terms of proportion, very few households are at the left-hand end of the assets distribution: only 7% of households own between 0 and 2 assets (results available on request). Therefore, this U-shaped relationship might be caused by the presence of extreme cases.

a one unit increase in log-transfers decreases by 0.6 percentage points⁴ the probability of the poorest 25% staying compared to the richest 75% (coefficient significant at 1%). These results are our most significant contribution to existing literature. In short, the poorest households are particularly sensitive to the low payment amounts that characterize the urban version of the programme. We speculate that the urban cash transfers fail to offset the constraints associated with compliance with conditionalities (such as direct and indirect costs, loss of time and preference for immediate gratification), resulting in the poorest households leaving the programme (H2 accepted).

VI. Conclusions

In keeping with the seminal work of González-Flores, Heracleous and Winters (2012), we find a positive relationship between head of household income and the probability of staying in the programme for urban Mexican households. This positive trend disproves the self-targeting theory and is indicative of considerable exclusion errors. This finding is critical for the programme's administrators as it calls into question the effectiveness of the scheme in its current format: despite its goals, the programme fails to target and retain the poorest households living in urban areas.

This study contributes to the existing literature by drawing attention, through empirical analysis, to the role of cash incentives as a key determinant of the worryingly high number of programme dropouts in urban areas. In line with theory on take-up, our results highlight the imbalance between cash incentives and conditionality-related constraints that significantly increase exclusion errors and programme dropouts in urban areas of Mexico. Below a certain threshold, cash allowances may not offset the constraints related to compliance with conditionalities (such as direct and indirect costs) and may, therefore, increase the risk of dropping out of the programme. Moreover, the low cash incentives available to households in Mexican cities particularly affect the capacity of the poorest to stay in the programme. This indicates that the conditionalities are particularly difficult to meet for the poorest and most disadvantaged households (as assumed by González-Flores, Heracleous and Winters (2012)). In addition to the apparent inability of the programme to retain the poorest participants, the insufficient cash incentives may dissuade many poor households from even enrolling. Therefore, we can conclude that the relatively low value of the cash transfers in urban areas may largely explain the low participation rate and the high dropout rate.

The results suggest that the cash incentives in Mexican cities are too low (the amount is the same as that paid to rural households) to offset the different constraints arising from compliance with the related conditionalities. Since the cost of living is higher in cities than in rural areas of Mexico, we recommend adapting the value of cash transfers to the urban cost of living. Increasing the value of transfers in urban areas might not only encourage more eligible households to enrol but may also curb the number of dropouts among the poorest beneficiaries. In addition, reducing the number of dropouts and exclusion errors is in the public interest for reasons other than combating poverty. For example, a recent study has shown that long-term enrolment in the programme has a protective effect against weight gain (obesity being a huge problem in emerging countries such as Mexico), while short-term enrolment increases the risk of weight gain (Levasseur, 2019). Evidently, additional analysis is needed to determine the appropriate value of cash transfers for urban households. To minimize the negative externalities that an extra cash payment could generate, such as migration flows or inclusion errors, the programme administrators should take several precautions. For instance, the value of cash payments should be proportional to the cost of living in the municipality and proportional to the poverty level of

⁴ $\frac{\Delta \text{Prob}(\text{staying})}{\Delta \log(\text{transfers})} = 0.5113 + (-1.107) * \Delta \text{Income}Q1 = 0.5113 + (-1.107) * 1 = -0.5957$.

the eligible household. In addition to potentially discouraging migration, such proportional payments may reduce the risk of dropping out for the poorest households living in the most expensive areas. Lastly, an important finding that should be taken into account is that dropout risk increases in tandem with household vulnerability and city size.

Bibliography

- Álvarez, C., F. Devoto and P. Winters (2008), “Why do beneficiaries leave the safety net in Mexico? A study of the effects of conditionality on dropouts”, *World Development*, vol. 36, No. 4, Amsterdam, Elsevier.
- Angelucci, M. and O. Attanasio (2009), “Oportunidades: program effect on consumption, low participation, and methodological issues”, *Economic Development and Cultural Change*, vol. 57, No. 3, Chicago, The University of Chicago Press.
- Angelucci, M., O. Attanasio and V. Di Maro (2012), “The impact of Oportunidades on consumption, savings and transfers”, *Fiscal Studies*, vol. 33, No. 3, Oxford, Blackwell Publishing.
- Attanasio, O., C. Meghir and N. Schady (2010), “Mexico’s conditional cash transfer programme”, *The Lancet*, vol. 375, No. 9719, Amsterdam, Elsevier, 20 March.
- Banerjee A. and E. Duflo (2011), *Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty*, New York, Public Affairs.
- Behrman, J. R. and others (2012), “Are conditional cash transfers effective in urban areas? Evidence from Mexico”, *Education Economics*, vol. 20, No. 3, London, Routledge, Taylor & Francis.
- Fiszbein, A. and others (2009), “Conditional cash transfers: reducing present and future poverty”, *A World Bank Policy Research Report*, 47603, Washington, D.C., The World Bank.
- González-Flores, M., M. Heracleous and P. Winters (2016), “Conditional cash transfers and schooling decisions: evidence from urban Mexico”, *IDB Working Paper Series*, No. 721, Washington, D.C., Inter-American Development Bank (IADB).
- (2012), “Leaving the safety net: an analysis of dropouts in an urban conditional cash transfer program”, *World Development*, vol. 40, No. 12, Amsterdam, Elsevier.
- Hernández, D., J. Gómez de León and G. Vásquez (1999), *Más oportunidades para las familias pobres: evaluación de resultados del Programa de Educación, Salud y Alimentación: primeros avances*, Mexico City, Secretariat of Social Development (SEDESOL).
- Hoddinott, J. and L. Bassett (2008), “Conditional cash transfer programs and nutrition in Latin America: assessment of impacts and strategies for improvement”, *SSRN Scholarly Paper*, No. 1305326, Rochester, Social Science Research Network [online] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1305326.
- Levasseur, P. (2019), “Can social programs break the vicious cycle between poverty and obesity? Evidence from urban Mexico”, *World Development*, vol. 113, Amsterdam, Elsevier.
- Orozco, M. and C. Hubert (2005), “La focalización en el Programa de Desarrollo Humano Oportunidades de México”, *Serie de Documentos de Discusión sobre la Protección Social*, 32761, No. 0531, Washington, D.C., World Bank.
- Schultz, T. P. (2004), “School subsidies for the poor: evaluating the Mexican Progresa poverty program”, *Journal of Development Economics*, vol. 74, No. 1, Amsterdam, Elsevier.
- Skoufias, E. (2005), “PROGRESA and its impacts on the welfare of rural households in Mexico”, *Research Report*, 139, Washington, D.C., International Food Policy Research Institute (IFPRI).
- Skoufias, E., B. Davis and S. de la Vega (2001), “Targeting the poor in Mexico: an evaluation of the selection of households into PROGRESA”, *World Development*, vol. 29, No. 10, Amsterdam, Elsevier.

Annex A1

Table A1.1

Estimates of school grants and basic food transfers under the Mexican CCT programme between 1999 and 2012
(Pesos)

	Dec 1999	Dec 2002	Dec 2005	Dec 2009	Dec 2012
Basic food transfers per household	125	150	170	202	227
School grants per child					
<i>Third year of primary school</i>	80	96	109	130	145
<i>Fourth year of primary school</i>	95	114	129	154	173
<i>Fifth year of primary school</i>	125	150	170	202	227
<i>Sixth year of primary school</i>	165	198	224	267	300
<i>First year of secondary school for boys</i>	240	289	326	389	436
<i>Second year of secondary school for boys</i>	250	301	340	405	454
<i>Third year of secondary school for boys</i>	265	319	360	429	482
<i>First year of secondary school for girls</i>	250	301	340	405	454
<i>Second year of secondary school for girls</i>	280	337	381	453	509
<i>Third year of secondary school for girls</i>	305	367	414	494	554
Grant for school materials per children					
<i>Primary school</i>	165	198	224	267	300
<i>Secondary school</i>	205	246	279	332	373
Cash transfer ceiling per household	750	902	1019	1214	1363
Inflation multiplier	1	1.2024	1.359	1.6188	1.8172

Source: Prepared by the author, on the basis of D. Hernández, J. Gómez de León and G. Vásquez, *Más oportunidades para las familias pobres: evaluación de resultados del Programa de Educación, Salud y Alimentación: primeros avances*, Mexico City, Secretariat of Social Development (SEDESOL), 1999, and Ibero-American University (IBERO)/Center for Economic Research and Teaching (CIDE), "Mexican Family Life Survey" [online] <http://www.enrvih-mxfls.org/english/index.html>.

Note: The inflation multiplier is calculated using the consumer price index provided by the National Institute of Statistics and Geography (INEGI).

Table A1.2
Descriptions of variables

Variable	Description
Age of the head of the household	Age of the head of household in years.
Sex of the head of the household	Male=1; Female=0.
Civil status of the head of the household	In a couple=1; Not in a couple=0.
Number of children in the household by age groups	Three age groups were used: 0–5 years (not in school); 6–12 years (primary school); 13–15 years. (secondary school)
Percentage of girls	The number of girls (aged 15 or under) is divided by the total number of young household members aged 15 or under and the result is multiplied by 100.
Education of the head of the household	No education=1; Primary education (at least)=0
Highest cognitive skills score obtained by household adult members	The cognitive skills score is measured using MxFLS and a standard approach based on Raven's Progressive Matrices. The score ranges from 0 (for low cognitive skills) to 100 (for high cognitive skills). This study uses the highest score obtained by adult members within the household because no information was available for each household member.
Occupational status	Four categories: inactive, unemployed or unpaid worker (the reference group); informal salaried; formal salaried; self-employed.
Labour income of the head of the household	Annual labour income of heads of the household in pesos were grouped by quartile for analysis. Labour incomes were corrected for price variations between the Mexican regions using data from the National Institute of Statistics and Geography (INEGI).
Owned assets index	The composite index of household assets adds six dummy variables: a property; a second property; a motorized vehicle; an electronic device; a household appliance; and an electrical cooking appliance. Hence, this index ranges from 0 for the poorest households to 6 for the wealthiest.
Infrastructure development index	The composite index of infrastructure development of the municipality adds the five following dummy variables: public transportation; health centre; refuse collection; sewage system; and running water. Hence, this index ranges from 0 for the poorest municipalities to 5 for the most developed municipalities.
Age-dependency ratio	Number of minors (aged under 18) and older persons (aged over 65) in the household, divided by the number of household members of working age (18 to 65 years).
The annual amount of cash transfers received by the household	Sum of annual payments received by all household members (in pesos). This variable is analysed using two approaches: a logarithmic transformation (linear approach) and a quartile transformation (non-linear or categorical approach)

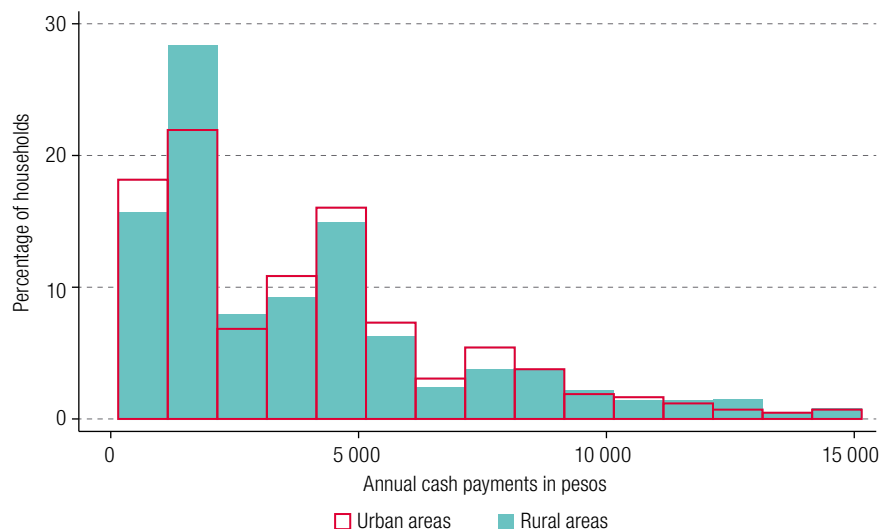
Source: Prepared by the author.

Table A1.3
Prices of tortillas and beverages in 2012 by area of residence
(Pesos)

	Mean price of one kilo of tortillas	Mean price of one bottle of a soft drink
Urban areas	45	22
<i>more than 100 000 inhabitants</i>	44	23
<i>between 15 000 and 100 000 inhabitants</i>	45	21
<i>between 2 500 and 15 000 inhabitants</i>	46	19
Rural areas	36	17
Rural vs. urban mean-comparison test	8	5
(p-value)	(0.000)	(0.000)

Source: Prepared by the author, on the basis of Ibero-American University (IBERO)/Center for Economic Research and Teaching (CIDE), "Mexican Family Life Survey" [online] <http://www.ennvih-mxfls.org/english/index.html>.

Figure A1.1
Distribution of cash payments by households' area of residence
(Percentage of households and pesos)



Source: Prepared by the author, on the basis of Ibero-American University (IBERO)/Center for Economic Research and Teaching (CIDE), "Mexican Family Life Survey" [online] <http://www.ennvih-mxfls.org/english/index.html>.

Table A1.4
Influence of socioeconomic status on the value of cash payments received
by participating households, 2005
(Pesos)

	Number	Mean	Standard deviation	Median
Labour income of the head of the household (quartile)				
Quartile I	32	2 691	2 190	2 040
Quartile II	40	3 066	2 161	2 040
Quartile III	25	3 182	2 343	2 040
Quartile IV	32	3 381	2 645	2 460
Education of the head of the household				
Primary education (minimum)	37	3 584	2 771	2 750
No education	115	2 993	2 250	2 040
Occupation of the head of the household				
Inactive	24	2 373	1 897	2 040
Informal salaried	64	3 172	2 424	2 040
Self-employed	47	3 163	2 430	2 040
Formal salaried	14	3 640	2 320	3 600

Source: Prepared by the author, on the basis of Ibero-American University (IBERO)/Center for Economic Research and Teaching (CIDE), "Mexican Family Life Survey" [online] <http://www.ennvih-mxfls.org/english/index.html>.

Note: All mean-comparison tests between each group are non-significant at the 10% level. Thus, we accept the null hypothesis of mean equality between several subsamples.

Guidelines for contributors to the *CEPAL Review*

In order to facilitate the submission, consideration and publication of articles, the editorial board of the *CEPAL Review* has prepared the following information and suggestions to serve as a guide for future contributors.

The submission of an article implies an undertaking by the author not to submit it simultaneously to other publications. The copyright to all articles published in the *Review* shall be owned by the United Nations.

Each article will be reviewed by the editorial board, which may decide to submit it to external referees.

Papers should be submitted in the original language (English, French, Portuguese or Spanish). They will be translated into the appropriate language by the relevant ECLAC services.

Each article must be accompanied by a summary, no more than 150 words in length, giving a brief description of its subject matter and main conclusions.

Each article must also carry three JEL (Journal of Economic Literature) classification codes. The JEL Classification Codes Guide is available online at www.aeaweb.org/jel/jel_class_system.php.

Papers should be no longer than 10,000 words, including the summary, notes and bibliography. Shorter papers will also be considered.

Articles should be sent by e-mail to revista@cepal.org in Word format. Papers in pdf format will not be accepted.

Style guide:

Titles should not be excessively long.

Footnotes

- It is recommended that footnotes be kept to a minimum.
- It is recommended that footnotes not be used to cite bibliographical references; such references should preferably be incorporated into the text.
- Footnotes should be numbered consecutively using superscript Arabic numerals.

Tables, figures and equations

- It is recommended that tables and figures be kept to a minimum, avoiding any redundancy with the text.
- Equations should be written using the Office equation editor "MathType"; they should not be inserted as "pictures".

- Tables, figures and other elements should be inserted at the end of the text in the format in which they were designed; they should not be inserted as "pictures". Figures in Excel should include the corresponding worksheets.
- The location of tables and figures in the body of the article should be indicated in the appropriate place as follows:
Insert figure 1
Insert table 1
- Tables and figures should include an explicit and complete reference to their sources.
- Tables should indicate the period covered at the end of the title, and should indicate the units in which the data are expressed in a subtitle (in italics and between brackets).
- The symbols referred to in the "Explanatory notes" which appear on the page preceding the table of contents should be taken into account in the preparation of tables and figures.
- Footnotes to tables and figures should be ordered consecutively using superscript lower-case letters.
- Figures should be prepared bearing in mind that they will be printed in black and white.

Acronyms and abbreviations

- Acronyms and abbreviations should not be used unless absolutely necessary, in which case the full name should be written out the first time it occurs in the article.

Bibliography

- Bibliographical references should be directly related to the content of the article and should not be excessively long.
- At the end of the article, under the title "Bibliography", all the necessary information should be included accurately and in alphabetical order by author: name of author(s), year of publication, full name of article (if any) and publication (including any subtitle), city of publication, publisher and, in the case of a periodical, month of publication.

The editorial board of the *Review* reserves the right to make any necessary editorial changes in the articles, including their titles.

Authors will receive a one-year courtesy subscription to the *Review*, plus 30 offprints of their article in Spanish and 30 in English, at the time of publication in each language.

Publicaciones recientes de la CEPAL

ECLAC recent publications

www.cepal.org/publicaciones

■ Informes Anuales/*Annual Reports*

También disponibles para años anteriores/*Issues for previous years also available*



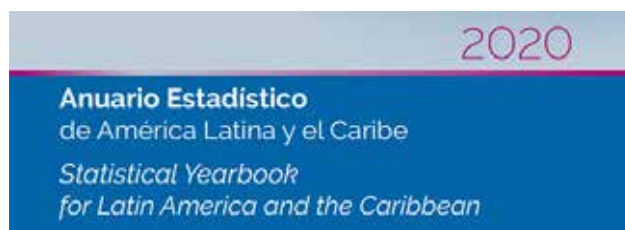
Estudio Económico de América Latina y el Caribe 2020
Economic Survey of Latin America and the Caribbean 2020



La Inversión Extranjera Directa en América Latina y el Caribe 2020
Foreign Direct Investment in Latin America and the Caribbean 2020



Balance Preliminar de las Economías de América Latina y el Caribe 2020
Preliminary Overview of the Economies of Latin America and the Caribbean 2020



Anuario Estadístico de América Latina y el Caribe 2020
Statistical Yearbook for Latin America and the Caribbean 2020



Panorama Social de América Latina 2020
Social Panorama of Latin America 2020



Perspectivas del Comercio Internacional de América Latina y el Caribe 2020
International Trade Outlook for Latin America and the Caribbean 2020

El Pensamiento de la CEPAL/ECLAC Thinking

Construir un nuevo futuro: una recuperación transformadora con igualdad y sostenibilidad

Building a New Future: Transformative Recovery with Equality and Sustainability

La ineficiencia de la desigualdad

The Inefficiency of Inequality

Desarrollo e igualdad: el pensamiento de la CEPAL en su séptimo decenio.

Textos seleccionados del período 2008-2018



Libros y Documentos Institucionales/Institutional Books and Documents

Construir un futuro mejor: acciones para fortalecer la Agenda 2030 para el Desarrollo Sostenible. Cuarto informe sobre el progreso y los desafíos regionales de la Agenda 2030 para el Desarrollo Sostenible en América Latina y el Caribe

Building forward better: Action to strengthen the 2030 Agenda for Sustainable

Development. Fourth report on regional progress and challenges in relation to the 2030 Agenda for Sustainable Development in Latin America and the Caribbean

Panorama Fiscal de América Latina y el Caribe, 2020: la política fiscal ante la crisis derivada de la pandemia de la enfermedad por coronavirus (COVID-19)

Fiscal Panorama of Latin America and the Caribbean, 2020: fiscal policy amid the crisis arising from the coronavirus disease (COVID-19) pandemic



Libros de la CEPAL/ECLAC Books

La tragedia ambiental de América Latina y el Caribe

La emergencia del cambio climático en América Latina y el Caribe: ¿seguimos esperando la catástrofe o pasamos a la acción?

The climate emergency in Latin America and the Caribbean: The path ahead – resignation or action?

Los sistemas de pensiones en la encrucijada: desafíos para la sostenibilidad en América Latina



Páginas Selectas de la CEPAL/ECLAC Select Pages

Protección social universal en América Latina y el Caribe.

Textos seleccionados 2006-2019

Migración y desarrollo sostenible: la centralidad de los derechos humanos.

Textos seleccionados 2008-2019

Empleo en América Latina y el Caribe.

Textos seleccionados 2006-2017



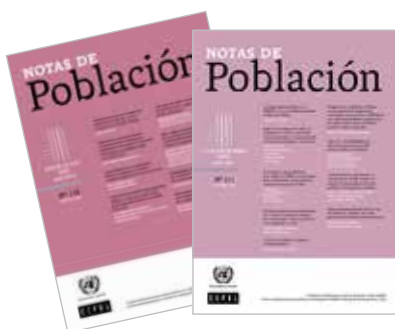
Revista CEPAL/CEPAL Review



Series de la CEPAL/ECLAC Series



Notas de Población



**Observatorio Demográfico
Demographic Observatory**



**Documentos de Proyectos
Project Documents**



**Informes Especiales COVID-19
Special Reports COVID-19**



Coediciones/Co-editions



Copublicaciones/Co-publications



**Suscríbese y reciba información oportuna
sobre las publicaciones de la CEPAL**

**Subscribe to receive up-to-the-minute
information on ECLAC publications**



www.cepal.org/es/suscripciones

www.cepal.org/en/suscripciones



NACIONES UNIDAS
UNITED NATIONS



www.cepal.org/publicaciones



facebook.com/publicacionesdelacepal

**Las publicaciones de la CEPAL también se pueden adquirir a través de:
ECLAC publications also available at:**

shop.un.org

United Nations Publications
PO Box 960
Herndon, VA 20172
USA

Tel. (1-888)254-4286
Fax (1-800)338-4550
Contacto/Contact: publications@un.org
Pedidos/Orders: order@un.org



REVIEW

MIGUEL TORRES
Editor

www.cepal.org/en/review

EDITORIAL BOARD

OSVALDO SUNKEL
Chairman

JOSÉ ANTONIO ALONSO
RENATO BAUMANN
LUIS BECCARIA
LUIS BÉRTOLA
LUIZ CARLOS BRESSER-PEREIRA
MARIO CIMOLI
JOHN COATSWORTH
ROBERT DEVLIN
CARLOS DE MIGUEL
RICARDO FERENCH-DAVIS
DANIEL HEYMANN
MARTÍN HOPENHAYN
AKIO HOSONO
GRACIELA MOGUILLANSKY
JUAN CARLOS MORENO-BRID
JOSÉ ANTONIO OCAMPO
CARLOTA PÉREZ
GERT ROSENTHAL
PAUL SCHREYER
BARBARA STALLINGS
ANDRAS UTHOFF
ROB VOS



UNITED NATIONS

ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN

ECLAC

United Nations Publication • S.21-00507 • April 2021 • ISSN 0251-2920
Copyright © United Nations • Printed in Santiago



LC/PUB.2021/6-P/REV.1