N° 136
APRIL • 2022

CEPAL REVIEW

ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN

UNITED NATIONS

ECLAC

ISSN 0251-2920

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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.

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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.2022/5-P
Sales No.: E.22.II.G.8
Distribution: G

Printed at United Nations, Santiago
S.21-00929

This publication should be cited as: Economic Commission for Latin America and the Caribbean (ECLAC), *CEPAL Review*, No. 136 (LC/PUB.2022/5-P), Santiago, 2022.

Contents

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.

Determinants of capital accumulation in Latin America

Jeruza Haber, Leonardo Bornacki de Mattos[1]
and Luciano Dias de Carvalho

Abstract

The theoretical model of Bhaduri and Marglin (1990) is one of the most discussed works regarding capital accumulation and functional income distribution. However, their analysis does not include the effects of an economy with government. The aim here is to identify the relationships between capital accumulation, the real exchange rate and the debt-to-GDP ratio, using a modified version of that model. The results of the theoretical model showed that an increase in the debt-to-GDP ratio contributes to a regime of conflict between capitalists and workers. The empirical results for a group of countries in Latin America are consistent with this. Undervaluation of the real exchange rate has a positive influence on capital accumulation. A higher debt-to-GDP ratio has a negative effect.

Keywords

Capital, capital formation, foreign exchange rates, public debt, gross domestic product, income distribution, economic growth, econometric models, Latin America

JEL classification

E12, F31, F43

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[1] The author gratefully acknowledges the financial support received from the National Council for Scientific and Technological Development (CNPq) through a PQ-2 research productivity grant.

I. Introduction

The relationship between capital accumulation and functional income distribution has been studied by several authors, such as Bhaduri and Marglin (1990), Bowles and Boyer (1990), Lima, Sicsú and de Paula (1999), Uemura (2000), Stockhammer and Onaran (2004), Naastepad (2006), Hein and Vogel (2008) and Stockhammer, Onaran and Ederer (2009). "The relationship between growth and income distribution enables identifying economic growth patterns. Thus, if aggregate demand responds positively to a profit share increase in income, it is said that the economy is characterized by a profit-led regime. In situations where aggregate demand responds negatively to a profit share increase in income, the economic growth regime can be characterized as wage-led" (Araújo and Gala, 2012, p. 41).

Depending on the prevailing regime of accumulation, a greater share of wages in income can increase or decrease capital accumulation. Thus, wage variations have a complex and ambiguous influence on the level of production and employment. Wage increases can drive up production costs, causing a decrease in capital accumulation, but they can also expand the purchasing power of workers, leading to an increase in effective demand (Bhaduri and Marglin, 1990; Bowles and Boyer, 1990; Lima, Sicsú and de Paula, 1999; Uemura, 2000; Stockhammer and Onaran, 2004; Naastepad, 2006; Hein and Vogel, 2008; Stockhammer, Onaran and Ederer, 2009).

Bhaduri and Marglin (1990) developed a theoretical model in which capital accumulation is explained by the profit share in income and the level of capacity utilization. This model is usually applied in the context of "neo-Kaleckian" models of growth and functional income distribution, in which the level of the real exchange rate can affect long-term economic growth, owing to the impact this variable has on the functional distribution of income. In fact, if a profit-led accumulation regime prevails, an undervalued real exchange rate causes higher inflation, which in turn leads to a reduction in real wages. This exponentially increases firms' profit margins, encouraging them to increase productive capacity utilization and, consequently, levels of investment (Bhaduri and Marglin, 1990; Blecker, 2011).

Empirical data accumulated in recent years suggests that maintaining the real exchange rate at a competitive and stable level can directly stimulate capital accumulation, mainly in developing countries (Oreiro and de Paula, 2007; Gala, 2008; Razmi, Rapetti and Skott, 2009; Missio, 2012; Rapetti, Skott and Razmi, 2012; Oreiro and Araújo, 2013; Oreiro, Missio and Jayme, 2015). To study the relationship between economic growth, income distribution and the real exchange rate, Missio (2012) and Oreiro and Araújo (2013) developed a non-linear macrodynamic model for an open economy in which investment in fixed capital is assumed to be a function of the profit share of income and the level of capacity utilization, as in Bhaduri and Marglin (1990), but also as a quadratic function of the real exchange rate.

This article aims to contribute to the relevant literature by expanding on the theoretical model of Bhaduri and Marglin (1990) to include the variables "real exchange rate"[2] and "debt-to-GDP ratio" as determinants of capital accumulation. Another intended contribution to the literature is the use of the expanded theoretical model for empirical analysis, based on econometric estimation of the model from data on a group of Latin American countries for the 1990–2014 period.[3]

In this article, the inclusion of the debt-to-GDP ratio is based on the history of the Latin American countries analysed, which tend to face recurrent economic instability, with undesirable political and social repercussions. In some cases, the instability is related to the productive structure and external

[2] Real exchange rate misalignment refers to a situation in which a country's real exchange rate deviates from the notion of an "equilibrium" real exchange rate. The exchange rate is said to be "undervalued" when it is depreciated with respect to the equilibrium and "overvalued" when it is appreciated with respect to the equilibrium. These misalignments are considered to influence economic performance (Razin and Collins, 1997).

[3] Argentina, the Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Panama, Paraguay, Peru, the Plurinational State of Bolivia and Uruguay. The selected countries account for around 94% of the GDP of Latin American countries.

economic relations of these countries. Given the constant variations in the prices of primary products on the international market and the inelasticity of demand for those products, countries' capacity to service debts is compromised, giving rise to imbalances and a need for external financing (Munhoz, 2002).

With high levels of public debt, Latin American governments are constrained in terms of monetary policy, leading to higher inflation, lower real wages and, consequently, a smaller share of wages in income. The need to maintain high interest rates creates a situation of macroeconomic instability in the countries, which translates into low rates of capital accumulation and economic growth (Oreiro, Sicsú and de Paula, 2003).

Government financing difficulties increase expectations of default and countries lose the political capacity to make internal economic and financial decisions, leaving them at the mercy of the market and unable to invest or accumulate capital (Hermann, 2002). The reduction in public resources for investment also affects the confidence of private investors, and they are left to hope that at some point governments will increase the tax burden to pay their debts. As a result, private investors do not invest either, which reduces capital accumulation and, consequently, growth of countries' economies.

Regarding the relationship between public debt and the exchange rate, in some cases, the former is linked to the latter. Exchange rate fluctuations will influence the volume and risk of debt and public sector financing needs. Initially, a pattern of exchange rate undervaluation increases the cost of external debt, which is often dollar-denominated (Meurer, Moura and Nunes, 2007).

The theoretical results show that a higher debt-to-GDP ratio contributes to a regime of conflict between capitalists and workers. The empirical results were consistent with the adapted theoretical model. Specifically, it can be observed that greater undervaluation of the real exchange rate, of the profit share in income and of capacity utilization has a positive influence on capital accumulation. A higher debt-to-GDP ratio also has a negative effect on investment.

This article is divided into six sections, including this introduction. The second section describes the basic structure of the theoretical model adapted from that of Bhaduri and Marglin (1990). The third section outlines the development of the adapted model, its implications and theoretical results, and the fourth section details the methodology for the empirical analysis of the adapted model. The fifth section presents and analyses the empirical results obtained, and the sixth section provides the conclusions of the work.

II. Adapting the theoretical model to the determinants of capital accumulation

This section presents the structure of the theoretical model adapted from the original study by Bhaduri and Marglin (1990). The model developed by these authors is based on an economy without government Therefore, in this section, an adapted model will be structured that aims to describe the relationship between real wages and effective demand in a context of distributional conflict for an economy with government.

Aggregate savings (S) are given by:

$$S = S_P + S_G + S_E \tag{1}$$

where S_P is private savings, S_G is government savings and S_E is external savings.

It is assumed that workers consume all their income and that capitalists save a portion s of their untaxed profits. Thus, it is possible to describe the private savings function S_P as follows:

$$S_P = s(1 - \tau)R \tag{2}$$

where s is the propensity to save of capitalists $(0 < s < 1)$, R is the profit of capitalists, and τ is the tax rate on profit $(0 < \tau < 1)$.

Government savings (S_G) are the difference between tax revenues (T) and government expenditure (G):

$$S_G = T - G \tag{3}$$

The government only taxes capitalists by means of a tax rate on profits (τ):

$$T = \tau R \tag{4}$$

In the interest of simplification, government expenditure is assumed to be composed only of amortization of public debt and interest on that debt:

$$G = (\alpha + i)D \tag{5}$$

where α is the amortization rate for public debt $(0 < \alpha < 1)$, i is the interest rate of public debt $(0 < i < 1)$, and D is public debt.

External savings can be written as given by:

$$S_E = \varphi_0 Y - \varphi_1 \theta \tag{6}$$

where Y is national income and θ is the real exchange rate of the economy. Consider that $\varphi_0 > 0$ and $\varphi_1 > 0$.

Substituting equations (2) to (6) in (1) and making some adaptations, the new aggregate savings equation is obtained:

$$S = \Gamma h z - (\alpha + i)\mathcal{S} z + \varphi_0 z - \varphi_1 \theta \tag{7}$$

where $\Gamma = \left[s(1-\tau) + \tau\right]$; $h = R/Y*$ is the share of profits in income; $z = Y/Y*$ is capacity utilization and $\mathcal{S} = D/Y$ is public debt as a proportion of income.[4]

As in Bhaduri and Marglin (1990), the investment function is inferred from the savings function. Thus, the new version of the investment function is:

$$I = I(h, z, \mathcal{S}, \theta) \tag{8}$$

where $I_h > 0$, $I_z > 0$, $I_{\mathcal{S}} < 0$ and $I_\theta > 0$.

A country's debt is generally divided into capital expenditure, interest payments and primary current expenditure. Capital expenditure is considered productive debt and primary current expenditure unproductive debt. Capital expenditure, such as infrastructure investment, increases productivity and promotes economic growth. Unproductive debt, in contrast, does not stimulate a country's growth, and is strictly financial. Throughout the history of Latin American countries, productive debt has represented a small part (around 20%) of total public debt as a proportion of income. Most debt is unproductive and corresponds to primary current expenditure (ECLAC, 2018).

[4] Here, the potential output is normalized, without loss of generality, to make it equal to 1.

The justification for including public debt as a proportion of income in the original investment function is that that the higher debt-to-GDP ratios in Latin American countries tend to reduce capital accumulation (investment) through several channels: they reduce governments' investment capacity and therefore decrease total investment; they increase expectations that tax burdens will increase (to finance the rise in debt), thus discouraging private investors and in turn reducing total investment; they increase perceived country risk among foreign investors, which is detrimental to capital accumulation and economic growth (Meurer, Moura and Nunes, 2007; Oreiro, Sicsú and de Paula, 2003).

With a high debt-to-GDP ratio, monetary policy is dominated by fiscal policy. As a result, inflation tends to remain higher, affecting real wages and reducing the share of wages in income.

Undervaluation of the real exchange rate stimulates net exports, which eases the external constraint and allows countries to benefit from static and dynamic economies of scale (owing to the larger market). These effects increase effective demand and intensify economic growth.

The macroeconomic equilibrium is given by:

$$S = I \tag{9}$$

where aggregate saving *(S)* is equal to the aggregate investment *(I)* of the economy. Based on this equilibrium, the adapted theoretical model can be developed, on the basis of the original model of Bhaduri and Marglin (1990).

III. Developing the adapted theoretical model on the determinants of capital accumulation

This section outlines the development of the theoretical model adapted from the original study by Bhaduri and Marglin (1990) and the results obtained.

Substituting (7) and (8) into (9), it follows that $\Gamma h z - (\alpha + i)\mathcal{S} z + \varphi_0 z - \varphi_1 \theta = I = I(h, z, \mathcal{S}, \theta)$. Therefore, the slope of the IS (investment-saving) curve is:

$$\frac{dz}{dh} = \frac{I_h - \Gamma z}{\Gamma h + \varphi_0 - (\alpha - i)\mathcal{S} - I_z} \lessgtr 0 \tag{10}$$

Analysing the slope of the IS curve, some possible results can be obtained, which are summarized in table 1.

Table 1
Possible slopes of the IS (investment-saving) curve and their conditions

Cases	Slope	Conditions
A	$dz/dh > 0$	$(I_h - sz) > (1 - s)\tau z$ $sh + (1 - s)\tau h + \varphi_0 > (\alpha + i)\mathcal{S} + I_z$
B	$dz/dh > 0$	$(I_h - sz) < (1 - s)\tau z$ $sh + (1 - s)\tau h + \varphi_0 < (\alpha + i)\mathcal{S} + I_z$
C	$dz/dh < 0$	$(I_h - sz) > (1 - s)\tau z$ $sh + (1 - s)\tau h + \varphi_0 < (\alpha + i)\mathcal{S} + I_z$
D	$dz/dh < 0$	$(I_h - sz) < (1 - s)\tau z$ $sh + (1 - s)\tau h + \varphi_0 > (\alpha + i)\mathcal{S} + I_z$

Source: Prepared by the authors, on the basis of the results of this research.

For a positive IS curve as in case A, the sensitivity of investment with respect to the share of profits in income minus aggregate savings relative to potential output, has to be greater than the propensity to consume multiplied by the amount collected as a proportion of potential output; marginal propensity to consume measures how much a person's consumption increases when there is an increase in their disposable income. In addition, the savings of capitalists added to the marginal propensity to consume multiplied by the tax that affects the share of profits in income plus the income elasticity of imports $(sh + (1 - s)\tau h + \varphi_0)$ must be greater than the financial costs of public debt plus the sensitivity of investment to capacity utilization (accelerator effect).

If the sensitivity of investment to the share of profits in income is less than the propensity to consume multiplied by the amount raised as a share of potential output, for the IS curve to maintain a positive slope, the denominator of equation (10) must also change. The expression $sh + (1 - s)\tau h + \varphi_0$ must be less than the financial costs of public debt in relation to GDP plus the sensitivity of investment to the level of capacity utilization, case B.

Cases C and D correspond to a negative IS curve slope. In these cases, the signs of the expressions in the numerator and denominator must be opposite, as shown in table 1.

Also as shown in table 1, the condition for the tax on profit $(0 < \tau < 1)$ to always remain positive is that:

$$\tau^c = \frac{I_h - sz}{(1 - s)z} > 0 \tag{10.1}$$

Upon observing the denominator of equation (10.1), it can be seen that the denominator will always be positive. Thus, for τ^c to be positive, it is necessary that $I_h - s.z > 0$. This expression states that investments should be more sensitive than savings. Investments are assumed to respond relatively more strongly to a change in the profit share than to savings.

Capitalists' profit can be defined as follows: $R/Y* = hz$ It follows that:

$$d\left(R/Y*\right) = dhz + hdz$$

Let it be assumed that profit as a proportion of potential output is constant. Hence:

$$\varepsilon_{zh} = -1 \tag{11}$$

where ε_{zh} is the elasticity of capacity utilization with respect to the share of profits in income.

From the income perspective, the output is given by the sum of capitalists' profit and workers' wages. This means that workers' wages are equal to the total output minus capitalists' profit. It is also known that the share of profits in income equals capitalists' profit divided by the total output. Thus, the profit of capitalists is given by the share of profits in income multiplied by the output. Therefore, workers' wages are given by:

$$W = (1 - h)Y \tag{12}$$

Dividing both sides by $Y*$ and deriving, it follows that:

$$d\left(W/Y*\right) = (1 - h)dz - zdh \tag{13}$$

or equally:

$$\frac{d\left(W/Y*\right)}{dh} = (1 - h)\frac{dz}{dh} - z \tag{13.1}$$

Equation (13.1) can be used to analyse whether the increase in the profit share of income results in a rise or fall in wages as a proportion of potential income. This will depend on the sign of equation (13.1).

There are two possible outcomes: first, if $\left(dz/dh\right) < 0$ occurs, it means that the sensitivity of capacity utilization with respect to the share of profits in income must be negative, which characterizes an accumulation regime of stagnation. With this first possibility, the sensitivity of wages with respect to the share of profits in income is negative, which characterizes a regime of conflict between capitalists and workers.

There is also a second possibility: if the sensitivity of the level of capacity utilization with respect to the share of profits in income is positive $\left(dz/dh\right) > 0$, characterizing an accumulation regime of acceleration. Two cases may arise.

The first case results in a regime of cooperation between capitalists and workers, which occurs when the increase in the share of profits in income causes wages as a proportion of income to rise $\left(\frac{d\left(W/Y*\right)}{dh} > 0\right)$. For this to occur, $dz/dh > z/(1-h)$, which means that the sensitivity of capacity utilization to the share of profits in income has to be greater than the ratio of capacity utilization to the share of wages in income.

If $\left(dz/dh\right) > 0$ occurs, a second case may occur. The result is that the rise in the share of profits in income leads to a decline in wages as a proportion of income $\left(\frac{d\left(W/Y*\right)}{dh} < 0\right)$, which characterizes a regime of conflict between workers and capitalists. For this to happen, it is necessary that $dz/dh < z/(1-h)$. This means that the sensitivity of capacity utilization to the share of profits in income has to be lower than that of capacity utilization to the share of wages in income.

A summary of the possible results is presented in table 2.

Table 2
Possible accumulation regimes

Accumulation regime \ Social regime	Cooperation	Conflict
Acceleration	$\frac{d\left(W/Y*\right)}{dh} > 0$ $\left(dz/dh\right) > 0$	$\frac{d\left(W/Y*\right)}{dh} < 0$ $\left(dz/dh\right) > 0$
Stagnation	$\frac{d\left(W/Y*\right)}{dh} > 0$ $\left(dz/dh\right) < 0$	$\frac{d\left(W/Y*\right)}{dh} < 0$ $\left(dz/dh\right) < 0$

Source: Prepared by the authors, on the basis of the results of this research.

As table 2 shows, in a regime of acceleration, a higher share of profits in income positively affects capacity utilization, this being a profit-led regime (in this case the slope of the IS curve is positive). If in a regime of acceleration, a positive share of profits in income increases the share of wages in income, the social regime is said to be one of cooperation between capitalists and workers. If a higher share of profits in income negatively affects the share of wages in income, the social regime is one of conflict.

When the economy is in an accumulation regime of stagnation, it is understood that a higher share of profits in income negatively affects capacity utilization, as it is a wage-led regime (the slope of the IS curve is negative). In this case, as it is a social regime of cooperation, an increase in the profit share of income positively affects the wage share of income, but in a social regime of conflict, an increase in the profit share of income negatively affects the wage share of income.

1. Equal functional distribution of income

Suppose that capitalists and workers divide income into equal parts. Therefore:

$$h = (1-h) \Rightarrow \frac{h}{(1-h)} = 1$$

As $\frac{dz}{dh} \cdot \frac{h}{z} = -1$, then:

$$-\frac{dz}{dh}\frac{h}{z} = \frac{h}{(1-h)} = 1 \tag{14}$$

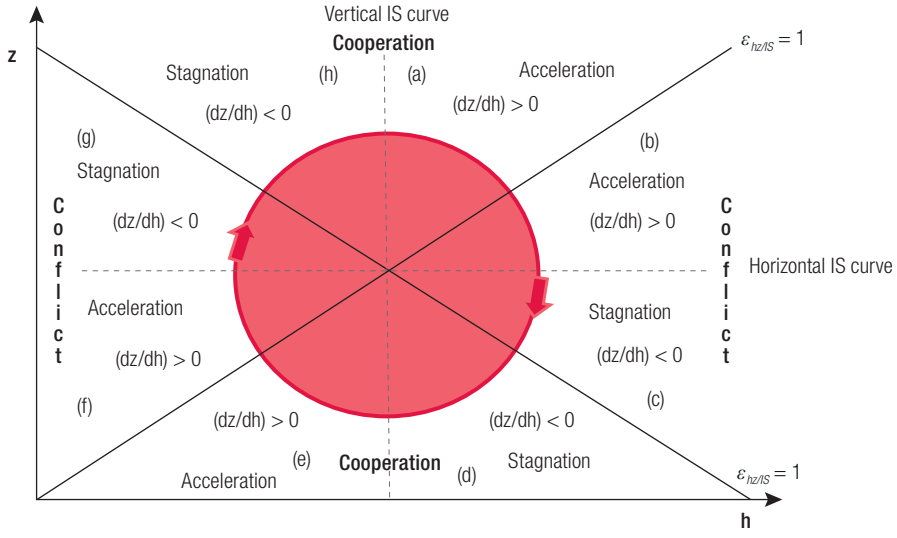
or

$$-\frac{dz}{dh} = \frac{z}{(1-h)} = 1 \tag{14.1}$$

If $\frac{dz}{dh}\frac{h}{z} > \frac{h}{(1-h)}$ occurs, it is a regime of cooperation between capitalists and workers. If $\frac{dz}{dh}\frac{h}{z} < \frac{h}{(1-h)}$ occurs, it is a regime of conflict between capitalists and workers. Under condition (14), a given decrease (increase) in the wage share (profit share) of income sufficiently stimulates demand and capacity utilization to increase aggregate employment and the wage bill. This provides a landscape that favours cooperation between the two classes in the regime of acceleration.

Figure 1 summarizes and presents the possible results of the model, with h on the horizontal scale and z on the vertical scale. For a vertical IS curve, it is necessary that the numerator of equation (10) tends to infinity or that the denominator tends to 0. For a horizontal IS curve, it is necessary that the numerator of equation (10) tends to 0 or that the denominator tends to infinity. A positive slope occurs when elasticity is 1, where an increase of 1 in the wage share of income increases the level of capacity utilization by the same amount. A negative slope occurs when the elasticity of capacity utilization with respect to the share of profits in income is -1, as shown in equation (11).

Figure 1
Zones of cooperation and conflict in the two accumulation regimes



Source: Prepared by the authors, on the basis of A. Bhaduri and S. Marglin "Unemployment and the real wage: the economic basis for contesting political ideologies", *Cambridge Journal of Economics*, vol. 14, No. 4, December, 1990 and adapted to the results of this research.

Equation (13), which provides the necessary support for the conclusions of the model, explains some of the points in figure 1. In zones (a) and (b), there is a regime of acceleration. When approaching an infinite slope of the IS curve, as in (a), $\frac{dz}{dh}$ is very large and greater than $\frac{z}{(1-h)}$. Thus, the derivative $\frac{d\left(W/Y^*\right)}{dh}$ is positive, which characterizes a regime of cooperation, because when the share of profits in income increases, the share of wages in income also increases.

In zone (b), the slope is already close to zero. Thus, while $\frac{dz}{dh}$ is still positive, it is small; thus, it is less than $\frac{z}{(1-h)}$ $\frac{d\left(W/Y^*\right)}{dh}$ and is less than zero and the conflict zone is identified. In zone (c), $\frac{dz}{dh}$ is negative, which leads to the derivative $\frac{d\left(W/Y^*\right)}{dh}$ also being negative.

In zone (e), $\frac{dz}{dh}$ is positive and large, as it is close to the slope of the infinite IS curve. Thus, it can be understood that $\frac{dz}{dh} > \frac{z}{(1-h)}$, which leads to $\frac{d\left(W/Y^*\right)}{dh} > 0$. If the increase in the share of profits in income also increases the share of wages in income, the regime is one of cooperation between capitalists and workers. In zone (f), although it is positive, $\frac{dz}{dh}$ is small, and less than $\frac{z}{(1-h)}$, and thus, $\frac{d\left(W/Y^*\right)}{dh} < 0$, meaning that it is a regime of conflict. Zone (g) has a small negative $\frac{dz}{dh}$, as it is in the stagnation zone and close to the zero slope of the IS curve. Thus, $\frac{d\left(W/Y^*\right)}{dh} < 0$ and the regime is one of conflict.

Another exercise that can be performed using the adapted model is determining the effect of the debt-to-GDP ratio variable on the slope of the IS curve. To do this, it follows that:

$$\frac{\left(dz/dh\right)}{dS} = \frac{\left(I_h - \Gamma z\right)\left(\alpha + i\right)}{\left[\Gamma h + \varphi_0 - \left(\alpha + i\right)S - I_z\right]^2} \lesseqgtr 0 \tag{15}$$

It is known that $\Gamma = \left[s\left(1-\tau\right)+\tau\right]$. Thus, if $\left(I_h - \Gamma z\right) > 0$, the derivative $\frac{\left(dz/dh\right)}{dS} > 0$ and the IS curve become more vertical. If $\left(I_h - \Gamma z\right) < 0$, the derivative $\frac{\left(dz/dh\right)}{dS} < 0$ and the IS curve become more horizontal. Thus, in an economy with high levels of taxation and capacity utilization, the resulting sign of equation (15) is negative. Indeed, the slope of the IS curve flattens, making it more horizontal and putting the economy closer to a zone of conflict between capitalists and workers (see figure 1).

IV. Methodology

1. Effects of the real exchange rate and public debt on income distribution and economic growth

The core argument of the theoretical model developed in this article is that the exchange rate and the debt-to-GDP ratio are important in explaining capital accumulation, in addition to the variables included in the original theoretical model (the share of profits in income and productive capacity utilization). The empirical model is used to test this argument. Thus, in this section the aim is to empirically test the effect of the real exchange rate and the debt-to-GDP ratio on the new investment function presented in section II that gave rise to equation (8). The function obtained is estimated as:

$$\begin{aligned} g_{it} = \frac{1}{K} = \alpha_0 + \alpha_1 g_{it-1} + \alpha_2 \ln h_{it} + \alpha_3 \ln z_{it} + \alpha_4 \ln \varphi_{it} \\ + \alpha_5 \ln \varphi_{it-1} + \alpha_6 \ln Debt_{it} + \alpha_7 \sum_{j=5}^{K} \beta_j X_{it} + f_i + u_{it} \end{aligned} \tag{16}$$

where $i = 1, ..., 15$ is the number of Latin American countries analysed and $t = 1990, ..., 2014$ the time period analysed; g is a proxy for the rate of capital accumulation; I is gross investment; K is the capital stock; h is the share of profits in income; z is productive capacity utilization; φ is the real exchange rate according to the methodology of Rodrik (2008);[5] $Debt$ is the debt-to-GDP ratio of each country, and u_{it} is the random error term. According to theory, the coefficient of the share of profit in income (α_2) can be positive or negative depending on the prevailing accumulation regime. The productive capacity utilization (α_3) and real exchange rate $(\alpha_4$ and $\alpha_5)$ coefficients should be positive, while the coefficient for the debt-to-GDP ratio (α_6) should be negative.

The dependent variable was included in the empirical model as also determined by its past value in a period. Thus, it is possible to consider the persistence of the dependent variable over time. The same procedure was used by Rapetti, Skott and Razmi (2012), Razmi, Rapetti and Skott (2009), Missio and others (2015) and Gabriel (2016), which characterizes a dynamic panel model.

The vector *"X"* is composed of three control variables, namely: average years of schooling of the population, inflation (annual percentage, based on consumer prices) and government consumption (final consumption expenditure of the public administration as a proportion of GDP).[6] The β_j's are the parameters to be estimated and f_i is a variable that captures the unobserved and fixed characteristics of each country over time.

The definition of the control variables contained in X_{it} was based on the empirical studies on economic growth and the exchange rate by Gala (2008); Rapetti, Skott and Razmi, (2012); Razmi, Rapetti and Skott (2009) and Gabriel (2016).

The control variables can be divided into two groups: structural and macroeconomic. The first group corresponds to variables known in the literature on economic growth and includes proxies for human capital. The second group comprises variables from the more recent literature, which seeks to correlate short-term variables with long-term economic performance, such as inflation and government consumption.

This article uses annual data from 15 countries, relating to the 1990–2014 period, i.e., a total of 375 observations. However, some data are not available for debt-to-GDP ratios and average years of schooling, which makes the panel unbalanced. Two models are estimated in this article. The first contains only the variables of the theoretical model discussed in sections II and III, while the second includes some control variables.

2. Econometric procedures used to analyse the determinants of capital accumulation

The systems of Arellano and Bond (1991) ("Difference GMM"), Arellano and Bover (1995) and Blundell and Bond (1998) ("System GMM") are the most appropriate for estimating the adapted equation in this analysis (equation (8)). The reason for this is the treatment of certain issues inherent to the data, such as the use of the lagged dependent variable as the explanatory variable of the model —as is the case of the capital accumulation rate variable (g_{it-1})— which characterizes a dynamic panel. Another justification for the use of dynamic panel systems is the presence of explanatory variables that are not strictly exogenous or have endogenous characteristics. The variable representing the real exchange

[5] Presented in section IV.3.

[6] The Bhaduri-Marglin model was developed at a stage in the world economy when financialization was in its infancy. Thus, to make the empirical model more current, an indicator of financialization of the economy (constructed using the ratio between total non-monetary financial assets through a proxy of the difference between monetary aggregates M3 and M1 (in dollars) and GDP in constant dollars (2010=100), as suggested by Bruno and others (2011)) was tested as a control variable. However, the results were neither robust nor significant.

rate, φ_{it}, has this characteristic. Theory on the relationship between economic growth and the real exchange rate (Razmi, Rapetti and Skott, 2009; Gala, 2008; Loayza and Fajnzylber, 2005; Missio, 2012; Gabriel, 2016) has shown that the latter variable is contemporaneously associated with the former. In addition, there is a feedback effect, which characterizes simultaneity and, as a result, endogeneity.

To control for endogeneity, the generalized method of moments (GMM) panel methodology needs valid instruments. Otherwise, the efficiency of the estimators may be reduced, the standard errors become larger, and the number of statistically significant coefficients is smaller. As is often the case in empirical macroeconomic research, there are difficulties in obtaining good exogenous regressors. Thus, the chosen methodology will take the lagged in-level and first-difference regressors as instruments for the cases linked to the real exchange rate, as suggested by Arellano and Bover (1995) in another context. Razmi, Rapetti and Skott (2009), Missio (2012) and Gabriel (2016) have used this procedure in matters related to this research.

In the estimator of Arellano and Bond (1991), the "Difference GMM", is used instead of GMM. However, assuming the first differences are uncorrelated with fixed effects allows the introduction of more instruments, improving the efficiency of the estimators, a method called "System GMM", an estimator of Arellano and Bover (1995) and Blundell and Bond (1998), which is an extension of the original model (Roodman, 2009; Gabriel, 2016). As the first differences of the variables may reduce the time period in relation to the number of cross-sectional observations, the system used in this article is that of Arellano and Bover (1995) and Blundell and Bond (1998), which is to say the "System GMM".

3. Construction of the index of undervaluation of Rodrik (2008)

The real exchange rate undervaluation or overvaluation index was constructed following the methodology proposed by Rodrik (2008), which has been frequently used by authors dealing with the subject, such as Araújo (2010), Razmi, Rapetti and Skott (2009), Missio (2012), Missio and others (2015) and Gabriel (2016). Using data from the Penn World Table 9.0, the real exchange rate (RER) with respect to the nominal exchange rate $(XRAT)$ and the purchasing power parity conversion factor (PPP) were constructed. The real exchange rate and the nominal exchange rate are expressed in local currency units per United States dollar.[7]

The exchange rate undervaluation index is essentially a measurement of the misalignment of the real exchange rate with respect to an equilibrium exchange rate, corrected for the Balassa-Samuelson effect, adjusting a real exchange rate to a country's development process. The rapid increase in productivity and the growth of the tradable goods sector, whose prices are determined on the international market, lead to a rise in wages. When this rise spreads throughout the economy, the prices of non-tradable goods also climb, owing to the greater purchasing power of individuals and greater demand for services. Thus, this measure of the real exchange rate adjusts the relative price of tradable goods to that of non-tradable goods.

The real exchange rate undervaluation indicator (φ_{it}) is calculated using three steps. The first step uses countries' nominal exchange rate data $(XRAT_{it})$ and purchasing power parity conversion factors (PPP_{it}) to calculate the real exchange rate (RER_{it}):

$$ln\, RER_{it} = ln\left(XRAT_{it}/PPP_{it}\right) \tag{17}$$

[7] Penn World Table 9.0 provides the variable "nominal exchange rate" (xr, in local currency per dollar) and the variable "GDP price level" (pl_gdpo), which is given by (PPP/XR). Purchasing power parity is the ratio of nominal GDP in local currency to real GDP in constant 2011 dollars. This variable shows how prices differ between countries when converted at the nominal exchange rate (Feenstra, Inklaar and Timmer, 2015).

where index i is the 15 countries in the sample and t is the unit of time, which in this article is 24 years (1990–2014). RER values of more than 1 indicate that the national currency is undervalued with respect to what the purchasing power parity (PPP) suggests.

In the second step, the equilibrium real exchange rate is adjusted for the Balassa-Samuelson effect. Equation (17) must be corrected for differences in factor endowments, with per capita GDP in dollars $(pcGDP)$ as a proxy for this endowment. Thus, in the second step, this effect is taken into account by regressing RER with respect to pcGDP, as given by:

$$ln\, RER_{it} = \alpha + \beta\, ln\left(pcGDP_{it}\right) + f_t + \epsilon_{it} \tag{18}$$

where f_t is the fixed effect per time period and ϵ_{it} is the error term.

When estimating (18) with robust standard errors and correcting for the verified problems of heteroskedastic structure and autocorrelation, the β result is -0.86 $(t = -4.24)$, with a statistically significant p-value of 0.00. This value is different from those found by Razmi, Rapetti and Skott (2009), Missio (2012), Missio and others (2015) and Gabriel (2016). However, all of them worked with advanced, emerging and developing economies, which differs from this analysis, whose data relates to Latin American countries.

In the third step, to determine the φ_{it} indicator of Rodrik (2008), the following equation is used:

$$ln\left(\varphi_{it}\right) = ln\, RER_{it} - ln\, \widehat{RER}_{it} \tag{19}$$

where RER is the real exchange rate constructed in equation (17) and $\widehat{RER}$ is the equilibrium real exchange rate, given by equation (18). When φ_{it} is greater than 1, the real exchange rate means that goods produced in the country are relatively cheaper in dollar terms, which is to say that the exchange rate is undervalued. Conversely, when φ_{it} is less than 1, the real exchange rate is overvalued.

4. Description and sources of data

The data used in this article are from the database of the World Bank (n/d), the world development indicators (WDI) and the Penn World Table (PWT 9.0), in addition to the *Statistical Yearbook for Latin America and the Caribbean* (ECLAC, 2016). The Latin American countries for which the largest possible database existed for the 1990–2014 period were selected. The period ends in 2014 because the data available for construction of the real exchange rate undervaluation index ends in that year.[8]

The countries selected for analysis account for around 94% of the total GDP of Latin America.[9] They are: Argentina (7.7% of GDP), the Bolivarian Republic of Venezuela (7.4%), Brazil (40.9%), Chile (4.3%), Colombia (5.6%), Costa Rica (0.70%), Ecuador (1.4%), El Salvador (0.38%), Honduras (0.29%), Mexico (19.5%), Panama (0.63%), Paraguay (0.39%), Peru (2.9%), the Plurinational State of Bolivia (0.39%) and Uruguay (0.77%). Thus, the panels formed have 15 countries (i) over 25 years (t). Some data, such as those related to the average years of study of the population, are not complete, so the panel is not balanced. Variables with negative values had their values added to a positive constant, so that it was possible to apply the natural logarithm.

Table 3 provide the symbols, descriptions and sources of the variables.

[8] Penn World Table 9.0 data.

[9] Considering the years from 2010 to 2016 and values in constant 2010 dollars.

Table 3
Descriptions and sources of variables used in model estimation

Symbol	Variable description	Source
I	Gross fixed capital formation as a percentage of GDP	World development indicators (WDI)
K	Productive fixed capital endowment. Corresponds to the sum of the endowment in machinery and equipment plus the endowment in non-residential buildings	PWT 9.0
G	Rate of accumulation of productive fixed capital. Corresponds to the proportion of gross fixed capital formation and fixed capital production endowment available in the economy of each country	Prepared by the authors
ϕ	Metric of exchange rate undervaluation or overvaluation according to the methodology of Rodrik (2008)	Prepared by the authors on the basis of PWT 9.0 data
$xrat$	Nominal exchange rate by country measured in United States dollars	PWT 9.0
ppp	Purchasing power parity in relation to each country's GDP (2011=100)	PWT 9.0
rer	Real exchange rate adjusted for purchasing power parity. Based on the methodology of Rodrik (2008)	Prepared by the authors on the basis of PWT 9.0 data
h	Share of profit in income	Tosoni (2017)
Y	Gross domestic product (GDP) in constant dollars (2010=100)	WDI
Y^P	Potential output. Defined as the actual level of output that the economy could generate if it operated at high rates of resource utilization	Aravena (2010)
z	Productive capacity utilization, constructed as Y/Y^P	Prepared by the authors on the basis of data from Aravena (2010) and WDIs
$Debt$	Total central government public debt (domestic and external) as a proportion of GDP of the countries (as a percentage)	CEPALSTAT
$YrsSch$	Average years of schooling of the population	IDB
$GovCons$	Government consumption (general government final consumption expenditure as a proportion of GDP, in percentages)	WDI
$Infla$	Annual inflation rate (based on consumer prices)	WDI

Source: Prepared by the authors, on the basis of Economic Commission for Latin America and the Caribbean (ECLAC), CEPALSTAT [online database] https://statistics.cepal.org/portal/cepalstat/index.html?lang=en; World Bank, World Development Indicators (WDI) [online database] https://datatopics.worldbank.org/world-development-indicators/; University of Groningen, Penn World Table [online database] www.ggdc.net/pwt; Inter-American Development Bank (IDB) [online database] https://data.iadb.org/; C. Aravena, "Estimación del crecimiento potencial de América Latina", *Macroeconomics of Development series*, No. 106 (LC/L.3269-P), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), December, 2010; D. Rodrik, "The real exchange rate and economic growth", *Brookings Papers on Economic Activity*, vol. 2008, No. 2, 2008 [online] http://muse.jhu.edu/journals/eca/summary/v2008/2008.2.rodrik.html; A. Tosoni, "Distributional Cycles and Economic Growth in Latin America", *Cuadernos de Economía*, vol. 36, No. 72, 2017 [online] http://fce.unal.edu.co/media/files/v36n72a01_Alarco.pdf.

V. Results and analysis

1. Im-Pesaran-Shin and Fisher-ADF (Augmented Dickey-Fuller) unit root tests

The unit root tests of Im, Pesaran and Shin (1997) and the Fisher-ADF version proposed by Maddala and Wu (1999) for panel data were applied in this analysis. These tests are the most commonly used in the literature, with unbalanced panels, as in the case of this article. Table 4 shows the results of the tests performed. All variables were stationary at 1% and 5% significance levels and, thus, all were used in level.

Table 4
Unit root tests (Im-Pesaran-Shin and Fisher-ADF) for panel data, 1990–2014

Variable	Method	Statistic	p-value
lng	Im-Pesaran-Shin -W - stat	-2.7023***	0.0034
	Fisher-ADF χ^2	112.0772***	0.0000
lnφ	Im-Pesaran-Shin -W - stat	-5.4250***	0.0000
	Fisher-ADF χ^2	119.8972***	0.0000
lnh	Im-Pesaran-Shin -W - stat	-2.4594***	0.0070
	Fisher-ADF χ^2	86.2619***	0.0000
lnz	Im-Pesaran-Shin -W - stat	-9.31750***	0.0000
	Fisher-ADF χ^2	282.7014***	0.0000
lnDebt	Im-Pesaran-Shin -W - stat	-2.2287**	0.0409
	Fisher-ADF χ^2	93.7748***	0.0000
lnYrsSch	Im-Pesaran-Shin -W - stat	-1.7862**	0.0370
	Fisher-ADF χ^2	127.9773***	0.0000
lnGovCons	Im-Pesaran-Shin -W - stat	-1.6853**	0.0460
	Fisher-ADF χ^2	123.2229***	0.0000
lnlnfla	Im-Pesaran-Shin -W - stat	-2.2923**	0.0109
	Fisher-ADF χ^2	161.7077***	0.0000

Source: Prepared by the authors, on the basis of the results of this research.
Note: ** Significant at 5% and *** significant at 1%. Tests with time trend and intercept. The lags of the tests were selected according to the Akaike information criterion. The null hypothesis of the Im-Pesaran-Shim and Fisher-ADF χ^2 tests is that the variable contains unit root and the alternative hypothesis is that the variable is stationary.

2. The effects of real exchange rates and public debt on capital accumulation

Section II of this paper presented an adaptation of the original model of Bhaduri and Marglin (1990), addressing the determinants of capital accumulation. This section presents the estimates of this model adapted to a sample of 15 Latin American countries, the results of which are shown in table 5.

Applying the first- and second-order serial correlation test of Arellano and Bond (1991), the null hypothesis of no first-order serial correlation is rejected. However, the hypothesis of no second-order serial correlation is not rejected. The Sargan-Hansen test was applied and the null hypothesis of joint validity of the moment conditions was not rejected. Estimates were performed using system GMM with the robust covariance matrix (*robust vce*).

The coefficient of the lagged capital accumulation rate (g_{t-1}) was positive and significant for the estimates for both model (1) and model (2). Thus, it can be concluded that there is a persistence of capital accumulation over time in the case studied in this paper, as confirmed by previous studies (Rapetti, Skott and Razmi, 2012; Razmi, Rapetti and Skott, 2009; Missio and others 2015; Gabriel, 2016).

The contemporaneous effect of the coefficient of the exchange rate undervaluation or overvaluation variable (φ) was negative and significant for the first estimation. Razmi, Rapetti and Skott (2009) and Gabriel (2016) obtained a similar result. The justification may lie in the fact that, according to Rodrik (2008), undervaluation of the real exchange rate leads to a decline in the share of agriculture in GDP. The countries studied in this study are agro-exporters. Initially, exchange rate undervaluation may cause a decline in the share of agriculture in GDP, hindering the growth of these economies.

Table 5
Dynamic panel estimates of the capital accumulation determination model, system GMM

g	(1)	(2)
lng_{t-1}	0.359***	0.357***
	(0.010)	(0.013)
lnh	0.035*	0.043
	(0.020)	(0.050)
lnz	0.166***	0.205***
	(0.013)	(0.017)
$ln\varphi$	-0.210**	-0.133
	(0.082)	(0.099)
$ln\varphi_{t-1}$	0.224***	0.153*
	(0.076)	(0.090)
$lnDebt$	-0.052***	-0.054**
	(0.169)	(0.023)
$lnYrsSch$		0.194**
		(0.081)
$lnGovCons$		-0.191***
		(0.040)
$lnlnfla$		-0.014*
		(0.007)
Number of observations	324	250
Arellano-Bond test for AR(1) - A	z= -2.805 Prob>z 0.005	z= -2.657 Prob>z 0.007
Arellano-Bond test for AR(2) - A	z= -1.080 Prob>z 0.279	z= -0.672 Prob>z 0.501
Sargan-Hansen test - B	chi2(324)=78.05 Prob>chi2=0.5048	chi2(245)=69.65 Prob>chi2=0.5900

Source: Prepared by the authors, on the basis of the results of this research.
Notes: Terms in parentheses are standard errors; *** significant at 1%. In A, the null hypothesis is that there is no correlation of order "n" in the residuals. In B, the Sargan–Hansen test verifies the validity of the instruments used. The null hypothesis: the instruments are jointly valid.

The effect of real exchange rate undervaluation with a lag was positive and significant for both estimations. This suggests that it takes some time for currency undervaluation to stimulate capital accumulation and, consequently, economic growth in developing countries, a result also found by Razmi, Rapetti and Skott (2009) and Gabriel (2016).[10]

According to Razmi, Rapetti and Skott (2009), with the aforementioned result, "the real exchange rate becomes a critical element of successful development". The authors provide empirical data showing that the effect of exchange rate undervaluation on investment growth is particularly meaningful for developing countries, as can be confirmed in the case of this paper for the Latin American countries analysed.

Based on the relationship between growth and income distribution, it is possible to define patterns of economic growth (Bhaduri and Marglin, 1990; Bowles and Boyer, 1990; Lima, Sicsú and de Paula, 1999). Thus, the results show that the coefficient of the share in profits variable (h) is positive and significant in the estimation performed in model (1). In this case, the economy is said to be characterized by a profit-led accumulation regime (Araújo and Gala, 2012; Oreiro and Araújo, 2013). Thus, a greater share of wages in income tends to decrease capital accumulation. In effect, the increase in wages generates an increase in production costs, which causes a decline in capital accumulation.

[10] The effects of the J-curve indicate that, in the short term, in the event of exchange rate undervaluation, the trade balance deteriorates with respect to the period prior to the shock. However, given the rigidity of the contracts signed by economic agents in foreign trade, the trade balance tends to return to equilibrium in the periods following changes in the exchange rate, which can subsequently lead to economic growth.

However, profit-led accumulation regimes cannot be guaranteed to promote economic growth because, even if profit rates grow, they may not stimulate investment, given other more profitable and low-risk alternatives, such as financial assets.[11] In this article it was not possible to consider the effect of the financialization of Latin American economies on the variable "profit share in income", whose series of values was provided by Tosoni (2017). Nor was it possible to break it down into operating and non-operating profits obtained in the financial market.

The coefficient of capacity utilization *(z)* was significant and positive in the estimations performed, a result expected based on theory. This occurs when a rise in the ratio of actual output to potential output exerts a positive influence on capital accumulation (Bhaduri and Marglin, 1990; Oreiro and Araújo, 2013).

If the sensitivity of investment to changes in profit margins is high, and if the difference between the propensity to consume of wages and profits is small, the contraction in consumer demand induced by a decline in real wages will be more than offset by the increase in investment demand. This leads to an increase in productive capacity utilization (Oreiro and Araújo, 2013), and as in this article productive capacity utilization is found to have positive effects on capital accumulation, there is a feedback cycle.

The coefficient of the debt-to-GDP ratio variable *(Debt)* was negative and significant for the cases presented. This shows that the rise in public debt in Latin American countries has hindered capital accumulation and, consequently, economic growth. This is because the pattern of public indebtedness in Latin American countries is largely made up of unproductive and current expenditure (ECLAC, 2018).

The result can also be explained by the fact that with a high debt-to-GDP ratio governments are constrained in conducting monetary policy (Oreiro, Sicsú and de Paula, 2003). The external financing difficulties encountered by governments also increase expectations of debt default (Hermann, 2002), which generates a situation of insecurity. The need to maintain high interest rates and the reduction in public resources for investment also erode the confidence of private investors.

Upon including the control variables, the coefficients of the base model variables remained significant and maintained the same signs as in model (1). The results showed that the coefficient of the average years of schooling *(YrsSch)* exerts a positive and significant influence on capital accumulation.

The coefficient of the government consumption variable *(GovCons)* was significant and had a negative sign. This suggests that countries with higher shares of government consumption relative to output have lower rates of growth in capital accumulation and, consequently, lower rates of economic growth.

The coefficient of the inflation variable *(Infla)*, which represents a proxy for economic stability and monetary policy (Gala, 2008), was significant.

VI. Conclusions

The main objective of this study was to add theoretical and empirical elements to the literature that studies the effects of exchange rates and public debt on the growth of economies. To do this, the capital accumulation function commonly used in studies on the relationship between economic growth and income distribution was modified by including the undervaluation index for the real exchange rate and the debt-to-GDP ratio in the investment function.

The conclusion that can be drawn from the adapted theoretical model is that, in an economy with high levels of taxation and capacity utilization, higher debt-to-GDP ratios tend to make the relationship between workers and capitalists more conflictive. Thus, it should be in the interest of governments to reduce debt-to-GDP ratios so that rises in the profit share of income have a less negative influence on the wage share of income. Thus, relations between capitalists and workers would be more amicable.

[11] The authors thank an anonymous consultant for commenting.

Based on the empirical results, it can be concluded that the adapted theoretical model fits well with the reality of Latin American countries for the period from 1990 to 2014. An undervalued real exchange rate exerts a direct and positive influence on capital accumulation. Thus, it is concluded that an undervalued real exchange rate causes a change in the pattern of international insertion, increasing a country's competitiveness. This occurs because a real exchange rate that is undervalued with respect to its equilibrium enables a country to produce new goods or compete in markets that were previously inaccessible for its products.

Since investments are sensitive to increases in the share of profits in income, Latin American economies are in a profit-led regime of accumulation. Thus, a given fall (or rise) in the wage share of income (profit share of income) sufficiently stimulates demand and capacity utilization to increase aggregate employment and the wage bill. Therefore, incentive policies to increase the share of profits in income, such as reducing taxes on profits, should be considered in the pursuit of increasing capital accumulation.

Thus, if a profit-led accumulation regime prevails, an undervalued real exchange rate will lead to a reduction in real wages, which will increasingly push up firms' profit margins, encouraging them to increase productive capacity utilization, and resulting in investment.

It is also concluded that the governments of Latin American countries should attempt to rein in growth in debt-to-GDP ratios. This will result in more freedom to conduct monetary policies and less difficulty in obtaining external financing, meaning that they will be able to improve investors' expectations.

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Foreign direct investment in Latin America from the perspective of illicit financial flows: "cocacolonisation" of saving?

Katiuska King Mantilla

Abstract

This article analyses the implications of illicit financial flows for foreign direct investment (FDI). During the 2003–2017 period, in the financing of gross fixed capital formation in Latin America, external savings show high variability in relation to domestic saving. This study calculates the net effects of FDI on the balance of payments by country, concluding that its contribution is not always positive. In fact, it is negative in countries with investments mainly in the primary or extractive sector. The volume of inward FDI is lower than recorded for all countries when considering pass-through or phantom investment, with signs of round-tripping in secrecy jurisdictions. This is of concern in countries that have traditionally kept their capital abroad. The concept of "cocacolonisation" of savings is therefore proposed.

Keywords

Capital movements, financial flows, illegality, foreign direct investment, savings, balance of payments, capital formation, macroeconomics, Latin America

JEL classification

F21, H26, O16, H87, K42

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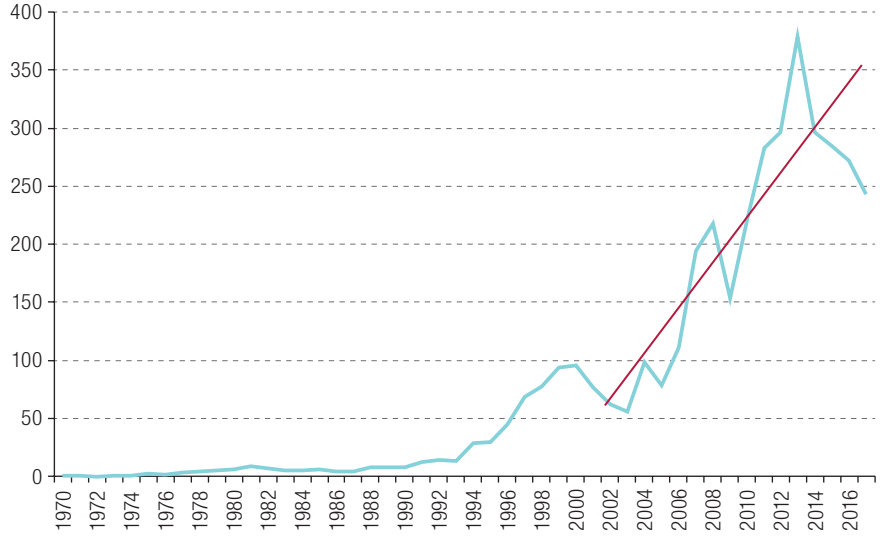
I. Introduction

Receipt of foreign direct investment (FDI) has become the badge of success for developing economies. Particularly in Latin America, it is championed without knowing whether it offers an answer to the external difficulties that countries may have. In terms of public opinion, there is a lack of saving and inward FDI is appealing as a sign of confidence in the country, even though its implications in terms of illicit financial flows are unknown and rarely discussed. Foreign investments become a sort of demonstration effect for the economies that receive them. They are considered life-saving remedies or "good flows", in the words of Blanchard and Acalin (2016, p. 1). One of the supposed advantages of inward FDI that calls for analysis is that it is considered, a relatively stable source of external financing (Ruesga and da Silva, 2009) and of contribution to financing of gross fixed capital formation. Another important factor is that, in terms of debt, FDI has a better reputation, because there is no clarity about income payment and because in developing economies an increase in gross fixed capital formation is desirable in the long term, as are the accompanying technological transfers.

Illicit financial flows —as cross-border movements of illegally obtained or transferred money— include tax evasion and avoidance by multinational enterprises and high-net-worth individuals (Kar and Cartwright-Smith, 2008; TJN, 2020). These illicit financial flows can result in misreporting of macroeconomic variables, such as exports and imports of goods or services. As a result, they can give a distorted picture of GDP and of traditional responses to macroeconomic problems. This is because some illicit financial flow transactions are fictitious and are used to evade taxes or circumvent legislation, meaning that the real movements of certain variables are unpredictable. In this article we propose analysing this problem with three aims: (i) evaluating the stability of external saving with respect to domestic saving; (ii) determining the net effect on the balance of payments, in the 2003–2017 period; and (iii) calculating the contribution of FDI to gross fixed capital formation in view of the 2000–2017 illicit financial flows. This period is analysed because there has been a change of trend in the region's inward FDI since 2003, as shown in figure 1.

Figure 1
Latin America: trend in inward foreign direct investment, 1970–2017
(Billions of dollars)



Source: Prepared by the author, on the basis of World Bank, "World Development Indicators" [online database] https://datatopics.worldbank.org/world-development-indicators/.

Analysed in terms of illicit financial flows, the contribution of FDI to gross fixed capital formation in Latin America is variable and smaller than reported. Its net contribution to the balance of payments is dubious, because of the possibility of domestic and national saving being disguised as external saving as a form of "cocacolonisation" of saving, a concept that will be explained later. This hypothesis is analysed using information on FDI stock and ultimate investors (a term that identifies the real investor, when the direct investor conceals the real investor's identity and is only an intermediary) of FDI from the United Nations Conference on Trade and Development (UNCTAD) and information on balances of payments from the International Monetary Fund (IMF), compared with the official information reported by the countries and compiled by the Economic Commission for Latin America and the Caribbean (ECLAC). This research approaches FDI from the perspective of illicit financial flows, in terms of what is considered pass-through or phantom investment, and of the net contribution to the balance of payments. Therefore, to examine effects of FDI that more closely reflect reality, certain elements that are not usually taken into account when analysing FDI must be made visible, as they become apparent if analysing FDI in the context of illicit financial flows.

This article is structured as follows: in this first section, the possible relationships between FDI and illicit financial flows are outlined; the second section offers an overview of previous theoretical and empirical studies on FDI; the third section presents stylized facts regarding FDI in the world, for the 2000–2017 period, in a context of illicit financial flows; the fourth section contains macroeconomic analyses of FDI to check the hypothesis, and the concept of "cocacolonisation" of saving is proposed; in the final section the conclusions are given.

II. Prior theoretical and empirical studies

Promoting long-term investment is key to increasing the productive capacity of an economy (Jha, 2003) and, in that regard, FDI is considered important. This reflects the goal of a direct investor residing in one economy who becomes ultimate beneficiary of an interest in a firm located in another economy, with a direct investment in a different firm. The interest entails the existence of a long-term relationship between the direct investor and the direct investment in another firm and a degree of direct influence in the management of the firm, established by equity that entitles it to 10% or more of the voting rights in the recipient company (IMF, 2009).

For Stephen Hymer, precursor of the neoclassical theory on FDI and multinational enterprises, FDI is possible if there are market imperfections that multinationals can exploit. He differentiates between direct investment and portfolio investment, explained not only by differences in interest rates, but also by enabling multinational enterprises to maintain their monopolistic power (Dunning and Rugman, 1985). Dunning (1980) distinguishes between these advantages in terms of industrial organization and develops the eclectic paradigm —or ownership, location, internalization (OLI) model— on the competitive advantages of firms that undertake FDI and seek attractive locations to obtain higher returns. The higher the earnings, the greater the likelihood of internationalization.

For Michał Kalecki (1976), FDI falls into the category of foreign aid and is understood as receipt of:

> "…additional resources in foreign currency, or its equivalent in goods, over the capacity to import generated by exports or financed from accumulated reserves, without the need of immediate repayment and at a cost lower than the prevailing interest rates of commercial loans" (pp. 64–65).

The author mentions the advantages of importing capital for the rapid development of a country and the relief in the need for foreign currency:

> "…the process of development tends to strain the balance of payments by raising the requirements for imports of capital goods as a result of higher investment, the requirements for imports of industrial raw materials because of growing industrial production, and the requirements for imports of food if home production lags behind demand" (p. 55).

From a post-Keynesian view, Joan Robinson (1976) considers that FDI is "directed to what the corporations expect to be profitable, not to what the developing country needs most". Robinson refers to this as "cocacolonisation" and defines it as "the right to remit profits in perpetuity [which] makes this the most expensive of all forms of borrowing" (1976, p. 12).

Along the same lines, from a structuralist perspective, Raul Prebisch (1978) states that FDI increases the "rate of accumulation, as well as the growth rate of the surplus, by virtue of [its] acknowledged efficiency, with favorable effects on the rate of development". However, he notes that "all this is paid for when the net inflow is reduced or becomes negative as new investment decreases and the financial remittances from earlier investments increase" (p. 242).

According to Pérez-Caldentey (2015, p. 57), the external constraint implies that

> "…an economy (especially on the periphery) is unlikely to be able to maintain a current account deficit for a long period, except in the case of countries that usually receive substantial amounts of foreign direct investment or official assistance flows".

Thus, theoretically, inward FDI can solve the external constraint and provide required capital. In addition, it has effects on the transfer of modern technology and knowledge, and creation of management and organizational skills (Jha, 2003), as well as facilitating formation of channels of access to foreign markets.

For a multinational enterprise, foreign investment is undertaken because it is more cost-effective to keep access to unique technologies, managerial skills or marketing expertise within the corporate network (Frieden and Lake, 2000). For Caves (2000), FDI is a means for multinational enterprises to diversify risk.

The Washington Consensus model put forward by Williamson (1990) proposed eliminating barriers to inward FDI (Rodrik, 2011), assuming, as stated at the beginning, that its contribution would always be positive.

The *Global Investment Competitiveness Report 2017/2018* published by the World Bank (2017) states that the concept of investment competitiveness is "defined by the ability of countries to not only attract but also retain and integrate private investment into their respective economies" (p. ix). It is these standardized policies that have enabled a race to the bottom on tax.

At the empirical level, no clear effects can be found, as they vary according to certain features of the host economy: its income level, productive sector, integration of investment into productive capacity and level of human capital. Depending on how these factors combine, transfer effects can be larger or smaller (Aitken and Harrison, 1999). In terms of the sector receiving FDI, investment in the extraction of natural resources has harmful effects (Alfaro, 2003). The study by Ruesga and da Silva (2009) shows that Spanish investments in the Latin American region are explained by the size of the destination economies and the privatizations performed by them, without finding effects on the real economy (effects on investment, exports, productivity and employment are analysed). This is essentially because investments were concentrated in the services sector, meaning there was no increase in the volume of capital in the economies. Alfaro and others (2010) attempt to bring the macro- and microeconomic perspectives on FDI in economic growth closer together and find that there may be a larger growth effects when goods produced by multinational enterprises are substitutes rather than complements.

Recent empirical studies in the region have sought to identify the determinants of inward FDI in general (Galaso and others, 2017; Henry, Saadatmand and Toma, 2015) or in a particular country, such as Brazil (Martins Correa da Silveira, Triches and Dias Samsonescu, 2017), as well as the effects this has on growth and inequality (Herzer, Huhne and Nunnenkamp, 2014; Suanes and Roca-Sagalés, 2015) or on poverty and other macroeconomic variables (Quiñonez, Sáenz and Solórzano, 2018).

Djulius (2018) compares foreign sources of financing with domestic saving with a time-based perspective. The study finds a positive effect of FDI on growth in the short term, which becomes negative in the long term, while external debt has a negative effect in the short term and a negligible impact in the long term, and domestic saving has positive short- and long-term effects.

More specific empirical studies include examinations of round-tripping FDI, mainly with regard to China and the Russian Federation.

Xiao (2004) explains that when new capital is created, channels for illicit financial flows are formed, such as trade misinvoicing and smuggling, and others that enable capital flight. These resources then return from abroad in a sort of round trip. The paper states this is a way to diversify domestic risks and to seek protection of property rights, which are weak in China. These resources also appear as a means of avoiding exchange rate controls, and they depend on a country's ability to generate new capital.

In the case of the Russian Federation, Ledyaeva and others (2015) find that round-tripping is mostly driven by domestic corruption and financial secrecy abroad. Foreign investors prefer regions where there is less corruption, while domestic investors look for regions with greater secrecy.

Borga (2016) acknowledges that not all foreign investment is in fact foreign and gives as reasons for round-tripping the incentives offered for such investments, controls on capital movements or exchange rates, better financial services offered by overseas financial centres, investment treaties and the possibility of concealing one's identity.

Round-tripping in China has been more notable and more frequently analysed because, given the size of the economy, the volume of round-tripping capital is considerable and because foreign capital receives differential treatment. In the Russian Federation, the most important factors analysed are the possibility of obtaining secrecy and the relation to corruption.

Ironically, in the case of Latin America —a region historically characterized by persistent capital flight— such processes have been studied little.

In this review of empirical studies, no recent research was found that estimated the actual effects of FDI on saving or external constraints. However, studies that are relevant to the analysis in this article were published in 2019. In one study by Casella (2019), which is referenced in UNCTAD (2019) a bilateral matrix of volumes of inward FDI is estimated, enabling identification of the ultimate investor of 95% of that FDI. A paper by Damgaard, Elkjaer and Johannensen (2019) estimates that phantom investment in corporate shells with no economic substance or links to the local economy may account for almost 40% of global FDI. The same authors also calculate the actual volume of inward FDI by country.

In the following section, some stylized facts are presented concerning FDI on topics that are relevant to illicit financial flows.

III. Stylized facts on foreign direct investment at the global level

Four empirical facts are raised in relation to FDI, based on an examination of illicit financial flows in the 2000–2017 period.

1. Internationalization of production through subsidiaries

International production that generates added value through foreign subsidiaries of multinational enterprises has grown more than fivefold since 1990: it grew from US$ 1.3 trillion in 1990 to US$ 6.7 trillion in 2017 (UNCTAD, 2019), equivalent to a rise from 5.7% to 8.4% of global GDP (as calculated by the author). Thus, the revenues of the largest companies[1] account for a considerable proportion of global GDP, with a correlation coefficient between the two variables of 0.87.[2] The revenues are so significant that those companies' average sales for the last six years are equivalent to around 50% of the world's GDP. The first stylized fact is internationalization of production through multinational enterprises' foreign subsidiaries, which accounts for 8% of global GDP.

2. Developed countries receive the largest share of inward foreign direct investment

In 2016, the United States was the largest recipient of inward FDI, amounting to US$ 391 billion (UNCTAD, 2017), more than one-fifth of all inflows. In 2017, this amount decreased in absolute terms, owing to the United States' restriction on corporate restructuring for tax purposes (UNCTAD, 2018). Nonetheless, the United States remained the main recipient of inward FDI. Contrary to what might be expected, and to the trends observed until 2014, according to data from UNCTAD (2017), inward FDI was mostly received by developed countries: in 1990 they accounted for 83% of the total, while the lowest percentage recorded in the period was in 2014, at 46%. In 2015 and 2016, those countries accounted for 62% of total inward FDI and in 2017 the figure was 51%, as shown in table 1.

Table 1
Share of inward foreign direct investment received by developed countries, 1990–2017
(Percentages)

	1990	1995	2000	2005	2010	2014	2015	2016	2017
Percentage of total inward FDI	83	64	82	62	50	46	62	62	51

Source: Prepared by the author, on the basis of United Nations Conference on Trade and Development (UNCTAD), *World Investment Report: Special Economic Zones*, Geneva, 2019.

This marks a second stylized fact, as inward FDI from 2015 onward was again directed to developed countries and cannot be considered development aid, because it was mainly among developed countries, except in 2014.

[1] The 3,000 largest publicly traded companies in the world, according to Bloomberg, are included in the calculation.

[2] Author's own calculations for the 2010–2016 period, with GDP data from IMF and Bloomberg.

3. Tax cuts play a prominent role in foreign direct investment changes

(a) Mergers and acquisitions dominated FDI growth in 2014–2015

According to the *World Investment Report* from UNCTAD (2016), global FDI flows in 2015 totalled US$ 1.77 trillion, with 41% (US$ 721 billion) from mergers and acquisitions. In 2015, there was 38% growth in FDI compared to the prior year. UNCTAD states that this growth appears inconsistent with growth fundamentals and the decline in commodity prices. One of the explanations for this growth is mergers and acquisitions, as previously mentioned, owing to corporate restructuring for tax purposes. Excluding the effect of such agreements, inward FDI grew by just 15% (UNCTAD, 2016). The third stylized fact relates to the information that three-fifths of global FDI growth in 2015 was driven by mergers and acquisitions to reduce tax burdens.

(b) Destinations of investment, and financial instruments as a means of making foreign direct investment

FDI to offshore financial centres, and through special purpose vehicles,[3] rose in the first three quarters of 2015 and fell in the last quarter. In 2012, 19% of the investment in Latin America by volume was made through special purpose vehicles and 11% through offshore financial centres (UNCTAD, 2015). These investments reflect accounting transactions related to financial needs, tax arbitrage between jurisdictions and tax evasion, which is to say illicit financial flows. They are also considered pass-through foreign investments. The main recipient countries of investment flows through special purpose vehicles were Luxembourg and the Netherlands (UNCTAD, 2016), which also recorded more inward FDI. The two countries are considered to be the new global financial centres and are seen as systematic conduits (Casella, 2019). Much of the investment is channelled through special purpose vehicles, as mere financial intermediaries (Damgaard and Elkjaer, 2017). The United States and the United Kingdom have historically been the financial centres par excellence.

The fourth stylized fact is that financial transactions to reduce tax burdens or circumvent regulations —in contrast with productive investments— clearly stand out in FDI variations as commercial and tax practices that become normal among large multinational enterprises.

IV. Analysis and discussion of macroeconomic effects

In developing countries, FDI has traditionally been the preferred instrument for financing the capital account of the balance of payments.

In that regard, countries have ceded legal sovereignty, cut taxes, forgone tax resources and pursued various machineries to attract investment by offering lower labour costs and establishing tax incentives and benefits, as well as making use of the specific conditions of the country that make it an attractive destination for investment.

[3] Special purpose vehicles (SPVs), also known as special purpose entities (SPEs), are used to conceal the beneficial owner and have several purposes, such as keeping profits in a particular country to evade taxes or circumvent regulations, while also obtaining secrecy regarding such actions (Damgaard, Elkjaer and Johannensen, 2019).

Robinson's (1976) original concept of "cocacolonisation" referred to companies targeting only the most profitable sectors and remitting profits in perpetuity. This is the concept studied here, from the perspective of development financing and resolution of the external constraint. To this end, in this section an analysis is performed of the stability of external saving as a mechanism for financing investment, followed by a calculation of the contribution of FDI to the balance of payments, to determine its support for easing of the external constraint.

Because illicit financial flows exist, not all FDI is real, owing to the financial practices of multinational enterprises. In addition, they allow domestic or national saving to be disguised as external saving, with FDI income remitted in perpetuity, referred to here as "cocacolonisation" of saving. In addition to this, there has been a rise in international trade misinvoicing in recent years. It is therefore important to examine the actual contribution of FDI to gross fixed capital formation, as is done in section (c). Section (d) explores round-trip investment or "cocacolonisation" of saving.

The three aims set out in the introduction are then discussed.

1. Stability of external saving in the financing of gross fixed capital formation

The first aim of this article is to determine whether FDI has made a stable contribution to gross fixed capital formation. Table 2 shows the different types of saving that finance gross fixed capital formation in Latin America.

Table 2
Latin America: financing of gross fixed capital formation at current market prices, 2000–2017
(Percentages of GDP)

Item	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Domestic saving	19.0	18.0	19.1	20.0	21.4	21.2	22.2	22.4	22.2	20.4	21.4	21.7	21.2	20.4	19.5	18.4	18.3	18.3
Net factor payments to the rest of the world	-2.5	-2.6	-2.7	-3.0	-3.1	-3.2	-3.1	-2.9	-2.7	-2.6	-3.1	-2.9	-2.7	-2.4	-2.6	-2.6	-2.6	-2.7
Net current transfers	1.0	1.3	1.6	2.0	2.1	2.0	2.1	1.9	1.6	1.5	1.3	1.1	1.1	1.1	1.1	1.4	1.5	1.5
National saving	17.5	16.6	18.0	19.1	20.3	20.1	21.1	21.4	21.1	19.2	19.7	19.9	19.6	19.0	18.0	17.2	17.2	17.1
External saving	2.9	2.7	1.1	0.0	-0.3	-0.3	-0.7	0.2	1.8	0.8	2.2	2.4	2.5	3.0	3.3	3.2	1.9	1.6
Gross fixed capital formation	20.3	19.3	19.1	19.0	20.0	19.8	20.5	21.5	22.9	20.1	21.9	22.3	22.1	22.0	21.4	20.4	19.1	18.7

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of CEPALSTAT [online database] https://estadisticas.cepal.org/cepalstat/web_cepalstat/estadisticasIndicadores.asp?idioma=i.
Note: National saving = domestic saving – net factor payments to rest of the world + net current transfers. Gross fixed capital formation = national saving + external saving.

External saving followed a cyclical pattern and increased after the 2008 crisis, when returns in wealthy countries fell. Table 3 shows the coefficients of variation and standard deviations of the different types of saving, factor payments and gross fixed capital formation in Latin America.

Table 3
Latin America: analysis of dispersion and variation of macroeconomic indicators, 2003–2017

	Standard deviation	Coefficient of variation
Domestic saving	1.43	0.07
External saving	1.39	0.97
Net factor payments to the rest of the world	0.23	-0.08
Gross fixed capital formation	1.32	0.06

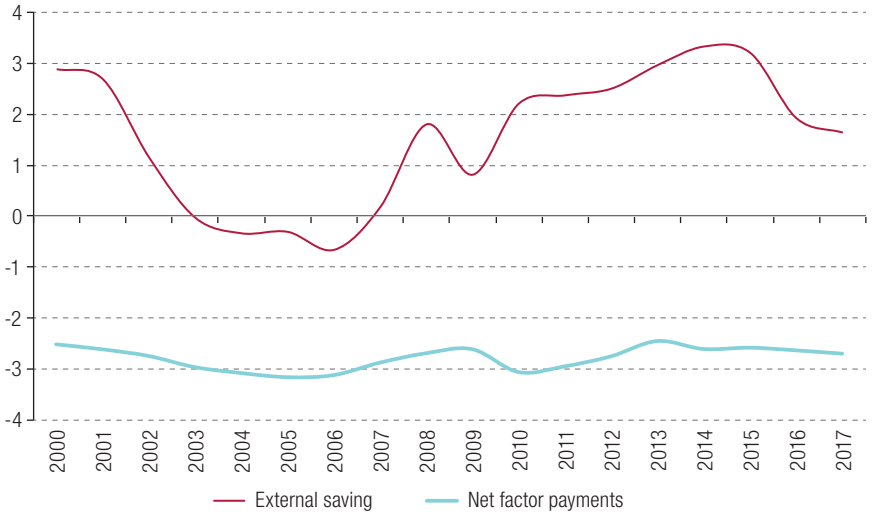
Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of CEPALSTAT [online database] https://estadisticas.cepal.org/cepalstat/web_cepalstat/estadisticasIndicadores.asp?idioma=i.

In the 2003–2017 period, domestic and external saving show the same standard deviation, while domestic saving has a much lower coefficient of variation than external saving.[4] External saving has a coefficient of variation close to 100% and a range of 4 percentage points of GDP, indicating high variability and volatility. This demonstrates that in Latin America it is in fact national saving that enables a larger and more stable increase in gross capital formation.

Net factor payments have the lowest standard deviation and a coefficient of variation of -8%, with a smaller range (0.7 percentage points of GDP), meaning that they are more constant. These payments, which range from 2.4% to 3.2% of GDP, reduce domestic saving.

Figure 2 shows the patterns in net factor payments and external saving in the 2000–2017 period. The downtrend in external savings can be seen in the figure from 2014 onward.

Figure 2
Latin America: external saving and net factor payments to the rest of the world, 2000–2017
(Percentage points of GDP)



Source: Prepared by the author, on the basis of CEPALSTAT [online database] https://estadisticas.cepal.org/cepalstat/web_cepalstat/estadisticasIndicadores.asp?idioma=i.

[4] The coefficient of variation is calculated by dividing the standard deviation by the mean of the variable analysed. If the result is positive, it is used to compare the dispersions of the variables.

Table 4 presents the correlation coefficients for the variables analysed, for the 2003–2017 period.

Table 4
Latin America: correlation coefficients for macroeconomic indicators, 2003–2017

Macroeconomic variables analysed	Pearson correlation coefficient
Domestic saving and gross fixed capital formation	0.61
National saving and gross fixed capital formation	0.50
External saving and gross fixed capital formation	0.44
Domestic saving and net factor payments to the rest of the world	-0.58

Source: Prepared by the author, on the basis of CEPALSTAT [online database] https://estadisticas.cepal.org/cepalstat/web_cepalstat/estadisticasIndicadores.asp?idioma=i.

In the 2003–2017 period, a negative correlation of 0.58 is found between domestic saving and net factor payments, along the same lines as previously discussed. There is also a very similar positive correlation between domestic saving and gross fixed capital formation of 0.61, and a lower correlation coefficient between external saving and gross fixed capital formation of 0.44.

The first finding is that, although external saving contributes to gross fixed capital formation, it is not a stable source of financing or of contributions to alleviating the external constraint, for two reasons: its volatility and the constant burden of net factor payments to other countries, which reduces national saving. The following section analyses the extent to which FDI contributes to the balance of payments.

2. Net effect of foreign direct investment on the balance of payments

As the second aim of this study, the net contribution of FDI to the balance of payments is analysed, and the basic definitions of FDI and FDI income are repeated.

Equation 1: calculation of FDI and its income

FDI = capital contribution + reinvested earnings + inter-subsidiary loans

Income = dividends + reinvested earnings + interest

The first approach would be to analyse whether the sum of FDI income flows exceeds FDI stock, as set out in equation 2:

Equation 2: calculation of the net effect of FDI

FDI - income = capital contribution + reinvested earnings + inter-subsidiary loans
- (dividends + reinvested earnings + interest)

FDI - income = capital contribution + inter-subsidiary loans - dividends - interest

The net contribution will be positive while foreign companies continue to make new investments, with a ratio of less than 1. It will be negative when income is greater than the stock, with a value above 1.

Formula 1: ratio of net FDI contribution

$$\text{Net contribution ratio} = \frac{Income_{2000-2017}}{Stock_{2017}}$$

Table 5 presents the ratio of net FDI contribution in the 2003–2017 and 2000–2017 periods.

Table 5
Latin America (18 countries): ratio of net foreign direct investment contribution, 2003–2017 and 2000–2017

Country	Ratio 2003–2017	Ratio 2000–2017
Argentina	1.5	1.6
Bolivia (Plurinational State of)	1.1	1.2
Brazil	0.7	0.7
Chile	0.8	0.9
Colombia	0.7	0.7
Costa Rica	0.5	0.6
Dominican Republic	0.8	0.9
Ecuador	0.6	0.7
El Salvador	0.6	0.6
Guatemala	0.9	0.9
Honduras	0.8	0.9
Mexico	0.4	0.5
Nicaragua	0.2	0.2
Panama	0.7	0.7
Paraguay	1.4	1.4
Peru	1.2	1.2
Uruguay	0.8	0.8
Venezuela (Bolivarian Republic of)[a]	2.6	2.8

Source: Prepared by the author, on the basis of International Monetary Fund (IMF), Balance of Payments and International Investment Position Statistics (BOP/IIP) [online database] https://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52&sId=1390030341854; United Nations Conference on Trade and Development (UNCTAD), *World Investment Report 2019: Special Economic Zones*, Geneva, 2019.

[a] Information is only available up to 2016.

In countries for which total income is high, the contribution of FDI to the balance of payments is lower using this formula than if only the volume of inflows is considered. Thus, it is found that some countries suffer from what Prebisch (1978) described: a negative net contribution because of lower investments and higher remittances from prior investments.

These countries are the Bolivarian Republic of Venezuela, Argentina, Peru, Paraguay and the Plurinational State of Bolivia, in order of their ratios. Of these countries, three stand out —the Bolivarian Republic of Venezuela, Peru and the Plurinational State of Bolivia— which receive foreign investment for exploitation of primary commodities, including in the mining and oil sectors. This is in line with the findings of Alfaro (2003) on the effects of FDI in extractive sectors. In these sectors, moreover, the amount of the initial investment is relatively fixed (King, 2021).

The ratios are lower in Mexico and Costa Rica, which have investments in vehicles, machinery and, in the case of the latter, semiconductors. What is striking is that these countries are also the ones with the highest concentration of illicit financial flows in trade, with 48% and 8%, respectively, in addition to Brazil, which ranks second with 18% (Podestá, Hanni and Martner, 2017).

As seen above, the contribution of FDI to the balance of payments, if income remittances are also taken into account, becomes a net outflow of resources for certain countries. In countries where this does not occur, there are representative values of illicit financial flows that also affect the external constraint.

This situation, together with the cyclical access of the countries in the region to the capital market (Bértola and Ocampo, 2013; Ffrench-Davis, 2010), goes some way to explaining the high volatility of economic growth. If, as seen, FDI is solely devoted to remitting income, its positive externalities are diluted, national saving is affected, and balance of payments difficulties are aggravated. Beyond discussing whether investment is a product of the accelerator effect or of the exposure method, which is to say the relationship between current demand and the volume of capital available to meet it (Robinson, 1959), it is important to recognize the multiplicity of interests of foreign investors and of the national community with which they transact, as well as how those interests clash (Ffrench-Davis, 1979).

Although reinvestment of earnings is important in the production process, it does not entail an inflow of new resources, but rather a lack of an outflow of resources.

In relation to this aim of the study, it can be concluded that the net effect of FDI is not always positive; indeed, some of the results already show a negative contribution for several countries over a limited period, since only income from 2000 or 2003 onward is included.

3. The contribution of foreign direct investment to gross fixed capital formation when accounting for illicit financial flows

To fulfil the third aim of studying the contribution of FDI to gross fixed capital formation, available data shall be examined to differentiate between genuine investment and fictitious investment. Three areas are addressed: ultimate investors, confidential or unspecified investment, and phantom investment, which relates to investment through special purpose vehicles.

For the first and second areas, this paper draws on the aforementioned studies on estimation of ultimate investors in the bilateral FDI stock (Casella, 2019; UNCTAD, 2019), enabling a matrix to be created of FDI by ultimate investor, as a percentage of the total FDI stock.

For the first area, the data in the matrix is compared with macroeconomic information on the stock of inward FDI positions. This information was compiled by IMF (2017) on the basis of consolidated statistics on this subject.[5] Those statistics do not include information from certain jurisdictions that are considered tax havens, so a comparison with all countries is not possible. However, Luxembourg and the Netherlands are included, which, as previously mentioned, are the main FDI conduits for tax planning and are even considered the new global financial centres. The information is expressed in dollars and is therefore comparable.

Fictitious FDI by ultimate investor is defined as follows:

Formula 2: Definition of the percentage of fictitious FDI by ultimate investor

$$\text{Percentage of fictitious FDI} = \frac{1 - COND(N, L)}{FDI\ Stock} \times 100$$

Where $COND\ (N, L)$ is the share of FDI made from the Netherlands and Luxembourg as conduits.

Table 6 shows the percentage of fictitious FDI originating from Luxembourg and the Netherlands.

Only the countries listed above appear in the original UNCTAD (2019) estimates. According to table 6, Brazil is the country with the highest percentage of fictitious investment in its total FDI stock, followed by Mexico, Argentina, Honduras and Paraguay. They are followed by the Bolivarian Republic of Venezuela, the Plurinational State of Bolivia, Chile and Guatemala, with values between 4% and 6%.

[5] See Coordinated Direct Investment Survey (CDIS) [online database] https://data.imf.org/?sk=40313609-F037-48C1-84B1-E1F1CE54D6D5.

Mexico, Bolivarian Republic of Venezuela, Argentina and Brazil recorded the highest levels of capital flight (Pastor, 1990).

Table 6
Latin America (13 countries): cumulative share of fictitious foreign direct investment (FDI) from Luxembourg and the Netherlands, up to 2017
(Percentages of inward FDI stock)

Country	Percentage
Argentina	8.5
Bolivia (Plurinational State of)	5.5
Brazil	23.1
Chile	4.1
Costa Rica	2.0
El Salvador	0.6
Guatemala	3.8
Honduras	8.3
Mexico	12.3
Panama	1.0
Paraguay	7.0
Uruguay	1.7
Venezuela (Bolivarian Republic of)	5.9

Source: Prepared by the author, on the basis of United Nations Conference on Trade and Development (UNCTAD), *World Investment Report 2019: Special Economic Zones*, Geneva, 2019; International Monetary Fund (IMF), Balance of Payments and International Investment Position Statistics (BOP/IIP) [online database] https://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52&sId=1390030341854.

These conservative estimates of real FDI (as only Luxembourg and the Netherlands are included) suggest that, as an average of all the countries mentioned above, fictitious investment accounts for 11.4% of FDI stock up to 2017.

This appears to be closely related to the use of conduits by multinational enterprises that often base their financial and tax planning transactions in Luxembourg or the Netherlands.

In 2012, as mentioned by UNCTAD (2015), in Latin America 19% of investment by volume was made through special purpose vehicles and 11% through offshore financial centres. However, few countries collect data on investment through special purpose vehicles. In the region, only Chile does so.In the matrix, UNCTAD (2019) also calculates confidential or unspecified FDI, as presented in table 7. This relates to the second area of FDI contribution to gross fixed capital formation.

Table 7
Latin America (13 countries): cumulative share of confidential or unspecified foreign direct investment, up to 2017
(Percentages of inward FDI stock)

Country	Percentage
Argentina	3.28
Bolivia (Plurinational State of)	2.85
Brazil	6.16
Chile	37.50
Costa Rica	1.35
El Salvador	2.42

Table 7 (concluded)

Country	Percentage
Guatemala	3.31
Honduras	4.05
Mexico	2.66
Panama	4.03
Paraguay	2.42
Uruguay	15.76
Venezuela (Bolivarian Republic of)	2.44

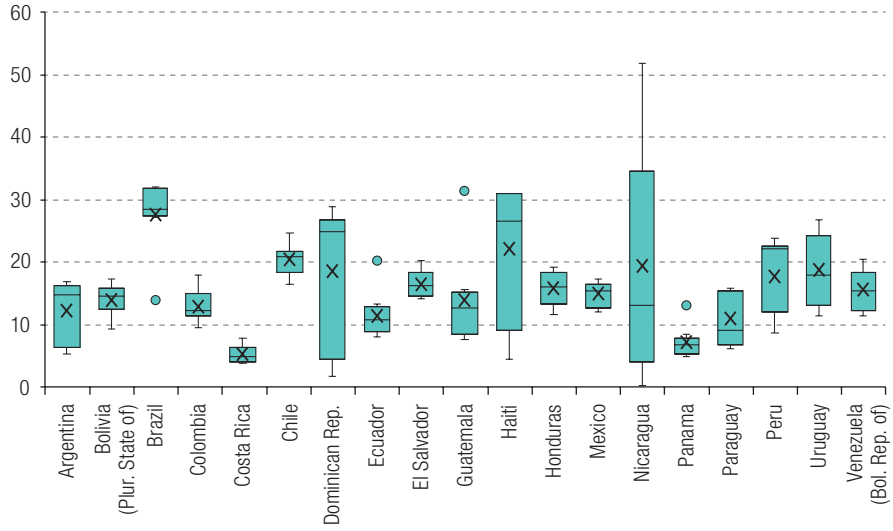
Source: Prepared by the author, on the basis of United Nations Conference on Trade and Development (UNCTAD), *World Investment Report: Special Economic Zones*, Geneva, 2019.

Chile is the country with the highest percentage of confidential or unspecified FDI (37.5%), followed by Uruguay (15.76%). The simple average for the region is 6.79%. In this area, the contribution to gross fixed capital formation is dubious because of the motivations for pursuing secrecy. There may be tax stratagems to reduce tax burdens.[6] There may also be domestic investors that appear to be foreign, which do not necessarily produce new investments or a real increase in gross fixed capital formation.

Regarding the third area, we use the study by Damgaard and others (2019), which defines phantom investment as that which is into empty corporate shells with no link to the local real economy, and which estimates exposure to phantom FDI.

Figure 3 presents, in a box-and-whisker plot, the descriptive indicators of phantom FDI exposure for 19 countries in the region, based on the values estimated by Damgaard and others (2019) for the 2009–2017 period.

Figure 3
Latin America (19 countries): box-and-whisker plot of phantom foreign direct investment exposure, 2009–2017
(Percentages of inward FDI stock)



Source: Prepared by the author, on the basis of J. Damgaard, T. Elkjaer and N. Johannensen, "What is real and what is not in the Global FDI Network?", *Working Paper*, No. 19/274, International Monetary Fund (IMF), December, 2019.

[6] Chile and Uruguay were on the list of countries that facilitate the creation of holding companies, which allows the accumulation of profits through such companies (Nazar, 2010).

For the Latin American region, the simple average of exposure to phantom investment is 19.6%. In this area, the estimates are higher than in a comparison solely of ultimate investor data for Luxembourg and the Netherlands or confidential information data.

Brazil also ranks first in this regard, followed by Haiti, Chile, Nicaragua, Uruguay, the Dominican Republic and Peru. Haiti has investment records from 2014 onward, showing an upward trend in phantom investment. Chile, in contrast, has lower values than in table 7, in which it appeared with the highest values for confidential or unspecified investment.

Guatemala, Haiti, Nicaragua and the Dominican Republic have high coefficients of variation. A second group in terms of variations comprises Argentina, Ecuador, Panama, Paraguay, Peru and Uruguay, which display high variability. Argentina, Panama and Paraguay show rising trends, Peru has a falling trend and Ecuador and Uruguay show more erratic patterns.

The findings indicate that the volume of inward FDI in the three areas presented is lower in all the countries, meaning that its contribution to gross fixed capital formation is also lower.

In practice, the resources classified as FDI may be resources that local investors remove from the country and then bring back in to take advantage of the benefits granted to FDI or simply to carry out financial transactions that favour them and reduce the tax burden. This may explain why two-thirds of foreign investment in the region does not create new physical capital (ECLAC, 2016).

This topic will be discussed in more detail in the following section.

4. A discussion of round-tripping

UNCTAD (2016) conducted a study of ownership of subsidiaries using information from the Orbis database which contained ownership information on 22 million companies in November 2015.[7] Distinctions were made between four types of ownership, the third being domestic companies that use offshore locations to channel investments back to their own country, which is to say round-trip investment. Although the focus of the study was on multinational enterprises and it excluded privately owned companies with family shareholders, in it the authors estimate that in Latin America and the Caribbean the ultimate owners of 11% of subsidiaries were companies from the same region and 19% of subsidiaries had direct owners from the region.

Moreover, the study states that capital in round-tripping investment mostly consists of private wealth or is directly controlled by individuals (rather than by companies). In other words, it is the capital of high-net-worth individuals. Round-tripping accounts for 20% of investment in the Caribbean and, because the total universe of companies excludes those without ownership information or that are owned by individuals, it can be said that as a phenomenon it is established in the region and is underestimated owing to the lack of information and the instruments using to conceal ultimate beneficial owners.

These percentages show how, when illicit financial flows are taken into account, FDI is found to make a lower real contribution, and that round-tripping investment exists, which does away with the supposed advantages of foreign capital.

In peripheral countries, “new investments” are promoted by offering them differential or preferential treatment. This can take the form of lower tax rates, free zones or a specific framework of legal protection in the event of disputes, through foreign investment protection treaties.

Special treatment is thus granted to companies that are domiciled abroad. This results in an aura of superiority, even if the ultimate beneficial owner is unknown, thus facilitating the mechanisms that drive illicit financial flows and capital flight.

[7] At that date, the database contained 136 million companies, meaning that information on ownership was available for just 16.2% of all companies in the database.

Herzer and others (2014) find a significant and positive correlation between FDI stock and inequality in several Latin American countries. This positive relationship, and the scarce creation of new physical capital in the region, could be explained by part of the inward FDI in fact being mere financial machinations to disguise local companies as new foreign investors, when the resources actually come from capital flight, fictitious or fraudulent sales that conceal the identity of the beneficial owner and do not increase physical capital.

The presented data are not exhaustive, as they are estimates. Moreover, round-trip investment is difficult to measure in the case of countries with a history of capital flight. In other words, such investment may be capital that left the country at some point, either as national saving that exited the country for legitimate or illicit reasons, or as resources from illicit flows that leave and then return as external saving. The truth is that it is very difficult to establish whether it is one or the other.

What can be verified is that round-trip investment or "cocacolonisation" of savings has not been considered in the case of Latin America, especially because, as previously mentioned, consideration is not given to the volume of resources that have fled in the past or the illicit financial flows generated by trade transactions. All these resources can return disguised as external saving to circumvent regulations, to obtain advantages granted to supposedly new capital or simply to conceal their origin. Even in the calculations by Casella (2019) using absorbing Markov chains, there is a noticeable bias in estimation of round-trip investment. He prefers to consider only those countries for which there are previous studies of that type of investment, such as China and the Russian Federation, applying an a priori probability approach.

Recognition of this type of investment means that the countries send royalties abroad on their own resources, putting additional pressure on the external constraint. If external financing is dependent on this type of foreign saving, external interests may intervene in the economic policy of the destination country and lobby for more incentives, thus further complicating the external constraint. The new legal, tax or other privileges in turn create an incentive for further round-trip investment, resulting in a vicious circle that can be somewhat "addictive". The more privileges or benefits the governments grant, the more the simulated national capital will demand. As is said of Coca-Cola, the more you drink, the more you want.

In addition, some high-net-worth individuals have inside information about their own country owing to their connections. They also usually know how to move within the environment, giving them more opportunities to do business, as suggested by Ledyaeva and others (2015).

We can thus reinterpret Robinson's (1976) concept of "cocacolonisation" of saving through round-trip investment and add to it the veto powers of the elites, as mentioned by Pastor (1993) in reference to nationalization of private debts in the 1980s.

V. Conclusions

In developing countries, FDI is always seen as desirable and the deceptive financial and tax practices that may be behind such investment, which are common among large multinational enterprises, are either not discussed or are not known. These enterprises operate in a framework of increased global production through subsidiaries. Inward FDI is mainly between developed countries. Tax planning determines new trends in FDI based on mergers and acquisitions, as well as the use of offshore financial instruments and centres. High-net-worth individuals mimic the practices of multinational enterprises to evade taxes and circumvent regulations.

This article provides an analysis of some dimensions of FDI, from the perspective of illicit financial flows. The first finding is that, in Latin America, external savings are quite volatile and factor payments

affect national saving, which could have been more stable in the 1990s (Machinea and Vera, 2006). FDI financing of gross fixed capital formation is lower than officially reported, as is its contribution to the balance of payments.

In short, the positive effect of FDI in Latin America should be considered with great care because although such investment finances the capital account, it also remits income that facilitates lower tax contribution owing to triangular structures and financial transactions carried out by investors, without considering the effect on the balance of services.

In some countries, FDI income is beginning to put the external sector at risk, because of continued payment for prior investments and the lack of new investments, especially in countries with a greater tradition of extractive industries. The cases of Mexico and Costa Rica are significant because FDI is directed towards industrialized goods and not just commodities, in line with the findings of Cipollina and others (2012) of a positive effect of FDI in sectors that are more capital-intensive and use more advanced technology. However, these countries record considerable illicit financial flows.

FDI round-tripping can be a mechanism used by high-net-worth individuals to benefit from FDI incentives, encourage capital flight and exert political power over economic policy decisions to obtain greater profits.

In most peripheral countries, multinational enterprises enjoy preferential treatment over local companies, which opens the door for the latter to benefit from this treatment or to try to do so. That differential treatment also facilitates illicit financial flows not only from tax evasion, but also from saving that is disguised as foreign investment. It can therefore be said that a "cocacolonisation" of saving exists, in a reinterpretation of Robinson's (1976) original concept.

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Development model, labour precariousness and new social inequalities in Latin America

Dídimo Castillo Fernández

Abstract

This article analyses the key characteristics of the two major economic models of the last century, and of the current one thus far, in Latin America. The first is centred on national development, with a relative welfare structure. The second presents the distinctive features of the current neoliberal model, in terms of the breakdown of the social pact between capital, the State and the working class, together with flexibilization and deregulation as modalities of labour management. As a hypothesis, some of these singularities are analysed in terms of the emergence of a new labour precariousness and new income inequalities and poverty. The study considers the differences between countries that adopted the neoliberal model and those that chose post-neoliberal forms of governance. In all of the dimensions and variables considered, it is found that conditions were worse in the countries that followed the neoliberal model most closely.

Keywords

Economic development, development models, neoliberalism, employment, labour market, employment security, equality, income distribution, poverty, social policy, welfare state, Latin America

JEL classification

O11, J01, E24, I38

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I. Introduction

In Latin America, as in the rest of the world, the establishment and rise of the neoliberal model was the result of the political defeats suffered by the working class and low-income sectors in the 1960s and mid-1970s —a period in which the capitalist class co-opted the government to launch an assault against the social progress achieved by these segments of the population. The forerunners of this included the political-military defeats suffered by the left in Argentina, Brazil, Chile, the Plurinational State of Bolivia and Uruguay, and the resulting installation of military regimes in those countries. This was a period of harsh offensives by the State and capital against the working class, which caused the breakdown of the "social pact" that had enabled the welfare state model and the failure of and low-income sectors. The latter ended up losing their horizon of struggle following the dismantling of the Soviet Union and the socialist camp in the late 1980s and early 1990s.

Given the centrality of the capital-labour relationship and the dynamics of capital accumulation, the social history of labour in capitalist society is neither linear nor uniform; instead, it is marked by shifting correlations between social and political forces in the different economic, social and political models. These changes have had specific consequences for production processes, the management of inclusion and exclusion, integration and social cohesion, and also for welfare policy and the fight against social inequalities and poverty. On the one hand, in the "work society", industrial society or, as Castel (2008) called it, "wage society", which is typical of the welfare state in the most developed countries, work —especially wage-earning work— was a source of integration and social cohesion, a factor contributing to the forging of identity and a pre-requisite for the development of citizenship. On the other hand, with the adoption of the neoliberal model, the flexibilization and deregulation of labour relations and the consequent fragmentation, segmentation and precariousness of employment, the mechanisms and sources that generated exclusion, inequality and poverty were modified.[1]

Neoliberalism has been successful in terms of its foundational objectives of recovering and reversing the trend of capitalist accumulation, which had been declining in the early and mid-1970s. The neoliberal model operates on the basis of two organically linked and articulated processes, aimed at underpinning the increase in capitalist accumulation. The first is based on the flexibilization and deregulation of labour, with a consequent increase in unemployment and underemployment, and the spread of various forms of informal and precarious work. As a result, a large proportion of the working class became disengaged not only from their jobs, but also from their natural social and political organizations. This placed the "new worker" in situations of greater vulnerability and social defencelessness. The second process concerns the inability, or limited capacity, to maintain accumulation through expanded and sustainable exploitation and reproduction, which is affected by the constant crises of accumulation. The result was recourse to certain strategies of conquest and production of new spaces, the delocalization of labour and the recreation of mechanisms that were supposedly typical of primitive accumulation, such as the predation or direct dispossession of resources, goods and capital (Harvey, 2005).

By breaking the social pact that had articulated the capital-State-labour relationship under the welfare state model, neoliberalism altered labour management processes; but it also modified the mechanisms of marginalization, inequality and poverty prevailing in that model. The most important change relates not only to the expansion and growing trend of labour exclusion and the consequent widening of wage inequality, but, above all, to its generating sources, the mechanisms of legitimization and the forms assumed by social policy to address them (Castillo Fernández, 2018a). With neoliberalism, there was a shift from a "regulated dynamic" (characteristic of the "wage society") to a deregulated

[1] Social integration and inclusion, along with the processes of identity and citizenship building, follow new logics. They are no longer necessarily based on labour relations, or perhaps ever less so. In many cases, they have other diverse and itinerant sources, which produces bewilderment, uncertainty and identity crises, especially among new workers, and also gives rise to exclusionary and precarious citizenships (Castillo Fernández, Arzate Salgado and Nieto Díaz, 2019).

one, with the inequalities that are intrinsic to labour flexibilization and precariousness (Castel, 2008). The merit of the national state, or the former welfare state, was the fact that it solved two problems in one, by facilitating an abstract form of social integration based on a mode of legitimization that was abolished with the new economic and labour model (Habermas, 1999). What might be defined as a new inequality and a new poverty does not necessarily concern or correspond to those excluded in labour, educational or territorial terms, as was previously the case. Hence, exclusion ceased to be confined to a simple and clearly defined representation between the integrated and the excluded, the winners and the losers; a context in which "the 'new poor' replaced the 'residual' poverty of the previous model" (Dubet and Martuccelli, 2000, pp. 163 and 165).

However, in Latin America no single development model has prevailed in recent decades, but, instead, very heterogeneous mixtures that are hard to classify. With the exhaustion of the import-substitution-industrialization model, or welfare state, the introduction of the neoliberal model ushered in a period of economic, social and political bifurcation, in which various models emerged, whether or not oriented towards containing the dominant model.[2] The region embarked upon a random process of containing neoliberalism, with the wave of progressive post-neoliberal governments that started in 1998 when Hugo Chávez came to power. The trend continued in Brazil, under the presidency of Luiz Inácio "Lula" Da Silva, former founding leader of the Workers' Party, in 2003; in Argentina, with the presidency of Néstor Kirchner, initiated in 2003 and continued by Cristina Fernández de Kirchner between 2007 and 2015; in the Plurinational State of Bolivia, with the presidency of Evo Morales since 2006; in Ecuador, with Rafael Correa, between 2007 and 2017; in Paraguay, with the administration of Fernando Lugo, which began in 2008 and was interrupted in 2012; and in Uruguay, with the presidency of Tabaré Vázquez from 2010, which was continued by José Mujica in 2010, and then in 2015 when Tabaré Vázquez won re-election. Under these administrations, the neoliberal sectors lost some of their hegemony and power in the region. The scope of the projects pursued by these governments was limited, but they managed to mitigate the state of social tension and the adverse economic and social consequences generated by neoliberalism. In particular, the social policy promoted by these governments had a significant impact on the well-being of the poorest and most indigent social sectors. They also influenced the "middle class", which expanded and consolidated significantly in many of these countries.[3]

This article uses empirical data to describe the features that seem to characterize the two major economic models of the last century and the present one thus far. The first model is characterized by the preponderance of the welfare state and the corresponding relative welfare structure thus generated. The second presents the distinctive and fundamental characteristics of the current neoliberal model, based on labour flexibilization, deregulation and precariousness. As a hypothesis, some of its key characteristics are explored in relation to the production of a new labour precariousness, along with new income inequalities and poverty in the region. The differences in this regard between the countries that embraced the neoliberal model and those that opted to promote and adopt post-neoliberal forms of governance are also analysed.

The study draws on official statistics published by the Economic Commission for Latin America and the Caribbean (ECLAC) and constructs a simple inequality abatement index (IA) that measures the range or difference in values of the Gini coefficient at two given points in time, applied to the measurement of inequalities: $IA_D = CG_1 - CG_2$. A poverty abatement index is also constructed, which measures the

[2] Argentina, Brazil, Chile and Mexico, which according to Bizberg (2015, p. 41) followed similar trajectories until the early to mid-1970s, diverged thereafter. Until then it was possible to speak of a Latin America, but now "it is now impossible to find a single development model in the continent".

[3] Inequality, as social heterogeneity, covers different social spheres or spaces. For example, it encompasses the sphere of social classes, income, sex, ethnic condition, race, ascription group, and generational group, among many others. Within these, various dimensions of equality or inequalities can be discerned; for example, income, social welfare status, resources and assets, human capital and qualifications, labour and social opportunities, or collective and individual rights, among others (Castillo Fernández, 2018a; Sen, 1999).

differences or changes in the percentages of the population living in poverty by country: $AR_P = PSP_1 - PSP_2$. In general, the results in all of the dimensions and variables considered (employment, inequality and poverty) reveal unfavourable employment and social welfare consequences in the countries that adhered most closely to the neoliberal model, compared to those that opted for reformist models or post-neoliberal orientations.

II. Social inequality and new sources of social integration, inclusion and exclusion

Since Marx and Marxism, the structure of social inequality has been viewed as an inherent feature of any form of class-structured society. In this case, it is considered intrinsic to the contradictions of capitalist society: not as a consequence of its failure or the distortions of its development, or of the lack of economic growth or its recurrent crises, but instead as the successful and victorious outcome of capitalist accumulation by one class, or sectors of the hegemonic classes, as opposed to the subordinate and dispossessed classes or sectors. According to Marx, capitalist society is unequal by definition;[4] and social inequality is inherent to the emergence, development and expansion of class society.[5] Recalling the biblical myth of "original sin", Marx explained the process of primitive accumulation and the process of "predation", by a nascent elite from the rest of society, with the consequent emergence of a social class of exploited and destitute workers.

> This primitive accumulation plays in political economy about the same part as original sin in theology. Adam bit the apple, and thereupon sin fell on the human race. Its origin is supposed to be explained when it is told as an anecdote of the past. In times long gone-by there were two sorts of people; one, the diligent, intelligent, and, above all, frugal elite; the other, lazy rascals, spending their substance, and more, in riotous living. (...) Thus it came to pass that the former sort accumulated wealth, and the latter sort had at last nothing to sell except their own skins. And from this original sin dates the poverty of the great majority that, despite all its labour, has up to now nothing to sell but itself, and the wealth of the few that increases constantly although they have long ceased to work (Marx, 1988, pp. 891 and 892).

In his critique of capitalist society and its contradictions, especially in terms of exorbitant production or overproduction, capitalist accumulation and its inherent crises, Marx himself did not in any way advocate an egalitarian distribution of income as a viable proposition. The equality he accepted, or at least envisioned, was only that which emanated from a classless society. In this regard, Engels (2014, p. 169) was radical in considering that "Any demand for equality which goes beyond that, of necessity passes into absurdity". Marx criticized the recurrent idea of considering human beings only as workers, while ignoring the other aspects of their life and the various requirements for the satisfaction of their needs. Hence he focused his attention on the idea of "multiple diversities" and, linked to this, on difference in needs. Equality and inequality are not unique, so it is convenient to talk about inequalities or, paraphrasing Sen (1999), the question should always be posed in terms of "inequality of what?" It

[4] As Wallerstein (1999, p. 92) stresses, this is an inherent and defining characteristic of the predominant system in the modern world. Capitalism "is an inequitable system by definition", not because it works badly, but because it works too well in supporting the interests of capitalist accumulation. From another perspective —such as structural functionalism, which is diametrically opposed and widely questioned— based on the idea of an "irremissible" society structured in perpetuity in terms of positions of power, prestige and money, every society has as a prerequisite a necessary and functional stratification system, in which the actors are socially rewarded according to their status or position and roles (Davis and Moore, 1945; Ritzer, 2002).

[5] A century before Marx, and using the metaphor of the natural state, Rousseau (1996) proposed that social ills stemmed from the emergence of private property and adherence thereto by the social majority. This approach gave rise to the concept of civil society.

should be borne in mind that, theoretically, all human beings are equal or unequal in one respect or another, considering a particular sphere within a domain of possibilities. To the first question one could add: from whom? or among whom? and the more difficult question, why? Moreover, equality in some areas could give rise to new inequalities in others.[6]

A characteristic of today's capitalist society, globalized, deregulated and with a high level of labour flexibility, is its elevated "ambivalence". This is evidenced by the fact that it produces and reproduces, simultaneously, both more inclusion and more exclusion, more equality and more inequality, more wealth and more poverty, more information and more disinformation, more political organization and less social control, more legality and more illegality, more democracy and less participation, more security and more risk (De Giorgi, 1998; Corsi, 1998). In the new environment, traditional or structural inequalities expanded while others emerged, differentiated by their heterogeneity, by their overlapping or re-classifiable characteristics within the old, very particular categories of inequality, by their juxtaposition and their sources of generation, and by the uncertain dynamics and randomness of individual trajectories (Fitoussi and Rosanvallon, 1997).

In this sense, and marking the distinctions with other elementary or pre-modern forms of society, Beriain argues that:

> Integration in modern societies does not take place in one sphere —economic, political or cultural— but is the product of the coordination of several integration processes [...]. There is no simultaneity in these integration processes. Integration does not occur "from outside" [...] but, rather, several integration processes coexist horizontally and suboptimally within society as a whole, each according to its own logic [...] (Beriain, 1996, p. 23).

From another perspective, this idea is also supported by Wallerstein, who highlights the apparently paradoxical and differentiating nature of the capitalist system in relation to previous social formations, when he notes that:

> One of the elementary formulae on which our own historical system, the capitalist world and economy, is based, is to keep people out while keeping people in. [Which is also] a specific feature of this historical system that distinguishes it from earlier ones, which usually started from the principle of including some people and excluding others. (Wallerstein, 1999, p. 92)

The global and universal treatment and regulation of exclusion and inclusion are relatively cancelled. Similarly, integration operates in increasingly specific and differentiated spheres, despite, or even because of, the processes of supposed social homogenization fostered by globalization. The latter has not only modified the mechanisms of exclusion, but has also displaced the centrality of the traditional and classic forms and sources of social inclusion and integration. In the modern globalized world, developed or otherwise, work has been the primary and basic source of social integration. Freedom and human fulfilment were not always linked to work. On the contrary, they had an opposing and marginal value in society. For example, in ancient Greece and classical Rome, in contexts of slavery, freedom was not defined in relation to work; but this factor excluded the individual from society. Thus, whoever had to work was neither free nor a member of society (Beck, 2000, p. 19). Society was defined in opposition to work; and social life was configured around other aspects and activities, generally of a cultural or political nature (even leisure). Work did not represent an individual or collective achievement —much less a virtue— and engaging in it denigrated the person.

While, in the pre-capitalist world, work excluded the individual from society, with capitalist modernity it attained a core value, central, and integrating of the individual in society. The feudal world inaugurated

[6] According to Sen (1999, p. 135), since "we are so profoundly diverse, equality in one realm often leads to inequalities in other realms".

a long period of social transition in this regard, which culminated in the paradox of the "liberation" of the individual worker (Anderson, 1990). It was industrial capitalism that finally and radically introduced positive change in the social value of work and generated the social conditions that determined the "ascent" of the labourer to the status of free worker, with the consequent recognition of his being the owner of his labour force, which he trades in the market to obtain subsistence (Castillo Fernández, 2017). From then on, work, especially waged work associated with the factory, became the central and integrating value of the individual in society, thus reversing the nature of feudal and earlier societies.[7] Work not only serves as a foundation for personal, labour and social identities with the disappearance of the traditional order, but also engenders new social bonds and the contradictions that are characteristic of modern societies (Dubet and Martuccelli, 2000; Bauman, 2003). Individuals achieve their identities and personalities only in and through work, in the same way that they acquire citizenship rights, and can only be conceived of as citizen workers (Beck, 2000, p. 21).[8]

With the neoliberal economic model, however, work has lost, or is losing, this capacity to bind and integrate the individual into society. The multiple and discontinuous segmentation of flexible and precarious work has served to erode and fragment the status of the individual and his or her links with other mechanisms of society. What has been somewhat lost is the work ethic that, in Weber's (1989) conception, characterized Western capitalism. The same author highlighted the economic, social and cultural importance that this ethic afforded to the organization of work and its significance in the modern world. Perhaps, as Dubet and Martuccelli (2000, pp. 147 and 148) argue, work remains a privileged place of construction of one of the dominant representations of the subject in our society; but it no longer has the hegemonic role from which it benefited in the past. To this they add that, while work still remains one of the main —but not the only— element of social integration, and even of the organization of social life, it is no longer really a matrix of meanings and values (Dubet and Martuccelli, 2000, pp. 148 and 149).

III. "Society of work", neoliberalism, precarious work and new social inequality

After World War II, Latin America experienced a long period of industrial development and a non-genuine form of "wage society", with its own characteristics (Castel, 1997 and 2008), following the implementation of the import substitution economic model and the establishment of the welfare state. While it maintained the centrality of exploitation and widespread accumulation of labour, the industrial wage society differed in many ways from the European model, operating under certain principles of social solidarity, with a strong government intermediation (of the welfare state) and a direct link between the other two social actors: the capitalist sector or national industrial bourgeoisie, and the working class or organized labour. Although this industrial society was never egalitarian or conflict-free, nor was ever intended to be, it accompanied a period of economic growth in which the management modality was negotiation. In that context, conflict, whether manifest or latent, operated in relation to those three clearly identifiable social actors (Castillo Fernández, 2018a).

The 1940s was a period in which two phenomena coincided. Firstly as a result of the development and expansion of medical knowledge and initial endeavours in the domain of social policy, mortality trends were altered —in circumstances in which fertility rates were accelerating— which generated

[7] With the exhaustion and subsequent disappearance of the traditional feudal order, work —in addition to engendering the social bonds of modern society— became the source of new identities (Dubet and Martuccelli, 2000).

[8] Modern democracy rests on the distribution of wage labour. There is no democracy without this elementary requirement. Castel, who defended the idea that wage labour organizes society, given that social cohesion is articulated around work, recalled the history of the right to vote in France, when, even after the French Revolution, servants did not have this right because they were considered non-autonomous or non-independent (Cabezón, 2013).

major changes in population growth rates. Secondly, the incipient industrialization process significantly deepened levels of impoverishment, unemployment and misery. The neo-Malthusian argument, which was propounded repeatedly at that time, was that "we are unequal and poor because there are too many of us". It was claimed that deteriorating welfare was a direct consequence of population growth. This idea found justification and fertile soil in the socioeconomic and demographic changes that occurred in that decade and subsequently, as well as in the growth of the emerging industrial proletariat.

According to the modernizing and developmentalist ideas of the time, economic growth was expected to solve the problems and distortions generated by underdevelopment and the failings of capitalism. Its promoters shared a predominant, yet false and almost mythical, notion that inequality and poverty stemmed from lack of development, and that industrial capitalist development would enable full social integration. The question and concern seemed correct in theory, but the answers did not. For this reason, it attracted early criticism from the academic community, especially from intellectuals who promoted dependency theory in its various versions. Modernization theory, with a structural functionalist orientation, which emerged in American society after World War II, also considered social stratification —and, consequently, social inequality— as valid and, to some extent, functional and necessary in contemporary society.

The 1960s marked the peak of the problem of unemployment, inequality and poverty. The complex characterization of the situation gave rise to a range of conceptualizations in the academic, institutional and political spheres, as well as different analytical approaches. This was a time when the concepts of marginalization, marginality (DESAL, 1965 and 1969) and, above all, that of "marginal mass" proposed by Nun (1971) and Quijano (1973), of neo-Marxist orientation, were introduced. These authors drew attention to the logical contradictions of the capitalist system, in terms of afunctionality or dysfunctionality of the "industrial reserve army" proposed by Marx, given the unusual increase in marginality and the surplus labour force that was not fully absorbed in the production process (Castillo Fernández, 2009 and 2018a). Shortly afterwards, in 1973, studies of domestic units attracted increasing interest, based on the concept of family or survival strategies (Duque and Pastrana, 1973). The variety of concepts, prior to and coinciding with that of the "informal sector" —which was introduced and coined through institutional channels in the 1972 report on Kenya published by the International Labour Organization (ILO)— reveals the magnitude and complexity attained by the problem of occupational marginalization in that period.

However, in the modernizing and developmentalist conceptions of the time, the idea persisted that economic growth would solve the problems and distortions generated by underdevelopment and the specific dynamics of peripheral capitalism. It was a period dominated by the false and almost mythical idea that inequality and poverty stemmed from a lack of development. Above all, the underlying assumption was that industrial capitalist development would make integration and social inclusion possible. Behind the idea of marginalization, supposedly derived from such imbalances, the concept of social integration prevailed as a viable, desirable and necessary possibility for the system itself. Marginalization was assumed as being peripheral or outside the system, or as a state of exception that should and could be remedied within the logic of the system itself. Inequality and poverty were considered transitory situations, in an inevitable process of extinction (Castillo Fernández, 2018a).

Aside from the magnitudes attained by these two social ills, at least in the institutional sphere, the idea of possible social integration persisted. This stemmed from the "social pact" between the three sectors involved: capital, the mediating benefactor State and the organized and belligerent working class. This utopia or illusion of inclusion, and the mechanisms to achieve it, were lost with the adoption of neoliberalism, for reasons inherent to its nature and to the foundations of the economic and

social dynamics of that model.[9] It should be noted that, the risks of inequality and poverty increased with the flexibilization and deregulation of labour relations and the consequent spatial and temporal fragmentation. The latter was compounded by the segmentation and increasing precariousness of employment (meaning a loss of job quality in terms of security, stability and income). Furthermore, unlike the previous economic, social and political model, the mechanisms and sources generating exclusion, social inequality and poverty were modified and institutionalized.

Neoliberalism implied, on the one hand, a substantial change in the mechanisms and forms of organization of production and management of work. However, it did not entail the loss of labour centrality, since the model represented a triumph of the financial bourgeoisie over the national industrial bourgeoisie and extended the sources of accumulation and appropriation beyond the expanded exploitation of labour. Coincidentally, it thus promoted a new form of exclusion and sources of inequality and poverty, distinct from those of the previous model. Moreover, according to Harvey (2005), a characteristic of the accumulation process in this model corresponds to what he calls "accumulation by dispossession", also called accumulation by predation, or primitive accumulation. This differs from the classical form of accumulation centred on the expanded and direct exploitation of the labour force and on economic growth. In certain phases — such as when the welfare state predominated— it was not even contradictory to the idea of raising workers' standard of living (Harvey, 2013). According to this author, this is a characteristic of neoliberalism, given the displacement of the goods-producing sectors and the hegemony of the financial sector. He therefore accepts that an increasing amount of surplus value is produced, but denies that this only occurs in the production domain.

In one sense, neoliberalism is an updated form of primitive accumulation. However, it does not substitute expanded reproduction (or exploitation of living labour in production) for a supposedly earlier phase, belonging to the stage of original or primitive accumulation, but rather the coexistence or organic link between the two.[10] One of its specific features consists of speculating on commercial liberalization and the valorization of assets, including "immaterial goods", as well as the devalorization of the labour force. On this point, Harvey agrees with Marx and argues that such liberalization will not produce a state of harmony in which everyone would be better off, but will instead generate higher levels of social inequality (Harvey, 2005, p. 112). This is what has happened throughout the nearly four decades of neoliberal hegemony, in developed and developing countries alike. It has also meant the emergence of new forms of social inequality and poverty, such as exclusion, no longer, or not directly, linked to the expanded exploitation of the labour force *strictu sensu*, as before, but generated, almost exclusively, in the spheres of production and direct extraction of surplus value (López, 1998). This is the new environment in which the existence of a "new form of social inclusion" was framed, replacing the exclusion, marginalization and residual poverty inherent to the labour management model of the welfare state and the "wage society", with its expectations of full integration into the labour market.

[9] Neoliberalism not only introduced major changes in the spheres of production and labour relations in the region and throughout the world, but it also transformed the class structure. Firstly, the national bourgeoisie was displaced by the export and financial bourgeoisie linked to transnational capital; and, secondly, the working class, represented mainly by the industrial worker, was cast adrift in labour, social and political terms. With neoliberalism, the State, as an mechanism of mediation between capital and the working class or civil society, became superfluous, separated from the functions of protection, security and social management (Castillo Fernández, 2018b).

[10] This particular form of accumulation can occur in various forms or modalities and can be repeated at different times (regardless of the historical stage), since it insures the capitalist accumulation process against the risks of being obstructed. It also reproduces or continues the systemic practices of the primitive accumulation phase, characterized by the methods of colonial policy, the resort to dispossession, predation, oppression, deception and violence, which made capitalist development viable. Harvey states that "inability to accumulate through expanded reproduction on a sustained basis has been paralleled by a rise in attempts to accumulate by dispossession" (Harvey, 2005, p. 100).

IV. Employment, income inequality and poverty

The deterioration of the quality of employment, compounded by increased income inequality and its consequences for conditions of well-being and poverty, is global and increasingly dramatic. Job insecurity and income inequality have been the greatest social scourge in developing countries, and even in developed ones, over the last three or four decades. The International Labour Organization (ILO) has recognized that the employment model has changed in recent decades, and that there has been an unusual increase in precariousness. This is explained by the loss of the importance of employment with stable contracts and full working days, factors that, according to Guy Ryder (2015), director of that organization, represent less than a quarter of all jobs in the world. The Organization has also noted that the trends are rising, and that the significant expansion of precarious employment has direct consequences in terms of increasing and widening income inequalities. Latin America has not been, and is not, the exception; on the contrary, this is one of its outstanding characteristics.[11] However, the adverse consequences for the labour market and the increase in inequality and poverty seem to be greater in countries that embraced the neoliberal economic model (in its most orthodox version) and subordinated their economic and social policies to the dynamics of the free market. In contrast, as shown by some indicators, in countries and governments that have promoted post-neoliberal policies in opposition or resistance to neoliberalism, albeit with heterogeneous and unequal emphases and results, the results have been relatively positive, in line with the economic and social policies promoted.

Decent, not precarious, work is a necessary condition for overcoming income inequality and poverty. However, for nearly four decades —with the establishment and hegemony of the neoliberal model— the gap between rich and poor has widened considerably, reaching unprecedented levels, particularly in the countries of the Organisation for Economic Co-operation and Development (OECD). Excluding Bulgaria, Chile, Costa Rica, Mexico, South Africa and Turkey, the United States has become one of the most unequal developed nations in the world (OECD, 2020).[12] In that country, unemployment, precarious part-time work and, above all, wage inequality, have all been growing since well before the economic crisis of 2008. Hence, according to Stiglitz (2012, p. 50), "Although the United States has always been a capitalist country, our inequality—or at least its current high level—is new." The inequality that has existed for about 30 years has grown dramatically. In 2007, with the crisis looming, the median income levels of the top 1 percent of earners were 73 times those of the bottom 20 percent.

The Better Jobs Index, created by the Inter-American Development Bank (IDB), which measures the employment situation of countries based on two dimensions (quantity and quality of jobs), offers suggestive results in this regard. The quantity dimension is broken down into two indicators: (i) the activity or labour participation rate; and (ii) the employment rate. The quality index is constructed from the formality rate and jobs paying wages above the cost of the basic food basket, sufficient to exceed the poverty line. The index is a weighted average of these four indicators and its scores range from 0 to 100. This means that, in a country scoring 100 points, all people participating in the labour force would be employed with a formal job paying a living wage (IDB, undated). It is worth noting that Chile, Costa Rica, Panama and Uruguay are the countries with the highest scores on this index and, consequently, with labour structures of greater relative coverage, and supply of and demand for "formal" employment. At the other extreme is the region's second largest economy, Mexico, which is ranked 13th out of 17 countries. This has one of the most limited and deficient labour markets in terms of job quality, better only than those of El Salvador, Guatemala, Honduras and Nicaragua (see table 1).

[11] Inequality in the share or appropriation of income generated in the production process, which translates into a low wage share, has been and remains one of the characteristics of Latin American and Caribbean economies. These have declined persistently since the mid-1970s, precisely when the neoliberal economic model was being adopted (ECLAC, 2018).

[12] It is estimated that there are five people who own as much wealth as half of the world's population (Buchheit, 2017), and that inequality is even increasing more among rich countries than in Latin America. Perhaps this is a result of the direct impact of governments that promoted redistributive policies under conditions of weak economic growth and development, with an indirect demonstrative effect on the other countries.

Table 1
Latin America (17 countries): Better Jobs Index and wage bill share of GDP, 2018

Country	Better Jobs Index (IDB) 2018	Rank	Wage bill divided by GDP 2016	Rank
Argentina	59.6	7	42.8	4
Bolivia (Plurinational State of)	57.4	9	30.2	12
Brazil	59.9	5	44.7	2
Chile	65.9	2	38.6	6
Colombia	57.4	10	33.5	9
Costa Rica	62.6	4	46.8	1
Ecuador	59.9	6	---	---
El Salvador	49.6	14	37.8	7
Guatemala	43.4	17	---	---
Honduras	44.6	16	44.1	3
Mexico	53.9	13	26.7	13
Nicaragua	48.4	15	39.8	5
Panama	64.4	3	24.8	14
Paraguay	58.7	8	31.4	11
Peru	55.9	12	31.5	10
Dominican Republic	56.4	11	---	---
Uruguay	71.4	1	37.4	8

Source: Inter-American Development Bank (IDB), "Better Jobs Index", n/d [online database] https://mejorestrabajos.iadb.org/en and Economic Commission for Latin America and the Caribbean (ECLAC), *Social Panorama of Latin America, 2018* (LC/PUB.2019/3-P), Santiago, 2019.

The key feature of the regional labour market is its high degree of heterogeneity, which implies various combinations that have an impact on job quality. An indicator of central importance in characterizing the quality of the labour market and the levels of capitalization and concentration of wealth is the structure of labour income. Directly or indirectly, this corresponds to the share of the wage bill in each country's national income or gross domestic product (GDP). In this regard, ECLAC (2017 and 2019a), for the first time included fundamental information for 15 countries and the regional average, with time-series data from 2002, 2006, 2010, 2014 and 2016. The data reported for the region reveal a significant reduction in the wage share of GDP (from 41.8% in 2002 to 39.4% in 2006, 39.3% in 2010, 40.2% in 2014 and 37.5% in 2016). This is an indirect indicator of the trend of increasing income concentration or the fall in the global average of workers' wages. As shown in table 1, the share of the wage bill or percentage of GDP allocated to wage-earners' remuneration varies between countries such as Costa Rica, Brazil and Honduras, with shares of 46.8%, 44.7% and 44.1%, respectively (the highest shares), and Mexico and Panama, in the lowest ranked countries, with shares of 26.7% and 24.8%, respectively, and systematically declining shares since 2002.

In 2002–2014, just four of the countries considered saw an increase in the share of GDP destined for the payment of employee wages; precisely the next four best rated in the last year: the Bolivarian Republic of Venezuela, Brazil, Honduras and Uruguay, with shares of 51.2%, 52.2%, 44.6% and 41.4%, respectively (ECLAC, 2017, p. 64). In that period, Brazil and the Bolivarian Republic of Venezuela experienced the highest wage shares, with increases of around 5.0%. Brazil was also "the only country in which the indicator rose in all the periods under consideration, [and those increases have] been relatively homogeneous since 2002" (ECLAC, 2017, p. 64). In general terms, the trends persisted in 2016, as Argentina, Nicaragua and El Salvador, with 42.8%, 39.8% and 37.8%, respectively, experienced significant improvements and overtook Chile and Uruguay. However, Mexico and Panama ratified their positions with the lowest wage shares in GDP in the region (see table 1) (ECLAC, 2019a).

However, despite significant efforts by some countries, global income inequality has changed little in the last 15 years. The general trend of steep decline in the Gini coefficient occurred in the

period 2002–2014; but this slowed from 2015 onwards, with increasingly smaller variations (ECLAC, 2017 and 2019b). The aggregate data, moreover, hide differences in the trends of specific countries, but reveal the concentration of income in the last two quintiles. Most importantly, they show the overall average change experienced (almost none), with no major impacts on the rest of the income structure in the lower and middle deciles. Inequality in the income distribution barely declined in the bottom segment of the richest 20% for more than a decade. The rich sacrificed little or none of their income, thus maintaining the poverty-generating structure of exclusion and inequality. The global change resulted largely from the contribution made by countries with governments that promoted more resolute income redistribution and poverty-reduction policies.

Latin America is still considered the most unequal region in the world, as a result of a stagnant structure, typical of an elitist society, apart from membership in certain social classes. Although it is not currently the region where inequalities are growing by most, at the domestic level the heterogeneity and differences between and within countries are notable. The same is true of the differences in the levels of abatement achieved in recent decades. The weak performance of the labour market, in addition to being conditioned by the relatively high rate of growth of the labour force —stemming from the shift in age cohorts and the consequent increase in the working-age population— and by the impact of growing female economic participation, has been affected directly by various business strategies aimed at maximizing capitalist profit rates, in an environment of increasing international economic competition. The positive trend of recent years, in this regard, has been very limited and uneven among the different countries and sectors of the population.

Data published by ECLAC on inequality in Latin America in the period considered (2000–2018), measured through the Gini coefficient (which takes values ranging from 0 to 1, representing the absence of inequality or total equality and maximum inequality, respectively), show a variation in the average value for the region that varies not only through time, but, above all, between countries. Income inequality went from 0.538 in 2002 to 0.477 in 2014; 0.469 in 2017, and 0.465 in 2018 (ECLAC, 2019b). The countries with the highest levels of inequality, with average Gini values above 0.5, are Brazil, Colombia, Guatemala and Mexico; and the countries with the lowest inequality are the Bolivarian Republic of Venezuela —the least unequal country in the region, according to data available from 2014— followed by Argentina and Uruguay (ECLAC, 2019b). In the period considered, the progress made, or level of inequality abatement, was also very unequal between countries.

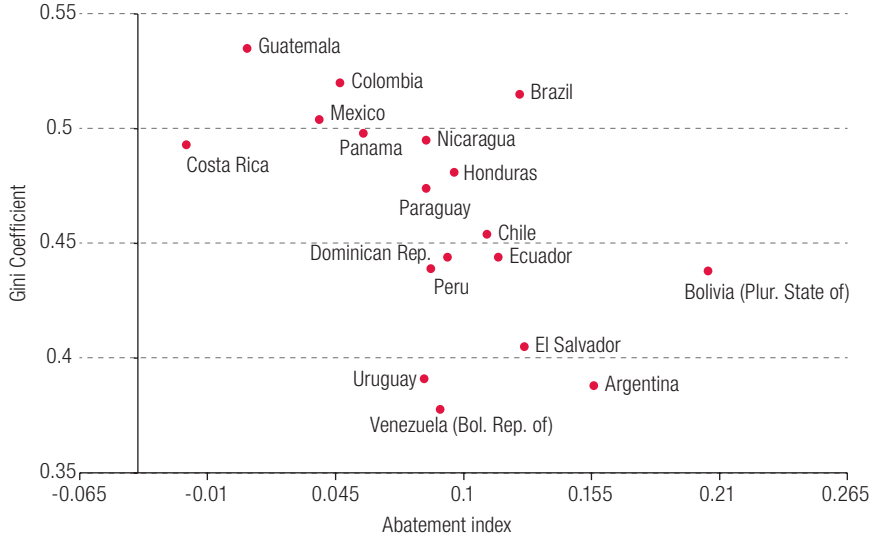
In this study, the consistency of the data on income inequality was extended by applying an abatement index (IA_D), defined as the range or difference of values of the Gini coefficient at two given points in time for which information is available.

$$IA_D = CG_1 - CG_2 \quad (1)$$

This index shows that the efforts made and the achievements attained in recent decades were very unequal across the region. Figure 1 is indicative of the hypothesized differential effects in the countries according to the economic models applied, based on the levels of inequality reported and the efforts made to reduce them. The countries with the best results, as measured by IA_D, were Argentina, Brazil, Ecuador, El Salvador and the Plurinational State of Bolivia. The worst, or those making the least progress or suffering the greatest setbacks were Colombia, Costa Rica, Guatemala, Mexico and Panama. In general, the economic crisis of 2007 and 2008 did not widen the disparities between the extreme groups of the distribution of average income in the region; and, according to ECLAC, seven of the ten countries considered (the Bolivarian Republic of Venezuela, Costa Rica, the Dominican Republic, Ecuador, Paraguay, Peru and Uruguay) displayed a trend towards a reduction in income distribution disparities during that period. As an exception, "Mexico was the only country to show a clear trend toward worsening income distribution" (ECLAC, 2009, p. 54). Mexico was also one of the lowest ranked

countries in terms of job creation —with one of the worst wage structures in the region, wage levels that have been stagnant for more than 20 years (González, 2015; Barragán, 2015) and one of the highest levels of inequality among OECD and Latin American countries. In the last three decades —during the long period of neoliberal hegemony— the disparity between rich and poor widened in this country. The differences in incomes received between the richest 10% and the poorest 10% have widened still further since 2000, from 25.8 times in 2004, to 26.8 in 2008 and 28.5 in 2010. In the latter year the income differences between these groups in OECD countries as a whole was 9.8 times (González, 2013).

Figure 1
Latin America (18 countries): Gini coefficient and levels of income inequality abatement, 2000–2018



Source: Prepared by the authors, on the basis of Economic Commission for Latin America and the Caribbean (ECLAC), *Social Panorama of Latin America, 2019* (LC/PUB.2019/22-P/Rev.1), Santiago, 2019; *Social Panorama of Latin America, 2016* (LC/PUB.2017/12-P), Santiago, 2017, and *Statistical Yearbook for Latin America and the Caribbean, 2014* (LC/G.2634-P), Santiago, 2014.

Note: In the cases of Argentina, Brazil and Ecuador, the years 2017, 2015 and 2017, respectively, were taken as the last year of analysis, coinciding with the end of post-neoliberal governments and the reversal of observed trends.

In the region, the population living in poverty has declined in recent decades, partly owing to the average rise in income levels in countries that pursued redistributive policies, in conjunction with the anti-poverty policies implemented by governments. Most of these policies consisted of targeted programmes aimed at subsidizing the basic minimum needs of the most disadvantaged groups. Nonetheless, poverty and extreme poverty levels in the region have increased since 2015, reaching 30.8% and 11.5% of the population, respectively, in 2019 (ECLAC, 2019b). This requires the great challenge of social policies to be reconsidered; and it must be accepted that economic growth is a necessary, but insufficient, element for poverty abatement.

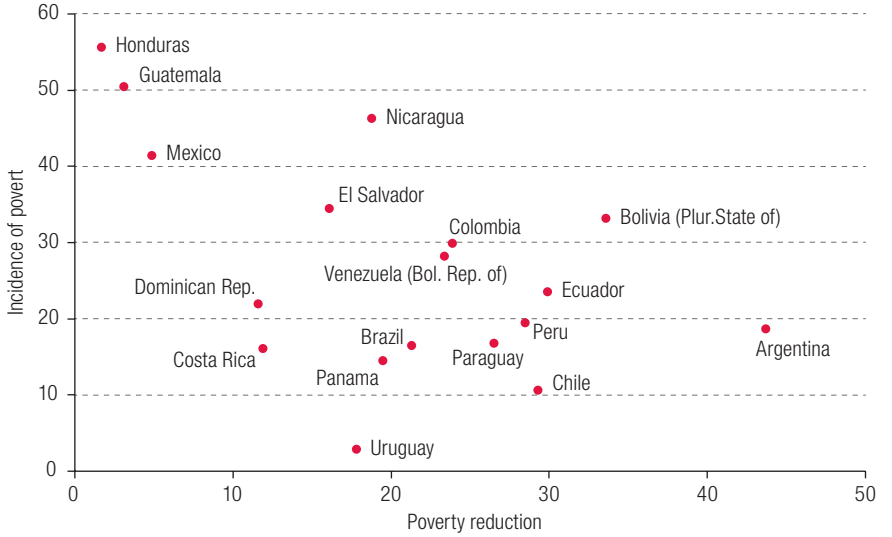
According to ECLAC data on the proportion of the population living in poverty and indigence in Latin America in 2018, the countries with the lowest incidence of poverty are Uruguay and Chile, with rates of 2.9% and 10.7%, respectively, followed by Panama (14.5%), Costa Rica (16.1%) and Brazil (16.5%). The first two, Uruguay and Chile, present very low levels of extreme poverty, at just 0.1% and 1.4% of their population, respectively (ECLAC, 2019b). The opposite is true of the countries with the highest levels of poverty, namely Honduras (55.7%), Guatemala (50.5%), Nicaragua (46.3%) and Mexico (41.5%). The countries with the highest levels of extreme poverty are Honduras (19.4%), Nicaragua (18.3%) and Guatemala (15.4%).

The analysis of poverty abatement trends or rates in the region, measured through the poverty abatement index (IA_P) —which considers the range or difference in the proportion of the population living in poverty at two given points in time for which information is available— points in the expected direction.

$$IA_P = PSP_1 - PSP_2 \quad (2)$$

Figure 2 demonstrates these trends in the expected direction and corroborates the hypothesis regarding the achievements of the models pursued by the countries of the region, and the effort made, or not made, to reduce poverty. This index shows that the achievements were very unequal across the region, correlating with the type of welfare policy promoted. The countries with the highest IA_P, with poverty levels below or above the average and greater achievements, were Argentina, Chile, Ecuador and the Plurinational State of Bolivia. With lower relative levels, due in part to the poverty rates already achieved, were Brazil, Costa Rica, Panama and Uruguay. Meanwhile, with poverty rates well above the average, in the quadrant of high poverty with setbacks or few achievements, Honduras displays the least progress, followed by El Salvador, Guatemala, Mexico and Nicaragua, which stand out for the magnitude of the setbacks suffered in combating poverty in the period considered (see figure 2). In terms of poverty levels and the weakness of policies to reduce and combat poverty, the group of five countries mentioned (El Salvador, Guatemala, Honduras, Mexico and Nicaragua) shows once again how a process of "Central Americanization" has occurred in Mexico during the last almost two decades of neoliberal hegemony.

Figure 2
Latin America (18 countries): population living in poverty and poverty abatement rate, 2000–2018
(Percentages)



Source: Prepared by the authors, on the basis of Economic Commission for Latin America and the Caribbean (ECLAC), *Social Panorama of Latin America, 2019* (LC/PUB.2019/22-P/Rev.1), Santiago, 2019, and *Statistical yearbook for Latin America and the Caribbean 2014* ((LC/G.2634-P), Santiago, 2014.
Note: Data for Argentina, Brazil and Ecuador correspond to 2017, 2014 and 2017, respectively, coinciding with the end of post-neoliberal governments and the reversal of observed trends.

In Mexico, as in the region's other countries, poverty conditions are linked to the dynamics and quality of employment, especially in terms of labour income. According to the World Bank, labour markets have been the main avenue for reducing poverty levels in the region, at least since 2013. In many of the countries, poverty related to labour income —or labour poverty, in which a household's

labour income is insufficient to support its members— continued its downward trend. This phenomenon became "the primary driver of poverty reduction", and, although the pace has become increasingly slower, at least since 2010 the trend has been maintained, from which "Mexico was the only exception" (World Bank, 2015, p. 17). Mexico has been, and continues to be, the "country of exceptionalities", derived from the vulnerability of workers owing to the economic and labour model applied, and the country's structural dependence on the dynamics and performance of the United States economy. While most of the countries in the region have significantly reduced their poverty and indigence rates, regardless of the economic crises they faced, Mexico has failed in this endeavour. Hence, in the context of the 2007 and 2008 crisis, "Only in Mexico did the situation worsen" (ECLAC, 2009, p. 50).

It is worth considering that, theoretically, in addition to the factors associated with employment conditions and wages that are typical of peripheral neoliberal globalized economies, in economies and countries that are more closely linked to each other and produce for a global market, the production or marketing cycle no longer depends on domestic consumption, or else does so less. Accordingly, these countries can dispense with the consumption of a portion of their national workers by maintaining low-income wage structures, along with their direct and indirect consequences for levels of well-being, inequality and poverty among the population, and rely instead on the international market. Hence, any change aimed at strengthening the domestic market, even if minimal and complementary, could have a positive impact on the most vulnerable. South American countries in particular, which have promoted post-neoliberal development models, have made significant progress in terms of well-being and reducing inequality and poverty levels among their populations.

V. Final remarks

Flexibilization, deregulation and precariousness were institutionalized, and their legitimization was promoted, initially de facto, as part of the labour normalization process and, subsequently, through labour reforms, which also institutionalized the risk of exclusion. Labour flexibilization and deregulation, which was proposed as a way out of the employment crisis that began in the mid- and late-1960s, rather than a cure (or remedy) became the evil itself, the "labour disease" (Castillo Fernández, 2018a). Neoliberalism took the disease itself as the solution, thus closing down any possibility of improvement and "healing on its own body", leaving its own death as the only viable way out. Labour flexibilization and precariousness are intrinsic to the neoliberal model —its very essence. Hence, the principle of distributive justice articulated to work as employment and the payment of a wage —through a generally stable job— typical of the wage society model and the welfare state, has no place in the logic of neoliberalism.

With the adoption of the neoliberal economic model and the separation of the three fundamental elements (the national state, the industrial bourgeoisie and the working class), the basic foundations on which the welfare state and the idea of development promoted under the import substitution model had hitherto rested were eroded. In the context of neoliberal globalization, the State, as an instrument of power and class domination, was not weakened. On the contrary, the disarticulation of the working class redirected the correlation of forces in its favour, to the detriment of the working class and other subordinate classes. The national state was significantly eroded (Ohmae, 1997); but, as an instrument of power at the service of the financial bourgeoisie, it was strengthened. The question arises as to whether, if a protectionist or semi-protectionist economic model is imposed, it would be possible to consider a return to development, based on the reconfiguration of a new welfare state model in Latin America. Early in the last decade, Quijano (2000, p. 38) warned that the problem of development, as a goal to be achieved in the context of globalization itself, seemed to be gaining ground.

The claim being made in this regard is that the breakdown of this pact, which occurred in the mid-1970s, and the current organizational weakness of the working class, makes it unfeasible to rebuild an authentic welfare state, aside from all considerations regarding the possibility of reorganization from the State and reorientation of the economic model. In this framework, the resurgence of a new welfare state becomes almost impossible, since the working class has no social or political capacity to assume such an alternative project, as a counterweight to the State and the capitalist class, following the model of the previous welfare State. At least, this is what seems to be happening (Castillo Fernández, 2018b). The question that arises is whether or not, in the current context, it is possible to reconstruct or redefine that social pact. However, despite all the known contradictions, the return to protectionism or to a semi-protectionist model, with the development of the national state, could be favourable, at least for the middle social sectors and the working class that are directly affected by labour flexibilization and deregulation in their employment conditions and social and labour welfare. In particular, the production and reproduction of inequality and poverty in the capitalist logic would require the social pact to be redefined. The fundamental conceptual triad that explains and determines labour and social exclusion is not that of the State, the market and the international system, as Cimadamore (2008) claims, but that which is implied by the relationship between the State, the working class and the market, and which served as the basis of social policy during the welfare state.

The State has a function beyond serving as a mechanism of political control and intermediation. Even under free market capitalism, its intervention in the redistributive tasks of a democratic system. It is here that a new form of State would seem to be appropriate and play an important role.[13] However, the State is an epiphenomenon if it is not considered in relation to the interests of the classes in power and the consequent internal correlations of forces. This may not be possible; but a "forced" change in the economic policy of commercialization, with protectionist or semi-protectionist systems, would require Latin American countries to make adjustments to the economic model being pursued. In principle, they might have to look for other markets. Also (and this could be favourable to policies for the expanded development of domestic production and consumption markets), these adjustments could be combined with policies on job creation and income redistribution, and even promote, in a complementary manner, interregional integration mechanisms for the marketing of products and the development of regional labour markets.

Unemployment, precariousness, social inequality and poverty, in their new forms, magnitudes and trends, are inherent consequences of the contradictions of capitalism in the globalized neoliberal phase. The shift away from standard work arrangements, typical of the welfare state model, to flexible, deregulated and precarious employment, by institutionalizing new forms of labour management, normalized the risk of wider income inequalities and new forms of poverty. A welfare policy aligned with the conditions and demands of the population is unfeasible under neoliberalism, because it faces insurmountable obstacles. However, post-neoliberalism, whether as reformism or as a possible way out, despite failing to overcome the source of contradictions of the economic and labour model —and even making the model viable— makes this model less cruel and dramatic, as has been demonstrated, insofar as it can target its social policy to the most immediate interests of the neediest population groups, deprived of resources and basic benefactors.

[13] Wallerstein himself, who questions the viability of development in the context of today's globalized capitalism, recognizes that the State is not irrelevant in this process (Wallerstein, 1999, p. 137).

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Technological change and labour market trends in Latin America and the Caribbean: a task content approach

Ignacio Apella and Gonzalo Zunino

Abstract

The aim of this paper is to analyse employment profile trends in the Latin American and Caribbean countries according to the task content of workers' jobs. This analysis seeks to approximate the impact of technological change on the labour market. The paper uses the definitions of an indicator that captures the relative importance of four types of tasks, namely cognitive versus manual and routine versus non-routine tasks, based on information from the Occupational Information Network (O*NET) and household surveys. The analysis finds that there has been growing demand for workers over the last two decades in occupations which are intensive in cognitive abilities, with higher remuneration than for occupations which are intensive in manual tasks. Cognitive skills are therefore a key variable for improving participation in current and future labour markets.

Keywords

Technological change, employment, labour market, labour productivity, occupational qualifications, skilled workers, unskilled workers, job analysis, Latin America and the Caribbean

JEL classification

J01, J22, J24

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I. Introduction[1]

Technological change, such as advances in digital technologies, communications and robotics, can lead to an improvement in the general well-being of the population and reduce poverty, thanks to increased overall productivity in the economy.

The potential benefits of technological progress are important for both firms and consumers. Digital technologies, for example, can create jobs and bring benefits to small and medium-sized producers through the expansion of access to information and communication mechanisms, especially in those sectors which could be, or already are, users of these technologies. An example of this might be the creation of trading platforms connected via the Internet through which buyers and sellers can be brought together with minimal transaction costs.

From the point of view of consumers, the benefits from technological change are associated with potential reductions in the downstream prices of products as a consequence of the profits yielded by greater efficiencies and the increased range of goods and services available, generating a positive change in the consumer surplus. The majority of these consumer gains come from reduced marginal costs of production and distribution when the productive sector incorporates technological innovation and automates production processes, taking advantage of the economies of scale which are generated.[2]

However, possible negative consequences of rapid technological change have been analysed with concern in the literature.

For one thing, technical progress, in particular the advance of robotics, means that certain activities run a high risk of becoming obsolete, since routine tasks, for example, or those which can be replaced by a code, can be easily automated, leading to what is commonly known as technological unemployment.

A number of studies have drawn attention latterly to the potential labour market impacts of the recent process of technological change (Brynjolfsson and McAfee, 2014; Autor, Levy and Murnane, 2003; Spitz-Oener, 2006; Acemoglu and Autor, 2011; Frey and Osborne, 2013; OECD, 2016; Arntz, Gregory and Zierahn, 2016; Nedelkoska and Quintini, 2018). In particular, this group of studies not only discuss the possibility that technological change could displace many current occupations (Frey and Osborne, 2013; Brynjolfsson and McAfee, 2014; OECD, 2016; Arntz, Gregory and Zierahn, 2016; Nedelkoska and Quintini, 2018), but look in detail at the type of tasks that are most likely to be affected by this displacement and, conversely, the type of tasks that could be increasingly in demand because of the new technologies (Autor, Levy and Murnane, 2003; Spitz-Oener, 2006; Acemoglu and Autor, 2011; Arntz and others, 2016; Nedelkoska and Quintini, 2018). This approach to the effect of technological change on labour markets is usually called the task content approach.

Previous literature based on the task content approach states that jobs which are intensive in cognitive tasks, particularly non-routine cognitive tasks, will not just suffer less from technological displacement but will actually be stimulated by it (Autor, Levy and Murnane, 2003; Spitz-Oener, 2006; Acemoglu and Autor, 2011; Keister and Lewandowski, 2016). Thus, the employment that people can access and the productivity of labour will increasingly depend on the ability of workers to perform cognitive tasks.

At the same time, and in connection with this approach, a number of previous studies have warned that the incorporation of automated production mechanisms and advances in digital communication pose a risk to the labour market, not so much in the form of technological unemployment as because of their distributive impact, which could worsen inequality.

[1] This article is an extension of an earlier paper, Apella, I. and G. Zunino, "Technological change and the labor market in Argentina and Uruguay: a task content analysis", *Policy Research Working Paper*, No. 8215, Washington, D.C., World Bank, 2017.

[2] However, the transfer of a technological improvement to final prices assumes a certain grade of competition in each market. In a market with a high concentration, profits from efficiency will be transferred to the profit margins of the companies.

Indeed, the automation of certain tasks, especially routine tasks, could change the structure of employment, increasing the weight of two major groups of workers: a highly skilled and productive group, working in occupations that are intensive in non-routine cognitive tasks and earning high incomes, and the group of low-skilled workers, relegated to low-productivity occupations that are intensive in non-routine manual tasks and earning low incomes. The change seems to be taking the form of a decrease in demand for the labour of workers with average skill and income levels, who are usually employed on routine tasks, whether manual or cognitive. A number of studies describe this process of employment polarization in developed economies (Acemoglu and Autor, 2011; Autor and Dorn, 2013; Goos and Manning, 2007; Goos, Manning and Salomons, 2014; Bussolo, Torre and Winkler, 2018).

The consequences of this will be distributed differently depending on whether machines are capable of replacing only unskilled work, skilled work, or all work. In any event, the new situation is challenging and calls for additional investment in the labour force if the benefits offered by technological change are to be realized. In other words, the productivity of workers needs to be raised by increasing their human capital so that they can adapt to the new forms of production. The benefits from the use of new production technologies are not automatic. Not only does access to information services and digital communication need to be improved, but new basic skills need to be incorporated into the workforce through education system modernization and ongoing training.

A major limitation of the previous literature from the perspective of policymakers in emerging countries is that most studies of the potential impact of technological change on labour markets is based on developed countries, while evidence for emerging countries, and particularly for Latin America and the Caribbean, is much more limited.

Emerging countries' characteristics are distinct from those of developed countries, which could potentially lead to different trends in technological progress and the task profile of labour markets. Economic structures and specializations differ between the two groups of countries. Emerging countries are characterized by lower wages and thus fewer incentives for automation compared with developed countries. Then, emerging countries usually perform less well in comparative tests of cognitive skills, which could entail constraints in the effort to move the labour supply towards a task profile that is more intensive in cognitive tasks.[3]

Stylized facts obtained for developed countries do not necessarily hold good for emerging countries, then, and the following question arises: is technological change also resulting in a growing demand for workers with cognitive skills in emerging countries? This paper aims to provide some elements for an answer to this question based on the evidence for Latin America and the Caribbean in the last two decades.

To do this, the paper will examine past trends in employment levels according to the type of tasks that workers did in their jobs, with a view to reaching an approximate assessment of the possible impact of technological change on the demand for labour and initiating a discussion on the possible public policy responses to this challenge. For this purpose, it will apply the task content methodology proposed by Acemoglu and Autor (2011) to a set of nine Latin American and Caribbean countries (Argentina, Brazil, Chile, the Dominican Republic, El Salvador, Mexico, Peru, the Plurinational State of Bolivia and Uruguay), which we consider to represent quite well the different characteristics of the whole region.

This paper provides new evidence that labour markets in the Latin American and Caribbean countries are not exempt from the process described. During the last 20 years, the labour force in the region has moved from more manual occupations to occupations that are more intensive in cognitive tasks. This allows us to state that, on average across the whole market, jobs are changing and with them

[3] See, for example, the gaps in cognitive skills between emerging and developing countries in the Programme for International Student Assessment (PISA) test (OECD, 2015) and the Programme for the International Assessment of Adult Competencies (PIAAC) survey (OECD, 2013).

the type of skills, and workers, required. This phenomenon is characteristic of processes of change in the production functions of economies, particularly the adoption of new technologies such as robotics, which allow manual labour to be replaced in certain tasks.

The paper proceeds as follows. The next section discusses the theoretical framework of analysis for the relationship between technological change and the rate of substitution of factors of production. Section III presents the methodology and information used. Section IV analyses the main results obtained for a set of nine Latin American and Caribbean countries. Section V discusses the challenges that these tendencies entail for public policies. Lastly, section VI contains some closing reflections.

II. Theoretical framework

The impact of technological progress on the performance of labour markets is discussed extensively in the literature (Autor, Levy and Murnane, 2003 and 2013; Frey and Osborne, 2013; among others), where it is suggested that it leads to a reduction in the level of employment in occupations that are intensive in routine tasks, i.e. occupations consisting principally in tasks which follow well-defined procedures that can easily be performed by some sort of algorithm. Not only technological progress itself, but also any reduction in the cost of accessing new production technologies, results in a potential displacement of part of the labour force by machines administered by a computerized system. Thus, technological change, and in particular the advance of robotics, could give rise to an increase in technological unemployment.

Frey and Osborne (2013) distinguish between occupations at high, medium and low risk of automation and argue that close to 47% of all work in the United States can be placed in the high-risk category. For its part, the World Bank (2016) estimates that an average of 50% of the current work in Latin America might not continue to be performed by people in the future.

However, not all jobs are susceptible to automation. Analysis of this phenomenon requires jobs to be differentiated not by the level of qualifications or skills they call for, as might be thought, but by the combination of tasks they involve. This framework of analysis, known as "task content", is proposed by Autor, Levy and Murnane (2003) and Acemoglu and Autor (2011), among others. According to these authors, tasks are not the same as the skills with which a worker is endowed, although the two concepts are closely related. While skills are tied to workers, tasks are tied to occupations.

Specifically, a task is defined as an activity which enables a product to be created (Acemoglu and Autor, 2011). However, workers need a number of skills to be able to carry out tasks. As an example, an architect needs great numerical and mathematical skills to perform cognitive tasks which are generally non-routine, such as the design and development of plans. Skills may be understood as workers' ability to perform particular tasks.

Tasks can be classified into two broad categories: routine and non-routine. A task is routine if its performance involves a clear and repetitive set of invariable actions. Many tasks, such as temperature control on a steel production line or the transfer of a car part to its place on an assembly line, have this characteristic. Since these tasks require the methodical repetition of an unvarying procedure, they can be clearly specified in a computer program and performed by a machine.

A non-routine task, on the other hand, is one that requires a number of actions to vary in time and those performing these actions to have the ability to adapt to the context using language, visual recognition and social interaction, among other things. As Polanyi (1966) puts it, these are the skills that mean a driver cannot be completely replaced, while the knowledge that a person has about their own body differs completely from their knowledge of physiology, and the rules of rhyme and prose do not in themselves explain what a poem conveys. Accordingly, the movement of a car through the traffic of a city and the writing of a poem fall into the category of non-routine tasks, the reason being that these

tasks require visual, socioemotional and motor processing abilities that cannot be described in terms of a set of programmable rules.

At the same time, the tasks in each of these two categories may be of either a manual or a cognitive nature, i.e. relate to either physical work or to knowledge. It is thus possible to establish four main categories of tasks:

(i) Routine manual tasks, normally performed by low- or medium-skilled workers. Such tasks are highly codifiable and replaceable by automation, and examples of those performing them include assembly line workers and manual factory workers.

(ii) Non-routine manual tasks, commonly performed by low-skilled workers. The performance of these tasks requires the ability to adapt to situations and involves language, visual recognition or social interaction. Drivers and mining and construction personnel are examples of workers who perform these types of tasks intensively. These tasks have a low or zero probability of being computerized, although Frey and Osborne (2013) have suggested that some of them, such as transport and logistics and administrative support, are at risk of being automated.

(iii) Routine cognitive tasks, carried out by medium-skilled workers. Computers may be a substitution factor in some occupations more than others, specifically those that involve explicit and repeated sets of activities which can be coded in a computer program. The tasks performed by secretaries, salespeople, administrative staff and bank cashiers, among others, fall within this group.

(iv) Non-routine cognitive tasks, normally performed by highly skilled workers. These tasks, which are often divided into the two broad subcategories of analysis and personal relations, require abstract thought, creativity, the ability to solve problems and communication skills. Computers may complement the performance of these tasks, increasing the productivity of the skilled workers. These tasks are commonly performed by professionals such as managers, designers, engineers or information technology specialists, teachers, and researchers, among others.

All occupations, with differing levels of intensity, involve one or a combination of the tasks described. The intensity of tasks appears to vary greatly between occupations. As an example, car drivers perform non-routine manual tasks the majority of the time but also perform personal non-routine cognitive tasks and routine cognitive tasks. In contrast, scientists spend the majority of their time performing non-routine cognitive tasks, but also perform routine cognitive or manual tasks, or both, with a lower frequency.

As the cost of accessing new technologies declines, computer-controlled machinery could replace those workers who perform largely routine tasks, especially manual ones. The phenomenon is not new, as such substitution has been seen since the first industrial revolution, but the technological revolution has developed in such a way that machines can perform cognitive tasks which a few decades ago were only performed by people. As Bresnahan (1999) points out, during the last three decades computers have increasingly performed tasks involving calculation and the coordination of activities and communications and taken over the work of bank cashiers, telephone operators and other performers of repetitive information-processing tasks.

On the other hand, the ability of computers to replace workers employed in the performance of cognitive tasks is limited. Combinations of tasks which demand flexibility, creativity, problem-solving and communication skills (non-routine cognitive tasks) are less susceptible to automation, with the need to produce a series of explicitly programmed instructions constituting a restriction.

Computer technology is more adept at replacing workers who perform routine tasks than non-routine tasks, but it can be a complementary factor in the performance of non-routine tasks, and may increase marginal productivity. To give an example, the ability to use a bibliographic search program through a networked computer increases the efficiency of researchers using such references as inputs and enhances the quality of their output.

Not all tasks are susceptible to replacement by machines, and decisions in the production sector about optimum combinations of production factors are found to be driven not only by the flexibility with which substitution can be carried out between factors but also by their relative prices. The simple model proposed by Autor, Levy and Murnane (2003) and also by Frey and Osborne (2013) allows these decisions to be formalized.

Let us assume a Cobb-Douglas production function for work and capital as follows:

$$Q = \left(L_r + k\right)^{1-\beta} L_n^{\beta} \tag{1}$$

where L_r and k are the work to be performed in tasks susceptible to automation and the capital that these tasks can realize, respectively. The two factors are perfect substitutes. L_n represents the value of the work required so that the tasks are not susceptible to automation. Assuming that the product price is the numeraire, and taking w_r, ρ and w_n as the wage for the work that can be automated, the price of capital and the wage for the complementary work, respectively, of the first order conditions, we obtain the following expression:

$$PMg_{Lr} = PMg_k = \left(1-\beta\right)\frac{\left(L_r + k\right)^{-\beta}}{L_n^{-\beta}} = w_r = \rho \tag{2}$$

where PMg_{Lr} is the marginal product of labour in routine tasks, PMg_k is the marginal product of capital and $\theta = \frac{\left(L_r + k\right)}{L_n}$ is the relationship between tasks susceptible and not susceptible to automation within the production function. The optimal condition requires equality between the marginal productivity ratios of factors and relative prices:

$$\frac{PMg_{Lr}}{PMg_k} = 1 = \frac{w_r}{\rho} \tag{3}$$

This assumes a reduction in the price of capital, ρ, that implies that the technical substitution ratio is less than the relative prices, encouraging the company to reallocate factors of production in pursuit of economic efficiency, replacing labour with capital.[4]

Following Goos and Manning (2007) for the case of Great Britain, it is possible to see a tendency towards polarization in the labour market, with growth in high-income cognitive work and low-income manual occupations accompanied by a reduction in medium-income routine tasks. Falling prices for computing equipment are increasing the relative productivity of problem-solving skills, which explains the growth in occupations requiring the performance of cognitive tasks by a qualified labour force (Katz and Murphy, 1992; Acemoglu, 2002).

[4] In the case of additive production functions, the only effect in the face of an exogenous price shock is the substitution effect.

III. Methodology and information sources

To carry out this analysis, the information available in the Occupational Information Network (O*NET) database was used in conjunction with household surveys. The database provides information on the task content of occupations. O*NET data have been collected in the United States using the Standard Occupational Classification (SOC) system for approximately a thousand occupations since 2003, with periodic updating.[5]

Following the work of Acemoglu and Autor (2011), two sets of O*NET data are used: work activities and work context. Each contains descriptors intended to measure the importance, level or scope of the activity on a scale. For this, data from O*NET 2003 and 2015 are used to capture changes in the content of the tasks within each occupation over time.

In order to estimate the content of the tasks in the different occupations, the task elements provided by O*NET are mapped on to the corresponding four-digit occupations in the International Standard Classification of Occupations (ISCO). The results are combined with individual labour force data from household surveys. In general, each country has a specific version of the ISCO; in cases where a national classification is used, ISCO equivalents are applied. O*NET, meanwhile, uses a modified version of the Standard Occupational Classification (O*NET-SOC). A table of equivalences between these two classifications is employed so that the appropriate occupational attributes can be matched to the household survey data.

In many cases, the correspondence tables do not provide a one-to-one match between the occupational categories of O*NET and the household surveys. In these cases, the strategy used by Hardy, Keister and Lewandowski (2015) was followed. Four situations can be identified.

The first situation is one where an occupational code belonging to the O*NET classification corresponds to just one occupational code in the classification to be mapped to. In this case, the characteristics of the O*NET code are attributed directly to the classification in the household survey.

In the second situation, a specific code in the O*NET classification corresponds to more than one code in the classification to be mapped to. In this case, the characteristics of that one code in the first classification are attributed to all the occupations of the second classification.

In the third situation, a number of codes in the original classification correspond to a single code in the classification mapped to. In this case, the average value of the characteristics associated with the codes of the original classification are attributed to this latter code.

The final situation is one where a number of codes in the original classification correspond to several codes in the classification being mapped to. In this case, again, an average value for the characteristics associated with the relevant codes in the original classification is attributed to each code in the classification being mapped to.

The mapping once complete, following Acemoglu and Autor (2011) and Hardy, Keister and Lewandowski (2015), five measures were constructed for the content or intensity of the main tasks involved in occupations: non-routine cognitive analytical, non-routine cognitive interpersonal, routine cognitive, routine manual and non-routine manual. These are based on the attributes of the activities that each occupation requires. Attributes (elements) representative of each task were selected and are presented in table 1.

[5] O*NET is the successor of the Dictionary of Occupational Titles (DOT), which is no longer updated. O*NET was launched in 1998 on the basis of the Bureau of Labor Statistics (BLS) Occupational Employment and Wage Statistics codes. It was changed to SOC in 2003, which implies that consistent measures of task content have been calculated since that year.

Table 1
Construction of task content measurements

Task	Task elements *(t)*
Non-routine cognitive analytical	Information analysis Creative thinking Interpretation of information for others
Non-routine cognitive interpersonal	Establishment of personal relationships Leadership, management and motivation of staff Training and development of others
Routine cognitive	Repetition of the same tasks Accuracy or precision is important The work is highly structured
Non-routine manual	Operation of vehicles or machinery Use of hands to manipulate, control or feel objects Manual dexterity Spatial orientation
Routine manual	Speed determined by that of the equipment used Control of machinery or processes Repetitive movements

Source: D. Acemoglu and D. Autor, "Skills, tasks and technologies: implications for employment and earning", *Handbook of Labor Economics*, vol. 4, part B, D. Card and O. Ashenfelter (eds.), Amsterdam, Elsevier, 2011.

The first step in building the five task intensity indices is to standardize each of the 16 indicators (t) taken from O*NET and attached to the occupations reported by individuals in the household surveys so that each of these indicators takes a value of zero for the average worker of the period in each country. Specifically, the values of each element t are normalized to make information comparable across time, using the following formula:

$$\forall j \in J t_{i,j}^{std} = \frac{t_i - \mu_j}{\delta_i} \tag{6}$$

where J is the combination of the 16 tasks listed in table 1 for occupation i, and μ_j and δ_j represent, respectively, the weighted average and the standard deviation of task j in the whole of the period from around 1995 to around 2015[6], computed as follows:

$$\forall j \in J \mu_j = \frac{\sum_i^N t_{i,j} w_i}{\sum_i^N w_i} \tag{7}$$

$$\forall j \in J \delta_j = \left(\frac{\sum_i^N w_i \left(t_{i,j} - \mu_j \right)}{\sum_i^N w_i} \right)^{1/2} \tag{8}$$

where w_i is the relative weighting attributed to occupation i.

After that, to construct the five measures of intensity for each task, all the elements of each group of tasks are added up and each of the five measures of intensity is again standardized. In this way, each of these five measures of task intensity takes a value of zero for the average worker of the period in each country. Normalization is carried out within countries. Thus, the concrete value of each task intensity index in a given country and period shows how it has evolved for the average worker over the entire period within the country concerned. It should be noted that these measures do not allow task intensity to be compared between countries, because each country has a specific index based on its own average worker in the period analysed.

[6] The specific period of analysis was subject to the availability of data in each country covered by the study.

An important limitation of the methodology applied arises as a consequence of the fact that the O*NET information used to identify the task profile of each occupation is based on surveys carried out in the United States, and the task profile of an occupation in an emerging country, with different levels of capital per worker, could be different from the profile observed in the United States.

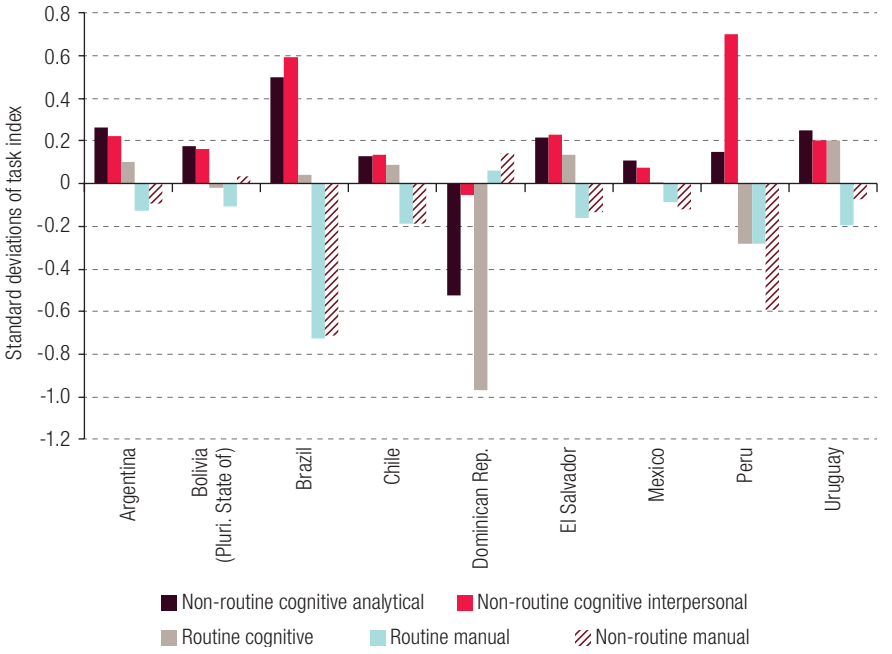
IV. Empirical results

1. The relative importance of tasks

This section presents the empirical results relating to changes in the tasks performed in the course of the average job in the selected countries between the mid-1990s and the mid-2010s. The aim is to identify not only the changes but also the factors that prompted these changes and the effects on the wage distribution.

Figure 1 shows changes in the content of each type of task in the average job in each country between the mid-1990s and the mid-2010s.

Figure 1
Changes in the task content of employment by country, mid-1990s to around 2015



Source: Prepared by the authors, on the basis of O*NET [online] https://www.onetonline.org and household surveys conducted in the respective countries.

Note: Owing to the availability of information, a different period is covered for each country: Argentina 1998–2015; Brazil 1996–2013; Chile 1996–2015; Dominican Republic 1996–2014; El Salvador 1998–2014; Mexico 1996–2014; Peru 1997–2013; Plurinational State of Bolivia 1995–2015; and Uruguay 1995–2015.

When the start and end years in each country are observed, a clear common trend of change in the profile of the average employment in the region is appreciated, although with some differences that need to be highlighted.

As regards the content of non-routine cognitive tasks, whether analytical or involving interpersonal relations, all the countries analysed, with the sole exception of the Dominican Republic, show an

increase in the content of these tasks in the average job. This finding is consistent with a process of change in the tasks performed by workers in a context where many of them are at risk of automation. As mentioned above, non-routine cognitive tasks are not susceptible to automation, and it is therefore in this group of activities that space is opening up for the workforce.

In the case of manual tasks, both routine and non-routine, their relative importance within the average job decreased during the period of study in all the countries except, again, the Dominican Republic. The Plurinational State of Bolivia is a particular case, because although there was a drop in non-routine manual tasks, there was a small increase in routine manual tasks.

On the other hand, the importance of routine cognitive tasks in the average job rose in five of the nine selected countries: Argentina, Brazil, Chile, El Salvador and Uruguay. In the cases of the Dominican Republic, Mexico, Peru and the Plurinational State of Bolivia, conversely, the content of routine cognitive tasks in the average job has decreased during the last 20 years.

The findings suggest that there has been a change in the profile of employment in Latin America and the Caribbean in terms of the intensity with which the different types of tasks are carried out by employees in their occupations, with a shift from jobs intensive in manual tasks to a greater intensity or content of cognitive tasks. The only exceptions to this common trend in our set of countries are the Dominican Republic, where the profile of employment changed in the opposite direction, and the Plurinational State of Bolivia, where the content of routine manual tasks increased during the period under study.

In general, the relative importance of non-routine cognitive tasks, both analytical and interpersonal, has grown in the region during the last 20 years. At the same time, the average intensity of manual tasks, both routine and non-routine, has decreased. All these changes are in line with findings in the most developed countries (Autor, Levy and Murnane, 2003; Spitz-Oener, 2006) and with the results of Keister and Lewandowski (2016) for countries in Central Europe.

However, there is room for doubt about the evolution of the relative importance of routine cognitive tasks in some countries of the region. Autor, Levy and Murnane (2003) found that tasks of this type lost ground in United States employment, and Spitz-Oener (2006) obtained similar results for Germany. However, a review and update by Acemoglu and Autor (2011) for the United States found different trends during specific periods. In the same way, Keister and Lewandowski (2016) identified an increase in the intensity of routine cognitive tasks for several countries of Central and Eastern Europe.

The importance of the increased content of routine cognitive tasks in the average job in the countries of the region lies in the risk of automation that these types of task present. The fact that jobs are now more intensive in them poses a medium-term risk of displacement for some workers due to automation. As mentioned previously, tasks of this type are carried out by workers with an intermediate level of education and average labour incomes, which implies that a process of automation and displacement could lead to a worsening situation of distributive inequality.

2. Factorial decomposition of the changes in task content

The changes in the content of the tasks observed raise some concerns about the mechanisms that are operating to alter the average employment profile in each of the countries analysed. It is possible to identify three major channels through which these changes in the importance of each task in the average job are being generated.

The first is associated with the movement of workers between economic sectors, commonly called the between-sector effect. As an example, migration of workers away from an economic sector such as agriculture, which is traditionally intensive in manual tasks, to the service sector, which is more

intensive in cognitive tasks, leads to a change in the profile of the tasks performed in the average employment in the country concerned.

As pointed out by Apella and Zunino (2017), this movement of workers between economic sectors can be prompted by different causes, such as changes in the terms of trade that affect a whole sector and put it at a disadvantage to international competitors, changes in global trade centres and the emergence of other countries with greater comparative advantages in the sector, the urbanization processes that take place as people leave jobs in rural areas and migrate to large cities to join the industrial, service or retail sector, etc. However, the role of technological change in this process is not minor. The incorporation of new production technology in sectors traditionally associated with manual tasks forces workers to seek employment opportunities in other branches of activity.

The second factor is the movement of workers between occupations within the same branch of activity, called the between-occupation effect. An example might be someone who ceases to work as a bank teller, an occupation that is intensive in routine cognitive tasks, and begins to work as a taxi driver, which is a non-routine manual occupation. This example indicates the importance that technological change can have for the average employment profile, encouraging movements of workers between occupations.

The third channel through which changes occur in the average content of the tasks performed by workers are specific modifications within each occupation over time, usually called the within-occupation effect. In other words, the incorporation of new production technology in each occupation forces workers to alter their roles within the workplace. The adoption of automated assembly machinery managed by a computer program requires workers to be reassigned from the tasks they previously performed, so that they may come to spend the majority of their time on tasks relating to sales and merchandising, for example. We approximate this change in the task profile of occupations over time by constructing the five intensity indicators based on the O*NET information from different years.[7]

In order to examine in detail the importance these transmission channels have had for the changes observed in the content of the different types of tasks performed in the average workplace in our set of countries, we now present a factorial decomposition exercise, which references the total changes in task intensity between the start point of the analysis (the mid-1990s) and the end point (the mid-2010s) for our set of countries, identifying the three possible separate effects mentioned above and the interactions between them:

(i) Structural change or between-sector effect. The hypothesis for this effect is that part of the change in the relative intensity of the tasks the labour force performs is associated with a movement of the labour force between sectors or branches of activity, prompted partly by technological change but also, as mentioned, by other exogenous factors.

(ii) Change between occupations or between-occupation effect. This effect derives from movements of workers between distinct occupations with different combinations of tasks.

(iii) Changes within each occupation or within-occupation effect. In this case, we try to capture the contribution of changes which arise within each occupation, in terms of the combination of tasks required for its performance.

(iv) The interaction of all the above.

The decomposition exercise methodology is described in detail in annex I, while the results are presented in figure 2.

[7] Since O*NET is periodically updated, we can study changes in the task profile of occupations over time.

Figure 2
Factor decomposition of changes in the content of tasks performed in the average job, mid-1990s to around 2015

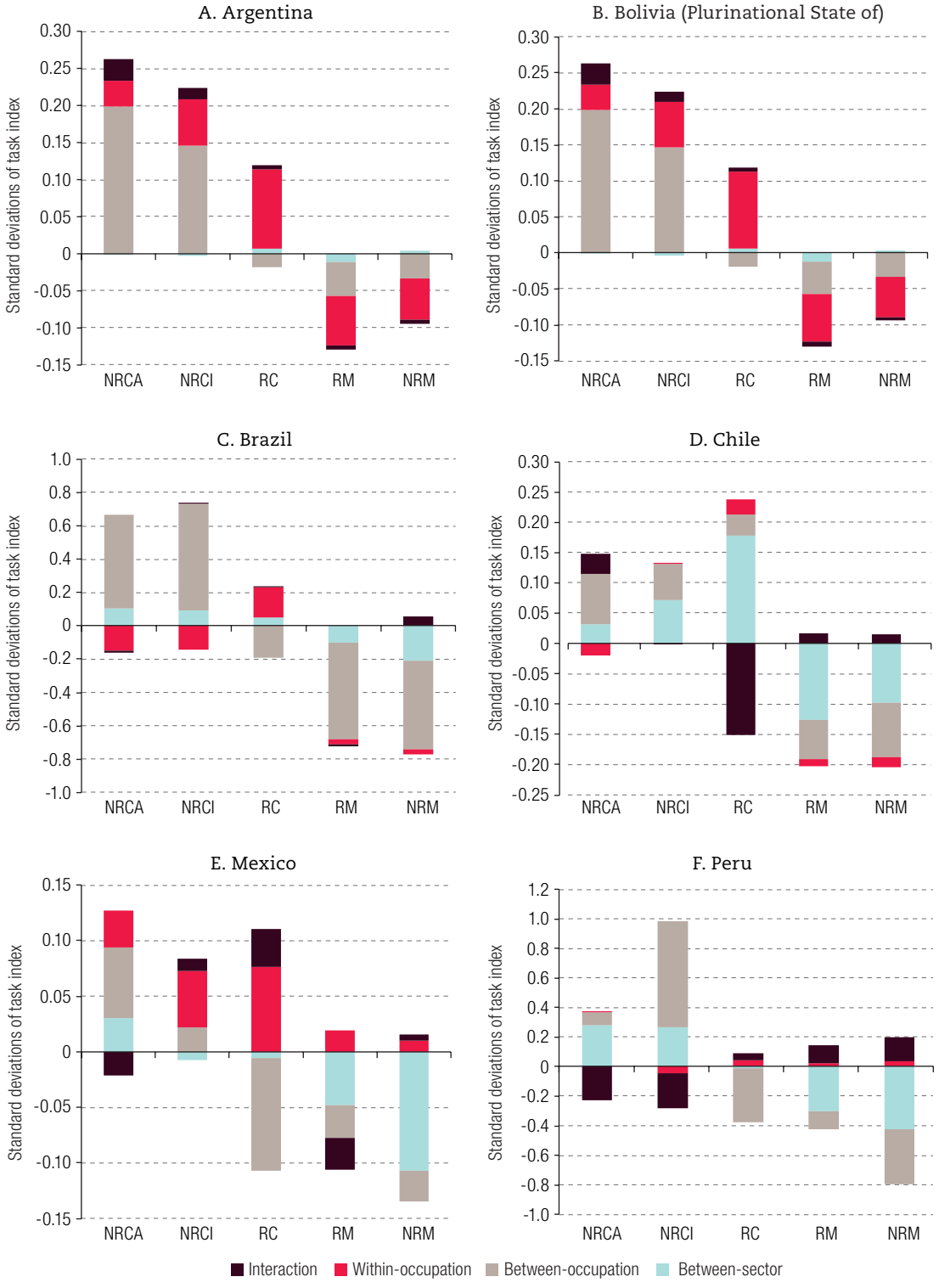
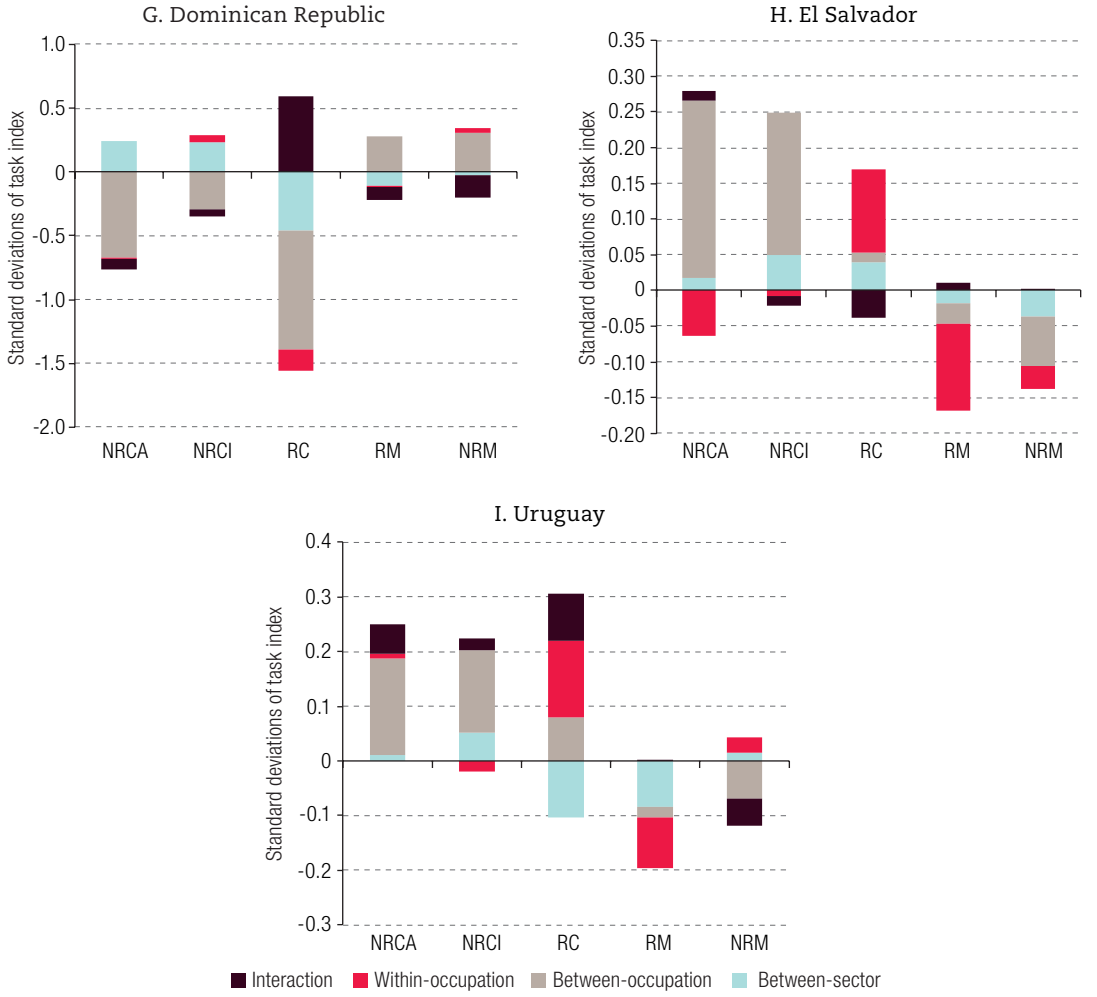


Figure 2 (concluded)



Source: Prepared by the authors, on the basis of O*NET [online] https://www.onetonline.org and household surveys conducted in the respective countries.

Note: NRCA stands for non-routine cognitive analytical, NRCI for non-routine cognitive interpersonal, RC for routine cognitive, RM for routine manual, NRM for non-routine manual, Int for interaction, WO for within-occupation, BO for between-occupation and BS for between-sector. Owing to the availability of information, a different period is covered for each country: Argentina 1998–2015; Brazil 1996–2013; Chile 1996–2015; Dominican Republic 1996–2014; El Salvador 1998–2014; Mexico 1996–2014; Peru 1997–2013; Plurinational State of Bolivia 1995–2015; and Uruguay 1995–2015.

To begin with the between-sector effect, it is observed that movements between branches of activity are an important factor behind the increase in the content of routine cognitive tasks in Chile and the decrease in the relative importance of routine manual tasks in Uruguay and Mexico. Likewise, the same effect explains a significant share of the increase in the content of routine manual tasks in the Plurinational State of Bolivia.

Observing changes in the employment shares of the different branches of activity over the last 20 years (see annex II for details), it can be seen that, both in Chile and in Mexico, there has been a significant fall in employment in industry and in primary activities (sectors that are intensive in manual tasks) and an increase in the real estate sector and services (sectors that are intensive in routine cognitive tasks). Similarly, in Uruguay there has been a significant shift of employment from the industrial sector to the service sector.

Contrary to the trend observed in the rest of the region, the share of routine manual tasks in the average job has increased in the Plurinational State of Bolivia in connection with a significant rise in employment in the primary sector, which showed an increase of 30% between 1995 and 2015.

This is an example of the between-occupation effect, which turns out to have been one of the main channels through which the profile of employment has changed in the region. Indeed, it is extremely important in explaining the increase in the content of non-routine cognitive tasks and the drop in the content of manual tasks in Argentina, Brazil, El Salvador, Mexico, Peru, the Plurinational State of Bolivia and Uruguay.

Lastly, changes in the relative intensity of tasks resulting from specific changes to each occupation, i.e. the intra-occupation effect, have played an important role in five countries: Argentina, El Salvador, Mexico, the Plurinational State of Bolivia and Uruguay. However, the tasks for which this effect is important varies substantially by country. In Argentina, changes in the combination of tasks within particular occupations explain the increase in the content of cognitive tasks, both routine and non-routine, and the drop in the importance of manual tasks. A similar picture, but less marked, is seen in El Salvador and Uruguay, where this effect explains the increase in the content of routine cognitive tasks in the average job and the reduction in routine manual tasks. In Mexico, the effect explains the increases in the relative importance of non-routine cognitive tasks, particularly those related to interpersonal relationships, and routine cognitive tasks. In the Plurinational State of Bolivia, lastly, the intra-occupation effect is important in explaining the increase in the content of routine cognitive tasks.

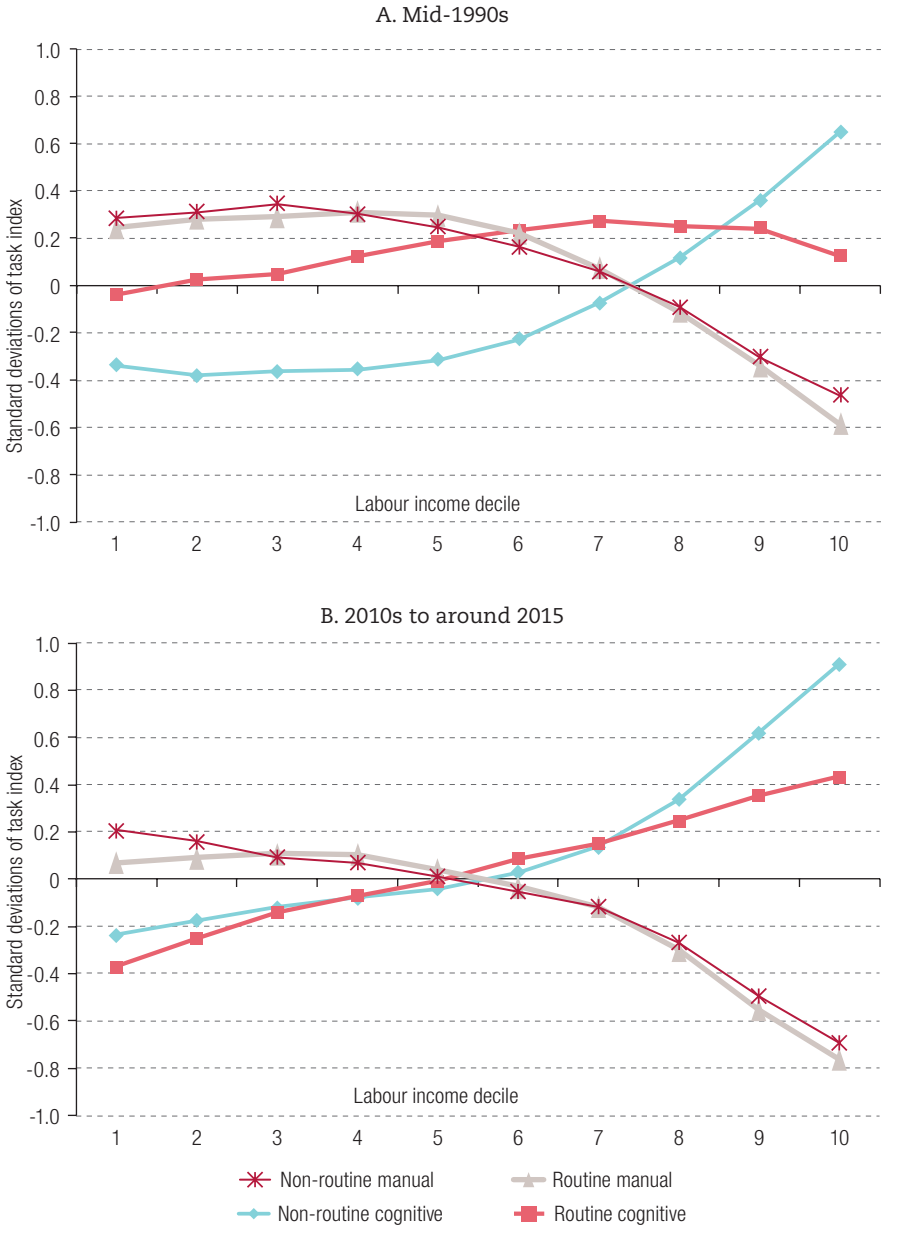
In a context of changes in the importance that some types of tasks have in the average job, requiring adaptation by the labour force, there is a risk of polarization in the labour market. The automation of certain tasks, especially routine ones, could cause its structure to become dominated at the top and bottom by two large groups of workers: on the one hand, highly qualified, highly productive individuals with high incomes working in occupations that are intensive in non-routine cognitive tasks, and on the other, a group of low-skilled workers relegated to occupations that are intensive in non-routine manual tasks and therefore have low productivity and provide low incomes. Meanwhile, workers with average qualifications and incomes, who generally perform routine tasks, whether manual or cognitive, face the risk of a decline in demand for their labour or in their incomes.

Figure 3 presents average task content per working hour, broken down into the four major task groups defined above, for each labour income decile in Latin America and the Caribbean at two different points in time: the mid-1990s and around 2015.

Consistently with the patterns observed in other countries, it can be appreciated that in those of the region most workers in the upper deciles perform non-routine cognitive tasks, while workers in the lower part of the distribution carry out manual tasks. As can be seen from the chart, however, the routine manual task content of occupations has decreased for workers in all labour income deciles. This result is in line with what has been previously discussed and with the replacement of these tasks by automatic production mechanisms.

Conversely, the importance of non-routine cognitive tasks has grown in all income deciles. In this process, two important facts can be observed. First, whereas in the mid-1990s only the occupations of workers in the top two deciles were intensive in this type of task, by the mid-2010s those of workers in deciles 7 and 8 were as well. Second, the gap between non-routine cognitive tasks and manual ones widened, suggesting that in the higher-income deciles the transition from manual to cognitive tasks, especially non-routine ones, was particularly intensive.

Figure 3
Latin America and the Caribbean: task content by labour income decile



Source: Prepared by the authors, on the basis of O*NET [online] https://www.onetonline.org and household surveys conducted in the respective countries.

Note: The figures are simple average for Argentina, Brazil, Chile, the Dominican Republic, El Salvador, Mexico, Peru, the Plurinational State of Bolivia and Uruguay. Owing to the availability of information, a different period is covered for each country: Argentina 1998–2015; Brazil 1996–2013; Chile 1996–2015; Dominican Republic 1996–2014; El Salvador 1998–2014; Mexico 1996–2014; Peru 1997–2013; Plurinational State of Bolivia 1995–2015; and Uruguay 1995–2015.

Observing the left tail of the distribution, it can be appreciated that although the gap between the content of non-routine cognitive tasks and the rest narrowed, these tasks remained the least prevalent among workers in the lowest income deciles. This suggests that workers with lower labour incomes are engaged in occupations which are intensive in manual tasks. Indeed, non-routine manual tasks are the most prevalent among workers in the lowest income deciles. While the content of this type of tasks

has declined almost throughout the distribution, it has remained practically unchanged among workers belonging to the first two deciles, which is an indication of how tasks of this type are concentrated in the lowest deciles.

If the last 20 years are considered, it is possible to observe a transition towards a content structure of tasks in which non-routine cognitive tasks are carried out mainly in the four highest income deciles (which are increasingly detached from the average) and non-routine manual tasks are concentrated in the lowest income deciles.

Although labour markets are not yet polarized, what happens in the future will clearly depend on the progress made with the automation of routine cognitive tasks. It is in occupations which are intensive in tasks of this type that workers with average qualification levels and incomes are employed, examples being credit analysts, office assistants, cashiers, sales personnel and editors, including translators. In most of the developed economies, occupations that are intensive in routine cognitive tasks tend to have remunerations situated around the mean of the distribution (Acemoglu and Autor, 2011, Goos, Manning and Salomons, 2014).

Our findings for the region are different from what has been described for developed countries. Both in the 1990s and in the mid-2010s, the share of routine cognitive tasks was substantial in the labour income deciles from the middle (the fifth decile) upward. In the mid-1990s, indeed, this type of task content was important in all the deciles from the fourth upward, but after 20 years it had lost ground in the occupations performed by workers in all but the highest deciles.

For this reason, given the increase in the content of routine cognitive tasks in the average job in the region, the risk of future polarization in the labour market will depend on the degree to which these are automated.

V. Public policy implications

The process of technological change now going on not only in the region but worldwide is a potential source of productivity increases. However, some challenges arise from the point of view of the labour market, determining the conditions under which new technologies are used. Technological change could lead to a reduction in the demand for the labour of those on medium incomes (usually associated with routine manual tasks), polarizing the labour market between two broad classes of employment: one of poorly-paid activities involving the performance of non-routine manual tasks, and the other of better-paid activities involving non-routine cognitive tasks.

In this technological race, there is a clear public policy challenge associated with the need for low-skilled workers to switch to other types of tasks that are not susceptible to automation, i.e. tasks requiring intensive use of creative or social intelligence.

In the last 20 years, the labour markets of the Latin America and Caribbean region have experienced a substantial shift from manual work to cognitive work, which can largely be attributed to changes in the different occupations' share of total employment, modernization within occupations themselves and, in some cases, movements of workers between sectors. As in the United States, Germany and the countries of Central and Eastern Europe, the importance of non-routine cognitive tasks in the average workplace has shown signs of increasing considerably in the Latin American countries. Two effects of technological change and the reduced cost of accessing technology can be seen, one that is more short-term and one that concerns the medium or long term but requires immediate action.

The first is a reduced need for routine manual tasks and therefore an increase in technological unemployment in some segments of the labour force. The second is the challenge of preparing the

younger generations, as they acquire human capital, to perform occupations which do not exist yet but will certainly incorporate a major component of non-routine cognitive tasks.

With regard to technological unemployment, policies aimed at confronting the negative effects of the shift in employment from production that is intensive in routine manual work towards production that is intensive in technological capital and cognitive work are of crucial importance. The transition may be approached from two different perspectives, that of the demand for labour and that of its supply.

From the perspective of the demand for labour, i.e. of individual production sectors as they seek a profit-maximizing combination of factors, the transition could be attenuated by regulations limiting the substitution of labour by capital. These types of regulations, although often used, are probably an inefficient solution. Any initiative of this kind must take account of the economic and social costs entailed (e.g. increased production costs and reduced well-being for consumers who pay higher prices in the market) as well as the benefits (maintaining employment levels in certain occupations).

In the same way, it is important to stress that technological change is ongoing and therefore that access costs will continue to decrease. This implies that the trend towards automation will grow over time, and accordingly that the costs of deterring it will too. In other words, to maintain their effect, interventions of this type will need to be strengthened over time as technological change advances, requiring the acceptance of ever greater intervention costs.

Alternatively, public policy could focus on the labour supply. The consistent challenge here is to strengthen the spaces and instruments used to adapt the labour supply, i.e. to redesign ongoing training systems in a way that takes account of changes in the demand for labour. This should include the pursuit of public-private cooperation, not only in the area of financing, but also through the design of a training strategy and exploitation of economies of scale in training work. This means clearly identifying the factors which can jeopardize the success of this type of initiative, especially where older workers are concerned.

The medium-term challenge, although it actually needs to be addressed immediately, is to prepare the younger generations during their human capital accumulation process to perform roles which do not yet exist. Looking beyond the potential creative destruction of employment and the consequent technological unemployment, this could be a step towards higher overall productivity in the economy and the creation of occupations which are currently unknown.

Economic growth takes place as jobs become more productive, but also as more productive jobs are created and less productive ones disappear. The benefits may take the form of new products, new methods of production and transportation or new markets, but they appear through a constant process of restructuring and redistribution of resources, including the labour force. Since economies grow as high-productivity jobs are created and low-productivity jobs disappear, the relationship between higher productivity and job creation is not mechanical. Innovations may entail increases or reductions in employment levels in the short term, but in the medium term the tendency will be towards a close alignment between higher employment and economic growth.

In a context where many of the jobs that will be done by today's children do not yet exist, it is not possible to plan a specific course of training for such occupations. The challenge, rather, consists in developing children's cognitive skills so that they have the ability to think creatively and adapt to whatever situation presents itself.

To achieve this, it is essential to rethink the educational system at all levels, so that subjects can be rapidly adapted to the demands of employment as they arise. Accordingly, we suggest that there is a need to switch from an approach in which educational systems are based on the knowledge acquisition paradigm (memorization) to one which prioritizes the development of cognitive and socioemotional skills through problem-solving, as a foundation for the ongoing acquisition of technical skills.

The challenge is to recognize the importance and generate pathways for the development of a study mechanism associated with the development of critical thought, argument and analysis, i.e. the generation of transferable and rapidly adaptable skills which are useful in different activities.

It is crucial for all students in the education system to develop and learn basic cognitive skills, above all numerical and problem-solving skills, since cognitive deficiencies at an early age are extremely difficult to overcome later in life. This must be complemented by constant updating not only of tools but of vocabulary itself. As an example, a new kind of literacy (cognitive and digital) is a minimum requirement for Internet use.

VI. Conclusions

Technological innovation, such as the advance of digital technologies, communications and robotics, may entail an improvement in the general well-being of the population and reduce poverty by increasing the overall productivity of the economy. However, some possible consequences of rapid technological change have been analysed with concern in the literature.

For one thing, technical progress, and particularly the advance of robotics, means that certain activities are at high risk of becoming obsolete, since a number of them, such as routine tasks and those replaceable by a code, can be easily automated, leading to what is commonly known as technological unemployment. For another, a number of previous studies have warned that the incorporation of automated production mechanisms and the progress of digital communication pose a risk to the labour market, not so much because of technological unemployment as because of their distributive impact, which could worsen inequality.

The objective of this paper is to study past trends in employment levels according to the type of tasks done by workers in their jobs and thereby reach an approximate assessment of the possible impact of technological change on the demand for labour. A review of the trend in employment profiles in the Latin American and Caribbean countries over the last 20 years reveals a significant increase in the relative importance of cognitive tasks in the workplace to the detriment of manual tasks. These changes have been generated by within-occupation shifts in the combinations of task types performed to produce a good or service; the movement of workers between occupations within the same branch of activity; and structural changes, i.e. movements of workers between branches of activity. We find that the movement of workers between occupations within the same branch of activity is extremely important in explaining the increase in the content of non-routine cognitive tasks and the drop in the content of manual tasks in most of the countries analysed.

Moreover, consistently with the patterns observed in other countries, we found that most workers in the upper deciles performed non-routine cognitive tasks in the countries of the region, while workers in the lower part of the distribution carried out manual tasks. Taking the last 20 years, the gap between non-routine cognitive tasks and manual ones was found to have widened, suggesting that the transition from manual tasks to cognitive tasks, especially non-routine ones, was particularly intensive in the higher income deciles.

This trend towards an increasing prevalence of non-routine cognitive tasks to the detriment of routine manual tasks can be expected to intensify as technological change advances and can be appropriated and adapted by the production sectors of developing countries. Clearly this will entail a reduction in the demand for labour specializing in routine manual tasks, generating technological unemployment in the short term. However, any technological change which replaces workers with machines will have effects on all product and factor markets. An increase in production efficiency which brings down the costs of production methods could generate increased demand for other goods and services.

Thus, technological progress has two effects on the level of employment. First, there is a destructive effect as technological change leads to labour force replacement; second, there is an effect of new job creation as the number of production units that internalize new technologies increases and productivity rises, complementary employment in these sectors expands and other occupations are generated to meet new demand for goods and services. In this context, it is vital to design two different strategies, one relating to the short term and the other relating to the long term but requiring immediate action.

With regard to the potential for technological unemployment, it is important to implement mechanisms that strengthen the provision of ongoing training in a way that aids the adaptation of the labour supply. In other words, it is important to redesign systems of ongoing training in consideration of the new skills required in the market.

The medium-term challenge, although it actually needs to be addressed immediately, is to prepare the younger generations in their human capital accumulation process to perform roles which do not yet exist. Looking beyond the potential creative destruction of employment and the consequent technological unemployment, this could be a step towards higher global productivity in the economy and the creation of occupations which are currently unknown. Growing cognitive skills are required to meet rising demand for the performance of non-routine cognitive tasks. This being so, the Latin American and Caribbean countries need to improve the quality of their education systems and reduce the educational gap between different sectors of the population, because increasingly a person's level of education will be a key variable in their prospects of finding a good job.

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Annex A1

Task decomposition exercise

The decomposition is computed for each country according to the formula:

$$IT_{i \in T}\left(IT_i^{2015} - IT_i^{1995}\right) = \sum_{j \in S} t_{i,j,2015}^{2015} h_j^{2015} - \sum_{j \in S} t_{i,j,2015}^{1995} h_j^{1995}$$

$$IT_{i \in T}\left(IT_i^{2015} - IT_i^{1995}\right) = BS_i + BO_i + WO_i + INT_i$$

where:

$$\forall_{i \in T} BS_i = \sum_{j \in S}\left[t_{i,j,1995}^{1995}\left(h_j^{2015} - h_j^{1995}\right)\right]$$

$$\forall_{i \in T} BO_i = \sum_{j \in S}\left(t_{i,j,1995}^{2015} - t_{i,j,1995}^{1995}\right)h_j^{1995}$$

$$\forall_{i \in T} WO_i = \sum_{j \in S}\left(t_{i,j,2015}^{2015} - t_{i,j,1995}^{2015}\right)h_j^{1995}$$

$$\forall_{i \in T} INT_i = \sum_{j \in S}\left(t_{i,j,2015}^{2015} - t_{i,j,1995}^{1995}\right)\left(h_j^{2015} - h_j^{1995}\right)$$

where:

$t_{i,j,2015}^{2015}$ and $t_{i,j,1995}^{1995}$ = average intensity of task i for workers in sector j in year y (around 1995 and around 2015), calculated using O*NET 2015 and 1998, respectively

h_j^{15} = workers in sector j as a share of total employment in year y

T = the set of five tasks defined above

S = the set of 13 sectors identified using the one-digit Standard Industrial Classification (SIC)

Annex A2

Employment by economic sector

Table A2.1
Changes in employment by sector, mid-1990s to the mid-2010s
(Percentages)

Argentina		Bolivia (Plurinational State of)	
Description	Change between 1998 and 2015	Description	Change between 1995 and 2015
Agriculture, forestry and fishing	-0.2	Agriculture, forestry and fishing	29.9
Mining and quarrying	0.1	Mining and quarrying	-1.0
Manufacturing	-2.5	Manufacturing	-8.3
Electricity, gas and water	0.4	Electricity, gas and water	0.0
Construction	1.2	Construction	0.7
Wholesale, retail trade and repair activities	-2.9	Wholesale, retail trade and repair activities	-12.2
Transportation, storage and communication	0.6	Transportation, storage and communication	-0.4
Accommodation and food service activities	0.6	Accommodation and food service activities	0.3
Financial and insurance activities	-0.4	Financial and insurance activities	-0.1
Real estate activities	-0.3	Real estate activities	-0.1
Other services activities	2.9	Other services activities	-8.5
Activities of extraterritorial organizations and bodies	0.5	Activities of extraterritorial organizations and bodies	-0.2
Brazil		**Chile**	
Description	Change between 1996 and 2013	Description	Change between 1996 and 2015
Agriculture, forestry and fishing	-10.3	Agriculture, forestry and fishing	-5.5
Mining and quarrying	0.0	Mining and quarrying	0.6
Manufacturing	-4.4	Manufacturing	-5.3
Electricity, gas and water	-0.5	Electricity, gas and water	0.0
Construction	3.6	Construction	0.5
Wholesale, retail trade and repair activities	2.7	Wholesale, retail trade and repair activities	2.9
Transportation, storage and communication	-2.1	Transportation, storage and communication	0.4
Accommodation and food service activities	1.7	Accommodation and food service activities	2.2
Financial and insurance activities	0.4	Financial and insurance activities	-4.3
Real estate activities	5.8	Real estate activities	6.8
Other services activities	3.1	Other services activities	1.7
Activities of extraterritorial organizations and bodies	0.0	Activities of extraterritorial organizations and bodies	0.0
Dominican Republic		**El Salvador**	
Description	Change between 1996 and 2014	Description	Change between 1998 and 2014
Agriculture, forestry and fishing	-2.4	Agriculture, forestry and fishing	-2.7
Mining and quarrying	0.2	Mining and quarrying	0.0
Manufacturing	-7.9	Manufacturing	-3.8
Electricity, gas and water	0.2	Electricity, gas and water	0.2
Construction	1.2	Construction	-0.5
Wholesale, retail trade and repair activities	2.3	Wholesale, retail trade and repair activities	0.9
Transportation, storage and communication	0.1	Transportation, storage and communication	-0.2
Accommodation and food service activities	2.3	Accommodation and food service activities	3.8
Financial and insurance activities	0.7	Financial and insurance activities	-0.3
Real estate activities	1.6	Real estate activities	1.5
Other services activities	1.8	Other services activities	1.0
Activities of extraterritorial organizations and bodies	0.0	Activities of extraterritorial organizations and bodies	0.0

Table A2.1 (concluded)

Mexico	
Description	Change between 1996 and 2014
Agriculture, forestry and fishing	-6.8
Mining and quarrying	-0.1
Manufacturing	-2.2
Electricity, gas and water	-0.1
Construction	0.7
Wholesale, retail trade and repair activities	1.9
Transportation, storage and communication	-0.5
Accommodation and food service activities	2.6
Financial and insurance activities	0.3
Real estate activities	2.1
Other services activities	2.1
Activities of extraterritorial organizations and bodies	0.0

Peru	
Description	Change between 1997 and 2013
Agriculture, forestry and fishing	-3.8
Mining and quarrying	0.5
Manufacturing	-0.2
Electricity, gas and water	-0.2
Construction	1.1
Wholesale, retail trade and repair activities	-1.5
Transportation, storage and communication	1.3
Accommodation and food service activities	2.3
Financial and insurance activities	0.0
Real estate activities	0.6
Other services activities	0.0
Activities of extraterritorial organizations and bodies	0.0

Uruguay	
Description	Change between 1995 and 2015
Agriculture, forestry and fishing	2.1
Mining and quarrying	0.0
Manufacturing	-11.1
Electricity, gas and water	-0.2
Construction	1.6
Wholesale, retail trade and repair activities	1.3
Transportation, storage and communication	1.9
Accommodation and food service activities	0.8
Financial and insurance activities	-0.5
Real estate activities	-2.9
Other services activities	7.0
Activities of extraterritorial organizations and bodies	0.0

Source: Prepared by the authors, on the basis of O*NET [online] https://www.onetonline.org and household surveys conducted in the respective countries.

A strategy for development with income redistribution: the minimum wage and growth fronts in Mexico[1]

Ricardo Bielschowsky, Miguel del Castillo, Gabriel Squeff, Roberto Orozco and Hugo Beteta

Abstract

The purpose of this study is to contribute to the discussion on the viability and potential impact of substantially increasing the pay of the lowest-income workers. To this end, a set of simulations are carried out using the input-output matrix to assess the impact on economic variables of increasing the minimum wage. The analysis yields very favourable indications for the viability of growth with income redistribution in Mexico, based essentially on the domestic mass consumption market. Stimulating growth in demand from the lowest-income households has a favourable impact on GDP and employment and only a relatively small effect on both inflation and imports, which grow by much less than they have with the model that has operated over recent decades.

Keywords

Economic development, income distribution, minimum wage, development strategies, employment, productivity, consumption, Mexico

JEL classification

O11, J31, R15

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[1] A preliminary version of this article was published in R. Bielschowsky and others, "Estrategia de desarrollo con redistribución del ingreso: salario mínimo y frentes de expansión en México", *Studies and Perspectives—ECLAC Subregional Headquarters in Mexico*, No. 188 (LC/TS.2021/35; LC/MEX/TS.2021/4), Mexico City, Economic Commission for Latin America and the Caribbean (ECLAC), 2021.

I. Introduction

A strategy of development with income redistribution in Mexico inevitably entails systematic growth in the pay of the lowest-income workers. Other elements relating to well-being and social justice, environmental sustainability and domestic production capacity must also be included, but increasing the wages of poor families is central to the strategy. A little more than a year and a half into the government of Andrés Manuel López Obrador, there is increasing consensus in Mexico that such wage increases are a key instrument for bringing about the desired change in the socioeconomic structure of the country.

In addition to this introduction and the conclusions, the present article contains a contextualization section (section II) and a further two sections summarizing the results of the study (sections III and IV). Section III presents simulations for the impact of changes in the minimum wage on some macroeconomic variables in Mexico, based on the 2013 input-output matrix produced by the National Institute of Statistics and Geography (INEGI). The aim is to contribute to the discussion on the viability and potential ramifications of a substantial increase in the wages of the lowest-income workers. As will be seen, the simulations project very promising scenarios, with favourable effects on output and employment, very low inflationary impacts and very moderate effects on imports.

Section IV disaggregates the results using an approach that brings out the impact of higher earnings on the production structure, subdivided into groups of sectors that are referred to in this study as "potential growth fronts in Mexico". This is a sectoral classification of gross domestic product (GDP) which, as detailed in section III, is organized by groups of sectors governed by particular logics of supply and demand (Bielschowsky, 2014; Bielschowsky, Squeff and Ferraz Vasconcelos, 2015). As will be seen, this approach can be used to rank government policy priorities according to the operating logics of the different segments of the production structure, with a transformation strategy that integrates both social and productive considerations.

Essentially, the methodology applied includes the following aspects:[2] (i) estimates of the number of persons earning the minimum wage and the impact of increasing the minimum wage on the total wage bill by sub-branch; (ii) the basic features of the input-output model adopted; (iii) classification of the sub-branches in the growth fronts; and (iv) the procedures used to calculate the simulations.

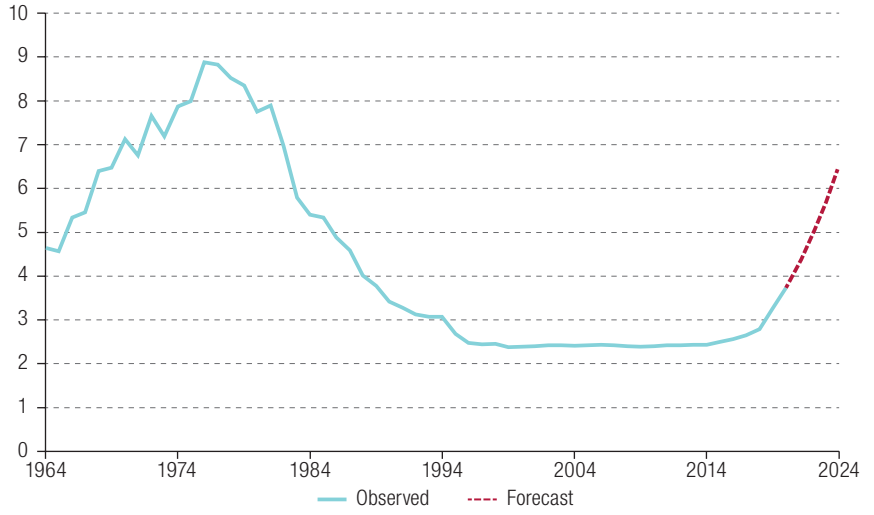
Figure 1 shows the continuous fall in the real minimum wage between the late 1970s and the late 1990s, its relative stability until 2018, and the actual and projected increases in 2019 and 2020, respectively. It also shows the evolution projected for the period 2021–2024, which would achieve the proposed doubling in real terms of the minimum wage over the six-year period 2019–2024.

The simulations presented in this article deal only with the effects of increases in low wages on the economy and on the "growth fronts". Other effects from investments in infrastructure, housing and oil are not taken into account, and nor is public expenditure on health and education. Nevertheless, the exercise serves to exemplify the analytical power of the concept of "growth fronts" for the purposes of future planning work to structure a wide-ranging long-term transformation strategy for Mexico's economy, above and beyond the necessary wage growth that is occurring at the time of writing.

Lastly, the concept of potential growth fronts is both Keynesian and structuralist in inspiration. It is Keynesian because GDP is subdivided into branches by specific logics of demand (induced and autonomous demand) that condition the expansion of supply, i.e., that condition investment. It is structuralist in the sense that the supply responses to increased demand in each group of branches into which GDP is subdivided depend on the structural conditions of output growth nationally.

[2] For details of methodological aspects, see the annexes to Bielschowsky and others (2021) in https://repositorio.cepal.org/bitstream/handle/11362/46748/1/S2100185_es.pdf [Spanish only].

Figure 1
Mexico: real monthly minimum wage, 1964–2024[a]
(Thousands of 2019 Mexican pesos)



Source: Prepared by the authors, on the basis of National Commission for Minimum Wages, "Salario mínimo general promedio de los Estados Unidos Mexicanos 1964-2016"; "Salarios mínimos. Vigentes a partir del 1º de enero de 2017"; "Salarios mínimos. Vigentes a partir del 1º de enero de 2018"; "Salarios mínimos. Vigentes a partir del 1º de enero de 2019"; "Salarios mínimos. Vigentes a partir del 1º de enero de 2020"; National Institute of Statistics and Geography (INEGI), *Estadísticas Históricas de México. Tomo II*, Mexico City, 1999, for the Mexico City retail price index from 1964 to 1969; and *Índice Nacional de Precios al Consumidor (INPC). Base 2ª Quincena Julio 2018*, for the national consumer price index from 1970 to 2019.

[a] Average wage weighted by the population of the different areas that have had a minimum wage during their history. Inflation of 3.5% was estimated for 2020. A doubling in real terms of the 2019 minimum wage is forecast for 2024.

II. Contextualization

The international literature on the effects of increasing minimum wages generally finds that there is no conclusive evidence for unfavourable effects on output or employment (Card and Krueger, 1995; Buszkiewicz and others, 2019). The effect on prices, although statistically significant, is also found to be very low or nil (Salazar, Amador and Serrano, 2018; Lemos, 2004). In Mexico, recent studies on the minimum wage have placed special emphasis on the relationship between this wage, poor income distribution and poverty (Samaniego Breach, 2014; Escobar Toledo, 2014; Bosch and Manacorda, 2010). As a result, in recent years the issue has begun to be debated (Heath and Martín, 2017; Moreno-Brid, Garry and Monroy-Gómez-Franco, 2014; Mancera, 2015) and the impact of minimum wage increases on employment and inflation has been studied (Campos-Vázquez and Esquivel, 2020; Fuentes and others, 2020; Campos Vázquez, Esquivel and Santillán Hernández, 2017).

This paper forms part of the wide-ranging international discussion on the need to deal with the process of income concentration to which many of the world's major economies (Piketty, 2014), and particularly those of Latin America (ECLAC, 2018), have been subjected. This debate is connected to the desire to remedy the low growth that has been observed in these economies as a result (Ros, 2013) and to abandon the strategy of reducing wages to increase competitiveness, which historically the Economic Commission for Latin America and the Caribbean (ECLAC) has dubbed spurious competitiveness, as opposed to genuine competitiveness. What is proposed instead is the implementation of a wage-led growth model that strikes a new balance between export-led growth and a stronger domestic market, and that reduces household indebtedness. This has been the approach used in these economies to compensate for the low effective demand resulting from wage restraint and income concentration (Lavoie and Stockhammer, 2012 and 2013).

This study is also inspired by progressive political thinking in Latin America, which proposes a style of development with social justice and lower inequality and which postulates that inequality is inefficient, since it is an obstacle to growth and development. This is the thinking endorsed by ECLAC since the 1960s (Bárcena, Bielschowsky and Torres, 2018) and systematically emphasized by it and by other United Nations agencies in recent decades (ECLAC, 1990, 2000, 2010, 2012 and 2018).

Between the 1930s and the early 1980s, as is well known, Mexico's development strategy was based on industrialization. This was a period of fast growth that led to a substantial structural transformation of the country. However, in common with most historical experience in Latin America, this model did not change the country's great social inequalities, and nor did it create a production structure with the endogenous capacity to produce and disseminate technology or to participate dynamically on that basis in world trade (Fajnzylber, 1983 and 1989; Cordera, 2010; Ramírez de la O, 2010).

The subsequent history is well known and has been much discussed. After the 1982 debt crisis and the period of stagnation that followed, Mexico radically changed its development model, assigning a smaller role to the government in the economy and seeking to dynamize its economy through exports linked to integration with the United States and Canada, within the framework of the North American Free Trade Agreement (NAFTA) (Aspe, 1993).

There has been a large expansion of exports as a result of the neoliberal strategy.[3] This strategy is closely associated with the maquila regime and has not led to significant dynamization of economic activity, investment, employment or productivity, as is demonstrated by the fact that the convergence between the NAFTA economies promised when the agreement was signed has not come about. On the contrary, the gaps have remained and even widened. Meanwhile, the external constraint on growth has increased as a result of rising imports and the loss of important links in domestic industrial production chains, plus a widening technology gap with the leading countries. Moreover, there have been no significant improvements in workers' incomes or in the distribution of income and property, and poverty has not been reversed. In the same critical vein, it is argued that, while there has been a degree of success in the essential task of controlling inflation and public deficits, macroeconomic fiscal and monetary management has been too orthodox, resulting in persistently very low economic growth rates. As Ros (2013) argues, the solution to the problem of low growth does not lie in the realm of microeconomic reforms, which to date have if anything been detrimental to growth. It lies in the macroeconomic sphere, especially in fiscal and financial reforms and policies aimed at income redistribution and capital accumulation.

In fact, the social failure of neoliberalism and of growth-limiting macroeconomic policies has sparked an intense debate in Mexico on the need to move on from the radical pursuit of this new model that has been a feature of at least the last three decades. This confirms the vibrancy of the country's political and intellectual culture. Among the documents that have come out of this critical and proactive political approach, mention should be made of *Proyecto Alternativo de Nación 2018-2024: Plataforma Electoral y Programa de Gobierno*, a platform and vision for the country launched in 2017 at the initiative of the National Regeneration Movement (Morena) and the then presidential candidate Andrés Manuel López Obrador, as an essential part of what would eventually become his victorious

[3] In this case, the term is understood in the sense given to it by David Harvey in his *A Brief History of Neoliberalism*: "Neoliberalism is in the first instance a theory of political economic practices that proposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets and free trade. The role of the state is to create and preserve the institutional framework appropriate to such practices […]. Furthermore, if markets do not exist (in areas such as land, water, education, health care, social security, or environmental pollution) then they must be created, by state action if necessary. But beyond these tasks the state should not venture. State interventions in markets (once created) must be kept to a bare minimum because, according to the theory, the state cannot possibly possess enough information to second-guess market signals (prices) and because powerful interest groups will inevitably distort and bias state interventions (particularly in democracies) for their own benefit" (Harvey, 2005). For an account of the set of public policies implemented in the name of neoliberalism, see the articles "What Should the World Bank Think about the Washington Consensus?", in Williamson (1999), and "The Washington Consensus as Policy Prescription for Development", in Williamson (2004).

campaign for the presidency (Morena, 2017). The ideas put forward in these texts were reflected in the National Development Plan 2019–2024 (*Diario Oficial de la Federación*, 2019), published by the federal government shortly after the inauguration of the new president, and in the sectoral programme of the Ministry of Labour and Social Welfare, which derived from this plan (Secretaría de Bienestar, 2020). These documents proclaim a commitment to fighting poverty and framing all programmes within the paradigm of sustainable development, with equity and the principle that no one should be left behind being "central to all plans and actions of the government which Mexico aspires to and deserves" (Morena, 2017, p. 10).

Another important document, which fits in with *Proyecto Alternativo de Nación*, is *100 Propuestas para el desarrollo*, a set of development proposals structured around four main pillars: (i) poverty alleviation and a more egalitarian society, (ii) higher and more inclusive and sustainable growth, (iii) territorial development and sustainability and (iv) institutional reforms for inclusive development (PUED/UNAM, 2019).

From the perspective adopted, the apparent challenges can be summarized as follows. After industrialization and neoliberalism, both involving great income concentration, is it possible to successfully implement a new alternative development model whose pillars include a substantial increase in the incomes of the most disadvantaged classes? Is it possible to envisage growth in which the domestic market once again plays a major role in dynamizing the economy? How viable and what is the scope of growth driven by the domestic mass consumption market, with better wages and a better redistribution of income? What is the impact on the external constraint (via imports) of a growth model with these characteristics? And how important is the role of industrial policies promoting domestic value chains and technological innovation in addressing the potential problems of the external constraint and stimulating growth in the economy? The present text is intended to contribute to this discussion.

First, two points should be made. One is that there are obviously numerous possible scenarios that can be simulated using input-output matrices. It would be of great interest to project the effect of increases in other factors that are vital for a reorientation of development in Mexico, such as a greater allocation of public spending to health, education and housing and increased investment in infrastructure, in the oil production chain and in science and technology, among other areas. However, as noted, this study is limited to assessing the impact on the economy of substantial increases in the pay of the lowest-income workers, which is the main policy being applied in the context of the new socioeconomic model.

The second point concerns the earnings composition data used in the simulations. These are based on a detailed study conducted by one of the authors of this text (Del Castillo, 2019) on employment and earnings statistics in Mexico.

Table 1 provides the basic data on worker numbers and wages estimated in that study (see Bielschowsky and others, 2021, annex 1, for a more detailed presentation). The data have been arranged to show the figures used in the two simulations presented in sections III and IV, dealing with the aggregate results of the simulations and the results by growth front, respectively.

Using the data on worker compensation from the 2016 National Household Income and Expenditure Survey (ENIGH), presented in table 1, the following two simulations were carried out with the Mexican input-output matrix:

(i) Simulation 1: the pay of all workers employed in private enterprises and earning less than twice the minimum wage is raised to twice the minimum wage. About 6.9 million workers were in this group in 2016, earning an average of 1.39 minimum wages that year. The simulated increase represents an average wage increase of 58.6%.

(ii) Simulation 2: the pay of workers in private enterprises (included in simulation 1) and private organizations and that of public sector employees is raised to twice the minimum wage. The income of workers in enterprises of the self-employed, personal or family type (including non-live-in domestic workers) is doubled, with the increase capped at two minimum wages. Table 1 shows that this second scenario adds 14.1 million people to the first scenario of 6.9 million workers, bringing the total to 21 million workers. It also shows that the categories incorporated into simulation 2 earned an average of 1.14 minimum wages. The increase simulated for these categories of workers represents a rise of 52.4% in their income.

Table 1
Mexico: workers earning less than two minimum wages and earning two or more minimum wages, by place of work, 2016[a]
(Millions of workers and proportions of the minimum wage)

Place or type of work	Workers on less than two minimum wages		Number of workers earning more than two minimum wages *(millions)*	Total number of workers with income *(millions)*
	Number *(millions)*	Average wage in 2016 *(as a proportion of the minimum wage)*		
1. Private sector company or enterprise	6.9	1.39	10.5	17.4
2. Self-employed, personal or family enterprise (including domestic workers)	13.0	0.99	5.0	18.0
3. Government institution	0.9	1.39	4.4	5.3
4. Non-government institution	0.2	1.33	0.4	0.6
Subtotal of subordinate paid workers	21.0	1.14	20.3	41.3
5. Self-employed workers with income (mixed income)	8.5	0.63	3.2	11.7
Total paid workers	29.5	1.00	23.5	53.0

Source: Prepared by the authors, on the basis of National Institute of Statistics and Geography (INEGI), National Household Income and Expenditure Survey (ENIGH), survey microdata, 2016.

[a] For the purpose of classifying people by earnings in multiples of the minimum wage, the sum of wages, salaries, piecework pay, commissions and tips (codes P001, P002 and P003 of the 2016 National Household Income and Expenditure Survey) was taken.

The 8.5 million self-employed workers with mixed incomes below two minimum wages have not been included in the simulations. This is because the income of this working population is unlikely to be impacted by government policies on minimum wages. In other words, the "lighthouse effect" that is assumed to operate on the income of the categories of workers included in simulation 2 is unlikely to apply in the case of the self-employed. For this category, it is reasonable to assume that other redistributive policies such as progressive taxation, a universal basic income and public social spending policies, together with education and health policies, will be more important.

III. Main results

1. Aggregate results

Using Mexico's 2013 input-output matrix and microdata from the 2016 National Household Income and Expenditure Survey, the effects on GDP, employment, prices and intermediate goods imports were calculated for each of the two simulations.[4] Table 2 shows the results of the simulations in aggregate terms.

[4] The methodological details of these simulations are presented in the annexes of Bielschowsky and others (2021).

Table 2
Mexico: rises in selected economic variables resulting from increases in the earnings of the lowest-income workers in the two simulations
(Percentages)

	GDP	Employment	Prices	Intermediate goods imports
Simulation 1	2.0	2.1	0.4	1.2
Simulation 2	4.0	4.4	0.8	2.4

Source: Prepared by the authors.

In the case of the impact on GDP, simulations 1 and 2 show growth rates of 2% and 4%, respectively. It should be noted that these results are not forecasts of what will happen over the coming years in the Mexican economy as a whole. The exercise only simulates additional stimuli in addition to those that would arise through the normal operation of the economy, i.e., changes resulting solely from increases in low pay. For example, assuming that cumulative growth in the economy over the five-year period 2019–2024 would be 10% in a business-as-usual scenario, a doubling of low pay would mean cumulative growth of 12% under simulation 1 and 14% under simulation 2.

The figures in table 2, although unimpressive in quantitative terms, show that increasing low pay produces a promising change of course. The reason is that the total mass of earnings of the 21 million workers who earned less than two minimum wages in 2016 (the base year for the exercise) accounted for only 15.6% of the total mass of earnings in the economy, i.e., 3.2% of GDP and 4.8% of private household consumption in the domestic market.[5] However, the simulation exercise provides a very favourable signal that not only is the course change towards higher minimum wages that has begun in the Mexican economy contributing to output and employment growth, but it does not threaten the country's macroeconomic stability.

The figures for the effects on prices are striking. The simulations show that the additional effect on cumulative inflation during the period of the intended wage increases would be 0.4% for simulation 1 and 0.8% for simulation 2. This almost nugatory inflation is the tax that society as a whole would be paying to substantially increase the pay of the working poor.

The figures for imports of intermediate goods are also reassuring from the point of view of the desired macroeconomic stability: the GDP elasticity of intermediate goods imports is well below 1 (0.6 in both simulations).[6] [7]

The model used does not allow final goods imports to be calculated. However, since about 75% of total imports in Mexico are of intermediate goods, it is reasonable to assume that the income elasticity of total imports will not be high. In fact, on the very pessimistic assumption that final goods imports resulting from the improvement in low wages grew in line with the normal operation of the Mexican economy, total imports (imports of intermediate goods plus imports of final goods) would

[5] This figure includes the private consumption of the institutions serving households.

[6] On the question of low imports of intermediate goods, it should be clarified that the exercise carried out with the Leontief model is static and therefore does not absorb the accelerating effect of GDP on investment. This means that imports of intermediate goods relative to capital goods have been projected only via the technical coefficients. Any differences from business as usual, whether positive or negative, when the accelerator effect is operating have been ignored. However, since the simulations yield permanent GDP growth rates of 2% and 4%, ignoring the accelerator effect is unlikely to significantly alter the picture of low intermediate goods imports arrived at.

[7] The two simulations have the same GDP elasticity of intermediate goods imports by construction, as the same Leontief inverse matrix was used in both. See Bielschowsky and others (2021, annex 2) and the classic book by Miller and Blair (2009) for a methodological introduction to the Leontief model.

grow by 2.2%, giving a GDP elasticity of total imports of 1.1.[8] This shows that, as noted below, the import content of the consumption basket of the poorest is indeed relatively small compared to that of high-income groups and to the overall performance of the economy in recent decades in terms of the income elasticity of imports.

The impacts on employment are also striking: it would grow by more than GDP in simulations 1 and 2 alike, with rates of 2.1% and 4.4%, respectively. This means that the simulated redistributive model entails strong demand for labour-intensive goods and services, which has at least two basic implications.

First, the result of the exercise indicates that the ratio between capital and labour in the sectors boosted most by growth in low wages is lower than in the business-as-usual scenario, implying less pressure on investment and capital goods imports.

Second, a sudden change in low wages, which would be a departure from the traditional income-concentrating model of the Mexican economy, would tend to dynamize the labour market to the advantage of workers, thus helping the government's current push to increase low wages. It should be noted, however, that this effect could make the redistributive model unfavourable to labour productivity unless accompanied by increases in worker training, education and technological innovation. Since the proposal is to implement the redistributive model step by step in the short, medium and long term, policies aimed at these objectives will have to gain increasing traction in the future to avoid total dependence on an expanding economically active population (EAP) and negative or low rates of change in labour productivity.

Despite the caveat, it can be concluded from the above that the growth model with higher incomes for the most disadvantaged classes is macroeconomically superior in several respects to the growth model in place in the recent past. One way to verify this is to compare the effects of the two simulations with what has happened when GDP has grown at rates equivalent to those in the calculations (see table 3). It is important to note that the periods selected for this comparison (the year 2017 and the period 2013–2014) are subsequent to the base year of the input-output matrix used in the simulations (2013), which implies that these counterfactual scenarios and the simulations run do not have similar production structures.

Table 3
Mexico: rises in selected economic variables, simulations compared to recent periods in which GDP grew at rates similar to those in each simulation
(Percentages)

	GDP	Employment	Intermediate goods imports
Simulation 1	2.0	2.1	1.2
Observed behaviour in 2017	2.2	1.2	6.6
Simulation 2	4.0	4.4	2.4
Observed behaviour in 2013 and 2014 (cumulative)	4.2	1.6	8.0

Source: Prepared by the authors, on the basis of data from table 2 and National Institute of Statistics and Geography (INEGI), Sistema de Cuentas Nacionales de México.

[8] As table 3 shows, GDP growth in 2017 was 2.2%, a rate very close to the result of simulation 1 (2.0%). To calculate the growth rate of total imports, we used the growth rate of imports of intermediate goods estimated in the model and the actual 2017 growth rate of final goods imports. Thus, final goods imports were calculated as the difference between total imports at 2013 prices and intermediate goods imports at 2013 prices, both available from the INEGI input-output matrix. The growth rate of actual final goods imports between 2016 and 2017 was 5.0%, and the growth rate of intermediate goods imports estimated in simulation 1 was 1.2%. Thus, simulation 1 yielded: (i) estimated intermediate goods imports = intermediate goods imports in 2013 * (1 + 1.2%) = (3,898,884) * (1.012) = 3,945,671; (ii) estimated final goods imports = final goods imports in 2013 * (1 + 5%) = (1,384,564) * (1.05) = 1,453,792; (iii) estimated total imports = estimated intermediate goods imports + estimated final goods imports = 3,945,671 + 1,453,792 = 5,399,463; and (iv) growth rate of total imports = [(estimated total imports) / (total imports in 2013)] - 1 = [(5,399,463) / (3,898,884 + 1,384,564)] - 1 = 0.022 (2.2%).

When GDP grew by 2.2% in 2017 (an increase similar to the simulation 1 result of 2.0%), business as usual in the Mexican economy produced employment growth of 1.2% (which is much lower than the 2.1% projected in simulation 1) and a 6.6% increase in imports of intermediate goods (which is much higher than the 1.2% projected in simulation 1).

The results of the simulation exercise are also much better when the comparison is with the 4.2% cumulative GDP growth in Mexico in 2013 and 2014 (slightly higher than the 4.0% of simulation 2). While employment grew by 1.6% in 2013 and 2014, the increase in simulation 2 is 4.4%. Imports of intermediate goods grew by 8.0% over the same period, well above the 2.4% growth in simulation 2.

2. Aggregate results by economic subsector

Another important aspect to highlight is the change in the composition of growth by economic subsector that a rise in low wages would lead to. In the 15 years between 2003 and 2018, economic activities oriented towards the external market, or characterized by a high degree of economic concentration in the domestic market, were those with the largest increases in value added. For example, telecommunications grew by 12.2% annually in real terms over the period. This was followed by financial activities (11.8%), manufacture of transport equipment (6.2%), electric power generation (5.8%), air transport (4.9%) and road freight transport (3.8%), among others (see figure 2).

Figure 2
Mexico: impact on the economic subsectors with the highest growth in value added, 2003–2018
(Real-term percentage annual growth rates)

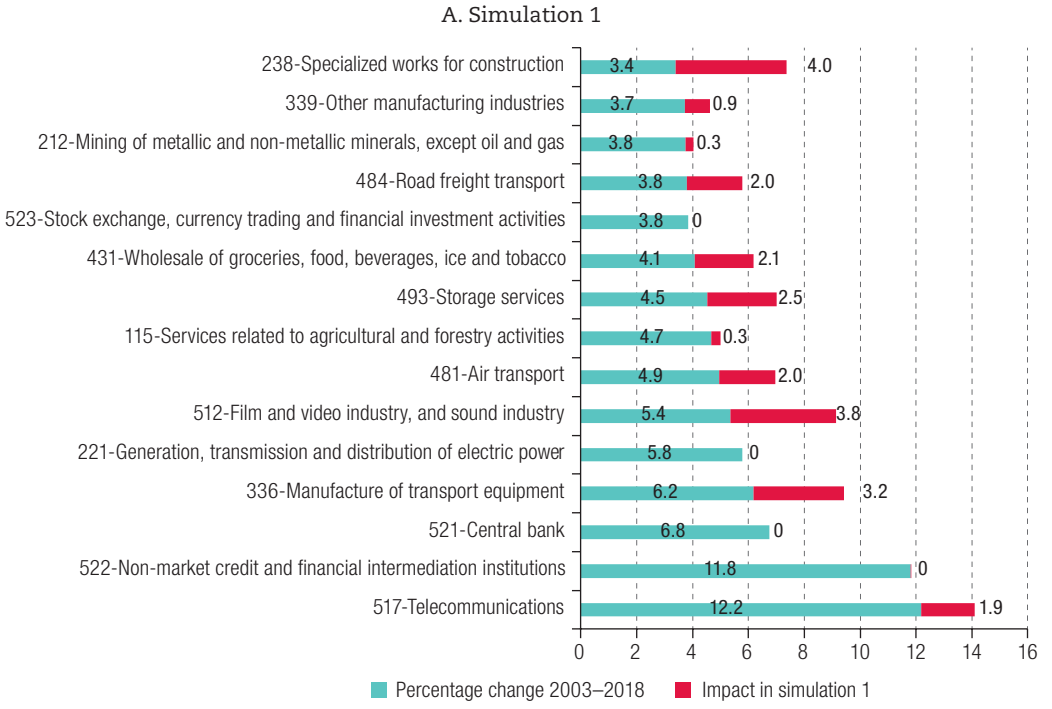
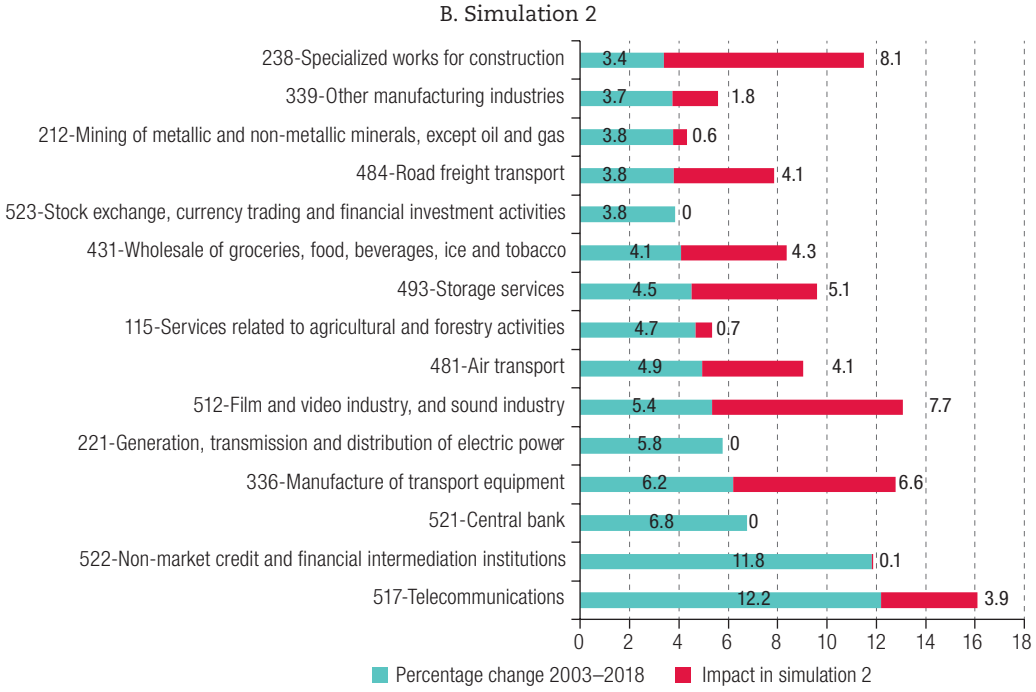


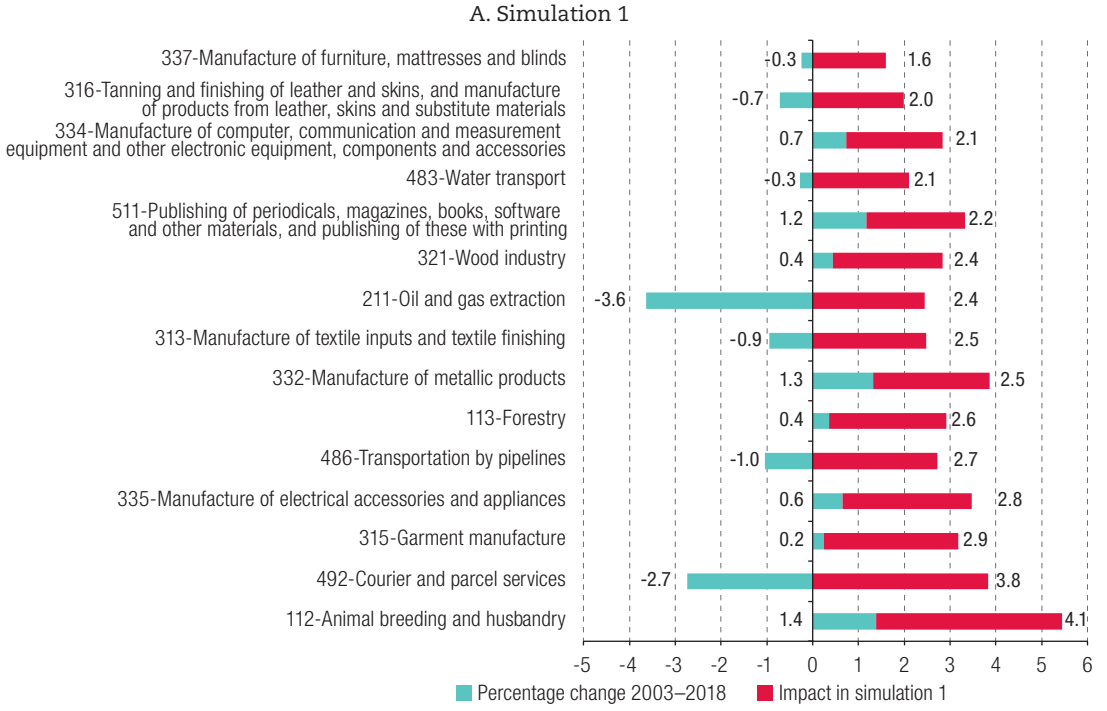
Figure 2 (concluded)

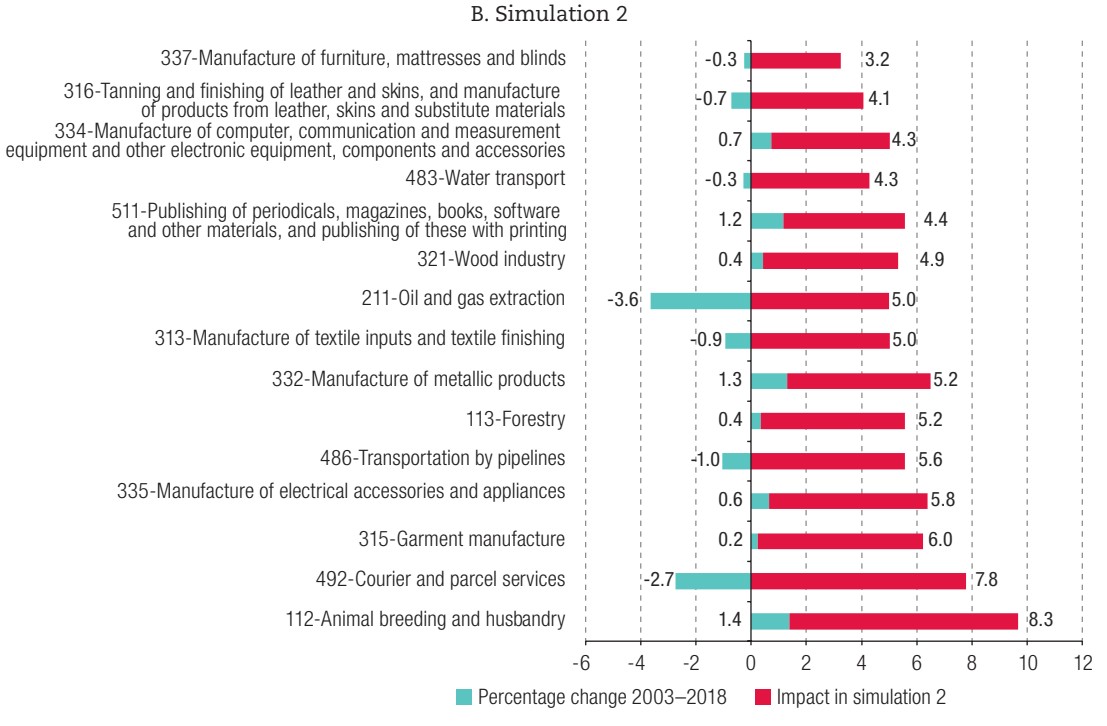


Source: Prepared by the authors, on the basis of data from table 2 and National Institute of Statistics and Geography (INEGI), Sistema de Cuentas Nacionales de México.
Note: The economic subsector codes are the levels of the North American Industry Classification System (NAICS).

In domestic market-oriented activities where growth was very low or even negative in 2003–2018, increasing low wages would have a very positive impact. For example, the value added of activities such as garment manufacture (up 0.2% over the period), manufacture of electrical accessories and appliances (up 0.6%), manufacture of textile inputs and textile finishing (down 0.9%), manufacture and tanning of leather (down 0.7%) and manufacture of furniture, mattresses and blinds (down 0.3%) would increase by between 1.6% and 2.9% in real terms, according to simulation 1 (see figure 3). The impacts are even larger in simulation 2. In sum, increasing the lowest wages would bring about a revival in sectors that have been depressed, without reducing growth in sectors that are currently expanding at high rates. In fact, the latter would also benefit, albeit to a lesser extent.

Figure 3
Mexico: impact on the economic subsectors with the lowest growth in value added, 2003–2018
(Real-term percentage annual growth rates)





Source: Prepared by the authors, on the basis of data from table 2 and National Institute of Statistics and Geography (INEGI), Sistema de Cuentas Nacionales de México.
Note: The economic subsector codes are the levels of the North American Industry Classification System (NAICS).

IV. Disaggregated results by growth front

The idea that the dynamism of different countries' economic systems is contributed to by different combinations of sectors of activity is a familiar one. It has been widely applied by economic theorists and historians and by ECLAC since its earliest days, when it analysed each country's conditions and ability to make the transition from commodity production and exporting before 1930 to diversification through industrialization and creation of the necessary infrastructure by the early 1980s. Today, as ECLAC argues, it is expressed in the form of development proposals that address the need for transformation of the production system to be strongly integrated with social equality in addition to meeting the essential requirements of environmental sustainability, progress towards activities and processes that are intensive in technological learning and orientation towards rapidly expanding markets (ECLAC, 2012 and 2018).

The grouping of economic sectors according to the concept of potential growth fronts in Mexico is a different and complementary classification to that traditionally used in the national accounts. Each "growth front" is taken to be a set of goods and services sectors or branches resembling one another in terms of the demand and supply logics that determine the growth of output, investment and productivity, and thus calling for differentiated public policies. As discussed throughout this section (and more operationally in Bielschowsky and others, 2021, annex 4), this methodology provides a way of looking at Mexico's economy that facilitates prioritization of economic policies based on objective issues relevant to the growth dynamics of the desired model of development with equality.

To this end, the entire Mexican economy (i.e., Mexico's GDP) is subdivided into the following potential growth fronts:

(i) final mass consumption goods and services (excluding durable goods and infrastructure-intensive services, which are classified in other groups)

(ii) health, education (public and private) and other government services

(iii) housing

(iv) services intensive in public and private infrastructure use

(v) oil and mining

(vi) consumer durables and capital goods sectors (essentially NAFTA-linked, but secondarily driven by domestic consumer demand in the case of durables and secondarily linked to investment demand across all the different growth fronts in the case of capital goods)

(vii) sectors that are important to all growth fronts because they produce goods and services that are widely used throughout the economy (commerce, intermediate goods and services, and construction)

Table 4 summarizes the supply and demand logics underlying the division of GDP by potential growth fronts in the Mexican economy.

Table 4
Subdivision of GDP by growth fronts in the Mexican economy and the supply and demand logics on which it is based

Potential growth front	Demand logic	Supply logic
1. Final mass consumption goods and services (except consumer durables and infrastructure services, which are included in other growth fronts)	Total wage bill, credit at low interest rates.	Investment decisions induced by demand growth and conditioned by competitiveness.
2. Health, education and government services	Unmet social demand, requirements of citizen rights.	Fiscal space or political will.
3. Housing (household investment)	Housing shortage, long-term financing at low interest rates.	Long-term financial system.
4. Public and private infrastructure services	Rates of economic expansion, income elasticities of demand.	Infrastructure deficits, fiscal space or political will.
5. Oil and mining	Domestic and external demand.	Natural resource endowment, decisions by Petróleos Mexicanos (PEMEX).
6. Capital goods and consumer durables in the framework of NAFTA	First, the growth of the United States economy; second, the expansion of the domestic market (economy-wide in the case of capital goods for the domestic market).	Induced mainly by United States growth and conditioned by international competitiveness (economy-wide in the case of capital goods for the domestic market).
Economy-wide fronts		
7. Commerce	Simultaneously associated with the growth logics of demand and supply on all fronts (and conditioned by competitiveness, in the case of intermediate goods).	
8. Intermediate goods and services		
9. Construction		

Source: Prepared by the authors.

Tables 5 and 6 show the results of the two simulations by potential growth front. The figures in the last line of each table (total GDP) are of course the data from the aggregate simulations presented in tables 2 and 3 of section III. The GDP of the final mass consumption goods and services, commerce, infrastructure services and housing fronts grows by more than total GDP in both simulations. Moreover, with the exception of housing, the same is true of employment, intermediate goods imports and prices. In the case of widely used intermediate goods, the effects are somewhat smaller than the GDP and employment aggregates, and better when the effects on their imports and prices are compared with total imports and prices. The remaining four fronts show much smaller impacts for all the selected variables.

Table 5
Mexico: changes in selected economic variables, by growth front, simulation 1
(Percentages)

Growth front	GDP	Employment	Prices	Intermediate goods imports
Final mass consumption goods and services	2.7	3.0	0.5	3.3
Commerce	2.6	3.6	0.5	2.4
Housing	2.8	0.6	0.3	0.6
Infrastructure services	3.4	3.2	0.6	3.6
Widely used intermediate goods	1.6	1.9	0.4	1.5
Oil and mining	0.6	0.5	0.1	1.0
Health, education and government services	0.3	0.3	0.3	0.4
Capital goods and consumer durables in the framework of the North American Free Trade Agreement (NAFTA)	0.3	0.2	0.1	0.2
Construction	0.2	0.2	0.1	0.1
Total GDP	2.0	2.1	0.4	1.2

Source: Prepared by the authors, on the basis of data from the National Institute of Statistics and Geography (INEGI) and simulation 1.

Table 6
Mexico: changes in selected economic variables, by growth front, simulation 2
(Percentages)

Growth front	GDP	Employment	Prices	Intermediate goods imports
Final mass consumption goods and services	5.5	6.0	1.0	6.7
Commerce	5.2	7.3	1.0	4.8
Housing	5.7	1.3	0.6	1.3
Infrastructure services	6.9	6.4	1.2	7.2
Widely used intermediate goods	3.3	3.8	0.9	3.1
Oil and mining	1.2	1.1	0.3	1.9
Health, education and government services	0.6	0.7	0.6	0.8
Capital goods and consumer durables in the framework of the North American Free Trade Agreement (NAFTA)	0.6	0.4	0.2	0.5
Construction	0.4	0.4	0.3	0.1
Total GDP	4.0	4.4	0.8	2.4

Source: Prepared by the authors, on the basis of data from the National Institute of Statistics and Geography (INEGI) and simulation 2.

In tables 5 and 6, and in the description that follows, the growth fronts are ranked by the contribution of each to total GDP growth, in accordance with the growth accounting exercise presented in table 7 (fifth column). Thus, the final goods and services fronts of consumption, commerce and housing are the ones contributing the most to total GDP growth as a result of the change in workers' wages.

Table 7
Mexico: GDP shares and growth rates and contributions to total GDP growth, by growth front
(Percentages and percentage points)

Growth front	Share *(percentages)*	Simulation 1			Simulation 2		
		Growth *(percentages)*	Contribution to growth *(percentage points)*	Contribution to growth *(percentages)*	Growth *(percentages)*	Contribution to growth *(percentage points)*	Contribution to growth *(percentages)*
Final mass consumption goods and services	17.9	2.7	0.5	24.6	5.5	1.0	24.6
Commerce	17.6	2.6	0.4	22.7	5.2	0.9	22.7
Housing	17.6	2.8	0.5	24.7	5.7	1.0	24.7
Infrastructure services	7.8	3.4	0.3	13.4	6.9	0.5	13.4
Widely used intermediate goods	11.4	1.6	0.2	9.2	3.3	0.4	9.2
Oil and mining	8.6	0.6	0.1	2.6	1.2	0.1	2.6
Health, education and government services	11.4	0.3	0.0	1.7	0.6	0.1	1.7
Capital goods and consumer durables in the framework of the North American Free Trade Agreement (NAFTA)	5.1	0.3	0.0	0.7	0.6	0.0	0.7
Construction	2.7	0.2	0.0	0.3	0.4	0.0	0.3
Total	100.0	2.0	2.0	100.0	4.0	4.0	100.0

Source: Prepared by the authors, on the basis of data from the National Institute of Statistics and Geography (INEGI).

In the same way, table 8 presents data on the share of each growth front in total Mexican employment in each of the simulations. Tables 7 and 8 have the virtue of simultaneously showing the composition of GDP and total employment in Mexico by potential growth front. They also show the relative size of the reactions in the different fronts' activity levels to the simulated changes in earnings. In both simulations, about half the GDP growth and three quarters of the increase in employment are accounted for by final mass consumption goods and services and commerce.

Table 8
Mexico: employment shares and growth rates and contributions to total employment growth, by growth front
(Percentages and percentage points)

Growth front	Share *(percentages)*	Simulation 1			Simulation 2		
		Growth *(percentages)*	Contribution to growth *(percentage points)*	Contribution to growth *(percentages)*	Growth *(percentages)*	Contribution to growth *(percentage points)*	Contribution to growth *(percentages)*
Final mass consumption goods and services	29.9	3.0	0.9	41.3	6.0	1.8	41.3
Commerce	19.2	3.6	0.7	31.8	7.3	1.4	31.8
Housing	9.2	0.6	0.1	2.7	1.3	0.1	2.7
Infrastructure services	4.5	3.2	0.1	6.6	6.4	0.3	6.6
Widely used intermediate goods	17.2	1.9	0.3	14.9	3.8	0.7	14.9
Oil and mining	0.8	0.5	0.0	0.2	1.1	0.0	0.2
Health, education and government services	11.4	0.3	0.0	1.8	0.7	0.1	1.8
Capital goods and consumer durables in the framework of the North American Free Trade Agreement (NAFTA)	4.3	0.2	0.0	0.4	0.4	0.0	0.4
Construction	3.5	0.2	0.0	0.3	0.4	0.0	0.3
Total	100.0	2.1	2.1	100.0	4.4	4.4	100.0

Source: Prepared by the authors, on the basis of data from the National Institute of Statistics and Geography (INEGI).

The results of the simulations for each potential growth front will now be discussed. To illustrate the advantages for planning and prioritization of using the concept of growth fronts in a strategy with the characteristics that have been discussed in Mexico during the current government, brief considerations will also be presented regarding some policies that should be applied for certain of the growth fronts to contribute to the success of the project.

1. Final mass consumption goods and services and commerce

In the scenario where the lowest wages rise, the growth fronts on which the impact is greatest are, unsurprisingly, final mass consumption goods and services, and commerce. The latter is significantly boosted by the spread of mass consumption. While the two fronts were responsible for about 35% of GDP in 2013, they account for 47% of the increase in GDP in the two simulations (see tables 7 and 8).[9] The effect on employment is even stronger. While these two fronts employed approximately 50% of the labour force in 2013, in both simulations the increase in employment there accounts for 73% of total employment growth.

It is observed in the simulations that, as the number of workers benefiting from a substantial increase in income grows, i.e., in moving from the first to the second simulation, activities oriented towards the production of final mass consumption goods and commerce grow in a similar proportion and by more than total GDP. While total GDP grows by 2.0% and 4.0% in simulations 1 and 2, respectively, the GDP of the two growth fronts mentioned above grows by 2.7% and 2.6%, respectively, in the first simulation and by 5.5% and 5.2% in the second.

[9] Since the composition of GDP is the same in the two simulations, the percentage point contribution of each growth front is also the same in both cases. A similar reasoning applies with respect to employment.

As regards employment, while it grows by 2.1% and 4.4% overall in simulations 1 and 2, respectively, the estimated expansion of employment in final mass consumption goods and services industries is 3.0% and 6.0%, respectively; i.e., the income elasticity of employment is very high. It is even higher for commerce, where employment in the two simulations increases by 3.6% and 7.3%, respectively. Imports of intermediate goods destined for final mass consumption goods and services increase by slightly more than GDP in both simulations (the income elasticity of imports is 1.2). In the case of commerce, they increase by slightly less than GDP (income elasticity of 0.9). As seen in the considerations regarding the aggregate results, the redistributive model is also superior to the current one with respect to the external constraint.

As regards policies applicable to both growth fronts, on the demand side the experience of mass consumption models in developed countries suggests that the effects of a rising total wage bill need to be reinforced by a number of complementary policies. These include an adequate supply of consumer credit, whose expansionary effects on demand in the medium and long term usually depend crucially on interest rates being kept moderate. This prevents a situation where interest payments absorb a large part of real wage increases and households become overextended, which can impose major constraints on the continuity of growth. Other important elements linked to the model of growth induced by the domestic mass consumption market are distributional improvements in tax collection and the composition and quality of public spending (including minimum income or universal basic income programmes), because they have a direct impact on the income available for household consumption.

On the supply side, production and investment are essentially driven by the domestic market (supported by export dynamism). Businesses decide on their investments in a way that is induced by the actual and expected expansion of demand and conditioned by their international competitiveness. However, it is important to note that the model of expansion relying on the domestic mass consumption market is highly dependent on investment, like any growth model that is sustained in the medium and long term. The existence of a development bank that supplies long-term capital needs and offers low interest rates facilitates the accelerating effect of private investment. The role of public investment is also critical because of its direct and indirect effects on total investment, especially in sectors where private enterprise struggles to take on investment risks.

Before turning to the other growth fronts, three additional comments are in order. First, the fact that Mexico's population is large (126.6 million people in 2019, according to the National Population Council) and that Mexico is already a middle-income economy provides an opportunity that distinguishes the country from all others in Latin America (except for Brazil). This opportunity is to move through successive productivity increases (by scale) towards a mass production and mass consumption economy and to transform the profile of its exports, as happened successfully in the United States, European and Japanese economies over several decades in the post-war period.

Second, both production and commerce for mass consumption are likely to be carried out to a substantial degree by microenterprises and small and medium-sized enterprises. If so, policies should be adopted to promote the formalization of these enterprises and provide them with financial and technical support in order to increase their productivity and make the desired development model sustainable in the medium and long term. Tax incentives can also be used to achieve greater formalization of enterprises while increasing access not only to social security benefits, but also to credit.

Third, although the production of final goods for the most disadvantaged classes of the population appears to be intensive in low-skilled labour, it also involves very technology-intensive sectors and production chains, not least because of the sophisticated intermediate and capital goods required. This points to the need to intensify technological efforts in these production chains and ensure a fair distribution of productivity gains. It is also important to remember that boosting the economy through growth in the lowest wages leads to increases in income and demand across all social classes, including those that are consumers of more technology-intensive and technologically sophisticated goods.

Looking beyond the scenarios simulated in this study, it should also be noted that if the incomes of the most disadvantaged classes grow sustainably in the long run, the composition of their demand will shift towards more technology-intensive goods and services, including those forming part of the other growth fronts, discussed below.

All the above implies the need to diversify the production structure and make substantial technological efforts. Policies must be implemented to promote productive development right across the economy, in terms of backward and forward linkages, labour training, research and development, and technological innovation. This is important to achieve endogenous technical progress and to boost the economy's potential growth fronts and labour productivity, as well as to avoid future supply-side constraints and balance-of-payments effects that could undermine the continuity of growth.

2. Housing

The demand for housing-related activities (building, water and gas supply and real estate services) depends on three factors. First, it is linked to the large deficit of residential accommodation in Mexico, which makes housing one of the major social demands. Second, it depends on the existence of long-term financing at low interest rates and of extensive housing subsidy mechanisms for the most disadvantaged groups of the population. The third factor is the demand from high-income classes (part of which is associated with investment portfolios based on speculative financial logic).

The simulations (see tables 5 and 6) and the growth accounting tables (see tables 7 and 8) show housing as one of the growth fronts having the largest impact on GDP in absolute and relative terms, with a growth rate similar to that of final mass consumption goods and services and of commerce.

Interestingly, the large impact that the simulations show the housing sector having on GDP is not matched by a similar impact on employment, which is expected to grow by very little. This is counter-intuitive because housing is supposed to be a labour-intensive activity. One hypothesis, to be tested, is that as low incomes rise, there is an intensification of self-construction by poor households, whose work on their housing is captured in the National Household Income and Expenditure Survey.[10] This type of work is not counted as part of self-consumption and thus may not be included in GDP accounting. However, it contributes to the dynamism of the construction materials and inputs sector.

In the case of imports of intermediate goods, there is no surprise: the simulations show them expanding very slowly, with income elasticities of about 0.2. This points, as expected, to a domestic response to the demand for building inputs, especially in low-income housing.

For most families in Mexico, the monthly costs associated with the purchase of a house are excessively high given their current income. The major constraint on house-buying, which is essential for the well-being of the population, is therefore the lack of long-term public and private financing systems with low interest rates. Especially in the case of low-income housing for the poorer classes, fiscal space and political will to implement subsidy schemes are also key factors. However, existing housing improvement programmes, such as those implemented by the Mexico City government, should be considered for their dynamizing effect on the building materials sector and local job creation in residential districts and housing estates.

In principle, this is a promising growth front in the new development model sought for the Mexican economy. However, a resolute public policy is required for it to realize its full potential and produce significant economic and social impacts.

[10] This is captured specifically in the household expenditure questionnaire. In the latest surveys, however, INEGI has estimated self-consumption from the household business questionnaire.

3. Infrastructure services

This potential growth front includes electricity, transport and communication services (the supply of piped water and gas has been included in the housing sector). These are sectors where demand is strongly associated with growth rates in the economy as a whole, with elasticities that differ across subsectors. They may also be associated with the existence of large infrastructure gaps, which have negative impacts on the systemic competitiveness of the economy. On the supply side, fiscal space, the ability to mobilize significant amounts of financial resources and political will are the main determinants of the infrastructure growth needed to make the expansion of services viable.

Its importance for the welfare of the population is strikingly illustrated in the simulations, with growth far exceeding that of total GDP. This indicates that poor households, where demand is heavily suppressed by low incomes, increase their consumption of services such as energy, transport and communications by a much larger proportion when those incomes increase. The two simulations give GDP growth rates of 3.4% and 6.9% for this growth front, the highest of all fronts and much higher (by about 70%) than total GDP growth rates. This front also has the second-highest employment growth rate in both simulations (see tables 5 and 6). Infrastructure services are the fourth most important growth front in terms of their share of total GDP growth (see table 7) and the third most important front in terms of their job creation rate (see table 8). This is also the front that drives the highest inflation rate in both scenarios: 0.6% in scenario 1 and 1.2% in scenario 2, which is 50% higher than the overall inflation rates of 0.4% and 0.8%, respectively. Likewise, its intermediate goods imports are the fastest-growing, even though this does not amount to much when set against total intermediate goods imports, since its share of this aggregate is very small.

All this should sound a strong warning: since the redistributive model is very demanding of infrastructure services, these need to be planned for to prevent bottlenecks in the future, considering that the necessary investment involves complex financial equations and relatively long implementation time frames. The signals provided by the simulations are also likely to be significant from the point of view of urban mobility planning, particularly in the outlying metropolitan areas where lower-income households live. The use of mechanisms to cross-subsidize the charges for these services, which can have a major impact in terms of social justice, would enhance the importance of this growth front in the proposed socioeconomic model.

At the same time, it is essential to adapt infrastructure to the requirements of the economy and society of the twenty-first century. What is needed is an economic and social structure that is increasingly intensive in data transmission and digitalization in general. Effective broadband access for very substantial sectors of the population, including the lowest-income deciles, is an essential part of infrastructure policies that open up extensive opportunities for public and private investment to help bridge the digital divide. Accordingly, as ECLAC has pointed out, it is important for the entire population to have access to a basic digital basket.

4. Widely used intermediate goods

As in the case of the commerce sector discussed above, there are goods sectors whose products are also in widespread use throughout the economy. They should be grouped as a separate growth front because their behaviour is not subject to specific supply and demand logics. They are economy-wide sectors that are associated with the behavioural logics of several or all the other growth fronts.[11]

[11] As mentioned, the criteria used to classify branches as widely used intermediate goods and services branches for the purposes of the simulations are explained in detail in Bielschowsky and others (2021, annex 4).

Accordingly, and unsurprisingly, the results of the two simulations for widely used intermediate goods, as compared to the other growth fronts, bear some resemblance to the results for the economy as a whole in terms of GDP and in terms of employment (where they are somewhat lower). Regarding the concern about the external constraint, it should be noted that the income elasticities of intermediate goods imports are slightly lower than one.

This growth front comprises a set of branches of production that vary greatly in scale and technology requirements. Given its importance for the Mexican economy, and the trade balance in particular, import substitution should be planned for with a long-term perspective, and technological modernization and innovation capacity should be stimulated to secure the competitiveness of companies operating in Mexico.

5. Oil and mining

The other potential growth fronts, including oil and mining, are relatively unaffected by the sudden change in earnings. Demand in the oil and mining sectors is associated with both the domestic market and exports. The decisive factor in the expansion of supply is the availability of oil at a competitive cost. The PEMEX investment decision-making process also plays a role in ensuring that the increase in energy demand expected to accompany a dynamic economy does not lead to higher oil and gas imports and aggravate Mexico's already compromised energy security. One possible explanation for the outcome of the simulations is that poor households' share of total consumption of oil and oil products is very low, so that an increase in demand from them has only a small effect on total production. The result may also be influenced by the fact that the ratio of petrol imports to domestic refinery production is high. In fact, this growth front has the highest income elasticity of imports of all those examined (about 1.6 in both simulations).

As is well known, there is a major debate in Mexico about the need for investment in the oil and oil products complex. Although the additional demand for hydrocarbons would be relatively low at the beginning of the redistribution process, in the medium and long term insufficient domestic production capacity in this key sector of the economy could have adverse effects on the balance of payments and the external constraint on growth. The country's hydrocarbon production capacity therefore needs to be expanded. For environmental reasons, among others, it is also necessary to make a transition towards a greater share of alternative energies, such as solar and wind, in the Mexican energy mix.

6. Health, education and government services

Together with higher employment and worker incomes, access to housing, health care and education is the great social demand in Mexico. This is because of their effects in reducing poverty and improving quality of life and income distribution. The demand logic is driven by the social need for better and more extensive public services, while in the case of private services it relies on an increase in the total wage bill of the higher-earning sectors in the population. The supply logic essentially depends on fiscal space and the political will of governments to increase the share of social spending in total government expenditures.

Besides their social and civilizing consequences, the expansion and strengthening of health and education services have two basic effects on the economy. First, they help to increase the productivity of the labour force. Second, when these services are free or subsidized by the government, they increase the household budget available for mass consumption and investment in housing.

What is observed in the simulations is a very modest supply-side reaction in health, education and other typical government services. However, it should be noted that no simulations of the impact on public expenditure have been carried out. The result is that GDP on this front grows only modestly

in both simulations (0.3% in simulation 1 and 0.6% in simulation 2, compared to 2.0% and 4.0% total GDP growth, respectively).

This is because these are simulations in which earnings growth occurs in groups of households belonging to the most disadvantaged classes, and thus the increases are generally not spent on education or private health care. Since these population groups rely on public health care, it is important to strengthen this service (as the federal government is doing) to avoid a rise in out-of-pocket spending on health care due to the shortcomings and limitations of public care. As effective progress is made in removing health care and education from the market sphere, household disposable income will grow. Wage increases can then be used to meet other needs rather than to purchase goods and services that should be provided universally and free of charge because they are human rights.

The main significance of this result in the fields of health and education is the need for a substantial increase in direct State action, as the Mexican government recognizes. Otherwise, this potential growth front will not be able to contribute to productivity growth and will therefore work against the redistributive (and civilizing) model desired. It should be remembered, incidentally, that education and health were among the pillars of the model of full employment and social well-being successfully implemented in post-war Western Europe. One of the virtues of this model is that it creates very high demand for teachers, doctors and nurses, among others, leading to increased employment and qualification requirements for the working class.

7. Capital goods and consumer durables in the framework of the United States-Mexico-Canada Agreement (USMCA)[12]

The machinery and equipment industry, for both capital goods and consumer durables (the mechanical, electrical and electronics industries, among others), is concentrated in maquila plants, so that its production dynamics are essentially tied to the performance of the United States market and only secondarily to sales in the domestic market. In the branches belonging to this front, the ratio of exports to gross value added is over 50% (see Bielschowsky and others, 2021, annex 3).

For this reason, the supply of and demand for consumer durables, which should in principle be categorized as final mass consumption goods and services, and likewise the supply of and demand for capital goods, which should be considered an economy-wide growth front, have been classified as constituting export-centred supply in the USMCA regime. This potential growth front shows a modest impact in both simulations in terms of GDP, employment, imports and prices.

There are three possible reasons for this. The first is that low-income households are likely to increase their consumption of durables by relatively little. The second is that the impact of low incomes on total investment in the economy is also likely to be relatively small, something that can be attributed to a low capital-output ratio (or high labour-output ratio) in the production on which the demand of low-income households centres, as concluded from the simulation data. The third cause is intrinsic to the Leontief model; i.e., the model does not absorb the accelerating effect of growth on investment, which is the demand variable that drives the production and import of capital goods.

While the simulations, dealing as they do with the consequences of growth in low incomes alone, show little of importance on this growth front, this set of branches is nonetheless the focus of concern in the country in relation to the trade balance. The simulations do not measure the consequences for business as usual in all its ramifications in an economy that is highly dependent on imports of capital goods and consumer durables. According to the Mexican national accounts, approximately 50% of

[12] USMCA replaced NAFTA.

total imports of capital goods (final and intermediate) is absorbed by this growth front. For this reason, among others, and as with intermediate goods production, it is essential to implement a programme for increasing domestic value added in production chains, which presupposes the planning and implementation of incentives for import substitution and innovation, in order to create endogenous production capacity for capital goods. This growth front, as is well known, represents the main pillar of global technical progress. Whether an income-concentrating or -deconcentrating development model is adopted, then, international competitiveness and the scope for growth without balance-of-payments problems are determined by success in stepping up local production in these value chains.

8. Construction

Construction is a typical economy-wide front. It consists of building activities for all economic activities, and the construction of infrastructure in particular. It is the potential growth front that, together with capital goods and the construction or improvement of housing, constitutes gross fixed capital formation in the economy. It is observed to grow by proportionally much less than GDP in both the scenarios simulated.

The likely causes are similar to those explaining the relatively low increase in domestic output of capital goods. First, the change in the composition of output due to income redistribution seems to be redirected to capital formation to a lesser extent than the increase in GDP. This is due to the high income elasticity of employment in industries whose output is consumed by lower-income workers. Second, the accelerator effect of GDP growth on investment is not present in the simulations.

The main government effort should focus on providing the sector with financing mechanisms with adequate terms and modest interest rates. This is especially important in the case of small and medium-sized construction companies, which do not have access to international financing. This initiative could be supplemented by public policies to improve housing, residential districts and urban environments.

V. Conclusions

A national development strategy is the deliberate design of a desired and feasible development pattern for a nation to be led by government and social actors. Accordingly, this study used simulations based on the input-output matrix to analyse, first, the effects of increasing the minimum wage on GDP, employment, intermediate goods imports and prices for the Mexican economy as a whole. It also studied the effects of increasing the minimum wage on these variables by groups of sectors called "potential growth fronts". It has been argued that each growth front comprises a group of sectors that are alike in that they behave according to similar demand and supply logics. The analytical power of the method was supplemented by some indications of public policies and their instruments, differentiating them by potential growth front. It is possible to conclude that the method serves to help establish a hierarchy of priorities, i.e., to determine the relative importance of each type of policy and instrument according to the government's strategic objectives in the desired social and productive transformation.

The analysis provides very favourable indications for the viability in Mexico of growth with income redistribution, essentially driven by the domestic mass consumption market.[13] The main conclusion is that stimulating demand growth among lower-income households by raising the minimum wage has very positive potential effects on the economy. It favourably affects GDP and employment, while its impact on both inflation and imports is relatively modest and much smaller than that of the model in place in recent decades.

[13] In balance with reinvigorated exports, in accordance with the logic of genuine competitiveness.

In other words, gradually doubling minimum wages in real terms is a good way to start reorienting Mexico's economic development towards growth with social justice. Achieving this growth obviously requires other redistributive policies, such as tax progressivity, and greater access to quality education, health and housing.

Lastly, the model of growth with income redistribution is an important part of a future growth agenda that is not only in the interests of the poorest. The whole economy will benefit from the boost provided by the doubling of the minimum wage. This is true of other workers, owing to the employment multiplier effect, and of employers, since rising demand boosts profits. The main development in distributional terms will be that the incomes of the poorest households grow by more than other incomes. This will help close inequality gaps and fulfil the 2030 Agenda for Sustainable Development.

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Pension arrangements and economic thinking: unreal assumptions and false predictions in the case of Argentina

Milva Geri

Abstract

In accordance with mainstream economic thinking, the World Bank advised Latin American countries to reform and fully or partially privatize their pension systems. Argentina was one of the countries to follow these recommendations, which it did without first checking whether the arguments were valid or whether the theoretical assumptions were fulfilled. On the basis of publicly available statistical information and a historical review of the Argentine pension system, we conclude that most of the arguments put forward by the World Bank were refutable at the time of the reform, which did not solve the problems it set out to address. For this reason, decision-makers should heed the economic history of each country before following the recommendations of international organizations.

Keywords

Social security, economic systems, international organizations, pensions, economic reform, equality, retirement, retirement income, case studies, Argentina

JEL classification

H55, I38, J26

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The beauty of social insurance is that it is actuarially unsound
(Samuelson, 1967, p. 88).

I. Introduction

In the 1960s, an important discussion began in mainstream economics about the impact of pension systems on intergenerational welfare and economic growth. In that discussion, which involved several explicit or implicit assumptions representing a greatly simplified version of the way pension systems work in different countries around the world, a view of individual optimality ended up predominating over the original view of social optimality.

Influenced by mainstream economic thinking, analysts at the World Bank and International Labour Organization (ILO) led a discussion in the 1990s that was mainly concerned with the optimal design of pension systems. While some advocated the adoption of individually funded systems, others advised carrying out parametric reforms to balance system revenues and outgoings, without structural reform. The empirical evidence gathered in the countries that carried out the pension reforms proposed by the World Bank shows that they did not achieve the results which that body anticipated. Argentina was one of the developing countries that decided to partially comply with the World Bank's recommendations. It reformed its pension system to implement an integrated system (Arenas de Mesa and Bertranou, 1997), the Integrated Retirement and Pension System, in which an unfunded and an individually funded subsystem coexisted for 14 years. The aim of this paper is not to recount the details of the reform or the causes that led to the abandonment of the funded system, since that task has already been carried out by other authors (Cetrángolo, 1994; Rofman, 2002 and 2003; Bertranou and others, 2012). Rather, it will attempt to show not only that the problems the integrated system was intended to solve worsened while it lasted (Bertranou and others, 2015), but also that most of the arguments put forward by the World Bank for the superiority of an individually funded system over an unfunded one were refutable at the time of the reform.

The article is structured in three sections. The first outlines the course taken by mainstream economic thought in the study of pension systems since the late 1950s. The second describes the role that two international organizations, the World Bank and the International Labour Organization, came to play in pension policy in Argentina and other Latin American countries. Lastly, the third section shows, based on a review of the relevant legal literature and the statistical information available, that pension reform in Argentina did not solve the problems it was intended to.

II. Pension systems and economic thought

In 1958, Paul Samuelson set out to find a general equilibrium solution for determining the behaviour of the long-term interest rate, probably without realizing that he was initiating a wide-ranging debate in economic theory about the impact of welfare systems on well-being. Following a tradition in political economy, the author imagined the famous Robinson Crusoe making a bargain with Mother Nature.[1] He asked her to provide him with future consumer goods when he reached an advanced age in exchange for present consumer goods, on a one-to-one basis. If Robinson were to keep perishable goods such as the grapes or melons he picked on the island, he would undoubtedly earn a negative rate of interest. If, on the other hand, he could breed rabbits that reproduced according to compound interest, he would get a positive rate of interest.

[1] In a clear allusion to David Ricardo, Marx (1887) says that political economy is fond of "Robinsonades".

In a world without money, but with a constant flow of equally productive new generations, pay-as-you-go pension systems would serve the same function as the hypothetical bargain with Mother Nature: to exchange consumer goods and services by intergenerational transfer. If the population did not grow, providing goods to current retirees would be equivalent to providing these goods to oneself at a later period. In other words, these goods would be provided at a zero interest rate. In contrast, in a population with a positive growth rate, providing goods to today's retirees would be equivalent to providing these goods at a positive interest rate. The opposite would happen if the growth rate were negative.

Samuelson (1958) argued that the biological interest rate that matched the population growth rate was socially optimal in a Kantian sense, i.e., as a categorical imperative, in answer to the question: what common rule can be established as universal and enduring over time by a representative individual? However, the biological interest rate is not the one that would spontaneously prevail in a market in which no generation made a bargain with another generation that was as yet unborn. The author thus concluded that pension systems constituted a Hobbesian or Rousseauian social contract ensuring the sustainability of pensioners' future income when it was not possible to accumulate physical capital or, alternatively, when money did not fulfil its function as a store of value, making it difficult to efficiently transfer the savings generated during the active stage to the inactive stage.

Years later, Aaron (1966) demonstrated Samuelson's (1958) "social insurance paradox" whereby a pay-as-you-go pension system could increase the welfare of each individual if the sum of the population growth rate and the rate of growth in real wages exceeded the interest rate. Conversely, welfare would be reduced if the interest rate exceeded the sum of these rates, unless: (i) there were market imperfections that made the initial situation suboptimal, (ii) income redistribution were an objective of the social welfare function or (iii) there were economies of scale in public pension provision. However, all these considerations would be left aside in the economic analysis of pension systems, and the social optimum approach would ultimately be displaced by an individual optimum approach.

Thus, it would fall to Feldstein (1974) to turn Samuelson's article around by arguing that, in a world where a reliable volume of money is introduced, allowing value to be efficiently stored, pension systems are unnecessary because individuals can and should freely decide on their optimal amounts of intertemporal consumption and working hours. The idea that individuals do not need the State to meet their economic needs in old age had been introduced earlier by Friedman (1962), who described pay-as-you-go pension systems as a large-scale invasion of personal life. For Friedman (1962), individuals should be free to make their own mistakes, even if the consequence is that they live in poverty in their old age because they have not saved enough. This view was diametrically opposed to that of Samuelson (1975), who rightly considered that it was the very myopia of economic agents that made the existence of a paternalistic pension system optimal.

Feldstein (1974) suggested that pay-as-you-go systems produced two harmful effects on growth by interfering with individual decisions: (i) they reduced the incentive to save during the active stage and (ii) they reduced the labour supply by establishing fixed retirement ages. With regard to the net effect of a pension system on aggregate saving, Feldstein (1976) recognized that it needed to be estimated empirically because it was theoretically indeterminate, depending as it did on the relative strength of two effects: (i) the saving replacement effect and (ii) the induced retirement effect. The first effect entailed a reduction in saving during the active stage, a choice that individuals might make in anticipation of a pension benefit, while the second effect entailed an increase in saving to supplement the pension benefit and thus attain an optimal level of consumption over a longer retirement period. The author's estimates suggested that the United States pay-as-you-go pension system reduced private savings by 38%, which in turn reduced the volume of accumulated capital by 60% and, consequently, gross domestic product (GDP) by 11% (Feldstein, 1974).

Although Feldstein's (1974) empirical work was subject to serious methodological criticism (Darby, 1977; Esposito, 1978; Barro, 1979; Leimer and Lesnoy, 1982; Atkinson, 1995), his theoretical ideas ultimately prevailed in the economic literature. Franco Modigliani (1986) argued that the main parameter controlling the saving rate, given a certain level of output, was the length of the retirement period. According to the author of the life-cycle model, the pension system affects the length of this period by encouraging early retirement. Modigliani (1966) considered that consumption and saving decisions reflected intertemporal optimization by individuals as they sought to achieve their preferred distribution of consumption over the life cycle. These decisions were influenced by the population growth rate (which changes the relative proportion of young and old) and by productivity (which changes the level of income on which consumption and saving decisions are based).

Martin Feldstein's ideas were rapidly disseminated by countless authors via the design of dynamic general equilibrium models representing the functioning of an economy in accordance with neoclassical life-cycle theory under conditions of perfect information, perfect labour and capital markets, and homogeneous, rational individuals, which implies intertemporally consistent preferences and no myopia. One of the pioneering works in this line was that of Auerbach and Kotlikoff (1987), who argued that when the interest rate was higher than the population growth rate, pay-as-you-go systems decreased the welfare of future generations for two reasons. First, because future retirees would receive higher benefits if they invested their savings at the market interest rate. Second, because the crowding out of private savings caused by the existence of a pension system reduced capital formation, causing the economy to reach a steady state with a lower level of output per capita.

Auerbach and Kotlikoff (1987) observed that the complex relationship between contribution rates and eventual retirement benefits was misunderstood by most workers, for whom these rates were simply taxes on labour that ended up distorting the labour supply. For this reason, the authors suggested that the government should limit itself to requiring individuals to save in individual accounts whose funds would be invested at a given interest rate and then repaid at retirement. In that way, workers would interpret every dollar deposited in their account as a dollar transferred to their inactive stage, without any distorting effect on the labour supply.

Feldstein (1997) recognized that the real reason for people to drop out of pay-as-you-go systems was not that these were bankrupt or unsustainable, but that leaving them would improve the welfare of individuals, since a private system of individual accounts would be able to provide the same benefits as the pay-as-you-go system, but at a lower cost. The author established three conditions for a successful transition from a pay-as-you-go system to a private individually funded one: (i) the marginal product of capital must exceed the rate of wage growth, (ii) the rate at which future consumption was discounted must exceed the rate of wage growth and (iii) the economy must be growing. Feldstein (1997) considered that the transition would be successful because the private system required a lower contribution rate than the public system to deliver the same benefits. Thus, the transition generation would not have to make a very large effort to support retirees and would be able to save for their own retirement at the same time.

The conditions for the success of a pension reform and the admissibility of the assumptions on which a neoclassical model of the type proposed by Martin Feldstein is based were scarcely analysed in advance of pension policy recommendations being made to countries such as Argentina. Perhaps this was due to Milton Friedman's famous principle: "The relevant question to ask about the 'assumptions' of a theory is not whether they are descriptively realistic, for they never are, but [...] whether the theory works, which means whether it yields sufficiently accurate predictions" (Friedman, 1953, p. 15). The fact is that international agencies such as the World Bank and the International Monetary Fund were quick to recommend that developing countries reform their pension systems in order to privatize them fully or partially. Conversely, ILO analysts predicted that the risks from this reform would be greater than those presented by the existing situation (Mesa-Lago, 1996).

III. The international debate: the World Bank versus the International Labour Organization

In line with mainstream economic thinking, the World Bank questioned the performance of pay-as-you-go pension systems in its famous 1994 report *Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth*. The arguments put forward were as follows: (i) the redistributive potential of these mechanisms has sometimes been used to benefit the rich at the expense of the poor; (ii) beneficiaries face the political risk that benefits will be reduced by law, besides which many countries do not index benefits, and inflation causes them to lose purchasing power; (iii) pay-as-you-go mechanisms are unsustainable in the long run, as they benefit one generation to the detriment of another; (iv) social costs in the form of evasion and informal working conditions are considerable, and pay-as-you-go systems entail high labour costs that reduce productivity, employment and output; and (v) pay-as-you-go pension systems reduce aggregate saving and investment.

According to the World Bank (1994), income protection and income redistribution to prevent poverty in old age were two different objectives of the pension system and should be dealt with by a mechanism comprising different pillars. Such a mechanism would have a first non-contributory pillar financed by general taxation to deal with redistribution and poverty alleviation, while a second individually funded pillar would deal with income protection. Lastly, a third voluntary pillar would provide additional protection for those desiring it. With this design, the World Bank believed that countries could achieve two objectives at the same time: (i) make pension systems sustainable and (ii) alleviate poverty among older persons, all without distorting the economic variables involved in growth and employment.

Several Latin American countries, including Argentina, decided to follow the World Bank's recommendations and reform their pension systems, organizing them into a multi-pillar scheme. At the same time, analysts at the International Labour Organization who opposed the World Bank's recommendations challenged the Bank's arguments with the following counter-arguments: (i) many of the World Bank's theoretical postulates, such as the alleged distortion of the labour supply and the decrease in aggregate savings, lacked adequate empirical support; (ii) certain events, such as the increase in the dependency ratio caused by population ageing and the greater probability of the rich accessing benefits because of their longer life expectancy, were incorrectly associated with pay-as-you-go mechanisms, without considering that both events were independent of the pension mechanism adopted; (iii) the historical role of pay-as-you-go mechanisms in smoothing consumption and alleviating poverty among older persons in industrial countries was not recognized, and nor was the administrative efficiency with which these objectives were achieved; and (iv) too much reliance was placed on the markets of fund managers in developing countries (Beattie and McGillivray, 1995; Singh, 1996; Midgley, 1999).

Beattie and McGillivray (1995) recognized that, while perverse redistribution from poor to rich was inevitable in a system that aimed to diversify the longevity risk of a whole population, the poor who reached retirement age obtained higher replacement rates owing to the lump sum components contained in pension benefits, an argument that was also made by Barr (2002) years later. In relation to funding mechanisms, the authors stressed that benefits were open-ended and individuals would face enormous uncertainty in this regard, as they would depend on individual contribution capacity, the rate of return achieved by the fund manager, the amount of fees and administrative costs to be deducted from the fund, and actuarial calculations. Such calculations would discriminate against women because they live longer, resulting in gender bias (Arenas de Mesa and Montecinos, 1999), and the poor might obtain replacement rates below the minimum rates established by ILO (1967). The State would ultimately have to take measures to compensate individuals who did not obtain coverage or whose benefits were insufficient.

Singh (1996) collected empirical information on the Chilean case.[2] He used these data to argue against the World Bank's proposed reforms: (i) transition costs represented 5% of GDP, (ii) the poor population had a low effective contribution rate, (iii) the rich population enjoyed a higher average rate of return on funds and (iv) administration costs were high and fees represented 15% of contributions.

Similarly, Singh (1996) criticized the argument that a country would develop through capital market growth, which the World Bank claimed would come about simply by virtue of the creation of a market for pension fund managers. The author questioned whether the development of such markets would result in higher growth. He argued that, according to Keynes' *General Theory of Employment, Interest and Money* (Keynes, 1936), the likelihood of speculation and overvaluation in the short term was higher when markets of this type were more developed. Countries such as Germany and Japan, meanwhile, had industrialized prior to the development of their capital markets. According to the author, it was paradoxical that reformist theories had most support in the United States and the United Kingdom, countries where capital markets had played a critical role in the economy.

In the same vein, Midgley (1999) interpreted the reformist wave as a direct consequence of the free-market ideas advocated by Friedman and Hayek, authors who fervently opposed post-war welfare State policies. Accordingly, the term "reform" was used euphemistically to denote the privatization of the welfare system advocated by those who considered that social security had become irrelevant (Midgley, 1999, p. 95). Midgley denounced the United States pension fund management industry for lobbying for the privatization of the pension system and the United States media for publishing inaccurate reports predicting the bankruptcy of the pay-as-you-go system. A similar accusation had been made by Mesa-Lago (1996) in one of the first critical articles on pension reform, in which he mentioned the "international consultants who believe in the universality of the Chilean model" (Mesa-Lago, 1996, p. 82) and give only a few pages to the diagnosis of the public pension system of the country they are studying, instead using the bulk of their reports to reproduce the Chilean recipe.

Years later, renowned economists such as Orszag and Stiglitz (2001) undertook a theoretical refutation of ten myths about social security systems that were very often found in the economic literature and were among the main arguments put forward by the World Bank. They discussed, for example, the supposed increase in aggregate savings when pay-as-you-go mechanisms were abandoned, the supposed higher expected rate of return associated with funded mechanisms, the incentives generated in the labour market by each mechanism, the degree of competition in the pension fund management market, and the role of governments in each mechanism. Barr (2002) masterfully showed that demographic shocks were adverse not only for pension systems organized using a pay-as-you-go mechanism, but also for those organized with an individually funded mechanism. On the other hand, the pay-as-you-go mechanism makes it possible to exploit the second demographic dividend (Lee and Mason, 2010) via public investment in human capital, while the individually funded mechanism does not.

With regard to the main cause of the differences between the World Bank and ILO, Mesa-Lago (1996) argues that both agencies proposed multi-pillar systems, with the differences lying in the second pillar. While the World Bank suggests private management of funds with State regulation, defined contributions from workers and employers and undefined benefits, ILO suggests public management of funds under a social insurance system, financing from individual and employer contributions and taxes, defined benefits and partial and collective capitalization. Queisser (2000) stresses that, while the World Bank pays more attention to property rights acquired through the payment of contributions and accrued interest, ILO conceives provision in old age as a collective social duty whose main objective is to guarantee a minimum of income security for both current and future beneficiaries.

While the ILO was against the use of social security systems as a tool for capital market development, Queisser (2000) suggests that the dogmatic approach characterizing the debate between

[2] Chile was the Latin American pioneer in pension reform in the 1980s, and its case is often cited as paradigmatic.

World Bank and ILO analysts gradually gave way to a predominantly pragmatic approach, to such an extent that the once conflicting positions began to converge in some respects. This had already been observed by Mesa-Lago (1996), who stated that, despite the intractable disagreement between the two organizations on structural pension reforms, ILO began to consider some of the economic objectives and the World Bank included social aspects such as equity in its analyses. Thus, in 1999, Joseph Stiglitz, as chief economist of the World Bank, criticized the recommendations of the report produced five years earlier by the Bank, most particularly for assuming first-best conditions. For its part, ILO stated that pension benefits would only be considered adequate if they operated "in synergy with employment instruments and fiscal and other economic policies" and did not bring "unwanted economic consequences" (ILO, 2011, p. 33).

Similarly, Barr and Diamond (2009) note that, from the point of view of individuals, the purpose of the pension system is to smooth consumption and provide insurance against the risk of living too long or not long enough. However, governments have the additional objectives of alleviating poverty and redistributing income, as well as efficiency and economic growth goals that would seem at first sight to be unrelated to the pension system, but which end up being affected by it. Accordingly, the analysis must avoid "tunnel vision" and seek solutions that are optimal with respect to all these objectives. To this end, the authors advise against sticking closely to the theoretical framework of optimums. In their view, assuming that individuals make optimal decisions and that labour and insurance markets and saving institutions function ideally simplifies the analysis, but does not reflect the reality in most developing countries.

Over the last few decades, different authors have sought to incorporate into general equilibrium models elements such as uncertainty (Ermolieva, 2004; Auerbach and Lee, 2009), imperfect labour markets (Krueger, 2006; De la Croix, Pierrard and Sneessens, 2010), imperfect capital markets (Fehr and Habermann, 2005; Verbic, 2008; Hosseini, 2015), preferences for bequests (Kotlikoff, Smetters and Walliser, 2007) and family welfare (Fuster, İmrohoroğlu and İmrohoroğlu, 2007; Fehr, Kallweit and Kindermann, 2015), the heterogeneity of individuals' productivity (Wang and others, 2004; Nishiyama and Smetters, 2005; Buyse, Heylen and Van De Kerckhove, 2012), risk aversion (Binswanger, 2007) and the likelihood of survival (Chauveau and Loufir, 1997), rationality-limiting elements such as myopia (Docquier, 2002; Kiraly and Simonovits, 2016; Börsch-Supan, Hartl and Leite, 2017) and inconsistent preferences (İmrohoroğlu, İmrohoroğlu and Joines, 2003; Fehr, Habermann and Kindermann, 2006; Kumru and Thanopoulos, 2010), while also carrying out demographic projections for specific countries (Meijdam and Verbon, 1997; De Nardi, İmrohoroğlu and Sargent, 1999; Börsch-Supan, Ludwig and Winter, 2006; Krueger and Ludwig, 2006). These efforts always yield quantitative results that depend on the value of the parameters assumed in the specific model. For this reason, the usual conclusion in investigations of this kind is that the result changes when the parameters are modified, and it is not possible to predict the outcome without a detailed knowledge of the characteristics of the specific pension system being modelled and the peculiarities of the economy in which it is embedded.

IV. Unreal assumptions and false predictions in the case of Argentina

Five arguments put forward by the World Bank in its report *Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth* (1994) will now be discussed. The discussion is conducted both in theoretical terms and on the basis of empirical information concerning the Argentine case.

1. The redistributive potential of pay-as-you-go mechanisms has been used to benefit the rich at the expense of the poor

The basis for the World Bank's first argument is that the poor tend to have shorter lifespans than the rich and enter the labour force earlier. As a result, they finance benefits for longer and often do not reach the minimum retirement age or do not survive for as long after retirement. The poor do indeed live shorter lives than the rich, regardless of the pension mechanism a country adopts. The real solution to this dilemma would be to establish different minimum retirement ages for people with different income levels or to allow different regimes to operate for activities that take a heavier toll on health. In fact, in Argentina there are several differential schemes that take into account this inequality in the distribution of life expectancy by activity.

Furthermore, the distribution of pension coverage by income level did not become more equitable after 14 years of the mixed mechanism. Table 1, based on data from the Permanent Household Survey (EPH) carried out by the National Institute of Statistics and Censuses (INDEC), shows active pension coverage by per capita family income decile two months before the mixed system came into force (May 1994) and during its last quarter of operation (the fourth quarter of 2008). It also shows inactive pension coverage in May 1994 and in the third quarter of 2005. This latter period is taken to avoid the influence of the Pension Inclusion Plan, which eased the requirements for accessing benefits in November that year, artificially raising inactive coverage.

Table 1
Argentina: distribution of pension coverage[a] before and after the mixed system came into operation[b]
(Percentages)

Per capita family income decile	Active coverage, May 1994	Active coverage, fourth quarter of 2008	Inactive coverage, May 1994	Inactive coverage, third quarter of 2005
Decile I	29	10	70	48
Decile II	48	28	68	63
Decile III	56	41	66	66
Decile IV	57	55	67	65
Decile V	58	55	75	65
Decile VI	61	64	68	63
Decile VII	62	69	70	67
Decile VIII	63	76	74	70
Decile IX	67	80	74	66
Decile X	67	85	73	64

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of the one-off Permanent Household Survey (EPH) (May 1994) and the continuous EPH (third quarter of 2005 and fourth quarter of 2008).

[a] Active coverage: percentage of employees subject to pension deduction (weighted individuals). Inactive coverage: percentage of persons above the minimum retirement ages who receive a pension or retirement benefit greater than zero (weighted individuals).

[b] The mixed system (Integrated Retirement and Pension System) began operating in July 1994.

It can be seen that active coverage decreased in the first five per capita family income deciles and increased in the top five deciles between 1994 and 2008, which implies greater inequity in the distribution of access to pension protection for active workers. Inactive pension coverage decreased in all income deciles but did so proportionally more in the case of older persons in the first income decile than in the rest, which also implies greater inequity in access to pension protection during the inactive stage. It can thus be concluded that the introduction of an individual capitalization mechanism did not solve the problem of inequity in access to pension protection, a result that could have been foreseen at the time of the reform.

2. Beneficiaries face the political risk of benefits being cut by law; many countries do not index benefits, and inflation causes them to lose purchasing power

This argument implicitly assumes that pay-as-you-go mechanisms struggle more to cope with inflation and that political risk only exists with these mechanisms. Despite their criticisms of the Chilean pension reform, Arenas de Mesa and Montecinos (1999) seem to subscribe to this argument, claiming that the private system in Chile moderated the risks that existed before the reform by indexing pensions to inflation and that private pension funds were less prone to mismanagement or political use.

However, neither political risk nor the effects of inflation depend on the pension mechanism adopted. Kay (2009) effectively refuted the idea that political risk existed only with pay-as-you-go mechanisms, mentioning two events in Argentina's pension history as examples of it while the mixed mechanism was in operation: asymmetric pesification in 2002 and the nationalization of funds held by private managers in 2008. These events will now be described.

In December 2001, Decree No. 85 referred in its preamble to "the severe economic and social crisis" affecting Argentina, which made it "essential to adopt measures" that would ensure "that all sectors of the population, in consideration of the ineluctable principle of solidarity", would contribute "to the attainment of balance in the public finances". With this rationale, a state of emergency in the pension system was declared for a period of one year. During this period, nominal pensions were to be reduced by 13%. According to Rofman (2002), beneficiaries would then go on to suffer a real reduction in their pensions of around 28.5% as a result of the nominal reduction of 13% combined with the inflation of the first quarter of 2002.

For their part, all financial system creditors, including private pension fund managers and thus the beneficiaries of the capitalization subsystem, were obliged to accept the conversion to pesos and return of their dollar deposits at a rate of 1.4 pesos per dollar, as stipulated in Decree 214. Three days before the publication of this provision in the official gazette, a dollar was worth 2.05 pesos, according to the Central Bank of the Argentine Republic.

Seven years later, Law No. 26425 provided for the unification of the pension system into a single pay-as-you-go scheme to be called the Argentine Integrated Social Security System (SIPA). The funded system was absorbed and replaced by the new system. The funds accumulated up to that time in the individual capitalization accounts would become part of the Sustainability Guarantee Fund (FGS). The FGS could only be used for the payment of pension benefits and its assets would be invested "according to appropriate criteria of security and profitability, contributing to the sustainable development of the real economy so as to secure the virtuous circle between economic growth and increased pension resources". At the end of 2010, the assets of the FGS, of which almost 60% were invested in government securities, represented 12% of GDP. These assets were equivalent to 197% of pension spending administered by the National Social Security Administration (ANSES) that year (Bertranou and others, 2011).

Lastly, it could be argued that the existence or otherwise of a mechanism for indexing pension benefits does not depend on the pension mechanism adopted. Since 2009, under the new pay-as-you-go mechanism, Argentina has actually had a pension mobility (readjustment) formula, set out in Law No. 26417, whereby benefits are updated in line with changes in wages and pension system resources. In December 2017, this formula was modified by Law No. 27426 to replace the indicator associated with pension system revenue by an indicator associated with the general price level, and the weighting of the latter was increased.

3. Pay-as-you-go mechanisms are unsustainable in the long term, benefiting one generation at the expense of another

The third argument is based on the idea that any pay-as-you-go system is sustainable in its early years of operation but becomes unsustainable as the population ages because the number of contributors decreases and the number of beneficiaries increases. Thus, pay-as-you-go systems favour the first generations of beneficiaries to the detriment of subsequent ones. Once again, it can be said that the ageing process is independent of the pension mechanism and that what is important is to determine which mechanism can best take advantage of demographic dividends. At the same time, while it is not denied that the first generations of Argentines enjoyed greater benefits than subsequent ones (Diéguez and Petrecolla, 1974; Arza, 2006), this cannot be attributed entirely to population ageing but is largely owing to the performance of the labour market.

According to the 1991 National Population, Household and Housing Census, there were 4.8 persons over 18 years of age and below the current minimum retirement age in Argentina for every person over that age. The two subsequent censuses showed a slight reduction in this ratio to 4.6 persons of working age for every older person of retirement age. This implies that, in 19 years, the number of working-age individuals for every individual of retirement age changed by just 0.2 persons. However, the number of formal workers per pension system beneficiary is half the value indicated. Table 2 shows the pension sustainability ratio in May 1994 (before the mixed mechanism came into operation) and in the fourth quarter of 2008 (the last quarter in which it operated). This version of the sustainability ratio, which includes the number of actual contributors rather than potential contributors, is taken because the difference can be substantial in contexts of unemployment and labour informality.

Table 2
Argentina: pension sustainability ratio,[a] 1994–2008
(Number of formal workers per pension system beneficiary)

Period	Sustainability ratio
Before the mixed mechanism came into operation (May 1994)	1.61
Minimum value (May 1996)	1.54
Maximum value (third quarter of 2006)	2.40
Last quarter the mixed mechanism was in operation (fourth quarter of 2008)	2.01

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of the one-off Permanent Household Survey (EPH) (May 1994 to May 1996) and the continuous EPH (third quarter of 2006 to fourth quarter of 2008).
[a] Number of employees subject to pension deduction relative to the number of pension beneficiaries (weighted individuals).

It can be seen that the sustainability ratio did not alter substantially during the period the mixed mechanism was in force. With a change of less than one formal worker per beneficiary, the evolution of this indicator reveals the inability of the labour market to provide formal employment for all Argentines, a difficulty that aggravates those inseparable from population ageing, regardless of the pension mechanism adopted.

4. The social costs in terms of evasion and informal working are considerable; pay-as-you-go systems entail high labour costs that lower productivity, employment and output

Underlying this argument is the idea that evasion and informal work are always an individual choice of workers themselves, resulting from their inability to perceive the direct relationship between the contributions made and the expected pension benefits. This inability is held to be the main incentive to evade pension contribution obligations. From employers' point of view, meanwhile, it is often argued that high labour costs create disincentives for the formalization of workers.

In Argentina, employers' contributions were reduced on several occasions with the aim of encouraging greater formalization of dependent workers. In September 1980, for example, the Secretariat of State for Social Security issued Resolution No. 192 abolishing employers' contributions. The preamble of this resolution argued that reducing social charges for companies would improve competitiveness and remove an impediment to the hiring of labour, "thus allowing full employment to be maintained". This rule was in force for four years until repealed by Law No. 23081 in September 1984. Employer contributions were then reinstated at a level of 50% of what they had been in September 1980, i.e., 7.5%.

In August 1991, under Law No. 23966, employers' contributions were set at 16% of wages. This proportion was ratified by Law No. 24241, the Pension Reform Act, passed in September 1993. However, seven months before the integrated mechanism came into operation, Decree No. 2609 was passed, establishing a mechanism for reducing the employer contributions stipulated in the law that had been passed by Congress. Its preamble stated, as in 1980, "that a priority of national economic policy is to lay the foundations for sustained growth in economic activity, productivity and employment", "that with this objective in view it is particularly necessary to implement measures aimed at reducing the level of costs in the economic process" and that the "reduction of payroll contributions should be considered as a step towards their total abolition".

The mechanism consisted in applying different degrees of reduction according to the region of the country and the economic activity concerned, although a later regulation, Decree No. 372 of 1995, would extend the reduction mechanism to all economic activities except those carried out by the State. Thus, for example, the largest reduction was 80% and applied to the provinces of Chaco, Formosa and part of Santiago del Estero, where employer contributions were reduced to 3.2%. The smallest reduction was 30% and applied to the Federal Capital and Greater Buenos Aires, where employer contributions fell to 11.2%. The reductions continued to be modified by emergency presidential decrees until December 1998, when, by virtue of Decree No. 1520, employer contributions reached a value of 1.43% for the northern region and 5.01% for the central region.

According to the Ministry of Labour, Employment and Social Security (MTEySS, 2003), despite continuous reductions in social charges, the unemployment rate began to rise in 1994 and reached 21.5% of the economically active population in May 2002. During this period, moreover, 80 out of every 100 jobs created were informal, meaning a loss of resources of US$ 80 billion. At the same time, employment promotion measures, consisting of reductions in employer contributions, fixed-term contracts, probationary contracts and work placements for young people, did not achieve the objective of reducing unemployment (MTEySS, 2003). In view of this, the labour reform carried out by Law No. 25250 of May 2000 extended the trial period for collective employment agreements from 3 to 6 months, or up to 12 months in the case of small enterprises. The reform also granted an additional reduction in employer contributions to employers that increased the number of employees on open-ended contracts. This reduction brought employers' contributions down by a third of the standard rate or by 50% if the new hires were men aged over 45, female heads of household of any age or young people up to 24 years

old. According to Bertranou and others (2011), the effect of these incentives was less than expected and the recession that began in 1998 aggravated the problem of unemployment and non-compliance with social security obligations.

Lastly, in July 2001, Law No. 25453 set the unified social security contribution for four of its subsystems at a total of 16% for employers in general and 20% for employers in the commerce and services sector. Budget Law No. 25565 of 2002 raised each of these rates by 1 percentage point. According to the National Directorate of Social Security Policies, policies lowering employer contribution rates represented a loss of resources of the order of US$ 28 billion for the social security system as a whole over the period 1994–2002 (MTEySS, 2003). Table 3 shows the employment rate and the percentage of wage earners subject to pension deduction in Greater Buenos Aires in May 1994 and October 2001, i.e., two months before implementation of the mixed mechanism and three months after the establishment of the unified social security contribution, which raised employers' contributions to offset the reductions brought in by decree, but did not restore them to their original levels.

Table 3
Greater Buenos Aires: employment and formality rates, 1994 and 2001
(Percentages)

	May 1994	October 2001
Employment rate	89	82
Employees subject to pension deduction	55	51

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of the one-off Permanent Household Survey (EPH) (May 1994 to October 2001).

It can be seen that the reduction in employer contributions does not seem to have been sufficient to increase employment or labour formality, as these variables declined by 7 and 4 percentage points, respectively, during the period analysed.

5. Pay-as-you-go pension systems reduce aggregate saving and thus investment

Lastly, the final argument could be said to allude to one of the fundamental assumptions of a neoclassical model of economic growth: the understanding of saving as synonymous with real investment. The crowding out of private savings caused by the pay-as-you-go mechanism would thus be expected to translate into lower investment and thence lower employment and output. However, this assumption can be easily refuted in Argentina, where five money laundering laws were passed between 1987 and 2016 (Laws No. 23495 of 1987, No. 24073 of 1992, No. 26476 of 2008, No. 26860 of 2013 and No. 27260 of 2016). All these laws provided for remissions of tax debts for undeclared assets in the country or abroad and granted reductions in tax rates on the condition that the individuals or companies concerned regularized their tax situation. The mere fact of these laws being passed would seem to demonstrate that in Argentina the savings of individuals are not always converted into real investment, but that a large portion is taken out of the country in expectation of a new money laundering law that will allow it to be repatriated or declared. This implies that it would be a mistake to justify economic policies solely on the grounds that they increase aggregate saving and, a fortiori, to reform a pension system exclusively on the basis that this variable can be expected to increase.

V. Conclusions

In mainstream economic thinking, a view of individual optimality came to be enshrined in the study of pension systems. This had a very great influence on international organizations such as the World Bank, which strongly encouraged pension reforms in Latin American countries. Argentina was one of the countries in the region that followed these recommendations: in July 1994, it introduced an integrated pension mechanism in which a pay-as-you-go subsystem and an individually funded subsystem coexisted for 14 years, until it was abolished in November 2008.

In Argentina, as in other developing countries, many of the postulates upheld by the World Bank to defend the superiority of capitalization mechanisms over pay-as-you-go mechanisms were easy to refute at the time of the reform. The conclusion is that most of the arguments consisted of fallacies, since they concerned real problems whose solutions did not depend on the pension mechanism adopted. This is the case with the difference between the life expectancy of rich and poor, the process of population ageing and the political risk entailed by nominal or real reductions in pension amounts. At the same time, there is no conclusive information to support common assumptions of economic theory in the case of Argentina, such as the notions that saving is automatically transformed into investment or that a reduction in labour costs is immediately followed by a higher level of employment and labour formality.

It is concluded that some of the problems that the structural reform failed to solve could have been alleviated by implementing parametric reforms. Thus, for example, inequality of access to the pension system could have been reduced by setting special minimum retirement ages for low-income individuals or by making access requirements more flexible, as was done in 2005 with the implementation of the Pension Inclusion Plan. With regard to the risk of benefits losing their purchasing power, the solution would be to implement benefit adjustment formulas that can only be amended by law, as was done in 2009, thus reducing the discretion of governments to decide on the indexation of benefits.

However, it would appear that other problems considered to stem from the pension mechanism, such as unemployment, labour informality and the failure to convert saving into investment, are beyond the scope of pension policy and should be tackled with other economic policy instruments. Thus, although ILO recognizes that one of the requirements for deeming pension benefits to be adequate is that they operate in synergy with economic policy, this does not mean that the objectives of the pension system itself should be subordinated to those of economic policy.

In conclusion, the assumptions which mainstream economic thinking relied on in recommending pension system reforms that would totally or partially eliminate the pay-as-you-go system were not fulfilled at the time decision-makers decided to accept the suggestion. In view of this, decision-makers should not lightly follow the recommendations of international organizations, which sometimes base their proposals on dogmas of economic theory, often without taking account of conclusive empirical information on the countries or the particular characteristics of each. It is hoped that the conclusions of this article will contribute to the academic and political debate on the optimal design of pension systems in Latin America, especially at a time when arguments that have already been refuted by the experience of many countries' economies and pension systems are once again being urged.

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The ECLA-BNDE Economic Development Centre and the training of a generation of development planners in Brazil

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Abstract

This paper aims to reconstruct the history of the partnership between the Economic Commission for Latin America (ECLA) and Brazil's National Bank for Economic Development (BNDE). The ECLA/BNDE Economic Development Centre, which operated in Rio de Janeiro between 1960 and 1967, held courses on Problems of Economic Development in several regions of the country, training a generation of development planning specialists who worked to overcome underdevelopment. The Centre also functioned as a gateway to ECLA ideas and writings in Brazil and as a locus of knowledge production in the area of economic development. It thus impacted both the governmental sphere and the academic world, providing an alternative to predominantly neoclassical economics courses. Drawing on a combination of documents, newspaper articles and the testimony of former members of the Centre, this article describes its activities and retraces the events leading to its creation, expansion and closure.

Keywords

Economic development, development planning, development research, technical cooperation, training programmes, ECLAC, development banks, research centres, activities, history, Brazil

JEL classification

O200, B290, A230

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I. Introduction[1]

From the 1940s to the 1960s, a significant part of the modern Brazilian economic bureaucracy was built. To the existing Bank of Brazil and Ministry of Finance (founded in 1808), Administrative Department of Public Service (DASP) (1938) and Superintendency of Currency and Credit (SUMOC) (1945) were added the National Bank for Economic Development (BNDE) (1952), the Banco do Nordeste do Brasil (1952), the Superintendency of the Plan for the Economic Development of the Amazon (SPVEA) (1953), the Development Council responsible for the modernizing Plano de Metas (Goals Plan) (1956), the Superintendency for the Development of the North-East (SUDENE) (1960), the Ministry of Planning (1962), the Office of Applied Economic Research (1964) and the Central Bank of Brazil (1964). The rapid proliferation of economic organizations and the creation of State-owned companies such as Petrobras (1953) and Eletrobras (1962), charged with expanding infrastructure, stimulated growth in the number of economics and public administration specialists tasked with analysing socioeconomic scenarios and planning and implementing State-coordinated development policies.

The strong demand for professionals qualified to operate the new State bureaucracies led to a proliferation of schools of economics and public administration, which until the early 1950s had been few, small and concentrated in Rio de Janeiro, São Paulo and Belo Horizonte. At the same time, advanced courses were created for graduates, focusing on the theoretical improvement or practical management of the economy, or both. The main advanced courses were based in Rio de Janeiro (the federal capital until 1960) and provided by the National Economic Council (CNE) from 1949 to 1967, by the Getulio Vargas Foundation's Centre for the Advanced Training of Economists (CAE-FGV) from 1960 to 1966 and by BNDE partnership with the Economic Commission for Latin America (ECLA) from 1956 to 1967.[2]

The CAE-FGV aimed to prepare students of economics to pursue the next steps in their academic training abroad. The course focused on neoclassical economic theory, mathematics and statistics, while also including intensive English lessons (Alberti, Sarmento and Rocha, 2002, pp. 84–85). The CNE training included mathematics and statistics as well as specialized courses in foreign trade and consumption, economic organization, markets, and industrial costs (Ferreira, 1966, pp. 33–37). The ECLA Training Course on Problems of Economic Development (CTPDE), in turn, aspired to disseminate the "structuralist" doctrine developed at Commission headquarters in Santiago, Chile (Love, 2018, p. 156). ECLA distinguished itself from the other institutions by offering courses in numerous regions of Brazil and by prioritizing public servants among its students. Its courses focused on the planning and implementation of government programmes for economic and social development and on strategies for reducing regional disparities.

A history of the ECLA/BNDE Centre, the courses offered by the Commission in Brazil and the outgrowths of the partnership has never been systematically pieced together. A reconstruction of this kind can make an important contribution to the history of economics and economic ideas in Brazil and Latin America, given the influence of ECLA in disseminating a historically and geographically situated economic development project. The influence of developmentalist ideology in the 1950s and early 1960s warrants systematic study of the transmission, assimilation and critical evaluation of ECLA thinking. Its

[1] The authors wish to express their thanks to all those who agreed to be interviewed, for generously sharing their knowledge about the work of the ECLA/BNDE Centre, which was crucial in the writing of this article. Thanks are also owed to Jeremy Adelman for his detailed comments and suggestions, and to Nadya Araujo Guimarães for the invitation to discuss this article at the International Sociological Association congress and for encouraging its publication. Any errors are the sole responsibility of the authors.

[2] With the inclusion of the Caribbean countries in 1984, the Economic Commission for Latin America (ECLA) became the Economic Commission for Latin America and the Caribbean (ECLAC), the name by which it is now known. However, the earlier name was used throughout the period covered by this article and is accordingly preferred here. Similarly, what is now the National Bank for Economic and Social Development (BNDES) was known until 1982 simply as the National Bank for Economic Development (BNDE), the name used here.

impact on the formation of the cadres responsible for the planning of economic development in Brazil and Latin America is investigated here. The history of the ECLA/BNDE Centre is relevant, moreover, to the sociology of intellectuals and the academic field, since its study involves in-depth observation of a privileged instance of the circulation of agents, ideas and practices between peripheral countries.

The movement of people and ideas between Brazil and Chile was two-way. On the one hand, the Centre received ECLA officials from other Latin American countries, and they acquired new perspectives on the continent by deepening their knowledge of Brazil, which helped them review and refine ECLA analyses. On the other hand, ECLA participated in the intellectual and professional training of many Brazilians, both through its operations in Brazil and by welcoming to Santiago many intellectuals exiled from Brazil after the advent of the military dictatorship in 1964. On their return, in the late 1970s, they contributed to the construction of critical traditions that followed ECLA and post-ECLA thinking, which the heterodox world of Brazilian economists is structured around to the present day (Klüger, 2017a and 2017b).

To piece together ECLA cooperation with Brazil in the 1950s and 1960s, we searched the digital database of periodicals in the National Library for information about the ECLA/BNDE Centre, its courses on Problems of Economic Development and its staff. The reports produced by ECLA, BNDE and the Coordination for the Improvement of Higher Education Personnel (CAPES) were then collected and analysed, as were three crucial documents: the *Report on the ECLA/TAA Economic Development Training Programme* (ECLA, 1957), the report *Cinco anos de atividades* (ECLA/BNDE, 1965) and the *Memoria institucional da ECLA/ILPES nos seus 30 anos de contribuição permanente no Brasil* (Costa Santiago, 1990). Lastly, existing testimonies were consulted and new interviews were conducted with former staff of the Centre.

The article is divided into five parts after this introduction. Part II begins with a description of how ECLA engaged with Brazil in the 1950s and ends with the negotiations over the establishment of CTPDE in the country. Part III briefly profiles the participants, discusses the content of the Brazilian version of CTPDE and describes the regional coverage of the courses. In part IV, the history and operations of the ECLA/BNDE Centre are pieced together from the accounts of its former staff, with emphasis on the role played by the office in forming a nucleus of developmentalist intellectuals. Lastly, part V briefly describes the destinies of the Centre's members after its dissolution, mapping the effects of the geographical dispersion that resulted from the persecution perpetrated by the Brazilian dictatorship and discussing the continuing ECLA influence in Brazil. Part VI presents conclusions.

II. The arrival of ECLA in Brazil

The Economic and Social Council of the United Nations had already authorized the creation of two regional economic planning commissions, one for Europe and one for Asia and the Far East, when Chile's delegate at the United Nations proposed the establishment of an Economic Commission for Latin America (Santa Cruz, 1966, pp. 12, 19–20 and 27–29; Pollock, 1978). Founded in February 1948, with headquarters in Santiago, the Commission aimed to:

> study the measures necessary to facilitate joint action to promote the economic progress of the countries of Latin America, raise the level of economic activity in those countries and maintain and strengthen the economic ties that link them to one another and to the rest of the world, while also participating in the implementation of such measures (Santa Cruz, 1966, p. 14).

The Commission became known and recognized, and indeed controversial, following the 1949 publication of the original Spanish edition of Raul Prebisch's *The economic development of Latin*

America and its principal problems (1950). Prebisch called for a break with economic orthodoxy, arguing that each region had historical specificities requiring an appropriate theoretical approach. This so-called "manifesto for Latin American industrialization" (Garcia, 2005, p. 540) maintained that international trade would not lead to an automatic distribution of technical progress between the centre, specializing in manufactured goods, and the periphery, producing mainly commodities. Consequently, the large differences in living standards between regions would subsist until an active policy, consisting essentially in planned industrialization, was adopted to overcome the economic backwardness of the latter (Prebisch, 2011). From this point on, the actions of ECLA were oriented towards promoting industrialization in Latin America and training professionals to develop and lead planning for economic development. The Commission was also tasked with producing annual reports on the economies of the region and preparing teaching material to disseminate its ideas and planning techniques.

The ideas of ECLA spread with the international movements of its staff. In the case of Brazil, the first and strongest connection with the Commission was forged by Celso Furtado. A lawyer by training with a PhD in Economics from the Sorbonne, Furtado became an employee of the Commission in 1949 (Furtado, 2014). He was responsible for the translation of Prebisch's manifesto and its publication in *Revista Brasileira de Economia*, which aroused interest in ECLA ideas. In the diplomatic visit to President Getúlio Vargas that this led to in 1951, Prebisch and Furtado met businessmen, industrialists, journalists, academics, economists, students and authorities such as the Ministers of Foreign Affairs, Finance, and Agriculture, Livestock and Food Supply, and directors of the Bank of Brazil (Dosman, 2011, p. 321). Following this visit, Portuguese was made one of the official ECLA languages and it was agreed that Brazil would host the fifth session of the Commission, to be held in 1953.

Official ties were strengthened at this 1953 session, where a cooperation agreement between ECLA and Brazil's newly created National Bank for Economic Development (BNDE) was signed. This cooperation aimed at extending the production of data on Brazil, contributing to research to support the creation of a general plan for development, and training personnel for its accomplishment (BNDE, 1953, p. 30). The cooperation was led by Celso Furtado, who had been invited by Roberto Campos to become a member of the first BNDE board of directors. Consulted on the matter, Prebisch offered a Solomonic solution: they had only one Brazilian economist, Celso Furtado, and could not do without him at that stage, but ECLA and BNDE could work together because they had the same purpose, which was the development of Brazil and Latin America, so he proposed creating a joint programme (see Pereira de Melo and Moraes da Costa, 2009a, p. 103). Furtado and the Cuban economist Regino Boti were asked to work with BNDE staff to prepare a diagnosis of the economic situation that would support wide-ranging and systematic economic planning. The ECLA/BNDE joint group ran from 1953 to 1955 and published the document *Esboço de um programa de desenvolvimento para a economia brasileira: 1955-62*, which included macroeconomic analyses of development and discussion of the fundamental elements of a development programme (BNDE/ECLA, 1955). The troubled years from President Vargas's suicide in August 1954 to the beginning of Juscelino Kubitschek's presidency (1956–1961) were marked by a brief period of orthodox economic policies, which coincided with the end of the joint group's activities and Furtado's departure for Mexico. Before leaving Brazil, Furtado created the Economists' Club to keep ECLA ideas alive and created the journal *Economica Brasileira* to foster their circulation (Furtado, 2014). These changes, however, did not lead to a waning of ECLA collaboration with Brazil. In 1956, BNDE renewed its ties with the Commission by importing the Training Course on Problems of Economic Development, coordinated in Santiago by Jorge Ahumada, a Chilean economist with a master's degree from Harvard University.

III. Training to solve problems of economic development in Brazil

The obstacle represented by the shortage of local economists trained to formulate and implement economic development programmes for the region was thoroughly debated at the fourth session of ECLA, held in Mexico in 1951, and as a result the Commission, in partnership with the United Nations Technical Assistance Administration, crafted its Training Course on Problems of Economic Development (CTPDE), which debuted in 1952 (Melnick, 1958, p. 2). The course was initially held at ECLA headquarters with the aim of training promising young economists from governments throughout the region. Over 10 months, students received basic training in economic analysis, social accounting, sociology, economic development theory and project planning, followed by work in small groups focusing on special topics such as public sector management, budgetary planning and human resource development (Dosman, 2011, p. 320). From 1955 onward, a scaled-down version of the course was offered remotely so that professionals could receive training where they were, with a focus on local problems (ECLA, 1957, p. 75). The first course away from headquarters was held in Bogotá in 1955 and the second in Rio de Janeiro in 1956.

The Brazilian Government attached strategic importance to CTPDE as a tool for training civil servants to design and pilot development programmes. The initiative was so prestigious that President Juscelino Kubitschek personally attended the inaugural session of the course, stating in his opening speech:

> The importance of the course that has now begun is that it will tackle what is one of the most serious and underrated problems in Brazil, as in other countries that have not yet reached their full development: the shortage of personnel trained in programming and planning techniques [...]. A government can only effectively promote economic development if it has men at the different levels of the administration who are knowledgeable about the difficulties of development and the methods of solving them, possess enthusiasm, realism and a sense of priorities, and are eager to set about programming, planning and implementing (Kubitschek, 1958, p. 244).

The recently inaugurated Kubitschek government was facing precisely the challenge of implementing a large-scale development plan, the Plano de Metas (Goals Plan), which centred on transforming infrastructure and modernizing Brazilian industry (Lafer, 1975). The ferment generated by the acceleration of industrialization, the popularization of planning techniques and the proliferation of State economic agencies led to a sharp expansion in the demand for experts, revealing the huge shortfall in qualified professionals. Consequently, there was strong pressure for the creation of advanced training programmes, such as the one resulting from the ECLA/BNDE agreement.[3]

CTPDE was free of charge, and the travel costs of participants from other cities were paid. It relied on funding and support from the State bureaucracies that were sending their staff to be trained, in addition to what was provided by BNDE (*Boletim CAPES*, 1956, p. 9).[4] Other partnerships were established over time, notably with regional public banks such as the Banco de Credito da Amazonia, the Banco do Nordeste do Brasil and the Banco de Desenvolvimento de Minas Gerais; with planning

[3] The partnership with ECLA was neither the first nor the only effort to solve this problem, although it was the strongest and longest-lasting initiative. One precursor was the Training of Development Specialists programme organized by Rômulo Almeida and involving CAPES and the Banco do Nordeste do Brasil. These training courses were held in 1953 and 1955, the second under the supervision of a United Nations envoy, Stefan Robock, which shows that even before the partnership with ECLA, the United Nations assisted in training the experts in charge of public administration and economic analysis (Almeida, 1985, pp. 73 and 74; Barbosa, 2021, pp. 462 and 463).

[4] The first edition of the Course was also jointly sponsored by CAPES and the Higher Institute of Brazilian Studies (ISEB), an agency of the Ministry of Education that offered postgraduate courses in political and social studies and played an important role in defining nationalist-developmentalist ideology (Wanderley, 2015).

and development agencies such as the North-East Development Superintendency and State and municipal planning offices; and with economics faculties all over the country (BNDE, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966 and 1967). Hereafter, the collaboration with ECLA, originally led by the federal government and BNDE, was enthusiastically embraced by other governmental bodies and academic institutions, influencing the training of a generation of intellectuals and public servants throughout the country.

1. Participants

Regarding those targeted by the programme, the advertisement for the fifth edition of CTPDE explained that the course was designed for civil servants, professionals and teachers whose work is related in some way to the economic development process, and that the course could be attended by economists, civil engineers, agronomists and other professionals who worked in public entities, were registered as candidates by their respective departments or organizations, and passed the selection exam.[5] It was also possible for well-graded students of advanced economics courses to be accepted (*O Correio da Manhã*, 1960a, pp. 3 and 17).

Among the students on the courses offered between 1956 and 1964, 30% came from governmental and regional development agencies, 20% from public financial institutions (mainly the development banks, the central bank and the Bank of Brazil), 17% from ministries (especially those of Agriculture, Transport, Infrastructure, and War), 23% from other public bodies (including Petrobras and the highways and traffic departments) and 10% from universities (ECLA/BNDE, 1965). These data reveal a strong orientation towards the public sector, in contrast to the students of the other two economic specializations offered by CNE and the Getulio Vargas Foundation.

Regarding academic background, 42.5% of the participants were economists, 16.4% engineers, 14.4% lawyers and 6.7% agronomists, while 20% had a background in the military, sociology, accountancy and other disciplines (ECLA/BNDE, 1965). This distribution mirrors the transition in the administration of the economy from a generation of lawyers and engineers with practical economic knowledge to a younger generation with formal training and degrees in economics (Gomes, Dias and Motta, 1994; Loureiro, 1992). The prominence of economists indicates that the focus on planning for development in the CTPDE differed from what was available from universities at that time. Thus, rather than simply responding to the demand resulting from the shortage of experts, the course diversified the supply of economic ideas and technical knowledge in circulation.

2. Course structure and content

CTPDE started ten years before the first master's degree courses in economics in Brazil and was active for more than a decade. The 300 hours of training were divided between lectures (40 hours), seminars (80 hours) and basic training (180 hours). Students were required to have a minimum 90% attendance rate and eventually pass the exams to acquire the Development Specialist diploma (ECLA, 1957, p. 77). Good performance on these courses was, moreover, an asset when applying to positions in State economic agencies and ECLA itself, as will be discussed later.

The lectures were (i) on topics complementary to the core courses, dealing with concrete experiences or matters of particular importance; (ii) on subjects of general interest not included in the structure of the core courses, but essential to the students' training; and (iii) on issues related to the

[5] The public notice of 1960 stated that selection would be by interviews in which candidates' qualities and prospects of applying the knowledge to be taught would be assessed. Only candidates from other federal states could be selected on the basis of their curriculum vitae (*O Correio da Manhã*, 1960a).

current situation of the Brazilian economy and its development process (*O Correio da Manhã*, 1963a). They were taught by renowned intellectuals and public servants[6] who included sympathizers, allies and leading opponents[7] of ECLA. The lectures revolved around Brazilian economic development and foreign trade and industrial issues, fiscal and monetary arrangements and the balance of payments, transport, energy, metallurgy, natural resources and minerals, geography, agriculture, regional development, statistics and national indicators, demography, human resources training, education, and public health. They could be inspired by regional concerns, especially when courses took place in cities other than the capital, or address pressing themes from the national economic agenda. In 1963, for instance, the lectures on the Brazilian economy consisted mostly of discussions of the Three-Year Plan conceived at the Ministry of Planning under the leadership of Celso Furtado, in whose conception and implementation some of the students were directly involved (*O Correio da Manhã*, 1963a).

The seminars, in turn, consisted of round tables, applied exercises and activities in which students examined "the problems arising from their programme of reading, lectures and practical work" (ECLA, 1957, p. 77; *O Correio da Manhã*, 1963a). Lastly, the core courses presented techniques for the formulation and analysis of economic development programmes and projects and the elements that must be considered in implementing the economic policy that the expansion of production activities required and provided a coordinated picture of Brazil's economic problems and future prospects (BNDE, 1957, p. 57). The BNDE and CAPES reports have made it possible to piece together the structure of the programme and identify the people responsible for the main courses in several editions of CTPDE, and these are presented in table 1.

The students started with Social Accounting classes, which dealt with the measurement of national income, reading of input-output tables and analysis of the connections between budgeting, spending and investment. Next, they moved on to Development Theory and Programming, which discussed how to identify realistic development goals and select effective means to them. Economic Development Financing and Policy looked at how to stimulate development through capitalization using savings, investment and economic policy instruments, and Investment Project Preparation and Evaluation emphasized the connections between the projects included in development programmes, discussing criteria and priorities. There were also disciplines that focused on theory and method, such as General Introduction to Economics, Principles of Administration, and Mathematics and Statistics, and specialized topics such as Introduction to Public Programming, Brazil's Economic Development, and Regional Programming (*O Correio da Manhã*, 1964a).

[6] Among them were Celso Furtado, Roberto Campos, Eugênio Gudin, Rômulo de Almeida, Cleanto de Paiva Leite, Isaac Kerstenetzky, Aníbal Villela, Antônio Delfim Netto, Juvenal Osório, José Garrido Torres, Casimiro Ribeiro, Paulo Lyra, João Batista Pinheiro, Gerson Augusto da Silva, Diogo Nunes de Gaspar, Sebastião Advíncula da Cunha, Anísio Teixeira and Hélio Jaguaribe. There were also European experts, such as British financier Thomas Balogh and the chief of the national accounts division of the French planning agency, François Le Guay (*O Correio da Manhã*, 1960c, 1960d and 1962).

[7] Eugênio Gudin and Antônio Delfim Netto, for instance.

Table 1
Core courses of the Economic Commission for Latin America Training Course on Problems of Economic Development (CTPDE), 1956 to 1965

1956	1957	1958	1959	1960	1961	1963[a]	1964[a]	1965[a]
Social Accounting (Manoel Balboa, Argentina)	Social Accounting	Social Accounting (Manoel Balboa, Argentina)	Social Accounting (Manoel Balboa, Argentina)	Social Accounting (Alberto Fracchia, Argentina)	Social Accounting (Alberto Fracchia, Argentina)	Social Accounting (Bruno Linhares)	Social Accounting	Social Accounting (Ferdinando Figueiredo, Brazil)
Economic Development Programming (Jorge Ahumada, Chile)	Economic Development Programming	Economic Development Programming (Regino Botti, Cuba)	Economic Development Theory and Programming (Osvaldo Sunkel, Chile)	Introduction to Economic Theory and Programming (Osvaldo Sunkel, Chile)	Economic Development Theory and Programming (Retórico Fretes, Paraguay)	Development Programming (Jose Tharra)	Economic Development Programming	Economic Programming (Aníbal Pinto Santa Cruz, Chile, and Maria da Conceição Tavares, Brazil)
Financing of Economic Development (Carlos Oyarzún)	Financing of Economic Development	Financing of Economic Development (Aníbal Pinto Santa Cruz, Chile)	Financing of Economic Development (Aníbal Pinto Santa Cruz, Chile)	Financing of Economic Development (Aníbal Pinto Santa Cruz, Chile)	Planning and Budgeting (Sergio Molina Silva, Chile)	Financing of Economic Development (Jayme Santiago, Brazil)	Financing and Politics of Economic Development	Financing of Economic Development (Aníbal Pinto Santa Cruz, Chile)
Project Development and Evaluation (Julio Melnick, Argentina)	Project Preparation and Evaluation	Project Preparation and Evaluation (Osvaldo Fernández Balmaceda, Argentina)	Project Preparation, Presentation and Evaluation (Julio Melnick, Argentina)	Economic Project Development and Evaluation (Julio Melnick, Argentina)	Project Development and Evaluation (Carlos Pamplona)	Project Development and Evaluation (Antônio Holanda, Brazil)	Project Development and Evaluation	Project Development and Evaluation
	Administration for Programming	Administration for Programming (Braulio Jatar, Venezuela)[b]	Development Programme Administration (Braulio Jatar, Venezuela)[b]	Principles of Administration (Pedro Muñoz Amato, Puerto Rico)			Introduction to Budgeting and Public Sector Programming	
					Introduction to Economic Analysis (Osvaldo Sunkel, Chile)	General Introduction to Economic Analysis (Antônio Barros de Castro, Brazil)	General Introduction to Economic Analysis	Introduction to Economic Analysis (Antônio Barros de Castro and Carlos Lessa, Brazil)
	Linear Programming	Linear Programming (Thomas Vietorisz, Hungary)				Statistics (David Carneiro, Brazil)	Elements of Mathematics and Statistics	Elements of Mathematics and Statistics (Retórico Fretes, Paraguay)
	Brazil's Economic Development		Programming Brazil's Development (Celso Furtado, Brazil)		Economic Policy (Aníbal Pinto Santa Cruz, Chile)	Regional Programming (Norberto González, Argentina)	Regional Programming	Aspects of Economic Development (Aníbal Pinto Santa Cruz, Chile)

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of National Bank for Economic and Social Development (BNDES), *Exposição sobre o programa de reaparelhamento econômico, exercício de 1955*, Rio de Janeiro, 1956; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1956*, Rio de Janeiro, 1957; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1957*, Rio de Janeiro, 1958; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1958*, Rio de Janeiro, 1959; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1959*, Rio de Janeiro, 1960; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1960*, Rio de Janeiro, 1961; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1961*, Rio de Janeiro, 1962; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1962*, Rio de Janeiro, 1963; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1963*, Rio de Janeiro, 1964; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1964*, Rio de Janeiro, 1965; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1966*, Rio de Janeiro, 1966; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1966*, Rio de Janeiro, 1967; *Boletim CAPES*, No. 83, Rio de Janeiro, Coordination for the Improvement of Higher Education Personnel (CAPES), October 1959 [online] https://memoria.capes.gov.br/index.php/boletim-informativo-n-67; *Boletim CAPES*, No. 67, Rio de Janeiro, Coordination for the Improvement of Higher Education Personnel (CAPES), June 1958 [online] https://memoria.capes.gov.br/index.php/boletim-informativo-n-67; *Boletim CAPES*, No. 58, Rio de Janeiro, Coordination for the Improvement of Higher Education Personnel (CAPES), September 1957 [online] https://memoria.capes.gov.br/index.php/boletim-informativo-n-58; and *Boletim CAPES*, No. 45, Rio de Janeiro, Coordination for the Improvement of Higher Education Personnel (CAPES), August 1956 [online] https://memoria.capes.gov.br/index.php/boletim-informativo-n-45.

[a] It is not known which regional edition the available information refers to.

[b] This predates the name change to "Bolivarian Republic of Venezuela".

Comparing CTPDE with the other two advanced economics courses highlights what set it apart. Approximately one third of the CNE course was devoted to mathematics, statistics, econometrics and operational research and half to specialized areas: consumer theory/business, markets and industrial costs (21%), foreign trade (12%), income and employment theory (8%), monetary policy (4%) and fiscal policy (2%). Approximately one fifth of its content overlapped with that of CTPDE, divided into economic programming (8%), economic development (6%) and social accounting (5%) (Ferreira, 1966, pp. 33–37). Although the CNE and ECLA courses had points in common and were both oriented towards practical uses of knowledge, the focus was different, with the CNE course favouring the study of markets and commerce and being oriented mainly towards private management while the ECLA course prioritized public planning for national development. CAE-FGV, in turn, devoted one third of its programme to mathematics, statistics and econometrics and another third to microeconomics, macroeconomics and general economic theory. The teaching of English to prepare students for doctorates abroad was the single discipline that occupied most space in the curriculum. As for the specialized areas, only international trade and economic development were compulsory, and not much time was devoted to them (Simonsen, 1966, p. 28). It is possible to affirm, therefore, that CTPDE had a clear-cut content and focus, bearing in mind its mission of devising theoretical and practical tools to promote national development.

In addition to its focus on the programming of national development, ECLA differentiated itself by producing a significant part of the teaching material used on its courses. The Commission stated that a major problem in designing the courses was the lack of "literature on theoretical and practical problems relating to economic development" (ECLA, 1957, p. 80). Consequently, original manuals were prepared to address the lack of a literature on the subject and to produce teaching material in Spanish. The process of writing this material became an intermediate stage in the chain of content production, revision and testing that would later be consolidated in books published by the Commission's staff.

Until the mid-1960s, the textbooks of the Brazilian versions of CTPDE were written in Spanish and the classes were taught by foreign teachers, mostly in Spanish. With the creation of the ECLA office in Brazil in 1960, this arrangement was modified by the recruitment of local professionals who produced content and taught in Portuguese. Several lectures given by guest experts were also transformed into teaching material, so that a corpus of knowledge about the specificities of the country's economy and development was compiled (ECLA/BNDE, 1965). The establishment of the Brazil office also meant that the number of courses offered each year could greatly increase and CTPDE could operate throughout the country. This regional expansion, which contributed to the training of teachers and staff residing outside Rio de Janeiro, was the last and most crucial difference between CTPDE and the other two economics specialization courses.

3. Regional circulation of the courses

The first regional edition of CTPDE took place in Recife in 1959, in partnership with the North-East Development Council (CODENO), which was responsible for Kubitschek's Operation North-East project until the creation of the Superintendency of North-East Development (SUDENE) in December 1959 (Furtado, 2014, pp. 234–274). The seminars and lectures held in Recife focused on the economic development problems of the North-East region and aimed at strengthening the local bureaucracy and training the staff of burgeoning regional development agencies. At the end of the course, approximately 15 participants were recruited into the Superintendency, so that a strong link with ECLA was established from the outset, reinforced by the transfer of Celso Furtado from BNDE to SUDENE (Sunkel, 2012; *Boletim CAPES*, 1959, p. 16; Wanderley, 2015).

From 1963, rotation of CTPDE between cities became the rule (see table 2). Three training sessions were held every year, each one in a different region of the country. Partnerships with local agencies, such

as development banks and universities, made this circulation viable by providing the physical venues and material support required for the activities. Between 1956 and 1967, 21 editions of the course were offered in 12 cities. Three of them also hosted a specific training course for financial agents. Lastly, advanced training in industrial programming was carried out in Rio de Janeiro, including mathematical programming, industrial statistics, economic and industrial integration, industrial sociology and discussion of cases of planning and industrial policy in Brazil and Latin America (*O Correio da Manhã*, 1967).

Table 2
Courses held by the Economic Commission for Latin America (ECLA) and the National Bank for Economic Development (BNDE)

Year	Activity number	City	Type of activity	Participants
1956	I	Rio de Janeiro	CTPDE	48
1957	II	Rio de Janeiro	CTPDE	61
1958	III	Rio de Janeiro	CTPDE	64
1959	IV	Recife	CTPDE	71
1960	V	Rio de Janeiro	CTPDE	50
1961	VI	Rio de Janeiro	CTPDE	49
1962	VII	Rio de Janeiro	CTPDE	45
1963	VIII	Belém do Pará	CTPDE	46
1963	IX	Curitiba	CTPDE	59
1963	X	Rio de Janeiro	CTPDE	57
1964	XI	Belo Horizonte	CTPDE	34
1964	XII	Porto Alegre	CTPDE	41
1964	XIII	Fortaleza	CTPDE	65
1965	XIV	Belém do Pará	CTPDE	29
1965	XV	Florianópolis	CTPDE	37
1965	XVI	Recife	CTPDE	54
1966	AI	Manaus	Special training for financial agents	33
1966	AII	Fortaleza	Special training for financial agents	29
1966	XVII	São Paulo	CTPDE	40
1966	XVIII	Vitória	CTPDE	40
1966	XIX	Salvador	CTPDE	58
1967	XX	Curitiba	CTPDE	47
1967	XXI	Fortaleza	CTPDE	50
1967	AIII	Aracaju	Special training for financial agents	40
1967	BI	Rio de Janeiro	Advanced training in industrial programming	24
Total				1 171

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of National Bank for Economic and Social Development (BNDES), *Exposição sobre o programa de reaparelhamento econômico, exercício de 1955*, Rio de Janeiro, 1956; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1956*, Rio de Janeiro, 1957; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1957*, Rio de Janeiro, 1958; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1958*, Rio de Janeiro, 1959; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1959*, Rio de Janeiro, 1960; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1960*, Rio de Janeiro, 1961; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1961*, Rio de Janeiro, 1962; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1962*, Rio de Janeiro, 1963; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1963*, Rio de Janeiro, 1964; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1964*, Rio de Janeiro, 1965; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1966*, Rio de Janeiro, 1966; *Exposição sobre o programa de reaparelhamento econômico, exercício de 1966*, Rio de Janeiro, 1967; Economic Commission for Latin America (ECLA)/Brazilian National Bank for Economic Development (BNDE), *Cinco anos de atividades*, Rio de Janeiro, 1965.

Table 3 shows the regional distribution of participants from 1956 to 1964. The data reveal the effect the circulation of CTPDE had on the geographical dissemination of knowledge, given the rising number of attendants from outside Rio de Janeiro. In the first courses taught in the capital, only a minority of participants came from more distant regions. After the 1959 edition in Recife, the volume

of participants from the North-East systematically exceeded that from Rio de Janeiro. Their strong presence between 1960 and 1962 can be attributed to the continued need to train staff for the region's economic bureaucracies, in addition to the explicit priority given to the North-East in the selection process because of its crushing economic problems (*O Correio da Manhã*, 1963a). The courses taught in the South, North-East, North and South-East attracted predominantly local students, increasing the spread of ECLA ideas and planning techniques.

Table 3
Participants in courses held by the Economic Commission for Latin America (ECLA) and the National Bank for Economic Development (BNDE), by region

Region	1956	1957	1958	1959	1960	1961	1962	1963	1964	Total
North			1		1	2	2	45		51
North-East	3	11	17	69	22	20	20	20	65	247
South-East	2	8	9	2	8	6	6	2	30	73
Mid-West							1	5	4	10
South	3	3	7		2	5	3	56	41	120
Federal District	40	39	30		17	16	13	34		189
Total	48	61	64	71	50	49	45	162	140	690

Source: Economic Commission for Latin America and the Caribbean (ECLA)/Brazilian National Bank for Economic Development (BNDE), *Cinco anos de atividades*, Rio de Janeiro, 1965.
Note: Gray shading indicates that most participants were from the region where the course was held, while yellow shading indicates a larger number of participants from outside the region where the course was held.

In addition to spreading knowledge on a national scale, ECLA stimulated and supported the creation of local technical qualification initiatives. In February 1963, for instance, an Economic Development course was offered in Salvador as part of the intensive programme of SUDENE to raise the technical level of the North-Eastern workforce, inspired by those that ECLA taught in almost all the countries of Latin America (*O Correio da Manhã*, 1963b; BNDE, 1965, p. 21). ECLA supported similar initiatives at the University of Brasilia, the Brazilian Coffee Institute and the National Council of Economics, among other institutions, by providing both teaching staff and teaching material (*O Correio da Manhã*, 1963a). These connections with regional economic bodies and with the universities resulting from the mobility of CTPDE significantly expanded the ECLA sphere of influence in Brazil.

Another effect of this circulation of courses were changes in the worldview of ECLA staff themselves as a result of their travels around the country. The creation of the ECLA/BNDE office was a crucial step in making this mobility viable, since it made it possible to put together a permanent local team with advanced knowledge of Brazil that was fully available to engage with local activities resulting from cooperation. The ECLA/BNDE office thus became a Brazilian hub of intellectuals who were capable of thinking economically but also of looking beyond the economy and keeping social and regional disparities in view with the aim of promoting structural changes that would lead to egalitarian national development.

The three main peculiarities of the ECLA/BNDE course were therefore: (i) the larger place it gave to economic development disciplines such as planning and project evaluation, taking account of local history and social, political and regional aspects; (ii) its development of teaching material, owing to the inadequacy of the existing manuals of economic theory for addressing Latin American specificities; and (iii) its engagement with regional development agendas. These special features meant that the course could be grounded in Brazilian social and economic characteristics and unintendedly led to critical reflection on the limits and potentialities of the general ideas held by ECLA about Latin American development.

CTPDE was distinguished by its politically engaged nature, which was consistent with the argument that structural change would not come about spontaneously, and by an active commitment to tackling underdevelopment. Professor Carlos Lessa sums up this difference by saying that a specialist in development is a specialist in history-making (Lessa, 2011), and this can be understood as the attitude

driving the activities of the ECLA/BNDE Centre. The shortage of technicians was not the only reason, then, for the rapid expansion of the courses. There was also the political intention of instructing and training agents in strategic positions in the State apparatus to fight underdevelopment on its various fronts and, hence, make history.

IV. Building a developmentalist network around the ECLA/BNDE Centre

In 1957, shortly after the first edition of CTPDE, negotiations were carried out to establish a permanent ECLA office in Brazil. The office would have a small number of economists and would coordinate the study groups created under specific agreements between the international entity and Brazilian agencies, steer the Training Course on Problems of Economic Development, provide technical assistance to Brazilian organizations requesting it and prepare the specialized documentation on Brazil that ECLA was lacking in (BNDE, 1957, p. 184).

The creation of the ECLA/BNDE Centre was announced in 1959 and its office at 174 Avenida Graça Aranha in Rio de Janeiro was inaugurated on 3 October 1960 (*O Correio da Manhã*, 1960b). This location was particularly appropriate since it neighboured BNDE, the Ministry of Finance and the Brazilian Institute of Geography and Statistics. The Centre was, therefore, surrounded by the economic bureaucracies that benefited from its courses, lectures and debates and by the most influential economists in the country.

The first Director of the Centre was Osvaldo Sunkel, an economist with a postgraduate degree from the London School of Economics (LSE) who had replaced Jorge Ahumada as head of the ECLA training courses and worked with Furtado on a report on Mexican development issues (Treviño, 1998). His first visit to Brazil was in 1959, just before the ECLA course in Recife, when Furtado commissioned him to tour all the capitals of the region to interview candidates from right across the North-East. Sunkel described this trip as an adventure that allowed him to observe the precariousness of development in the region, which is subject to severe droughts, and explained that it was then that he really discovered poverty, wretched poverty, extreme poverty, poverty manifested in people's physical characteristics (Sunkel, 2012). This narrative exemplifies how teaching away from Santiago also contributed to a change of perspective that worked the other way, enhancing ECLA officials' awareness of the subcontinent about which they were theorizing. It paved the way for alternative points of view and methods of reasoning that were essential in the formulation of accurate recommendations to promote economic and social development. This movement of people was thus essential in integrating different ways of reasoning about Brazil and Spanish-speaking Latin America, which were rarely observed from a common perspective.

Sunkel and the Deputy Director of the Centre, Charles Rollins, a United States economist with a PhD from Stanford, arrived in Brazil with the task of recruiting local economists to join their team. They talked it over with Gerson Augusto da Silva, a foreign trade expert, who recommended three of his best students at the National Faculty of Economic Sciences (FNCE) of the University of Brazil, now the Federal University of Rio de Janeiro (UFRJ). Two of them, Carlos Lessa and Antônio Barros de Castro, had been his interns on the Customs Policy Council. The third was Maria da Conceição Tavares, a Portuguese mathematician and BNDE employee. Lessa started working at the Centre immediately, while Tavares joined in 1961, having obtained the best grades on a CTPDE course, and Castro in 1962 after his postgraduate studies at LSE and the Centre d'Études des Programmes Économiques (see Sunkel, 2012; Lessa, 2012; Mantega and Rego, 1999a, p. 159; Petrelli and Simioni, 2011, p. 12).

Castro and Lessa had been friends since high school and joined FNCE in 1956, while Maria da Conceição Tavares entered the Faculty the following year. They describe FNCE as a good school within

the framework of neoclassical economics, but very insulated. As an example, they said ECLA was not even mentioned. The publication of Furtado's *The Economic Growth of Brazil* had no repercussions. They called it an extremely conservative school and more than that, a bubble (Castro, cited in Mantega and Rego, 1999a, p. 157). They also relate that Keynes was never mentioned and that Brazil was never treated as an economy with special characteristics (Lessa, 2012). For them, joining ECLA meant accessing a new economics literature and acquiring a different economic perspective which positioned Latin America as the hub for building critical thinking about the structural conditions of economic and social development.

In addition to providing Brazilian data for the work carried out at ECLA headquarters in Santiago, Centre staff spent their time on research and the production of teaching content for the courses. Their analyses aimed to describe and interpret phenomena such as inflation, industrialization, the evolution of infrastructure, in the light of Brazilian economic development. Part of this work was meant to enable comparisons to be carried out with the data and analysis produced in Santiago, while another part was concerned with the specificities of the Brazilian economy as seen in the light of ECLA historical and critical thinking. The outputs were used in CTPDE and comprised some of the first local writings based on the main ideas of ECLA (ECLA/BNDE, 1965, pp. 2 and 3).

Among the projects carried out at the ECLA/BNDE Centre were a study of inflation in Brazil directed by Charles Rollins (ECLA/BNDE, 1965); a study on import substitution in Brazil initiated by Rollins and undertaken by Tavares, which led to the essay "The growth and decline of import substitution in Brazil" (ECLA, 1964); and an investigation into the phases and instruments of Brazilian economic policy coordinated by Carlos Lessa, which resulted in the article "Fifteen years of economic policy in Brazil" (Lessa, 1964). The work produced at the Centre that reached the largest audience was the textbook *Introdução à economia: uma abordagem estruturalista* by Castro and Lessa (1967). The authors employed the systemic and structural perspective of ECLA to discuss Brazil's economic problems, emphasizing the transformational power of planning and development policies.

These writings were mainly produced during the second directorship of the ECLA/BNDE Centre, lasting from mid-1962 to mid-1966. In 1962, Raúl Prebisch summoned Sunkel back to Santiago to coordinate the newly created Latin American Institute for Economic and Social Planning (ILPES)[8] training programme (Sunkel, 2012). Aníbal Pinto Santa Cruz, a Chilean lawyer and economist who had studied at postgraduate level at LSE, took over the Brazilian office and became a sort of intellectual mentor to the Centre's young researchers (Castro, 2000, p. 823, and 2014; Lessa, 2012; Tavares, 2010). At the same time, Carlos Lessa replaced Rollins as Deputy Director, and the team expanded rapidly with the addition of younger researchers and interns.

There are no complete records on the Centre's staff, just scattered information in testimonials, administrative reports and news articles. A 1965 report mentions that the Centre had a director, three "senior" economists, five "junior" economists, three trainees and an administrative staff of seven (ECLA/BNDE, 1965). It also mentions that when Lessa left the country, in 1964, Tavares became Deputy Director while Barros de Castro took over the Research Department and Jayme Costa Santiago the Courses Department (ECLA/BNDE, 1965, p. 1). Although the information on the staff is incomplete, some patterns can be detected. Most of the trainees were students of staff members at the University of Brazil. The junior economists were usually new economics graduates, some of them former interns, while others had achieved good grades on CTPDE.

[8] ILPES was created in Santiago in July 1962 as a result of the Alliance for Progress, promoted by John F. Kennedy, which replicated some of the philosophy of ECLA. "ILPES was responsible for training staff from different countries to prepare diagnoses, projections and sectoral plans and programmes and to perform other tasks that were necessary to obtain resources through the Alliance" (Treviño, 1998, p. 23). ILPES did not cater directly to the requirements of the region's governments, having more autonomy to undertake critical thinking (Furtado, 2014).

The "junior" team comprised Wilson Cano, an economics graduate of the Pontifical Catholic University of São Paulo, and Ferdinando de Oliveira Figueiredo, Luiz Guilherme dos Santos Vassalo and Roberto Manoel Ruiz de Gamboa of FNCE (Figueiredo, 2002; UNICAMP, 2014; Levy, 2008; Ismael, Braga and Freire D'Aguiar, 2013; *O Correio da Manhã*, 1964b). Most interns joined the Centre while studying economics at the University of Brazil, and those who stayed on at the Centre after graduation became junior economists, examples being Francisco de Almeida Biato and Magdalena Cronemberger, who entered in 1964. Sulamis Dain, José Eduardo de Carvalho Pereira and Luiz Cláudio Etchebert Marinho were brought in as trainees from the subsequent FNCE classes. A sociologist, Herbert José de Souza (Betinho), a well-known student leader at the time, was also briefly an intern (Cronemberger, 2019; D'Araujo, Farias and Hippolito, 2005, p. 368; Nakano and Roitman, 2001, pp. 57–61).

The first half of the 1960s was characterized by an expansion of the Centre's staff and a great increase in its activities. In 1965, for example, it held a major seminar on state-level planning in Petrópolis at which the topic was systematically discussed and experiences shared, since planning was conducted independently by each unit of the federation. Standardization of planning instruments and practices was encouraged to facilitate coordination of the country's development, which led to the creation of an integrated system of financing agencies at the national, regional and state levels, overseen by BNDE (ECLA/BNDE, 1965, p. 24; BNDE, 1965, pp. 54 and 55).

The second half of the 1960s, on the other hand, was marked by a crisis that led to the dissolution of ECLA cooperation with BNDE. Those involved indicate that this resulted from increasing pressure exerted by the military dictatorship. It started with overt surveillance and funding cuts and culminated in complete suspension of the BNDE side of the agreement. The backdrop to this was the appointment to the highest positions in the administration of economists such as Roberto Campos, Octavio Gouvêa de Bulhões and Antônio Delfim Netto, who publicly attacked the notion of general planning for development[9] and the call for structural social change with which ECLA was associated (Klüger, 2017a; Cano, cited in Ismael, Braga and Freire D'Aguiar, 2013, p. 294).

In September 1966, Aníbal Pinto left Brazil and Daniel Bitrán, a Chilean economist who had graduated from the University of Chile and studied at George Washington University, and who had worked for ECLA since 1952, became the new director of the Centre. According to Bitrán, he immediately became aware of the challenges he would face in running the office during the military regime. He recalled that the first time he entered the Centre, he found a note typed in red on his desk saying that ECLA was a 'nest of communists', and that they would be watched very closely. So closely were they watched that an agent was placed in the office to gauge the 'left-wing spirit' permeating the Centre. According to Bitrán (2019), the agent would sit down and read all the Project Evaluation manuals and get angry and furious because he could not find what he was looking for.

The Brazilian military regime attacked ECLA on two fronts. The first was the defunding and 1967 closure of the ECLA/BNDE Centre. The second was an attempt by the Brazilian Government to stop resources reaching ILPES in retaliation for its hosting of exiled Brazilian intellectuals such as Celso Furtado, Fernando Henrique Cardoso and Francisco Weffort, who openly criticized the economic model adopted by the new economic administration (Dosman, 2011, pp. 469–471).

Even though the Brazilian dictatorship was hostile to ECLA, the demand for its lectures and courses continued to grow. The government thus failed to undermine the prestige of the United Nations body, built up via its training activities throughout Brazil and by its close collaboration with the agencies charged with planning and financing local development. The main strategy adopted to weaken the ECLA/BNDE office was thus a constant reduction of its resources. Bitrán mentions that when he arrived, in September 1966, the Centre had about 30 employees. Funding cutbacks in the following

[9] The terms "planning" and "development" were both part of these economists' conceptual repertoire. The difference lay in the way they were operationalized, which differed greatly in theory and practice from the ECLA conception of them as instruments to promote far-reaching structural social change.

years forced them to shrink the team and move to a smaller office further from the financial heart of Rio de Janeiro (Bitrán, 2019).

These cuts followed a change in the economic perspective prevailing in the government and at BNDE, which became more susceptible to the influence of the United States. In 1965, the Inter-American Development Bank and the Agency for International Development signed agreements committing them to invest in a fund created by BNDE to finance studies, projects and programmes (Monteiro and Modenesi, 2002, pp. 9 and 10). The Ford Foundation awarded BNDE US$ 336,000 in 1967 and another US$ 119,000 in 1970 for "management training and research" (Ford Foundation, 1967, p. 119, and 1970, p. 71). The BNDE agreement with ECLA was discontinued at the same time, showing that it was not terminated because the need for training had been superseded but rather because of a political decision to change the source and nationality of imported expertise.

In unilaterally terminating its agreement with ECLA, BNDE announced that the ECLA/BNDE Centre was ending its activities after making an important contribution to critical thought and offering suggestions for the programming of national economic development, as well as vigorously cooperating in the specialized training of technical staff for development agencies (BNDE, 1967, p. 45). It also stated that ECLA would continue its activities in Brazil with the establishment of its own office and BNDE would redirect the resources released from the agreement to a specific programme of training for its technical staff and for analysts and operators at the financial agencies (BNDE, 1967, p. 45).

Maria da Conceição Tavares says that when informed that the ECLA/BNDE Centre was closing she contacted Hélio Beltrão, who was at the Ministry of Planning, and João Paulo dos Reis Velloso, who was the Director of the Institute for Applied Economic Research (IPEA). Tavares states that the pair salvaged the agreement between the Brazilian government and ECLA (see Pereira de Melo and Moraes da Costa, 2009b, p. 179). From 1968 to 1971, the office operated under the name ECLA-ILPES, relying on meagre resources from Santiago. It moved to smaller premises even further from the city centre, and the staff gradually dispersed. Besides the senior economists, Bitrán, Castro, Santiago and Tavares, who stayed a little longer, there were only two junior economists left, José Eduardo Pereira and Magdalena Cronemberger (Carvalho Pereira, cited in Leonor and Paiva, 2002; Cronemberger, 2019).

At its lowest ebb, the office started a collaboration with IPEA which allowed it to share costs and gain the assistance of additional researchers. IPEA staff had affinities with the ECLA planning orientation because some of them had been trained directly by the United Nations body, including some economists who had moved from the Centre to IPEA following the staff cuts. Between June 1969 and the end of 1970, they carried out joint research on the Brazilian industrial system and manufacturing exports, coordinated by Fernando Fajnzylber. Shortly afterwards, ECLA stated that it had no more resources to maintain its own Brazilian headquarters. The office was then fully incorporated into IPEA, operating in Rio de Janeiro from 1971 until June 1978, when it moved to the main IPEA premises in Brasilia (IPEA, 2004, p. 3; D'Araujo, Farias and Hippolito, 2005, p. 27; Santiago, 1990, p. 18; Torres, 2006, pp. 42 and 43; Cronemberger, 2019).

V. The exile and reconstitution of the ECLA Brazilian team

The dismantling of the ECLA/BNDE office and the subsequent reduction of resources resulted in the dispersal of the team. Indeed, some of the Centre's staff had left before this crisis because of the political repression exercised by the dictatorship, for in addition to the political pressure and vigilance the Centre was subjected to, some researchers were being persecuted personally for their left-oriented intellectual and political positions.

Celso Furtado left for Chile right at the outset. He was among the first Brazilians to lose their political rights following the issue of the first Institutional Act, which suspended direct elections and withdrew the political rights of public opponents of the dictatorship, a few days after the coup (Furtado, 2014). Carlos Lessa was the first of the Centre's staff to leave for exile. In his telling, shortly after the dictatorship came to power, he gave a "protest" course that "came down hard" on the dictatorship. One student came up to him and said that the military were getting annoyed with him and had been making complaints. Then, the United Nations thought it best to remove him from Brazil (Lessa, 2012). Aníbal Pinto Santa Cruz arranged for Lessa to be transferred to ECLA headquarters, where he arrived in 1964. Chile was a prime destination for exiled intellectuals because not only did it welcome Brazilians, but there were job opportunities for qualified professionals. A friendly government and a large number of universities, expanding research centres and international organizations were essential factors (Klüger, 2017b).

Expanding repression in Brazil, coupled with the dismemberment of the ECLA/BNDE Centre, propelled more and more departures to Chile. Francisco de Almeida Biato and Sulamis Dain arrived there, respectively, in 1966 and 1969. Biato joined the ILPES specialization course and was incorporated into IPEA on his return. Dain studied economics at the Graduate School of Latin American Economic Studies (ESCOLATINA) of the University of Chile and taught at the Federal University of Rio de Janeiro (UFRJ), the former University of Brazil, when she returned. Luiz Claudio Marinho went to Chile in 1968 and, after attending ESCOLATINA, worked for ILPES for three decades, later directing the ECLA offices in Buenos Aires and Brasilia (Núñez del Prado, 1998, p. 9). Conceição Tavares arrived in Santiago at the end of 1968. There she taught at ESCOLATINA and worked at ILPES and, from March 1972, Salvador Allende's Ministry of Finance (Tavares, 2010). Antônio Barros de Castro arrived in mid-1969, joining both ILPES and ESCOLATINA (Castro, 2014). Betinho arrived at the end of 1971 and, after working as a research assistant at the Latin American Faculty of Social Sciences (FLACSO), joined the National Planning Office (ODEPLAN) under Allende (Nakano and Roitman, 2001; Souza, 1976, p. 97). ECLA also helped place other exiled intellectuals who had previously forged ties with the office in Brazil and with Celso Furtado. A paradigmatic case is that of SUDENE staff, who, having been severely threatened after the coup, mostly left the country.

If proximity to ECLA at first encouraged "Latin Americanization" of these Brazilian intellectuals' thinking about development, in a second stage they looked beyond this broad Latin American framework in order to understand the peculiarities of their own country. There were discussions about the social and political arrangements that had led to the military coup in Brazil and about the type of economic growth, with worsening inequality, that was taking place in the country. These debates led to the essay "Beyond stagnation: a discussion on the nature of recent development in Brazil" (Tavares and Serra, 1973) and the book *Dependency and Development in Latin America* by Fernando Henrique Cardoso and Enzo Faletto (1979). At the same time, the experience of displacement expanded the intellectual horizons of the Brazilians in Santiago and led to changes in ECLA itself, as it incorporated the variations in national development trajectories into its thinking. They thus prompted comparative analysis of social, political and cultural structures aimed at understanding the internal diversity of economic arrangements. These considerations would give rise to post-ECLA currents and dependency theories that brought economic thinking closer to sociological perspectives, mobilizing Marxist and Weberian methods and concepts (Bresser-Pereira, 2005).

Following the issue in Brazil in December 1968 of the fifth Institutional Act, which gave the military extraordinary powers and suspended civil and human rights, a second wave of exiles arrived in Chile, largely formed of students and young teachers who in most cases did not hold positions of power or prestige. The students were welcomed at Chilean universities, especially in the areas of economics and the social sciences, and had considerable contact with core ECLA ideas and revisions thereof. ESCOLATINA, FLACSO and ILPES played a key role in transmitting the viewpoints cultivated at ECLA

to the new generations. The many young Brazilians who attended these institutions took these new theoretical insights back to Brazil, to be further developed once the dictatorship started to lose strength (Klüger, 2017b).

The paradigmatic case of the reestablishment of ECLA thought in Brazil in the 1970s was the creation of the Department of Economics and Economic Planning at the State University of Campinas (UNICAMP), chiefly by teaching staff and postgraduates who left Chile after the military coup in 1973. In addition to Carlos Lessa, Maria da Conceição Tavares and Antônio Barros de Castro, veterans of the ECLA/BNDE office, several young economists returning from exile were welcomed at UNICAMP. Most had attended courses at ESCOLATINA, ILPES or both, where they had studied under Osvaldo Sunkel, Aníbal Pinto, Lessa, Tavares and Castro, among many ECLA specialists. They arrived in Brazil with a Latin American perspective on economic issues, having been trained in planning for development and having had the opportunity to closely follow the debates and revisions of ideas taking place around the Commission.

Indeed, the UNICAMP economics department had close ties to ECLA from its inception. These connections preceded the return of the exiles, since three of the faculty's founders, Wilson Cano, Roberto Gamboa and Ferdinando Figueiredo, were economists from the ECLA/BNDE Centre. Cano recalls that when he left the Centre, in 1967, he was going to be transferred to headquarters in Santiago, but the opportunity arose, in the middle of the Brazilian dictatorship, to create a new school of economics with a critical perspective. The Dean of UNICAMP, Zeferino Vaz, appointed Fausto Castilho, who had attended CTPDE in São Paulo in 1966, as coordinator of the new economics programme. Castilho sought help from two CTPDE colleagues, João Manuel Cardoso de Mello and Luiz Gonzaga Belluzzo. Together they decided in 1968 to invite the economists leaving the ECLA office in Rio to join them at UNICAMP. Because Vaz was well respected by the military, he managed to secure his university against external censorship, creating the conditions for the development of a department in which banned ideas could circulate and those returning from exile could be hired and teach. Forbidden Marxist authors reappeared, heterodox perspectives on the economy were welcomed and ECLA influence found a solid anchorage. After a few years, some faculty members moved back to Rio de Janeiro, where they remodelled economics teaching at UFRJ, further spreading ECLA ideas (see Mantega and Rego, 1999b, pp. 194 and 195; Soares, Torino and Seneda, 2013; Gonzaga, 2014; Gomes, 2007, pp. 61, 74 and 93; Cano, cited in Ismael, Braga and Freire D'Aguiar, 2013, p. 294).

Furthermore, the influence of ECLA was not confined to the economic departments of UNICAMP and UFRJ. One example of its reach in other fields is the Brazilian Centre for Analysis and Planning (CEBRAP), a think tank at the centre of the development of the social sciences in Brazil during the 1970s. Created by intellectuals with Marxist backgrounds expelled from the University of São Paulo during the military regime, such as Fernando Henrique Cardoso, Paul Singer, Elza Berquó and Octavio Ianni, it welcomed many researchers returning from exile, including a number from Chile. At CEBRAP, the legacy of ECLA, Marxist influence and research into contemporary Brazil were merged with new sociological perspectives. A prime example is Francisco de Oliveira's "A economia brasileira: crítica à razão dualista" (Oliveira, 1972). Oliveira was first trained at the Banco do Nordeste do Brasil, attended the ECLA/BNDE course in 1957, worked for SUDENE and was then exiled, working at ECLA in Mexico and Central America before joining CEBRAP. His work was supposedly inspired by ECLA, but it offered a Marxist account of the Brazilian capitalist accumulation regime.

VI. Conclusion

Reconstructing the history of the ECLA/BNDE Centre makes it possible to observe in detail how ECLA thought became ingrained in Brazil. CTPDE was among the first postgraduate training courses in economics to be established in Brazil, its special feature being its focus on the planning of structural change-oriented policies to be conducted by the public sector. By providing training in planning to hundreds of specialists from different regions of the country and administrative levels, the Commission disseminated knowledge and contributed to the effective construction of development programmes inspired by its perspectives and methods. The activities of the experts connected to the ECLA/BNDE Centre acquired a clear and explicit transformative orientation, since they saw underdevelopment as a phenomenon that was not confined to the economic dimension but required larger changes to social structures.

Moreover, ECLA participated in the training of well-known intellectuals, helping to reshape academic research and economics teaching and to create spaces for critical thinking centred on Brazilian and Latin American specificities. The research projects conducted at the ECLA/BNDE Centre and the production of Portuguese-language teaching material addressing regional development issues also played a prominent role in spreading the Commission's ideas in Brazil. Along with Celso Furtado's vast and influential output, Lessa, Castro and Tavares's essays and books constitute the first classics in Brazil aligned with ECLA thinking. Lastly, the creation of faculties of economics coordinated by former members of the ECLA/BNDE office paved the way for a new set of theoretical alternatives to the economics mainstream.

Furthermore, sharing ideas with Brazilian intellectuals impacted ECLA thought itself, first through the direct immersion of some Commission staff in the specificities of the regional problems of economic development in Brazil, and later through the transfer of vast numbers of Brazilian intellectuals to Chile between 1964 and 1973. These exiled scholars took to Chile their knowledge of the Brazilian economy and society and new interpretations of the circumstances leading to the military coup in Brazil, which pushed ECLA to think about the political and social conditions underlying economic development and to adopt a comparative focus in its analyses. The immersion of these exiled Brazilians at the centre of critical economic thinking and their participation in the renewal of the perspectives prevailing at the Commission marked a generation who, after going back to Brazil, would shape new academic spaces that welcomed the legacy of ECLA and sought to continue it.

Despite the creation of new faculties embracing ECLA perspectives, they never regained their former influence on a national scale. UNICAMP did offer training courses similar to those of CTPDE for a few years, but critical economic perspectives ended up being more restricted to the university setting, as an alternative to neoclassical-oriented economics. Confined to the academy, this knowledge is less likely to reach its prime target audience, the higher State bureaucracy and those actively engaged in planning for development. Nowadays, those wishing to see planned development in the country and to fight against embedded inequalities face the challenge of winning back both State and society and of restructuring their concepts and tools to deal with dynamic economies and societies in a reshaped global context.

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International engagement of Brazilian agribusinesses: a comparative analysis

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Abstract

Urban population growth in developing countries, together with the expansion of the middle class and increase in per capita income worldwide, have increased the demand for food. This article uses the method of constant market share analysis (CMSA) to identify the drivers of agricultural export growth among the main countries operating in the market. Two periods are analysed: (i) 1992–2001 and (ii) 2002–2013. The countries studied were Argentina, Brazil, China, France, Germany, India and the United States. The results reveal the increasing representation of emerging countries with natural resource potential (Argentina, Brazil and India), while developed economies (the United States and European countries) and China (owing to its particular internal dynamics) are losing ground in the international market.

Keywords

Agriculture, international trade, agricultural trade, exports, agricultural products, market share, economic growth, comparative analysis, Brazil

JEL classification

Q17, Q10, F10

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I. Introduction

The increase in per capita income and urbanization in developing countries, the growth of a middle class with new cultural habits and demands, and the major impact of technological innovation on the production system are some of the key changes that have occurred in the international economy during the last 20 years. These transformations have had an impact on the distribution of economic power in different regions of the world and have altered international relations and world trade.

The 1990s were characterized by a high degree of economic openness, with less interventionist and more market-based development that stimulated integration between countries through bilateral and multilateral agreements (free trade areas, customs unions and common markets). International commodity prices rose sharply between 2004 and 2011, which has become known as a commodity-boom period (Barros, 2016).

The rise in prices was driven by several factors: the growth in food demand that outpaced production, the depletion of grain reserves to historically low levels, the impact of climate change on crop yields and the high price of crude oil, which encouraged the use of food commodities for the production of biofuels (World Bank, 2011). Since 2011, price indicators have fallen both in agriculture and in the minerals sector.

For regions or countries with a competitive agriculture sector, such as Brazil, the growth of international commodity trade has boosted economic growth. According to projections by the Organisation for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization of the United Nations (FAO) (OECD/FAO, 2015), in 2024 the United States, the European Union and Brazil will continue to be the world's leading exporters of agricultural products.

Maranhão and Vieira Filho (2016) analysed the sources of Brazil's agricultural export growth between 1992 and 2013. In the 1990s, global growth was relatively weak. However, Brazilian exports grew, driven by composition and destination factors. From 2000 onwards, world trade grew vigorously, fuelled by demand from emerging countries. The strong performance of Brazilian agricultural exports reflected not only world growth but also gains in competitiveness, which have slackened in recent years.

This study seeks to identify the sources of export growth in the leading agricultural goods-exporting countries, using the method of constant market share analysis (CMSA). The following countries were studied: Argentina, Brazil, China, France, Germany, India and the United States. The article is divided into four sections, including this brief introduction. Section II describes the methodology, the period of analysis and the data source used. Section III provides an overview of international trade and makes a comparative analysis of the countries evaluated; and the last section offers final remarks.

II. Method of analysis

As in Maranhão and Vieira Filho (2016), this study uses the CMSA method. According to Richardson (1971), this instrument examines the country's export growth (favourable or unfavourable), by analysing the structure and competitiveness of its exports. Leamer and Stern (1970) argue that the factors that cause a country's exports to fall below the world average are: (i) exports concentrated in products for which demand grows more slowly than average; (ii) exports destined for stagnant regions; and (iii) the country's lack of interest, stimulus or conditions to compete in the international market.

Constant market share analysis specifies that a country's market share is given by the value exported divided by total value of global exports, which itself is a function of relative competitiveness (equation (1)):

$$S \equiv \frac{q}{Q} = f\left(\frac{c}{C}\right) \text{ with } f'(\cdot) > 0 \tag{1}$$

where S denotes the market share of the country in question; q the total quantity exported by the country; Q the total quantity exported by the world; c the country's competitiveness; and C global competitiveness.

Differentiating with respect to time, and given that the growth of market share depends on the increase in the country's relative competitiveness, gives:

$$\frac{dq}{dt} \equiv S\frac{dQ}{dt} + Q\frac{dS}{dt} = S\frac{dQ}{dt} + Qf'\left(\frac{d(c/C)}{dt}\right) \tag{2}$$

Equation (2) states that the total variation in the country's export quantity $(\dot{q})$ is described by the growth of world exports $(S\dot{Q})$ and the competitiveness effect $(Q\dot{S})$.

According to Richardson (1971), the observation that a country's exports structure affects its total export growth, even without changes in relative competitiveness, leads to a more complex CMSA model. For example, a country should specialize in the production of goods for which demand is expanding; or else it should concentrate on selling to more dynamic geographic markets. From this standpoint, for a given commodity (or traded good) i, destined for a specific market j:

$$S_{ij} \equiv \frac{q_{ij}}{Q_{ij}} = f_{ij}\left(\frac{c_{ij}}{C_{ij}}\right) \text{ with } f'_{ij(\cdot)} > 0 \tag{3}$$

Analogously to the general case, and given that the effect of world export growth $\left(\sum_i \sum_j S_{ij}\dot{Q}_{ij}\right)$ can be decomposed into three different effects that take product and destination into account, total export growth can be expressed as follows:

$$\dot{q} \equiv S\dot{Q} + \left[\sum_i S_i\dot{Q}_i - S\dot{Q}\right] + \left[\sum_i \sum_j S_{ij}\dot{Q}_{ij} - \sum_i S_i\dot{Q}_i\right] + \sum_i \sum_j Q_{ij}\dot{S}_{ij} \tag{4}$$

(i) (ii) (iii) (iv)

The right-hand side of the foregoing identity shows four effects: (i) world trade growth; (ii) the composition of exports; (iii) the destination of exports; and (iv) a residual effect representing competitiveness. The decomposition is obtained based on the growth of world exports, favourable or unfavourable, associated with the structure of products or markets and changes in relative competitiveness.

Mathematically, in the discrete case, it is necessary to consider the initial period (denoted by 0) and the final period (denoted by 1). Thus, differentiation with respect to product i and destination j, gives the following identity:

$$\Delta q_{ij} \equiv \left(\frac{q_{ij}^1 - q_{ij}^0}{q_{ij}^0}\right) q_{ij}^0 + \left[q_{ij}^1 - q_{ij}^0 - \left(\frac{q_{ij}^1 - q_{ij}^0}{q_{ij}^0}\right) q_{ij}^0\right] \text{ with } \left(\frac{q_{ij}^1 - q_{ij}^0}{q_{ij}^0}\right) = g_{ij} \tag{5}$$

This expression can be grouped as follows, to show the four effects mentioned above:

$$\Delta q \equiv gq^0 + \sum_i (g_i - g)q_i^0 + \sum_i \sum_j (g_{ij} - g_i)q_{ij}^0 + \sum_i \sum_j \left(q_{ij}^1 - q_{ij}^0 - g_{ij}q_{ij}^0\right) \tag{6}$$

(i) (ii) (iii) (iv)

where g is the increase in global exports from period 0 to period 1.

Identity 6 expresses the variation in the exports of the country or region in question, from the initial to the final period, and makes it possible to decompose the country's export growth rate into four effects. The first two, (i) and (ii), are related to external factors, while (iii) and (iv) reflect the influence of domestic factors. These effects are described below:

(i) World trade growth: increase observed if the exports of the country under study have grown at the same pace as world trade.

(ii) Export composition: changes in the structure of exports with concentration in products with a more or less rapid growth in demand. The export composition effect indicates that if world exports of product i increase more than the world average for all products exported, then $(g_i - g)$ is positive.

(iii) Export destination: changes resulting from exports of products to markets with more or less dynamic growth. The export destination effect will be positive if the country has concentrated its exports in faster-growing markets and negative if it has concentrated them in stagnant regions.

(iv) Residual, a proxy for competitiveness: related to changes in relative prices, importers tend to replace the consumption of goods whose prices have increased with relatively lower-priced substitutes. When a country loses market share in world trade, the competitiveness term is negative.

The study was divided into two subperiods:

(i) 1992–2001: characterized by open trading arrangements, involving a less interventionist development stance. This model made it possible to use an exchange rate anchor to control inflation and contributed to the spread of privatization programmes. This period is also characterized by the integration of countries through bilateral and multilateral agreements (free trade areas, customs unions and common markets).

(ii) 2002–2013: characterized by rising commodity prices driven by the growth of the Chinese economy. China's accession to the World Trade Organization (WTO) in 2001 boosted world trade between 2002 and 2008. Key developments include the 2008 financial crisis, the slowdown in economies across the world and the slow resumption of growth after 2010.

Statistical information was obtained from FAO (2013) on agricultural products (soybeans, maize, oranges, sugar, wheat, cotton, roasted coffee, coffee beans, pork, beef and chicken meat) from the following countries: Argentina, Brazil, China, France, Germany, India and the United States. For the purposes of the analysis, the destination markets were South America, North America, Central America, Europe, Africa, Asia and Oceania.

III. Analysis and discussion of the findings

1. Overview of the agriculture sector

Table 1 reports the share of the agriculture, manufacturing and services sectors in gross domestic product (GDP) for the countries analysed. While the share of agriculture is decreasing, the services sector is trending upwards. Despite the decline in the agriculture share, there are positive spillover effects to the rest of the economy (Vieira Filho and Silveira, 2016). In other words, the value generated by agriculture-based systems tends to be captured by the input, capital intensive, manufacturing and processing, and distribution sectors (Zylbersztajn, 2014).

Table 1
Selected countries and country groupings: GDP share of the agriculture, manufacturing and services sectors and geometric growth rate, 1992–2013
(Percentages of total value added)

Value added *(percentage of GDP)*	Regions and countries	Years				Geometric growth rate (GGR)	
		1992	2001	2002	2013	1992–2001	2002–2013
Agriculture	World	..	5.2	5.0	4.0	..	-2.2
	Middle-income countries	17.1	12.5	12.4	9.4	-3.4	-2.4
	Low-income countries	42.4	34.0	32.9	31.8	-2.4	-0.3
	High income countries	..	1.9	1.7	1.5	..	-1.1
	Brazil	7.7	5.6	6.4	5.3	-3.4	-1.7
	Argentina	6.0	4.9	10.8	7.2	-2.2	-3.7
	Germany	1.1	1.2	0.9	0.8	0.9	-1.6
	France	2.9	2.3	2.2	1.6	-0.8	-2.8
	United States	..	1.2	1.0	1.5	..	3.4
	India	28.7	22.9	20.7	18.3	-2.5	-1.1
	China	21.4	14.1	13.4	9.4	-4.6	-3.2
Industry	World	..	29.6	29.1	27.9	..	-0.4
	Middle-income countries	37.7	36.2	36.1	35.5	-0.4	-0.2
	Low-income countries	17.1	20.1	20.9	20.7	1.8	-0.1
	High income countries	..	26.7	26.1	24.9	..	-0.5
	Brazil	38.7	26.6	26.4	24.9	1.7	-9.1
	Argentina	30.7	27.0	32.4	28.5	-1.4	-1.2
	Germany	35.9	30.1	29.4	30.3	-1.9	0.3
	France	26.2	22.9	22.6	19.8	-1.5	-1.2
	United States	..	22.1	21.3	20.6	..	-0.3
	India	25.8	25.1	26.2	30.8	-0.3	1.5
	China	43.0	44.7	44.3	43.7	0.4	-0.1
Services	World	..	65.3	65.9	68.1	..	0.3
	Middle-income countries	45.2	51.3	51.5	54.9	1.4	0.6
	Low-income countries	40.5	45.4	45.6	47.3	1.3	0.3
	High income countries	..	71.4	72.1	73.6	..	0.2
	Brazil	53.6	67.8	67.2	69.8	2.6	0.3
	Argentina	63.3	68.1	56.8	64.5	0.8	1.1
	Germany	63.0	68.7	69.7	68.9	1.0	-0.1
	France	70.9	74.7	75.2	78.5	0.6	0.4
	United States	..	76.7	77.7	77.9	..	0.0
	India	45.5	52.0	53.1	50.9	1.5	-0.4
	China	35.6	41.3	42.3	46.9	1.7	0.9

Source: World Bank, "Indicators", 2016 [online] https://data.worldbank.org/indicator.

Table 2 displays the per capita GDP growth rate, the urbanization rate and total population. In 2002–2013, middle-income countries achieved a per capita GDP growth rate of 5%, which was above the world average. The developing countries analysed are China, India, Argentina and Brazil, which posted growth rates of 9.6%, 6.1%, 4.2% and 2.6%, respectively. Urbanization rates grew worldwide, especially in China, where urban dwellers surpassed the rural population. Moreover, population growth rates were higher in developing countries than in developed ones (Vieira Filho and Fishlow, 2020). This points to a greater concentration in large urban centres, rising per capita income, the expansion of the middle class and the growing importance of the emerging economies —factors driving the increase in food demand (OECD/FAO, 2013).

Table 2
Selected countries and country groupings: GDP per capita growth rate, urbanization rate and total population, 1992–2013
(Dollars at constant 2010 prices, percentages and millions of people)

Indicators	Regions and countries	Years				Geometric growth rate (GCR)	
		1992	2001	2002	2013	1992–2001	2002–2013
GDP per capita *(dollars at constant 2010 prices)*	World	7 127.2	8 166.1	8 239.3	9 891.3	1.5	1.7
	Middle-income countries	2 074.3	2 503.8	2 573.9	4 391.5	2.1	5.0
	Low-income countries	414.6	423.1	420.9	558.8	0.2	2.6
	High income countries	29 732.5	35 739.5	36 068.0	39 968.1	2.1	0.9
	Brazil	7 735.5	8 743.9	8 880.2	11 797.4	1.4	2.6
	Argentina	7 304.9	7 756.1	6 834.9	10 758.2	0.6	4.2
	Germany	34 132.9	38 580.0	38 515.2	43 433.6	1.4	1.1
	France	33 271.1	38 992.6	39 143.0	41 268.4	1.8	0.5
	United States	36 566.2	45 047.5	45 428.6	49 849.2	2.3	0.8
	India	572.0	818.5	835.4	1 603.7	4.1	6.1
	China	883.3	1 893.5	2 051.8	5 652.4	8.8	9.6
Urbanization rate *(percentage of total)*	World	43.6	47.0	47.5	52.9	0.8	1.0
	Middle-income countries	37.7	41.1	42.8	49.6	1.2	1.4
	Low-income countries	23.3	25.7	26.0	29.9	1.1	1.3
	High income countries	79.9	77.1	77.5	80.7	0.3	0.4
	Brazil	75.4	81.6	81.9	85.2	0.9	0.4
	Argentina	87.5	89.3	89.5	91.5	0.2	0.2
	Germany	73.4	73.1	73.2	74.9	1.8	0.5
	France	74.4	30.0	34.9	46.5	3.2	3.0
	United States	76.1	79.2	79.4	81.3	0.4	0.2
	India	26.0	27.9	28.2	32.0	0.8	1.1
	China	28.2	37.1	38.4	53.2	3.1	3.0
Total population *(millions)*	World	5 453.4	6 195.5	6 274.7	7 176.0	1.4	1.2
	Middle-income countries	4 096.9	4 677.8	4 737.5	5 396.5	1.5	1.2
	Low-income countries	340.3	435.3	447.5	604.6	2.8	2.8
	High income countries	1 016.1	1 082.3	1 089.6	1 174.9	0.7	0.7
	Brazil	155.4	178.4	181.0	204.2	1.5	1.1
	Argentina	33.6	37.4	37.8	42.5	1.2	1.1
	Germany	80.6	82.3	82.4	82.1	0.2	0.0
	France	58.8	61.3	61.8	65.9	0.5	0.6
	United States	256.5	284.9	287.6	316.4	1.2	0.9
	India	906.4	1 071.8	1 090.1	1 279.4	1.9	1.5
	China	1 164.9	1 271.8	1 280.4	1 357.3	1.0	0.5

Source: World Bank, "Indicators", 2016 [online] https://data.worldbank.org/indicator.

Between 2002 and 2008, Chinese trade expanded, and the growing demand for natural resources and commodities drove up oil and commodity prices (WTO, 2015). Rapidly growing countries proved unable to respond with a matching increase in supply and tended to buy products from regions such as South America and Oceania and certain former Soviet Union countries (Piñeiro, 2015). Latin America became the world's largest net food exporting region (FAO, 2015).

Table 3 reports the economic indicators of the agriculture sector. A comparison of the countries shows that, in Brazil and Argentina, arable land expanded, and Argentine growth was stronger in the second period. Brazil has a total area of 851 million hectares, 278 million of which are used for agriculture. In 2013, approximately 196 million hectares were classified as land under permanent meadows and pastures, 76 million hectares as arable land, and 7 million hectares as land under permanent crops (FAO, 2013).

Table 3
Selected countries and country groupings: economic indicators for the agriculture sector, 1992–2013

Indicators	Regions and countries	Years				Geometric growth rate (GCR)	
		1992	2001	2002	2013	1992–2001	2002–2013
Arable land *(millions of hectares)*	Brazil	51.8	59.1	61.5	76.0	1.5	1.9
	Argentina	26.8	27.7	27.9	39.7	0.4	3.3
	Germany	11.5	11.8	11.8	11.9	0.3	0.1
	France	17.8	18.3	18.4	18.5	0.3	0.0
	United States	184.0	175.4	173.0	151.8	-0.5	-1.2
	India	162.7	160.3	160.4	157.0	-0.2	-0.2
	China	122.9	116.1	114.5	105.7	-0.6	-0.7
Agricultural production index *(2004–2006 = 100)*	World	72.5	84.9	89.7	125.1	2.4	3.1
	Middle-income countries	66.9	87.2	88.8	130.8	3.0	3.6
	Low-income countries	71.1	89.0	91.2	135.3	2.4	3.6
	High income countries	90.1	96.3	92.5	106.1	0.7	1.3
	Brazil	63.9	86.2	87.5	140.3	2.9	4.4
	Argentina	58.0	86.2	86.1	126.0	4.5	3.5
	Germany	85.2	104.5	96.2	97.7	2.3	0.1
	France	102.0	95.7	104.1	94.0	-0.7	-0.9
	United States	87.0	92.2	85.5	108.7	0.7	1.9
	India	77.2	95.0	84.7	141.9	2.3	4.8
	China	57.8	86.9	90.8	133.6	4.6	3.6
Livestock production index *(2004–2006 = 100)*	World	76.0	91.0	93.5	117.1	2.0	2.1
	Middle-income countries	67.0	86.4	89.3	125.1	2.0	2.8
	Low-income countries	70.4	83.8	90.9	123.5	2.0	2.8
	High income countries	90.4	98.4	100.0	104.4	0.9	0.4
	Brazil	51.6	80.4	85.7	127.5	5.1	3.7
	Argentina	81.1	87.3	83.0	110.7	0.8	2.7
	Germany	98.7	99.3	99.3	110.4	0.1	1.0
	France	103.7	104.9	106.2	100.2	0.1	-0.5
	United States	82.9	96.8	98.8	107.7	1.7	0.8
	India	63.9	87.8	89.5	135.2	3.6	3.8
	China	48.0	85.3	88.0	126.5	6.6	3.3
Land productivity *(kilograms per hectare)*	World	2 776.9	3 130.6	3 074.1	3 897.1	1.3	2.2
	Middle-income countries	2 444.0	2 842.0	2 834.2	3 678.5	1.7	2.4
	Low-income countries	1 061.0	1 150.6	1 159.4	1 466.7	0.9	2.2
	High income countries	4 284.5	4 682.6	4 489.1	5 685.5	1.0	2.2
	Brazil	2 142.5	3 149.6	2 846.0	4 826.4	4.4	4.9
	Argentina	3 057.3	3 206.8	3 240.8	4 724.7	0.5	3.5
	Germany	5 335.6	7 052.0	6 251.5	7 318.0	3.1	1.4
	France	6 488.2	6 739.1	7 468.3	7 079.3	0.4	-0.5
	United States	5 360.6	5 891.5	5 547.5	7 340.4	1.1	2.6
	India	2 024.8	2 423.1	2 187.3	2 963.4	2.0	2.8
	China	4 362.5	4 800.3	4 885.3	5 889.4	1.1	1.7
Labour productivity *(dollars at constant 2005 prices)*	World	1 258.7	1 577.3	1 603.7	2 124.7	2.5	2.6
	Middle-income countries	1 047.6	1 244.4	1 274.9	1 837.0	1.9	3.4
	Low-income countries	381.3	406.2	412.0	499.7	0.7	1.8
	High income countries	..	22 131.8	23 205.5	36 201.1	..	4.1
	Brazil	3 219.9	4 885.7	5 322.1	9 893.1	4.7	5.8
	Argentina	13 885.4	18 284.0	17 903.1	23 165.4	3.1	2.4
	Germany	22 407.8	22 602.1	23 470.3	38 051.9	0.1	4.5
	France	28 698.6	46 312.0	50 798.2	79 962.5	5.5	4.2
	United States	..	42 801.6	43 714.5	74 464.7	..	5.0
	India	749.8	891.7	822.9	1 116.3	1.9	2.8
	China	590.0	793.6	814.1	1 332.6	3.3	4.6

Source: World Bank, "Indicators", 2016 [online] https://data.worldbank.org/indicator.

Brazilian agriculture reveals productive potential in the temperate and tropical zones, with the South and Centre-West regions of the country having higher rainfall, better soils and moderate infrastructure. Properties in these regions are technology-intensive (OECD/FAO, 2015). Research undertaken by the Brazilian Agricultural Research Corporation (Embrapa) and universities produced technological packages that were adapted and responsible for the "tropicalization" of agriculture in Brazil (Mendonça de Barros, 2014; Vieira Filho and Silveira, 2016; Vieira Filho and Fishlow, 2020).

Argentina has land available to expand production, along with abundant water and excellent agricultural soils. It has a total area of 278 million hectares, of which 149 million are used for agriculture. In 2013, approximately 108 million hectares were classified as land under permanent meadows and pastures, 39 million as arable land, and 1 million hectares as land under permanent crops (FAO, 2013). The country is a world leader in the adoption of no-tillage agriculture. According to PwC Argentina (2014), the area dedicated to no-tillage almost tripled in the last decade, to nearly 27 million hectares (almost 80% of the country's agricultural area).

Argentina, Brazil, India and China have posted rising agricultural production indices over time and have the highest relative rates of growth. International comparisons (OECD/FAO, 2015) identified Brazil as one of the countries in which total factor productivity (TFP) has grown the most. Between 2006 and 2010, TFP grew by 4.3% per year in Brazil, 2.7% in Argentina, 1.9% in the United States and 3.3% in China. According to Binswanger-Mkhize and d'Souza (2012), productivity growth in India was 2.4% between 2006 and 2009.

Crop and livestock production and land indicators trended negatively in the case of France. Between 1992 and 2002, the French TFP index was 1.6%, but it dropped to 0.9% between 2003 and 2011. The 2008 crisis undermined economic growth, which had a knock-on effect on agricultural productivity (Boussemart, Butault and Ojo, 2012). Between 2002 and 2013, Germany's productivity index grew by 1.0% (Kijek and others, 2015).

2. Performance of the countries in the global marketplace

Brazil became the world's third largest exporter of agricultural products, behind the European Union and the United States. Its largest trading partners were the European Union, China, the United States, Japan, the Russian Federation and Saudi Arabia (OECD/FAO, 2015). As shown in table 4, agribusiness plays a very important role in the Brazilian trade balance in generating foreign exchange. A comparison between 1997 and 2013 shows that while the trade balance of the other sectors of the economy remained negative, with few exceptions, agribusinesses grew throughout the historical series. There were significant changes in the structure agricultural exports. Soybeans, meat and products from the sugar and alcohol sector became very important, which meant a qualitative improvement.

Table 4
Brazil: trend of the trade balance, agribusiness and other sectors of economic activity, 1997–2013
(Trillions of dollars)

Years	Exports			Imports			Balance		
	Agribusiness	Other sectors	Total	Agribusiness	Other sectors	Total	Agribusiness	Other sectors	Total
1997	23.4	29.6	53.0	8.2	51.5	59.7	15.2	-21.9	-6.8
1999	20.5	27.5	48.0	5.7	43.6	49.3	14.8	-16.1	-1.3
2001	23.9	34.4	58.3	4.8	50.8	55.6	19.1	-16.4	2.7
2003	30.7	42.6	73.2	4.8	43.6	48.3	25.9	-1.0	24.9
2005	43.6	74.9	118.5	5.1	68.5	73.6	38.5	6.4	44.9
2007	58.4	102.2	160.6	8.7	111.9	120.6	49.7	-9.7	40.0
2009	64.8	88.2	153.0	9.9	117.8	127.7	54.9	-29.6	25.3
2011	95.0	161.1	256.0	17.5	208.7	226.2	77.5	-47.7	29.8
2013	100.0	142.1	242.0	17.1	222.7	239.7	82.9	-80.6	2.3

Source: Ministry of Agriculture, Livestock and Supply, *Projeções do agronegócio: Brasil 2017/18 a 2027/28, projeções de longo prazo*, Brasilia, 2018.

In 1997, agribusiness exports totalled US$ 23.4 billion, while the corresponding imports were just US$ 8.2 billion. This produced an agribusiness trade surplus of US$ 15.2 billion. In 2013, sector exports amounted to US$ 100 billion, while imports were US$ 17.1 billion, implying a surplus of US$ 82.9 billion. When analysing the other sectors of economic activity, a trade deficit of US$ 21.9 billion was recorded in 1997, and the balance remained negative and widened to US$ 80.6 billion in 2013. Consequently, the aggregate trade balance for the economy as a whole, including agribusiness, was in deficit in 1997 (around minus US$ 6.8 billion) and in surplus in 2013 (around plus US$ 2.3 billion).

According to the data presented in table 5, Brazil is the world's leading exporter of soybeans, coffee beans, raw and refined sugar, orange juice, beef and chicken meat; and it is also the second largest maize exporter. Brazil's agricultural growth is attributed to the expansion of production in the Brazilian Cerrado region and, recently, to the growing production in the Matopiba region (Vieira Filho, 2016).[1] The country's cotton exports have also increased considerably: whereas Brazil ranked thirty-second in the 1992 export ranking, by 2013 it had risen to fourth place.

According to Fuglie, Wang and Ball (2012), countries that have built national research systems capable of developing and adapting a continuous flow of technologies in local production systems tend to achieve higher productivity rates over time. Technologies that have had positive effects on Brazilian food production systems include no-tillage, biological nitrogen fixation, productive integration techniques, genetic improvement of animals, and forage improvement through hybridization and biotechnology (CGEE, 2014; Vieira Filho and Fishlow, 2020). According to Vieira Filho (2014), the adoption of biotechnology both increases the productivity of varieties and also reduces production costs.

Argentina is the world's sixth largest exporter of agricultural products, behind the European Union, the United States, Brazil, China and Canada. Its agricultural exports totalled US$ 7.5 billion in 1990, and had grown to US$ 41.5 billion by 2013 (WTO, 2014). In that year, the most important export complexes were oilseeds, especially soybean and cereal production (INDEC, 2014). In 2014, agricultural products accounted for 60% of total exports; and in 2013 Argentina was the world's third largest soybeans and maize exporter, the eighth largest exporter of poultry and the ninth largest beef exporter. Its share of wheat exports decreased, as the country slipped from being the fifth largest exporter in 2001 to the twelfth in 2013. According to the Secretariat of Agriculture, Livestock, Fisheries and Food of Argentina (2009), low rainfall reduced agricultural yield potential between 2008 and 2009.

In 2013, France was the largest agricultural producer in the European Union, with an output of € 75 million, representing an 18.6% of the bloc's total. It was followed by Germany (13.8%), Italy (11.9%) and Spain (10.5%) (Eurostat, 2013). The data show that, in 2013, France was the world's second largest exporter of refined sugar; and it was ranked third in wheat, fifth in maize and roasted coffee and sixth in chicken. Fifty-four percent of the country's land area is used for agriculture, and more than half of the cereal production was wheat. This makes France the world's fifth largest cereal producer, behind China, India, the Russian Federation and the United States. It also has the largest livestock herd in the European Union. Cattle account for 22% of animal production, followed by chickens (14%) and pigs (13%) (Ministry of Agriculture, Agrifood and Forestry of France, 2016).

[1] Matopiba = the States of Maranhão, Tocantins, Piauí and Bahia.

Table 5
Selected countries: position in the world ranking of agricultural exports, 2013

Products	Argentina			Brazil			China			France			Germany			India			United States		
	1992	2001	2013	1992	2001	2013	1992	2001	2013	1992	2001	2013	1992	2001	2013	1992	2001	2013	1992	2001	2013
Beef	7	13	9	8	4	1	20	21	30	5	10	19	9	6	8	-	-	-	2	2	3
Coffee beans	-	-	-	2	1	1	87	36	17	23	22	38	8	7	5	12	11	10	19	18	20
Cotton	17	18	31	32	8	4	6	17	40	38	45	44	26	27	37	18	43	2	1	1	1
Chicken meat	43	25	8	4	2	1	7	5	11	3	4	6	9	10	7	43	25	8	2	1	2
Maize	4	3	3	52	5	2	3	4	35	2	2	5	9	7	15	66	18	6	1	1	1
Orange juice	7	15	21	1	1	1	-	22	40	15	10	11	8	26	15	-	-	61	2	2	4
Pork	24	45	53	-	9	6	-	12	12	47	7	13	14	8	2	-	37	-	-	2	1
Raw sugar	17	27	33	5	1	1	23	56	54	30	32	21	14	48	40	34	10	8	39	53	36
Refined sugar	38	38	34	1	2	1	3	8	48	1	1	2	3	3	4	11	5	6	8	21	27
Roasted coffee	65	51	61	21	24	30	39	77	27	8	11	5	1	2	3	22	38	53	5	3	4
Soybeans	3	3	3	2	1	1	4	7	10	14	26	22	12	15	25	-	27	11	1	1	2
Wheat	7	5	12	-	62	17	40	21	63	3	4	3	5	6	6	34	8	7	2	2	1

Source: Food and Agriculture Organization of the United Nations (FAO), Corporate Database for Substantive Statistical Data (FAOSTAT), 2016 [online] http://www.fao.org/faostat/en/#country.

Germany has 81 million of the world's wealthiest consumers and is by far the largest market in the European Union (Rehder, 2014). Half of its total land area is used for agriculture; and its average farm size increased from 36.6 hectares in 1999 to 45.3 hectares in 2007 (Federal Ministry of Food, Agriculture and Consumer Protection of Germany, 2009 and 2016). German agricultural exports have doubled since 1990 and quadrupled since 1980. With 8% of exports and 68% of imports, the European Union was the largest destination for German sales. In addition to the European bloc, the country's main trading partners are Brazil, China and the United States (Federal Ministry of Food, Agriculture and Consumer Protection of Germany, 2009). In 2013, the country ranked fifth among the world's largest exporters of coffee beans and third as an exporter of roasted coffee. The German economy is also a leading meat exporter, ranking eighth in beef, seventh in chicken and second in pork in 2013.

In the United States, agricultural exports grew from US$ 59.4 billion in 1990 to US$ 172 billion in 2013 (WTO, 2014). This country was the world's largest exporter of maize, cotton, wheat and pork; and it ranked second in chicken and soybeans, third in beef and fourth in orange juice and roasted coffee. Agricultural modernization in the United States began in the 1950s with improvements in the quality of inputs, such as machinery and chemicals. In livestock production, larger scale and integration between rural producers, input suppliers and processors enhanced the efficiency of production practices (Vieira Filho and Fornazier, 2016). The largest importers of agricultural products from the United States are China, Canada, Mexico, Japan and the European Union (Westcott and Trostle, 2014).

India has become the world's seventh largest net exporter, having grown its agricultural exports from a total of US$ 3.6 billion in 1990 to US$ 46.9 billion by 2013 (WTO, 2014). Since 2004, Indian exports have outpaced those of all other countries, with an annual growth rate of 21%. In comparison, Brazilian exports grew by 15% in the last decade, while China, the United States and the European Union have posted growth rates of 12%, 9% and 10%, respectively. India's position in the world ranking of agricultural commodity exports has improved considerably. In 2013, it ranked the second largest exporter of cotton, sixth in refined sugar and maize, seventh in wheat, eighth in chicken meat and eleventh in soybeans. One of the factors driving export growth was government support for irrigation, energy use and fertilizer adoption, which stimulated export-oriented production of crops such as cotton, sugar, wheat and rice. In addition to the United States, countries with imports of at least US$ 1 billion from India in 2013 were Bangladesh, China, Indonesia, Malaysia, Pakistan, the Islamic Republic of Iran, Saudi Arabia, the United Arab Emirates and Viet Nam (Flake, 2014).

China's world ranking has dropped considerably in most agricultural exports, since its demand for food has outpaced domestic production, causing its agricultural trade surplus to shrink. Brazil is one of the countries that have benefited from burgeoning Chinese demand. In 2000, China was Brazil's eleventh largest import market, with a demand of less than US$ 500 million, equivalent to 3% of the latter's total agricultural exports. In 2013, it purchased almost US$ 22.5 billion of Brazilian agricultural products, and had become that country's largest importer (Scott and Bugang, 2014) (OECD/FAO, 2015).

3. Breakdown of the sources of growth of agricultural exports of the countries studied

Table 6 provides a breakdown of the export growth rate in the countries analysed, between global growth, export composition, destination market and competitiveness. In 1992–2001, global agricultural exports grew at an annual rate of 2.2%. Between 2002 and 2013, with the expansion of emerging markets, growth was 12% per year and affected the entire market. An assessment of each country is provided below.

Table 6
Selected countries: annual growth rates of agricultural export and decomposition of growth into the effects of global growth, export composition, destination market and competitiveness
(Percentages)

Countries	Argentina		Brazil		China		France		Germany		India		United States	
Periods	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Annual growth rate														
Global agricultural exports	2.2	12.0	2.2	12.0	2.2	12.0	2.2	12.0	2.2	12.0	2.2	12.0	2.2	12.0
Agricultural exports	4.8	11.9	10.0	17.9	-5.5	-1.2	-4.3	8.1	3.0	13.2	11.7	23.5	1.8	9.8
Sources of growth														
(i) Global growth	41.0	100.6	15.8	48.4	-53.9	-1 890.7	-65.5	183.0	68.7	85.7	144.4	26.9	122.6	137.3
(ii) Composition of exports	0.9	16.3	5.8	6.4	12.8	36.6	28.9	-26.1	-20.5	-8.2	-22.8	-4.9	3.7	28.6
(iii) Export destination	2.8	23.5	-6.3	-1.8	-12.5	-162.7	64.2	0.1	-52.2	-2.9	21	4.8	68.0	-10.0
(iv) Competitiveness	55.1	-40.5	84.7	47.0	153.6	2 116.8	72.3	-57.0	104.0	25.5	-42.6	73.2	-94.4	-55.9

Source: Prepared by the authors.
Note: 1st period: 1992–2001; 2nd period: 2002–2013.

(a) Argentina

Between 1992 and 2001, Argentine exports grew faster than the global average, its exports being stimulated mainly by global growth (41%) and competitiveness (55.1%). The liberal policies adopted since the 1990s eliminated a number of export taxes and lowered tariffs on capital goods imports, thereby energizing international trade in agricultural products. A key feature of period was technological change, including more intensive input use, the adoption of no-till farming practices and gains in scale. In 1996, the first transgenic crop was introduced in Argentina: herbicide-tolerant soybean. Since then, herbicide-tolerant and insect-resistant transgenic varieties of maize and cotton have been approved (Trigo and others, 2002). The cultivated agricultural area has also expanded, replacing grazing land. The expansion of Argentina's agricultural production was concentrated in cereals, oilseeds and milk, with cereal production growing by 73% between 1990 and 1998, from 20 million tons to nearly 35 million tons. The largest increases occurred in maize (254%) and rice (142%) (Waquil, 2000). The composition factor had little influence on Argentina's export growth.

Between 2002 and 2013, Argentina's exports grew by 11.9%, a rate close to the global average. The drivers of this expansion were world growth, export destination and export composition, with competitiveness a negative factor. In 2000–2013, import substitution policies in agriculture, which used taxes and restrictions to prioritize domestic demand supplied by local production, had adverse effects on the agriculture sector. Inflation rates were higher than in the rest of the world, and public expenditure outpaced tax revenue. The destination market explained 25.3% of the export growth rate. Over 50% of Argentina's exports are sent to five markets: the European Union (20%), the Southern Common Market (MERCOSUR) (13%), China (10%), the United States (4%) and Chile (4%). The composition of exports had a smaller impact of 16.3%. As in the previous period, Argentina's export structure was concentrated in soybean products (Regúnaga and Tejeda, 2015).

(b) Brazil

Between 1992 and 2001, Brazil posted annual growth of 10%, while global exports expanded at a rate of 2.2%. Financial crises were a salient feature the international market in the 1990s. Nonetheless, global economic growth accounted for 15.8% of the increase in Brazilian exports. The most influential factor was the residual competitiveness effect, which accounted for 84.7%. Exports benefited from a more open economy and greater international integration —not only through trade flows, but also

through foreign direct investment (Pinheiro, Giambiagi and Gostkorzewicz, 1999). Agricultural exports helped improve the trade balance, which had slipped into deficit owing to the appreciation of the real in the second half of the 1990s.

Between 2002 and 2013, Brazil's agricultural exports outpaced the global average, the key drivers of growth being world trade (48.5%) and competitiveness (47%). The positive performance of exports in the last decade, especially since 2004, is associated with the commodity boom, which enabled the increase in export value (Pires and Santos, 2013). The rise in prices was driven by China's growth and, consequently, by its demand for commodities. Brazil became the largest supplier of soybeans to the Chinese market, increasing its export share to about 30% between 2000 and 2010 (Jenkins, 2012). Although competitiveness was also a significant factor, its importance declined from one period to the other, indicating the need to improve policies to foster productive efficiency.

(c) China

In a different scenario than that of the other countries, China posted a negative export growth in the two periods analysed, owing to competitiveness and composition factors. According to Fukase and Martin (2014), consumption is outpacing domestic production. Given the size of China's population and its income growth in recent years, food security has become a priority. Accordingly, the Government imposed export restrictions, lowered tariffs on imported goods and looked to the external market to source agricultural products. To this end, trade agreements were revised, foreign land was acquired and investments were made in transnational agribusiness firms (Figueiredo and Contini, 2013).

The demand for animal feed to sustain its growing livestock production had an impact on world trade (Gale, 2015). China has become the largest importer of soybeans, which contributed to the price increase of recent years. Increasing demand also drove up meat prices (Jenkins, 2012). According to Tong, Fulgitini and Sesmero (2012), while demand expanded, productivity also increased between 1993 and 2005, at an estimated 4% per year. In the 1990s, the rise in this indicator slackened, owing to the implementation of policies such as the governors' grain-bag responsibility system, which advocated self-sufficiency in grain production, but resulted in an inefficient reallocation of resources. Since 2000, productivity growth has resumed.

Chinese manufacturing exports have generated much of the demand for commodities, with the largest export sector, manufacturing, driving economic growth. Urban and industrial growth also increased competition for land and scarce resources (Roberts and Rush, 2012). The economic boom led to agricultural land being converted into housing complexes, industrial parks, power plants and other projects. Competition for land intensified; and increased domestic production of meat, milk, fruit and vegetables competed directly with cereal crops.

(d) France

In the first period analysed, French agricultural exports declined in absolute terms (growth of minus 4.3%). The competitiveness factor was the main contributor to this result, while global growth was the least detrimental. At the end of the 1990s, when Germany increased its exports by cutting the prices of final products, France did the opposite by hiking prices in response to depreciation of the euro.

In terms of market structure and income support for farmers, France belongs to a regional economic organization, the European Union, which has fostered the continuous strengthening of an internationally competitive trade market since 1985 (Coleman and Chiasson, 2000). In 2001, the Doha Round of trade negotiations confirmed the liberalization of agricultural and food markets. This opening-up process,

which began in Marrakesh in 1994, elicited a considerable reduction in protectionism. Nonetheless, France still maintained a high degree of protection for its agricultural products —estimated at 36% in 1997 (Chevassus-Lozza and Daniel, 2006).

In the second period, the exports grew at less than the global average rate, but was positive at 8.1% —driven basically by world trade growth, while destination hardly had any effect. Both competitiveness and export composition had negative effects. After 2005, the return on agricultural assets increased by 34.6% in real terms across the European Union. While in Germany, the United Kingdom and the Netherlands, the increase was 50%, in France it was below average (Lubatti and Bernadeau, 2015). French growth potential was damaged by the 2008 crisis, which impacted productivity directly; and between 2000 and 2007, France lost 30% of its export market to Germany and emerging markets (Lacan, Lelievre and Mourier, 2013). Despite being the largest agricultural exporter in the European Union, its exports grew at an average rate of 5% between 2006 and 2012, while the Netherlands saw export growth of 7% and Germany 8% in the same period. The loss of competitiveness of French exports reflected labour costs, health issues and, in particular, the small size of farms, which are unable to compete on the world market (Journo, 2014).

(e) Germany

In the 1990s, the German economy grew very little, with per capita GDP growth averaging 1.4% per year. As Ahearn and Belkin (2010) note, this weak performance is explained by several factors, including the high cost of integrating the East German economy since reunification in 1990, the high cost of social programmes, and the fact that the German economy has prioritized exports ahead of domestic investment. Between 1992 and 2001, German exports grew by 3% per year, compared to global export growth of 2.2%. Global economic growth (68.7%) and competitiveness (104%) were the main drivers of Germany's agricultural export growth. The openness of the economy and the stability of the currency contributed to imports of new technologies, which boosted agricultural activity. Despite the high cost of political and economic reintegration, reunification was positive for the agricultural export sector. Productivity in the east increased considerably, surpassing that of the west in the early 1990s (Koester and Brooks, 1997).

The composition and destination effects contributed negatively to German exports. The expansion of trade was significant between the emerging markets of Southeast Asia and Latin America and, above all, among the reforming economies of Central and Eastern Europe. Between 1990 and 1997, exports to Southeast Asia increased from 2,000,000,000 deutschmarks (DM 2 billion) to DM 4 billion, and sales to Latin America grew from DM 1 billion to DM 1.8 billion (Hinze, 1998). However, between 1997 and 1998, the economy was vulnerable to international shocks and was shaken by the crisis in Asian countries. Between 1999 and 2001, the negative impact was due to the rise in international oil prices (DG ECFIN, 2002); and between 1993 and 2000, Germany suffered an outbreak of classical swine fever. The main strains that spread throughout the European Union were caused by a virus originating in Asia, introduced via domestic pig feed (Penrith, Vosloo and Mather, 2011). The outbreak had an adverse impact, which may partly explain the result.

Between 2002 and 2013, German export growth outpaced the global average. About 85.7% of this was due to global growth and 25.5% due to competitiveness. German exports to North America, which totalled US$ 73 billion in 1991, increased to US$ 420 billion in 2013. For South America, the equivalent values were US$ 1.6 billion in 1992 and US$ 1.4 billion in 2013. For Central America, the figures were US$ 2 billion in 1992 and US$ 960 million in 2013. German exports to Asia, which totalled US$ 19 billion in 1992, amounted to US$ 1 trillion in 2013. Lastly, exports to European Union countries grew from US$ 2 trillion to US$ 10 trillion during the same period.

Although the European Union recorded an increase in agricultural exports in 2000 and 2001, its share of the world market has declined over time (Bojnec and Fertő, 2014). Destination continued to be a negative factor. Exports were mostly concentrated in the European Union (56%), followed by Asia (18%) and the Americas (13%) (Ministry of Foreign Affairs of Brazil, 2014). The composition of exports was also a negative factor, whereas competitiveness was the second largest driver of export growth, although less than before. Although food prices have fallen since 2008, farmers have continued to pay high prices for inputs such as fertilizers and machinery, which increased significantly in that period. In 2008, the agricultural input price index was 44.8% higher than in 2000 (Federal Ministry of Food, Agriculture and Consumer Protection of Germany, 2009). These factors undermined Germany's international agricultural competitiveness.

(f) India

In both the first and the second periods under analysis, the growth of India's agricultural exports outpaced the global average. The expansion of the external market played a major role in the first period, while competitiveness became more important in the second. In 1995, India became a member of the World Trade Organization (WTO); but, despite sustained productivity growth in the 1990s, the rate of return on agricultural products after liberalization was well below the rates seen in other regions of the world. Apart from the production of sugarcane, tea, coffee and jute, crop yields were below the world average. This scenario may explain the adverse effect of competitiveness in the first period. Since 2000, trade flows between emerging countries have expanded.

India's export growth rate exceeded that of all the other countries analysed, making India a major player in the world market, especially in the production of rice, cotton, sugar and buffalo meat. The United States is the largest market for Indian exports, followed by China, Iran, Viet Nam, Bangladesh and Saudi Arabia. Exports to developing countries were also particularly strong (Flake, 2014). While composition had a negative impact on the export growth rate, its outcome was less unfavourable than in the previous period. The export structure changed: traditional crops, such as tea (1.6% of the value of agricultural exports), coffee (1.8%), sugar (2.8%), spices (6.2%), nuts and seeds (4.6%), gave way to more dynamic sectors, such as guar gum (4.5%), rice (18.2%), meat and meat products (10.5%) and wheat (3.6%).

India's growth rate, labour productivity and TFP all declined between 1990 and 2000. Total factor productivity fell from 2.1% in the 1980s to 1.4% between 2000 and 2007. In contrast, Chinese TFP grew by 3% in the same period. Excessive agricultural subsidies in India hampered investments in research, extension and infrastructure. Low rates of investment lead to declining productivity, inefficiencies and hence higher production costs, and domestic food price inflation. Moreover, as irrigation and storage facilities are inadequate, Indian agriculture relies on the monsoon seasons, which makes its agricultural production a hostage to climatic disturbances (Dwivedy, 2011).

(g) United States

In the first period under review, agricultural exports from the United States grew positively, although at a slower pace than the global average. While world trade was a major driver of this growth, global competition increased, putting increasing pressure on the United States export sector and domestic market (Dimitri, Effland and Conklin, 2005).

Declining competitiveness was the main negative factor in the first period, and again in 2002–2013. According to Pardey (2009), productivity growth in the United States declined between 1990 and 2005, relative to 1961–1989. This slowdown responded to various factors, including climate change, reduced

investment and natural resource depletion. The slow growth of agricultural crop production between 1990 and 2000 fuelled concern about a possible slowdown in the sector (Wang and others, 2015).

Agricultural areas expanded in countries with larger amounts of available land. The fact that land is cheaper in Brazil than in the United States or Argentina, and soybean production cost are lower, gives Brazilian agriculture an advantage (Meade and McBride, 2016). Between 1992 and 2001, export destination exerted a 68% positive influence on the growth rate of United States agricultural exports; but in 2002–2013 its effect was negative. In the 1990s, the main destinations for its agricultural exports were Japan, the European Union, the Russian Federation, and the Republic of Korea. In contrast, in the last decade, the United States has concentrated its sales in China, which accounted for 16.7% of its exports in 2013, followed by Canada (15.2%) and Mexico (12.7%). Although exports grew positively throughout the period (9.8%), the growth rate remained below the world average. World trade was the main driver, fuelled by burgeoning demand from emerging countries, especially China. In 1995, the United States exported a total of US$ 4 billion to China, but by 2013 the value had risen to US$ 23 billion (Beckman, Dyck and Heerman, 2017).

Table 7 presents a comparative summary of the countries and the two periods analysed, showing the sources of agricultural export growth by their degree of importance, with a view to facilitating understanding of the information set out above.

Table 7
Selected countries: synthesis of the decomposition of the sources of agricultural export growth

Period	Countries	Global growth	Composition of exports	Destination of exports	Competitiveness
From 1992 to 2001	Brazil	XXX	XX	X	XXXX
	Argentina	XXX	X	X	XXXX
	Germany	XXX	X	X	XXXX
	France	X	XX	XXX	XXXX
	United States	XXXX	X	XXX	X
	China	X	XX	X	XXXX
	India	XXXX	X	XX	X
From 2002 to 2013	Brazil	XXXX	X	X	XXX
	Argentina	XXXX	XX	XXX	X
	Germany	XXXX	X	X	XX
	France	XXXX	X	X	X
	United States	XXXX	XXX	X	X
	China	X	XX	X	XXXX
	India	XX	X	X	XXXX

Source: Prepared by the authors.
Note: XXXX is very important; XXX is moderately important; XX is unimportant; and X is very unimportant.

IV. Final remarks

This study has successfully analysed the export performance of the leading countries in international agricultural trade, using constant market share analysis. Brazil, Argentina and India posted export growth rates in excess of the global average, both in the first period (1992–2001) and in the second (2002–2013). While the importance of competitiveness declined in Brazil and Argentina, both countries have advantages in terms of the availability of agricultural land and high rates of agricultural production. Is agribusiness growth in these two Latin American economies on the right track? In Brazil, competitiveness was a key driver in the two periods analysed, which indicates a positive performance. In Argentina, the importance of competitiveness declined in the second period, and export growth became dependent on the international situation. For this reason, Argentina's export performance is more fragile than that of Brazil.

The case of India is somewhat more complicated, especially with regard to productivity, which declined. Nonetheless, competitiveness improved significantly in the second period. In the case of Brazil, despite progress in agricultural policy and research, there are vulnerabilities in terms of health protection and infrastructure. In Argentina, the infrastructure problem was compounded by climate instability and protectionist policies that had adverse effects on grain prices.[2]

The United States is the world's second largest food exporter. Between 2002 and 2013, the expansion of world trade and the composition of exports were the main drivers of its export growth. However, productivity growth in that country has been slowing over time, possibly related to climate change and reduced investment. In terms of infrastructure, the United States economy has a major advantage over that of Brazil, since most of its agricultural production (about 60%) is transported through the waterway system, at a cost of US$ 9 per ton. In contrast, Brazil transports much of its production by road, at an average cost that is eight times higher (US$ 70 per ton).

The positive export performance of the countries analysed was stimulated mainly by the growth of world trade. China, in contrast, posted a negative result owing to domestic growth, which boosted the world economy but slowed the advance of Chinese international trade. Domestic demand exceeded its own production, and this brought forth policies to discourage the export of agricultural commodities.

In the case of Germany, agricultural exports performed well, whereas France has been losing competitiveness over time. In the German case, the openness of the economy together with currency appreciation helped to import new technologies, boosting production and yields. In the French case, protectionist policies harmed export performance, with growth rates below the world average. Composition, destination and competitiveness were all negative growth factors.

Given the lacklustre growth of the developed countries following the 2008 crisis and the expansion of China and India, countries such as Argentina and Brazil are displaying greater international engagement in the agricultural export scenario. South America enjoys a privileged position, as its agricultural land has not yet been fully exploited and its freshwater supply per capita is one of the most abundant in the world. From this perspective, Brazilian agriculture is superior to that of other countries, especially in terms of productivity gains and the incorporation of new agricultural frontiers —factors that require intensive use of knowledge and research.

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[2] Although Argentina is more efficient than Brazil in terms of transportation, infrastructure is an obstacle in its agricultural marketing system. According to Pastor (2012), in certain periods of the year (harvest peaks), its road and rail networks tend to become overloaded, as 85% of transport is by road (using an inefficient and outdated fleet). Of the 25,000 rail cars available, only 65% are used, and barely 2% of production is transported by the waterway system.

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Unionization and wages: a quantile analysis[1]

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Abstract

The aim of this article is to analyse the wage effects of unionization in a sample of the Brazilian population in 2015. Using data from the National Household Sample Survey (PNAD) and its supplement on labour relations and unionization, econometric techniques (ordinary least squares, propensity score matching and unconditional quantile regressions) are used to test the hypotheses that being unionized affects wages, and whether there is an additional benefit in the case of unions that participate more actively with their members. The results show that there is a positive relationship between unionization and average wages. It was also found that an increase in total unionization seems to reduce the pay of workers at the lower end of the distribution, but raise wages for the majority of the population. In addition, unions that participated in an agreement in the last 365 days generated average gains of 4.3%.

Keywords

Trade unions, labour relations, wages, economic analysis, econometric models, Brazil

JEL classification

J31, J51, J83

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[1] The authors are grateful to the Higher Level Personnel Training Coordination Unit (CAPES) and the National Council for Scientific and Technological Development (CNPq) for funding this research. Any errors or omissions are the authors' responsibility.

I. Introduction

In 2016, the Brazilian government sent a draft law to the national congress, making several changes to the structure of the *Reforma Trabalhista* [Labour reform] instrument. Of these changes, withdrawal of the mandatory nature of the union contribution proved controversial. The law required Brazilian workers to donate one day of service per year to the union of their job category. In 2016, about R$3,532,487,702 was collected in this way, corresponding to 0.06% of that year's gross domestic product (GDP). According to Menezes-Filho and others (2002), the unions, which have government authorization to act, have exclusive jurisdiction to negotiate category wages, including those of non-unionized workers, who also have to pay the contribution. According to these authors, this amount is distributed as follows: 15% for the state union federation, 5% for the national union federation, 20% for the Special Employment and Wage Account (CEES) and the remaining 60% for the union itself.

In July 2017, there were 16,625 unions registered in Brazil, between workers' unions (68.63%) and employers' associations (31.37%). However, this large number does not necessarily represent the members in question. According to Campos (2014), Brazil had a unionization rate of 17%, very similar to many of the other countries researched by that author, including Chile and Japan. Campos (2014) showed that, civil servants have the highest unionization rate among urban workers (36.8%), while unregistered employees in the private sector have the lowest rate. The author also notes that the Brazilian model differs from that of other countries because union entities can speak for the category as a whole, even if there are non-affiliated workers. According to Cardoso (2014), the membership rate varied between 22.5% and 18.1% between 1988 and 2012.

Thus, against this backdrop, unions will have to seek new forms of financing as from 2018, when the law comes into force, either by charging higher dues to their members or by attracting new members. When the "union tax" ends, these entities will have to be more competitive and participatory. The expected natural effect will be the end of inefficient unions and the growth of those that succeed in serving their members in a satisfactory manner, either by negotiating better wages, or by improving the work environment or offering other services that attract them.

Globally, many articles have reported that unionized workers are more likely to have job protection and to receive social benefits and pensions (Ebbinghaus, Göbel and Koos, 2011; Lu, Tao and Wang, 2010; Western and Rosenfeld, 2011). There are also studies showing that workers receive a wage premium from union membership (Borjas, 1979; Gyourko and Tracy, 1988; Mellow, 1982; Mishel, 2012; Yao and Zhong, 2013). In the case of Brazil, Campos and Moura (2017) analyse the probability that unionized workers receive additional benefits; and they use conditional quantile regressions to show that these workers earn more, mainly along the wage distribution.

In view of the above, two hypotheses are tested using the 2015 National Household Sample Survey (PNAD) and its supplement on labour relations and unionization of the same year —*Pesquisa Nacional por Amostra de Domicílios: aspectos das relações trabalhistas e sindicalização* [National Household Sample Survey: aspects of labour relations and unionization] (IBGE, 2015). The methodology of unconditional quantile regressions (regression of the recentred influence function (RIF)) is used. (Firpo, Fortin, and Lemieux, 2009), along with ordinary least squares (OLS) weighted by propensity score matching, to test the following hypotheses:

1. Hypothesis 1: being unionized increases average wages

According to the international literature on the subject (Bloch and Kuskin, 1978; Borjas, 1979; Gyourko and Tracy, 1988; Yao and Zhong, 2013; Yilmaz and San, 2017), unions have a positive effect on wages. The methodology employed comprises the Oaxaca-Blinder decomposition on the mean (ordinary least

squares); OLS weighted by propensity score matching, and recentred influence functions (RIF) regression, because the model does not presume the distribution of the dependent variable and makes it possible to visualize the results in the different income percentiles. The data source is the 2015 PNAD. The analysis of Campos and Moura (2017) was elaborated further by controlling for variables representing occupation and branch of activity, which made the results more robust. The RIF regression has the advantage of analysing the effect of an increase in the total number of unionized workers on quantile wages, which affords a broader view than conditional quantile regressions, which only make a local analysis.

2. Hypothesis 2: the degree to which individuals are involved in union activities affects wages directly

Where differentials exist between the wages of unionized and non-unionized workers, the analysis will verify whether the degree of unionization affects wages. Using information from the PNAD 2015 supplement on labour relations and unionization, and the doubly robust OLS and propensity score matching models, the hypothesis to be tested will compare only those who are unionized. On average, the results of the models (OLS and propensity score matching (PSM)) show that unionization is associated with an average gain of between 7% and 7.3%. The results of the PSM model were corroborated by the Rosenbaum bounds test, which did not detect the presence of unobservable characteristics that could affect either the probability of being unionized or the outcomes. Across the wage distribution, the RIF regression model shows that an increase in total unionization in Brazil would generate an increase in income for most workers, except for those in the lowest decile, who are estimated to lose.

With respect to the degree of participation in the union, and the use made of it, the results do not show statistically significant gains relative to members who neither make use of their union nor participate in it. However, on average, workers who reported that their unions participated in a dispute or wage negotiation process in the last 365 days have 4.3% higher wages than their peers who did not report any such action by their union.

This study contributes to the literature by verifying the effect of unionization on wages in Brazil. It makes it possible to evaluate not only the wage gains for unionized workers, but also how the degree of unionization (measured by the individual's participation in meetings and his/her use of the services offered by the union) affects the earnings of the respective members. Moreover, unconditional quantile regressions find that the effect of unionization is increasing along the distribution, but is negative for affiliates in the lower tail. Campos and Moura (2017) used conditional quantile regressions to show the individual's gain from joining a union. The data are interesting, as unions in Brazil defend the job category and not just the member. Thus, "free-rider" behaviour can be expected. However, the unions display higher wages than their peers, both in the middle and in the upper tail and median part of the distribution.

This article is divided into six sections, including this introduction. Section II makes a brief review of the literature, and section III provides contextual background on Brazilian union groupings. Section IV describes the data source and the methods used in the study. Section V reports the results obtained, and the sixth and last section offers final remarks.

II. Literature review

This section makes a brief review of the national and international literature on the role played by unions in wages. In the case of Brazil, only Campos and Moura (2017) estimate unionization wage premia directly, both at the mean and across the wage distribution.

There is a vast international literature on the effects of unionization on workers' wages, focused mainly on the United States and China. In the case of the United States, Bloch and Kuskin (1978) use OLS and data from the 1973 U.S. Census Bureau Current Population Survey (CPS) to estimate the wages of union and non-union workers. The authors conclude that the wage structure differs between the two groups. Using data from the National Longitudinal Surveys from 1969 to 1971, Duncan and Leigh (1980) respond to the authors through OLS and Heckman models (to correct sample selection bias). The authors conclude that if selection bias is not corrected, the effect of unionization on wages may be underestimated.

Also with respect to the United States, Borjas (1979) uses selection bias correction (Heckman, 1979) and the OLS model to estimate unionization wage premia. The data are taken from the National Longitudinal Survey of Older Men; and the results show that the reservation wage of unionized individuals is lower than that of their non-unionized peers, while unionized workers earn a premium from membership.

Gyourko and Tracy (1988) and Mellow (1982) estimate the effects of unionization on wages by using OLS and correcting for selection bias. The data source was the U.S. Census Bureau's Current Population Survey (from 1977 and 1979, respectively). The results show that unionized workers are consistently paid more than their non-unionized peers. Correcting for selection bias, Gyourko and Tracy (1988) find that the wage premium obtained from union membership is higher among public sector workers than among those of the private sector.

More recently, Mishel (2012) combines data from the U.S. Census Bureau's Current Population Survey with descriptive statistics to assess the effect of unionization. The author finds that union membership dropped from 26.7% in 1973 to 13.1% in 2011. Moreover, this decline affected the pay of men at the median of the distribution and increased the pay gap between those in managerial and technical positions. Western and Rosenfeld (2011) use the same data (1973–2007) and the OLS model with variance decomposition. The results show an inverse relationship between the unionization rate and wage inequality.

Firpo, Fortin and Lemieux (2009) employed the methods of unconditional quantile regressions (RIF) and conditional quantile regressions to test for differences between union and non-union workers along the income distribution. The data source was the Outgoing Rotation Group supplement to the U.S. Census Bureau's Current Population Survey from 1983 to 1985. The results of the conditional quantile regressions show that being unionized increases wages for men across the wage distribution. Moreover, RIF regressions show that an increase in unionization increases wages in the median and first income decile, but reduces them for those in the bottom decile.

In the case of China, Lu, Tao and Wang (2010) and Yao and Zhong (2013) test the effects of unionization on wages and other variables. The paper by Lu, Tao and Wang (2010) used OLS and instrumental variable methods, with data taken from the 2006 Private Enterprise Survey, to assess the effect of unionization on several variables. The results show that being unionized affects labour productivity positively and increases the likelihood that workers receive housing assistance, maternity leave, and other benefits. However, the results on wages show no significant differences between unionized workers and their non-unionized peers.

The results reported by Yao and Zhong (2013), using seemingly unrelated regressions (SUR) and data from 1,268 Chinese firms in 2006, show that unionization increases median workers' wages and reduces hours worked. It also increases the likelihood that workers have pension coverage. These results remain robust even after adding controls for education, employment and immigration.

Using a multilevel logit model and data from the European Social Survey, Ebbinghaus, Göbel, and Koos (2011) investigate the determinants of unionization in 19 European countries. Controlling for microeconomic and macroeconomic variables, the authors find that the expectation of being protected by unemployment insurance is a strong determinant of unionization. In the case of Romania, using data

from the National Institute of Statistics and data analysis, Stan and Erne (2016) test the hypothesis that migration increases unions' wage bargaining power in the Romanian health sector. The results show no direct effects between migration, labour demand and wage increases through union agreements. Yilmaz and San (2017) use data from the 2004 and 2008 Turkish National Household Surveys and Oaxaca-Blinder decomposition and quantile regressions. Their results show that, on average, unionized individuals earn more, and these results hold across quantiles, indicating larger gains among unionized workers in the lower tail of the income distribution.

In the case of Brazil, several authors, such as Becker (2015), Jacinto and Rodeghiero (2015) and Cruz and others (2016), use being unionized as one of the explanatory variables in wage equations, always using PNAD data. In general, the results report positive effects of unionization on wages. However, in the work of Cruz and others (2016), unionization shows no significant effect on wages in some regions. Gonçalves and Machado (2004) find a wage premium for members —the authors consider unionization as an institutional characteristic— decreasing from 25.38% in 1992 to 19.71% in 2001.

Campos and Moura (2017) combine data from the 2015 PNAD with quantile regressions and income to compare earnings between unionized and non-unionized workers. They use binomial logistic regression to identify the determinants of access to indirect remuneration (transportation, food and health subsidies). The results are significant and indicate that unionized workers have a higher chance (odds ratio) of access to benefits. With respect to earnings, unionized workers earn more both at the mean and in the quantiles, and their earnings increase as they move through the distribution to the right.

III. Labour unions in Brazil

This section provides details of trade unions in Brazil, based on data from the Ministry of Labour and Employment (MTE). Data from PNAD are also used to demonstrate the trend in the number of unionized workers in 2002–2015.

In July 2017, Brazil had 16,625 unions, divided between workers' unions (11,409) and employers' associations (5,216), representing 68.63% and 31.37% of total workers, respectively.[2] Table 1 shows the distribution of unions between rural and urban areas.

Table 1
Brazil: distribution of unions by zone, July 2017

Type of union	Urban zones	Percentages	Rural zones	Percentages	Total
Employer unions	3 595	68.92	1 621	31.08	5 216
Worker unions	8 482	74.34	2 927	25.66	11 409
Total	12 077		4 548		16 625

Source: Prepared by the authors, on the basis of Ministry of Labour and Employment of Brazil.

As shown in table 1, most unions, whether employer or worker, are concentrated in urban areas.

Using PNAD data, table 2 shows the proportion of workers who are union members, using the sample weights provided by the Brazilian Institute of Geography and Statistics (IBGE).

[2] Data for July 2017 [online] http://www3.mte.gov.br/cnes/default.asp.

Table 2
Brazil: union members by gender, 2002–2015
(Percentages)

Year	Unionized	Unionized men	Unionized women
2002	15.89	17.17	14.16
2003	16.70	17.64	15.44
2004	17.09	18.21	15.60
2005	17.38	18.39	16.06
2006	17.62	18.76	16.16
2007	16.99	17.87	15.86
2008	17.49	18.47	16.24
2009	17.07	18.09	15.77
2011	16.72	17.36	15.89
2012	16.19	16.83	15.35
2013	15.59	16.15	14.86
2014	16.17	16.28	16.03
2015	18.84	19.13	18.47
Mean	16.90	17.72	15.84

Source: Prepared by the authors on the basis of the National Household Survey (PNAD).
Note: A difference in means test showed than men are more likely to be unionized than women —a result that is statistically significant at 1%. The National Household Sample Survey does not have data for 2010, because the Brazilian census was held in that year.

Between 2002 and 2006, the proportion of workers who were unionized each year increased from 15.89% to 17.62%. After 2006, the rates fall slightly until 2013, and then recover between 2013 and 2014. In 2015, the first year of a more profound national crisis, the percentage of unionized workers increased substantially. In terms of gender, it is found that, in general, men are more unionized than women.

In the case of men, unionization rates varied between 17.17% and 18.87% in 2002–2011, and then slipped to 16.15% in 2014. Accompanying the total, the proportion grew again in 2015, to reach the peak of the historical series, at 19.13%. The proportion of women who are unionized varied between 14.16% and 16.16% in 2002–2014. As in the case of men, there was a sharp rise in 2015, to 18.47%.

Table 3 shows how union members are distributed between urban and rural employees, self-employed workers (*autónomos*), casual own-account workers (*avulsos*), independent professionals (*profissionais liberais*) and other types of unions.[3]

Until 2009, the proportion of urban employees who were unionized trended in a narrow range between 56.82% and roughly 60%. Subsequently, there was a sharp drop followed by a rebound in 2015, when the rate returned to 57.74%. In 2011, for example, 50.70% of unionized workers were urban employees. The proportion of rural employees who were union members varied between 28% and 30% until 2008, before starting a decline which pushed the rate down to 24.35% in 2015.

The proportion of self-employed workers (*autónomos*) and own-account casual workers (*avulsos*) who are union members decreased throughout the historical series presented in the sample: in the case of the self-employed, the rate almost halved from 2.61% to 1.39%. The same phenomenon occurred in the case of own-account workers, whose unionization rate decreased from 0.41% in 2007 to 0.20% in 2015. The rate also decreased in the independent professionals group, from 5.33% to 2.52% at the end of the historical series represented in the sample.

[3] In Brazil, a distinction is made between self-employed workers, own-account or casual workers, and independent professionals. Self-employed workers (*autónomos*) exercise a professional activity individually and are paid for it. Own account workers (*avulsos*), who may or may not be unionized, provide urban or rural services without an employment contract to several firms that hire labour through mandated intermediaries. Independent professionals have technical or academic training in a specific area and exercise their activities independently, but these are regulated and legalized.

Table 3
Brazil: distribution of unionized workers by type of organization, 2002–2015
(Percentages)

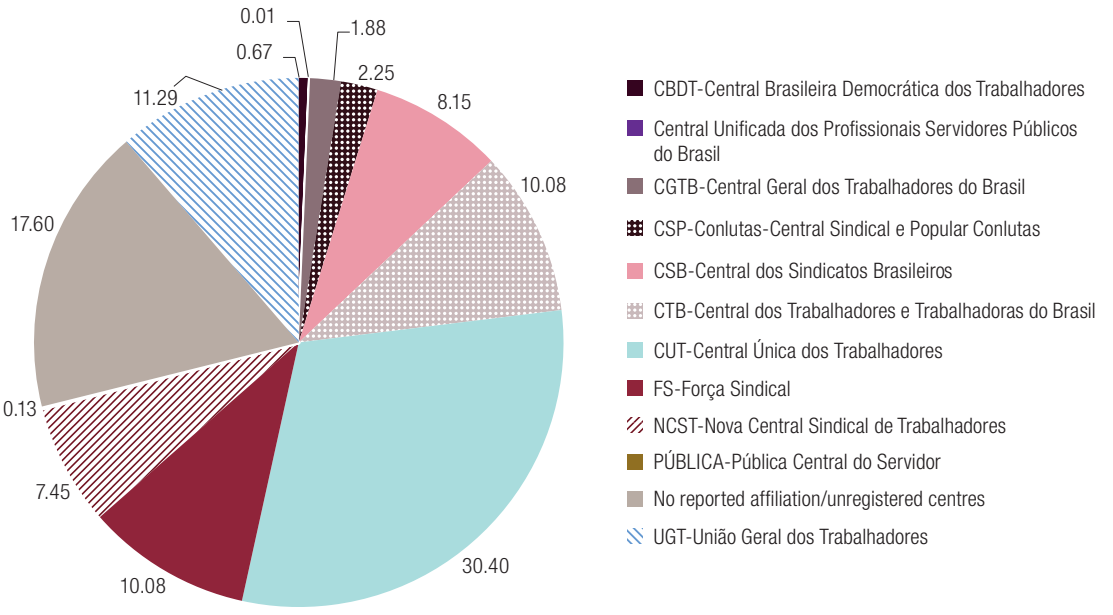
Year	Urban employees	Rural employees	Self-employed workers	Own-account workers	Independent professionals	Other unions
2002	59.83	28.07	2.61	0.36	5.33	3.79
2003	58.43	28.78	2.50	0.38	5.04	4.87
2004	58.82	29.43	2.28	0.29	4.57	4.61
2005	59.97	30.15	2.12	0.32	3.60	3.85
2006	59.41	29.90	1.92	0.38	3.93	4.45
2007	56.82	29.70	2.04	0.41	3.23	7.81
2008	59.51	28.89	1.83	0.38	3.14	6.24
2009	59.66	27.54	1.61	0.20	2.69	8.29
2011	50.70	27.74	1.63	0.34	2.66	16.93
2012	54.58	25.76	1.67	0.23	2.55	15.22
2013	53.37	26.31	1.67	0.33	2.46	15.85
2014	54.06	26.31	1.60	0.29	2.48	15.25
2015	57.74	24.35	1.39	0.20	2.52	13.80
Average	57.15	27.92	1.91	0.32	3.40	9.30

Source: Prepared by the authors on the basis of the National Household Survey (PNAD).
Note: The National Household Sample Survey does not have data for 2010, because the Brazilian census was held in that year.

Given that there were proportional reductions in several groups, the proportion of professionals who reported belonging to another type of union rose by about 4.5 times, from 3.79% to 16.93%, between 2002 and 2011. It is worth noting that, although the percentage is lower, 13.8% of individuals declaring themselves unionized in 2015 belonged to this group.

The Ministry of Labour and Employment publishes the number of affiliated entities in each union federation, as well as the number of members. The data in figure 1 refer to 2013.

Figure 1
Brazil: union membership by trade union federation, 2013
(Percentages)



Source: Prepared by the authors, on the basis of Ministry of Labour and Employment of Brazil.

In 2013, some union federations, such as Central Brasileira Democrática dos Trabalhadores (CBDT) or PÚBLICA, had fewer than 100,000 members. In contrast others had over 1 million, including Central Única de Trabalhadores (CUT), Força Sindical (FS), Central de Sindicatos do Brasil (CSB) and Central de Trabalhadores e Trabalhadores do Brasil (CTB).

Of the approximately 13 million affiliated workers, 30.40% are members of CUT; but 17.6% of workers have union membership that is not registered with the government or affiliated to any federation. In other words, nearly one in every two workers is either a member of CUT, or not a member of any federation, or else is affiliated to a federation that is not registered. The General Workers Union (*União Geral dos Trabalhadores* – UGT), FS and the CTB are also strong federations, accounting for approximately 31.5% of total union members.

Table 4 displays the foregoing data, by federative unit; in other words, the number of workers affiliated to unions in each state or the Federal District, or in unions that are not attached to a specific federative unit. The states with the largest number of labour unions are Minas Gerais, São Paulo and Rio Grande do Sul, with more than 1,000 each. The states with the fewest are Acre and Roraima, with 37 each. Roraima is the state with the fewest affiliates. São Paulo, the most populous state, also has the largest number of union members, at close to 3 million.

Table 4
Brazil: unions and unionized workers by federative unit, 2013

Federative unit	Unionized	Unions	Federative unit	Unionized	Unions
-	487	1	PA	261 073	290
AC	14 387	37	PB	265 227	338
AL	150 334	192	PE	1 013 362	394
AM	107 326	148	PI	400 566	284
AP	24 913	44	PR	747 638	825
BA	864 051	558	RJ	766 588	546
CE	480 061	427	RN	204 333	241
DF	395 269	136	RO	100 553	112
ES	336 316	229	RR	12 935	37
GO	206 223	341	RS	953 184	1 056
MA	409 830	335	SC	562 895	717
MG	1 000 504	1 163	SE	144 395	197
MS	201 372	297	SP	2 952 909	1 670
MT	128 070	258	TO	50 510	74
Total	12 755 446	10 947			

Source: Prepared by the authors, on the basis of Ministry of Labour and Employment of Brazil.
Note: Acre (AC); Alagoas (AL); Amazonas (AM); Amapá (AP); Bahia (BA); Ceará (CE), Distrito Federal (DF) Espírito Santo (ES); Goiás (GO); Maranhão (MA); Mato Grosso (MT); Mato Grosso do Sul (MS); Minas Gerais (MG); Pará (PA); Paraíba (PB); Paraná (PR); Pernambuco (PE); Piauí (PI); Roraima (RR); Rondônia (RO); Río de Janeiro (RJ); Rio Grande do Norte (RN); Rio Grande do Sul (RS); Santa Catarina (SC); São Paulo (SP); Sergipe (SE); Tocantins (TO).

IV. Data and models

This section is divided into three subsections, dealing respectively with: the source data, descriptive statistics and the dependent and independent variables; the theoretical models, describing the theoretical basis behind the economic models; and the empirical models, namely unconditional quantile regression models, OLS with Oaxaca-Blinder and propensity score matching.

1. Data

The aim of the National Household Survey (PNAD), conducted by the Brazilian Geographical and Statistical Institute (IBGE), is to collect socioeconomic and demographic data. The survey is generally conducted annually (except for years in which a demographic census is being held), with the aim of gathering information on the profile of the inhabitants of selected households (sex, age, education, work and income, in addition to household characteristics); and, depending on demand, to collect data on migration and fertility, among other matters.

In 2015, IBGE collaborated with the Ministry of Labour and Employment and the International Labour Organization (ILO), to produce the PNAD supplement on aspects of labour relations and unionization (*Pesquisa Nacional por Amostra de Domicílios: Aspectos das Relações Trabalhistas e Sindicalização*) (IBGE, 2015). Unlike the annual survey, which targets workers aged 10 years or older, this survey studied workers aged 16 years or older and examined the situation of unionized workers in the inference period, generating data on union density in Brazil.

Table 5 reports the descriptive statistics on the variables. The dependent variable is the wage per hour worked in the week. The main variable of interest is binary and measures the effect of the person being unionized. When only those who work are considered, the total number of union members drops by almost 1.2 percentage points from 18.84% to 17.65%.

Table 5
Descriptive statistics

Variable	PNAD 2015		SUPPLEMENT[a]	
	Mean	Standard deviation	Mean	Standard deviation
Hourly wage	13.76	63.68	17.28	68.94
Education level	9.08	4.12	9.66	4.24
Experience	23.04	13.30	24.89	12.88
In-firm experience	7.11	8.48	8.97	9.69
Married	62.93%	0.48	70.82%	0.45
Head of household	48.45%	0.50	56.62%	0.50
Metropolitan area	33.47%	0.47	32.51%	0.47
Urban area	87.99%	0.32	84.72%	0.36
White	46.35%	0.50	49.89%	0.50
Formal	49.42%	0.50	69.56%	0.46
Male	59.23%	0.50	64.15%	0.48
Unionized	17.25%	0.38	-	-
Made use of the union	-	-	19.67%	0.40
Participated in the union	-	-	14.3%	0.35
Active union	-	-	12.25%	0.33

Source: National Household Survey (PNAD), 2015.
Note: The wage variable is expressed in reais per hour; the variables education level, experience and in-firm experience are expressed in years; and the other variables are expressed in percentages.
[a] Part of the supplement *Pesquisa Nacional por Amostra de Domicílios: Aspectos das Relações Trabalhistas e Sindicalização*, in which workers report being unionized.

The control variables are level of education (individuals have an average of 8.5 years of schooling), experience in the labour market (average of 23.2 years) and in-firm experience (average of 7.62 years). These variables are directly related to productivity and are consonant with the income equation (Mincer, 1974).

The independent variables are linked to family and place of work: being head of household, being married, living in a metropolitan region or an urban area. These variables are used in the literature because they are directly associated with wage variations (Cirino and Lima, 2016; Hoffmann and Ney, 2004; Jacinto and Rodeghiero, 2015; Reis and Ramos, 2011; Santos and others 2010).

Dummy variables were also included to represent the type of employment, in each state, each type of occupation listed in the Brazilian Classification of Occupations (CBO) and according to the type of occupation from the National Classification of Economic Activities (CNAE). These variables are important because they separate the wage effect from the fact that employees and employers have different wages, as well as being able to be in different branches of occupation and activity. In addition, the state is considered since, as noted above, unionization patterns vary between them (Lu, Tao and Wang, 2010; Teixeira and Menezes-Filho, 2012).

The variables of interest for the degree of unionization hypothesis (hypothesis 2) are: *Used the union* (V90882), which is a dummy variable referring to the use (or non-use) of services such as legal assistance, medical-dental agreements, among others; *Participated in the union* (V90884), which is also a binary variable identifying persons who reported having participated in union activities (lectures, meetings, among others); and lastly, *Active union* (V90887), which is a binary variable in which the respondent indicates whether the union took action of any kind (negotiation or collective dispute) in the 365 days prior to the interview. It should be noted, however, that the part of the PNAD supplement on labour relations and unionization that was used refers to persons who declared themselves to be unionized.

The cross sections made in the PNAD database refer to age, occupation position and work activity group (both for the main job). Only persons aged 18 to 65 years, who are not military or civil servants and do not belong to civil service activity groups, were considered. For the supplement, in addition to the PNAD cross-sections, only unionized workers were considered, in order to understand the effects of participation, utilization and having an active union on the average earnings of unionized workers.

2. Theoretical model[4]

The wage differential that a worker gains for being unionized is called the wage gap. The difference in earnings between being unionized and non-unionized workers can be calculated using the following equation:

$$D_i = \frac{S_S^i - S_N^i}{S_N^i} \tag{1}$$

where D is the wage differential, S is the wage, the superscript i corresponds to the person and the subscripts S and N refer, respectively, to being unionized and not being unionized.

This differential refers to a single worker. The average pay differential obtained from being a member can be calculated by summing the differences between participating and not participating, so that the average difference is given by:

$$G = \frac{\sum_i^k D_i}{k} \tag{2}$$

where G is the average gain from being unionized and k is the number of individuals.

However, this difference in equations (1) and (2) does not occur because a person is or is not unionized; and production variables must be controlled for in the calculation. Hence, the average wage gap between persons of similar production characteristics but different unionization status is given by the following equation:

$$D = \frac{\bar{S}_S - \bar{S}_N}{\bar{S}_N} \tag{3}$$

The average wage differential arising from union membership is calculated as a percentage.

[4] Based on Borjas (2009).

3. Empirical models

The models used here have two stages: estimation of wages using the income equation proposed by Mincer (1974) —with the doubly robust propensity score matching method and the Rosenbaum bounds sensitivity test— and estimation of the income equation in income percentiles, according to the RIF regression model of Firpo, Fortin and Lemieux (2009), in addition to decomposing the differential at the mean with the Oaxaca-Blinder model.

(a) Ordinary least squares

The OLS model is used to estimate the Mincerian wage equation, which consists of using the natural logarithm of hourly pay regressed against the variable of interest (union membership), along with productivity variables (education, labour market experience and firm experience) and other variables that affect wages (marital status, household responsibility, gender, race), plus a random error term (μ):

$$ln\,y_i = \alpha + \beta d\_sind_i + \theta X_i + \mu \tag{4}$$

where α is the intercept, β is the coefficient on each of the independent variables, X is a vector of covariates, and d_sind is the binary variable that takes value 1 when the person is unionized.

(b) Oaxaca-Blinder

The Oaxaca-Blinder decomposition model arises from the work of Blinder (1973) and Oaxaca (1973). The decomposition creates a counterfactual from the separate estimation of the earnings equations for union and non-union members. The equation is presented in the following form:

$$Y_{NS} - Y_S = X_{NS}\left(\beta_S - \beta_{NS}\right) + \left(X_S - X_{NS}\right)\beta_S \tag{5}$$

where Y is the natural logarithm of hourly income, X is a vector of covariates and β represents the parameters associated with the values of X. The subscripts NS and S represent non-union and union workers, respectively.

The left side of the equality represents the union/non-union wage differential. On the right side, the first term is attributed to discrimination —a price effect— and the second term is the differential explained by observable components —the characteristic effect— (Crespo and Reis, 2004). In other words, the inter-group wage differential is decomposed into two parts: the part attributed to observable characteristics and the part considered in the literature as discrimination.

(c) Propensity score matching

Although the OLS model controls for observable characteristics that affect wages, union members may have observable and unobservable characteristics that differ from those of their non-unionized peers. Thus, a probability model is employed in which the dependent variable is *Being unionized*. Propensity score matching is a way of matching individuals according to observable characteristics, who have similar probabilities of being unionized relative to those who are not.

Two assumptions are considered for the model proposed by Rosenbaum and Rubin (1983). The first is that individuals whose probabilities are within a common range $(0 \leq p(T = 1|X) \leq 1)$ are compared; and, when controlling for observable characteristics, being unionized or not

becomes random $Y_i(0), Y_i(1) \perp T|X$. Thus, the mean effect of being unionized or average effect on the treatment group (ATT) will be given by the difference of the mean scores found for each group: $ATT = E[Y_i(1)|T_i = 1, X = x] - E[Y_i(0)|T_i = 0, X = x]$, where $E[Y_i(1)|T_i = 1, X = x]$ is the population mean for unionized workers and $E[Y_i(0)|T_i = 0, X = x]$ is the population mean for others.

The first step in the estimation of the propensity score matching involves estimating a probability model, probit, given by:

$$P(C_i = 1|Z) = \phi(Y_{i'} + Z_i'\alpha) = \phi(S_{i'}\delta) \tag{6}$$

where the cumulative density function is represented by $\emptyset$; and Si is a binary variable that takes the value 1 if the person is unionized. The index function is given by $Z_i'\alpha$, where Zi is the vector of explanatory variables, which affect the unionization decision.

Having estimated the probit model, the next step is to include the estimated propensity score, $\hat{p}(x_i)$ in the regression, which can be done by imputation or reweighting. However, $\hat{p}(x_i)$ may exhibit non-positive values; so the doubly robust methodology, as highlighted by Hirano, Imbens and Ridder (2003), generates additional gains in robustness, owing to the elimination of the effect of omitted variables, and reduces the correlation between omitted and included variables. The use of the estimated propensity score is more efficient than the true $p(x_i)$. It should be noted that the propensity score is sensitive to the matching estimator, and that the functional form is sufficiently sensitive to consider the overlap hypothesis.

(d) Sensitivity

In addition to good matching, a test must be made for omitted variables that affect both the treatment group (being unionized) and the outcome variable (natural log of wages) at the same time, which may cause bias. In this way, "omitted variable bias" can be tested using Rosenbaum's bounds (Rosenbaum, 2002).

According to Rosenbaum (2002), the probability of participation (in this case, unionization) of an individual i is given by:

$$\pi_i = Pr(T_i = 1 \mid X_i) = F(\beta X_i + \gamma\varepsilon_i) \tag{7}$$

where π_i is the probability that the person is unionized, given a set of observable variables, X_i; and γ is the effect of the unobservable error on the person in the treatment group $(T_i = 1)$. In a case where the bias is non-existent, $\gamma = 0$, the probability of being in the treatment group is given by the observable variables alone.

In a case where the function $F(.)$ has a logistic distribution and two matched individuals, i and j, with relative probabilities of being in the treatment group given by $\frac{\pi_i}{1-\pi_i}$ and $\frac{\pi_j}{1-\pi_j}$, respectively, the ratio of these probabilities is given by:

$$\frac{\frac{\pi_i}{1-\pi_i}}{\frac{\pi_j}{1-\pi j}} = \frac{e^{(\beta X_i + \gamma\varepsilon_i)}}{e^{(\beta Xj + \gamma\varepsilon_j)}} = e^{\gamma(\varepsilon_i - \varepsilon j)} \tag{8}$$

Equation (8) represents the ratio of the probabilities, showing that, when the omitted variables do not affect the probability of being in the treatment group, $\gamma = 0$, the ratio will be equal to 1. When this value is different from 1, there is an important variable that is omitted. In short, Rosenbaum's bounds consist of understanding how the omitted variables affect the differential given by $\varepsilon_i - \varepsilon_j$.

(e) RIF regression

The model developed by Firpo, Fortin and Lemieux (2009) is known as RIF regression, in which the dependent variable becomes an influence function (IF). The model assumes that a linear function of the independent variables can be used to model the conditional expectation of the *RIF (Y;v)*:

$$E\left[RIF(Y;v) \mid X\right] = X\gamma + \varepsilon \tag{9}$$

where, by means of OLS, it is possible to estimate the parameters γ.

In the quantile case, the *RIF (Y; Q_τ)* is an equality with $Q_\tau + IF(Y, Q_\tau)$ and can be written as follows:

$$RIF(y;Q_\tau) = Q_\tau + \frac{\tau - 1\{y \le Q_\tau\}}{f_Y(Q_\tau)} \tag{10}$$

where $f_Y(.)$ is the density of the distribution, at the margin, of Y; Q_τ is the τ-quantile population of the distribution of Y, unconditional; and $1\{.\}$ is an indicator function.

Thus, the following equation is estimated computationally:

$$RIF(\widehat{y;Q_\tau}) = \widehat{Q_\tau} + \frac{\tau - 1\{y \le Q_\tau\}}{\widehat{f}_Y(Q_\tau)} \tag{11}$$

V. Results

Table 6 displays the results of the effect of unionization on wages. The estimation procedure was divided into two parts: OLS and doubly robust propensity score matching. The results are quite similar, which makes initial model more robust.

Table 6
Income equations

Models	Ordinary least squares	Propensity score matching
	(1)	(2)
Unionized	0.073***	0.07***
	(0.005)	(0.005)
Education level	0.037***	0.043***
	(0.001)	(0.001)
Experience	0.003***	0.004***
	(0.000)	(0.000)
In-firm experience	0.008***	0.01***
	(0.000)	(0.000)
Married	0.095***	0.07***
	(0.004)	(0.006)
Head of household	0.071***	0.074***
	(0.004)	(0.006)
Metropolitan area	0.148***	0.156***
	(0.004)	(0.006)
Urban area	0.106***	0.099***
	(0.008)	(0.011)
White	0.074***	0.07***
	(0.004)	(0.006)

Table 6 (concluded)

Models	Ordinary least squares	Propensity score matching
	(1)	(2)
Formal	0.092***	0.098***
	(0.005)	(0.011)
Male	0.135***	0.146***
	(0.005)	(0.007)
Constant	1.345***	2.26
	(0.406)	(169.39)
D_UF	YES	YES
D_EMPLOYMENT_TYPE	YES	YES
D_CNAE	YES	YES
D_CBO	YES	YES
No. of observations	120 090	119 870
Adjusted R^2	0.397	0.482

Source: Prepared by the authors.
Note: * significant at 1%; ** significant at 5%; *** significant at 10%. D_UF is a dummy variable for each federative unit; D_EMPLOYMENT_TYPE represents dummy variables for employer, self-employed and employee; D_CNAE refers to a dummy variable for each branch of activity of the National Classification of Economic Activities (CNAE), and D_CBO refers to a dummy variable for each occupation of the Brazilian Classification of Occupations (CBO).

The results of the production variables, such as level of education, experience and specific experience are related directly to workers' earnings. Education accounts for an average wage increase of between 3.7% and 4.3% per year of study. Labour market experience (EXP) increases wages by 0.3% to 0.4% per additional year. On average, the effect of in-firm experience is greater, between 0.8% and 1% per additional year.

The main variable of interest is the effect of being unionized on wages. As there are controls for the effects of type of work (employee, employer, self-employed), effects related to CBO occupations, activity groups and federative unit, it is possible to control for the effects of all unions on wages. Thus, responding to hypothesis 1, the effect of being unionized turned proved positive, ranging from 7% to 7.3%. Cruz and others (2016) found estimated effects of unionization on earnings of between 9.2% and 11.03% in Brazil's regions in 2006. Jacinto and Rodeghiero (2015) found that unionization had an average effect of 16% on workers' wages in the Porto Alegre metropolitan region. In the case of China, Yao and Zhong found a unionization wage premium of between 8.7% and 12.6%. The effect estimated by Campos and Moura (2017) was 8.4%; and this study estimates the wage premium at between 7% and 7.3% for the unionized group. This is lower than the premia estimated by Gonçalves and Machado (2004), of 25.38% and 19.71% in 1992 and 2001, respectively.

The effect of having a spouse varies between 7% and 9.5% in the models estimated. Being head of household has a negligible effect, just 0.3 percentage points (between 7.1% and 7.4%). The variables representing living in a metropolitan region or an urban area, self-declaring as white, and being male increase people's wages by: 14.8–15.6%; 9.9%–10.6%; 7%–7.4%; and 13.5%–14.6% in the two models, respectively. Individuals working in the formal sector earn between 9.2% and 9.8% more than their peers in the informal sector.

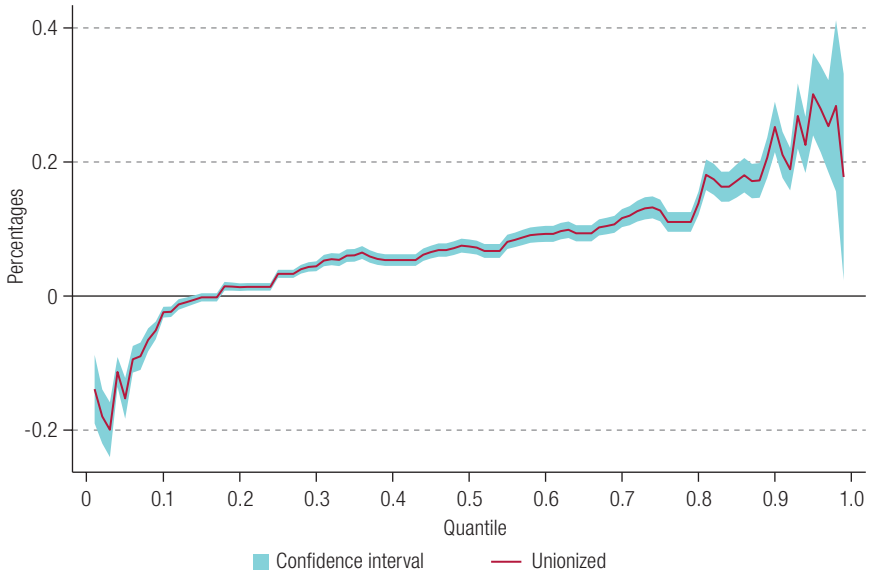
Table A1.1 in annex A1 separates the wage differential between the groups into two components: explained and unexplained —the Oaxaca-Blinder model. The total differential is 28.72% in favour of union members. This is almost entirely explained by production factors (21.41%), such as education level, experience and the other explanatory variables of the OLS and propensity score-matching models. The unionization wage premium is the component explained solely and exclusively by union membership, at 7.31%. In other words, roughly 75% of the wage differential between the groups is observable in the characteristics of the individuals.

Annex A1 presents some important results that corroborate the effect found in table 6 by robust propensity score matching. First, figure A1.1 reports the kernel density before and after matching. While the groups (union and non-union workers) are very different before matching, afterwards they become very similar. Table A1.2 reports the test of means of the variables used in the model, before and after matching. This shows that, before the matching procedure, most of the variables were statistically different between the groups. However, after matching, only two variables remained statistically different between groups.

For the results to be reliable, a sensitivity test needs to be performed. The Rosenbaum bounds omitted variable bias test is reported in table A1.3. The result shows that, at a 1% confidence level, it is possible to reject the null hypothesis that there is an omitted variable that simultaneously affects the treatment (unionization) and the outcome (natural log of hourly wage).

Figure 2 shows the effect of unionization on wages at each income percentile. Estimates were made using the non-conditional quantile (RIF) regression model. The differential varies between approximately 15% against unionized workers and 25% in favour of unionized workers. As shown in table 7, unionization has a positive effect on mean wages.

Figure 2
Effect of unionization on wages, by percentile



Source: Prepared by the authors.

Table 7
Income equation for unionized workers

Variables	Ordinary least squares
Made use of the union	0.011
	(0.013)
Participated in the union	-0.000
	(0.015)
Active union	0.043***
	(0.012)
Education level	0.043***
	(0.002)
Experience	0.003***
	(0.000)

Table 7 (concluded)

Variables	Ordinary least squares
In-firm experience	0.011***
	(0.001)
Married	0.058***
	(0.01)
Head of household	0.063***
	(0.01)
Metropolitan area	0.175***
	(0.012)
Urban area	0.118***
	(0.02)
White	0.067***
	(0.01)
Formal	0.085***
	(0.021)
Male	0.168***
	(0.013)
Constant	1.993***
	(0.074)
D_UF	YES
D_EMPLOYMENT_TYPE	YES
D_CNAE	YES
D_CBO	YES
No. of observations	19 150
R^2-Adjusted	0.521

Source: Prepared by the authors.

Note: * significant at 1%; ** significant at 5%; *** significant at 10%.D_UF is a dummy variable representing each federative unit; D_EMPLOYMENT_TYPE represents dummy variables for employer, self-employed and employee; D_CNAE is a dummy variable representing each branch of activity of the National Classification of Economic Activities (CNAE), and D_CBO is a dummy variable for each occupation of the Brazilian Classification of Occupations (CBO).

Figure 2 shows that up to about the tenth percentile, union members earn less than non-union members. From that point on, the trajectory increases gradually at each percentile, with small oscillations. The results also show that there is a substantial increase in union earnings between the seventy-fifth and eighty-fifth percentile.

Contrary to findings in studies targeted on the United States (Firpo, Fortin and Lemieux, 2009), the greatest protection is given to the wealthiest and not to the lower paid (who are even harmed). The interpretation of the RIF regression model is a higher level of analysis, not just local as in the case of conditional quantile regressions. As shown in figure 2, increasing the number of unionized workers reduces the wages of the lowest paid (first 10 percentiles). Thereafter, earnings rise incrementally until the end of the distribution, where the gains exceed 20%. Firpo, Fortin and Lemieux (2009) find gains of 0.195 for the first decile and losses of 0.135 in the last decile, associated with an increase in the unionization rate. For Brazil, using conditional quantile regressions, Campos and Moura (2017) find that the gains from being unionized increase between the start and the end of the wage distribution. However, the results are analysed by focusing on the income quantile and, in general, the gains across the distribution are statistically identical to the gain at the mean. The result of the unconditional quantile regression, shown in figure 2, indicates the extent to which an increase in unionization affects wages in general across the quantiles. In this case, in the lowest quantiles wages fall, indicating that unions defending those workers' interests are inefficient from the standpoint of financial gains.

Table 7 presents the result of the wage equation among unionized workers. The sample consists of 19,150 individuals. The equation was estimated with a fairly large number of explanatory variables, which partially justifies the adjusted R^2 of above 50%. The aim is to test hypothesis 2, in other words to verify the effect of the degree of unionization on wages. The degree of unionization is measured by the answers given by individual respondents.

The variables representing being a union participant or making use of the union are not significant in the wage equation. However, the mean wage of unionized workers who declare that their union participated in a dispute or collective agreement in the most recent period, is 4.3% higher than that of unionized workers whose union did not participate in any agreement.

Although unionized workers have a higher level of schooling than the overall sample, the gain per year of study is higher, at 4.3%. Experience generates gains of 0.3% per additional year, while the gain from in-firm experience is 1.1% per year. The other controls explaining wages are also significant: being married increases unionized workers' wages by 5.8%, while being a head of household raises them by 6.2%.

Binary variables related to place of residence show gains for people in urban areas and metropolitan regions of 12.6% and 17.7%, respectively. Two variables related to personal characteristics, being male and self-reporting as white, increase wages by 16.8% and 6.7%, respectively. On average, the wages of unionized workers in the formal sector are 8.5% higher than those of their informal-sector peers.

VI. Final remarks

There are roughly 17,000 unions in Brazil and about 17% of people are union members; of these, 73% live in urban areas and represent 68% of all unionized workers.

The initial motivation of this paper was to test the hypothesis that unions affect wages and that the effects are likely to differ across the wage distribution. An additional aim was to test whether the degree of unionization affects wages.

To answer these questions, microdata from the 2015 PNAD and its supplement on labour relations and unionization were used. The methodology employed consisted of OLS models (with Oaxaca-Blinder decomposition), propensity score matching and RIF regression.

The results show that, on average, unionized workers in the sample earn between 7.3% and 7.5% more than their non-unionized peers. These findings are consistent with those reported in the literature: being unionized has a positive effect on wages. When income percentiles are considered, the gain is greater towards the upper tail of the distribution. Nonetheless, higher rates of unionization generally cause a reduction in the wages of the lowest paid workers (up to the tenth percentile).

Hypothesis 2, that the degree of unionization affects wage levels among unionized workers is not confirmed. However, if the unionized worker declares that his or her union participated in collective agreements or disputes in the 365 days prior to the survey (active union), a wage difference of about 4.3% is observed.

As a caveat, it is impossible to capture the indirect effect of collective agreements that affect both unionized and non-unionized individuals. This effect should make the wages of the two groups very similar, but the results do not bear this out.

A closer analysis shows that, although unions have undergone various transformations in the last four decades, as institutions they remain strong, since union membership has a direct effect on the income of unionized workers. It is worth noting that these results weaken a device that has been in place since the 2017 labour reform of individual bargaining between employers and employees. Although it

was impossible to prove income discrimination according to the individual's degree of participation in the union, the wages of unionized workers who reported that their unions had been active in negotiations in the last 365 days were 4.3% higher, on average, than those of their peers whose unions were less active. Moreover, differences in union effects across the distribution may reflect the fact that different occupational categories have different bargaining powers when negotiating for better wages. These differences may also be signalling a decline in the number of small unions, which aggregate within the larger trade union federations.

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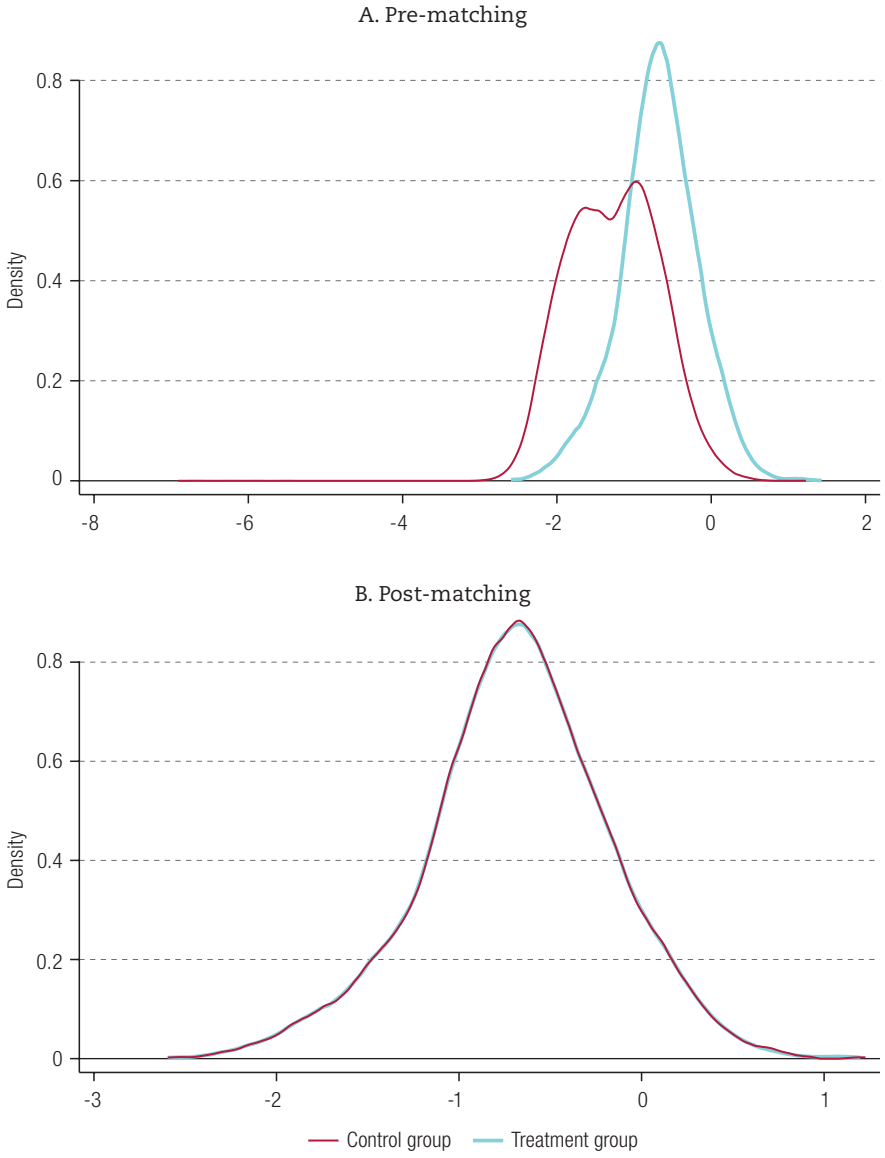
Annex A1

Figure A1.1
Kernel density before and after matching



Source: Prepared by the authors.

Table A1.1
Oaxaca-Blinder Decomposition

	Coefficient
Non-unionized	1.9763***
	(0.002)
Unionized	2.2635***
	(0.006)
Difference	-0.2872***
	(0.007)
Explained	-0.2141***
	(0.004)
Not explained	-0.0731***
	(0.005)

Source: Prepared by the authors.
Note: Robust standard errors in parentheses. Significant at: 1%***, 5%**, 10%*.

Table A1.2
Means of variables before and after matching

Variable	Before			After		
	Unionized	Non-unionized	t	Unionized	Non-unionized	t
Education level	10.44	9.27	***	10.44	10.44	
Experience	23.29	22.01	***	23.28	23.26	
In-firm experience	4.46	6.26	***	7.45	7.21	***
Married	0.69	0.60	***	0.69	0.69	
Head of household	0.54	0.45	***	0.54	0.54	
Metropolitan area	0.46	0.43	***	0.46	0.46	
Urban area	0.94	0.94		0.94	0.93	***
White	0.47	0.43	***	0.47	0.78	
Formal	0.78	0.46	***	0.78	0.78	
Male	0.61	0.55	***	0.61	0.61	

Source: Prepared by the authors.

Table A1.3
Rosenbaum bounds test for bias in matching (2002)

Rosenbaum bounds	p-value	Rosenbaum bounds	p-value	Rosenbaum bounds	p-value
1.00	0.00	1.20	0.00	1.40	0.00
1.05	0.00	1.25	0.00	1.45	0.00
1.10	0.00	1.30	0.00	1.50	0.00
1.15	0.00	1.35	0.00		

Source: Prepared by the authors.

The effects of oil royalties on regional inequality in Brazil

Rafaela Nascimento Santos,
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and José Ricardo de Santana

Abstract

This article evaluates the impact of oil royalties on Brazil's production structure and their effects on regional inequality. An interregional input-output model was used, encompassing the 27 Brazilian states and 26 sectors, with base year 2008. The simulation strategy assumed 75% of these funds are channelled into education and 25% into the health sector, as mandated by Law 12.858/2013. To measure the effect of royalties on regional inequality, the Gini coefficient was calculated both ex-ante and ex-post with respect to the impact analysis. The main findings indicate that interregional and intersectoral spillovers are weak; but, in the Southeast and Northeast regions, the investment of royalties in education and health could help reduce intraregional inequality.

Keywords

Economic development, regional development, petroleum revenues, royalties, productivity, regional disparities, income distribution, input-output analysis, Brazil

JEL classification

R15

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I. Introduction

The expansion of the oil sector since the last decade has made Brazil the second largest oil producer in South America. According to Falcão (2013), this situation is explained by Brazil's control of its oil reserves and an appropriate refining structure. These provide competitive advantages, such as the domestic security of sectors related to transportation and electricity production that are vital for the economy. Industrial competitiveness is gained through participation in international trade with the direct export of oil and its derivatives.

Nonetheless, the increasing extraction of oil and natural gas promotes environmental degradation and impairs well-being in the producing localities and municipalities, or others that are directly or indirectly affected by it. Accordingly, economic compensation must be paid for this activity. Recently, the Brazilian federal government altered the institutional apparatus that regulates the royalties destined for the municipalities and states that extract or produce this resource or are affected by oil activity.

Pursuant to subsection II of article 45 of Law 9.478/1997 (the "Oil Law"), royalties are economic compensation paid each month by the concession-holders, based on their extraction and production of oil or natural gas. The changes promoted by the "Oil Law" include new criteria for calculating and distributing these revenues among the municipalities affected by oil and natural gas production. The new law hiked the royalty rate from 5% to 10% of the gross value of production (GVP).

The evolution of oil legislation shows how, the past, royalties have been channelled to various areas of the economy, such as infrastructure, sanitation, health and education. However, according to Law 12.858 on oil royalties, enacted in 2013, 75% of the funds must be allocated to education and 25% to health. The investment of oil revenues in education and health demonstrates the importance that the Brazilian government attaches to these sectors.

The last ten years have witnessed an intense debate on the effects of oil royalties in Brazil, especially now that drilling has started in the pre-salt layer. The expansion of the oil sector stimulated by the rise in international commodity prices, increased the collection of oil and natural gas royalties. This, in turn, increased the revenues received by the beneficiary municipalities. Between 2010 and 2016, royalty collection totalled R$ 92.3 billion.

Based on different empirical approaches, various studies have measured the effects of oil royalties on different areas of the economy. These include studies on the effects of royalties on development (Pacheco, 2003; Postali, 2009; Caçador and Monte, 2013; Schlindwein, Cardoso and Shikida, 2014); the impact of oil revenues on the municipalities' public finances (Silva, 2007; Ribeiro, Texeira and Guitierrez, 2009; Carnicelli and Postali, 2014); and the effect of such revenues on social indicators (Terra, Givisiez and Oliveira, 2007; Givisiez and Oliveira, 2011; Postali and Nishijima, 2011 and 2013; Tavares and Almeida, 2014; Reis, Santana and Moura, 2018).

However, the literature contains few analyses of the effects of oil royalties on regional inequality in Brazil. Most empirical studies, using econometric approaches, analyse the effects on variables such as gross domestic product (GDP), social indicators and public finances, while ignoring intersectoral or interregional effects, which is the focus of this paper. The objective of this article is, therefore, to evaluate the effects of oil royalties on the production structure of Brazilian states and on regional inequality. For this purpose, an interregional input-output model is used, comprising the 27 Brazilian states and 26 sectors, with base year 2008.

This study contributes to the empirical literature by offering unpublished findings on the effects of oil royalties on regional inequalities in Brazil, based on an interregional and multisectoral model.

The article is divided into six sections, including this introduction. Section II analyses the main effects of oil royalties on the economy, and section III presents the interregional input-output model

and the impact analysis. The database and simulation strategy used are presented in section IV, while the results are discussed in section V. Some final thoughts and policy implications are set forth in the sixth and last section.

II. Economic effects of oil royalties

The potential effects of oil royalties on local development in the benefited municipalities and, consequently, their impact on the municipalities themselves have already been examined extensively in the literature, through various lines of research. While some studies analyse the effects of royalties on development, others consider their impact on municipal finances and social indicators.

The impacts of royalties on development have been studied by Pacheco (2003), Postali (2009), Caçador and Monte (2013), Schlindwein, Cardoso and Shikida (2014) and Magalhães and Domingues (2014), among others.

Based on the weight of oil royalties in the revenues of municipalities facing the Campos basin in the State of Rio de Janeiro, Pacheco (2003) confirmed that royalties and special participations are enabling additional investments in infrastructure in the municipalities considered and are used to provide local governments with the funds needed to satisfy the excessive demand for public services. Nonetheless, no concrete actions to promote the sustainability and diversification of the local production base, with a view to averting the economic decline derived from the depletion of hydrocarbon reserves, were identified.

Postali (2009) used a difference-in-differences econometric model to compare the trend of certain indicators in the municipalities affected and those not affected by adoption of the "Oil Law", Law 9,478 of 1997. This study used data on the growth rate of municipal per capita GDP and the human development index (HDI) of the municipalities, both before and after the event. The author found a negative relation between the amount of royalties transferred to the municipality and the growth rate of its GDP.

In an empirical model estimated to assess whether royalties affected municipal development indicators, Caçador and Monte (2013) found that oil revenues did not contribute significantly to the improvement of local development indicators.

Based on the creation of a socioeconomic development index (SDI) through multivariate analysis, Schlindwein, Cardoso and Shikida (2014) refuted the hypothesis that the development indicator of the Lindeiros do Oeste Paranaense municipality accompanies royalty collection. In other words, they challenged the idea that the larger the amount of revenue received, the higher the SDI of the municipalities. Furthermore, the correlation between SDI and royalty collection was negative in all municipalities; that is, the increase (decrease) in SDI values is correlated with the decrease (increase) in the amount of royalties.

Magalhães and Domingues (2014) estimated the effects of pre-salt layer oil extraction on the Brazilian economy, using a dynamic computable general equilibrium (CGE) model for the first time in a study on the Brazilian economy. This model is particularly suitable in terms of bilateral oil trade. The key finding is that the effects on Brazilian GDP and investment are positive and significant. However, the sectoral impact of pre-salt layer oil extraction is highly heterogeneous. While there are several sectors that benefit, there is also a group of activities that lose shares in Brazil's GDP and exports, in a Dutch disease effect. The explanation for this finding lies in the effect of the concentration of factors of productive in oil extraction, the rise in input prices (such as capital and labour) and export revenues affecting the balance of payments. As a result, the Brazilian economy becomes more dependent on the oil production sector, and the revenues from these exports dominate the country's foreign trade.

Studies on the impact of oil revenues on municipal public finances include Silva (2007), Ribeiro, Texeira and Guitierrez (2009), Carnicelli and Postali (2014) and Reis and Santana (2015).

According to Silva (2007), the track record of oil-producing municipalities is characterized by advances and setbacks in the performance of public finances and the provision of public goods and services. While advances lead to improvements in the performance of public finances and the quality of the public goods and services delivered, setbacks lead to inefficiency in the provision of goods and services and the capture of public funds.

In contrast, Ribeiro, Texeira and Guitierrez (2009) sought to identify the effects of royalty revenues received by municipal governments in the State of Espírito Santo on their respective per capita GDP. Data were collected from the state's 78 municipalities in 1999–2004. An econometric model using multiple regression based on balanced panel data was used to estimate relations between the variables. In other words, two models were used to test the elasticity of municipal per capita GDP with respect to royalties. The main finding is that there is no evidence of effects on per capita GDP in the municipalities analysed.

The method applied in the study by Carnicelli and Postali (2014) is doubly robust, based on a panel of municipalities between 2000 and 2009. The method consists of two stages. First, the probabilities of receiving oil revenues conditional on observable variables were estimated. In the second stage, a panel of fixed effects was estimated for the set of observations belonging to a common base constructed from the propensity scores estimated in the first stage. It was found that, although the municipalities hire additional civil servants in the presence of oil revenues, the average expenditure on personnel does not increase in the cities included in the treatment group.

Reis and Santana (2015) analysed the effects of using oil royalties to fund the public investments of Brazilian municipalities in 1999–2011, using the panel data econometric model. The study starts from the variables "Budget income", "Royalties" and "Capital expenditures" of the respective municipalities, obtained from secondary sources. The results show that municipalities that are more dependent on royalties increased their capital expenditures as royalties increased, from both a per capita and a fiscal ratio perspective.

The effects of oil royalties on social indicators have been studied by Terra, Givisiez and Oliveira (2007), Givisiez and Oliveira (2011), Postali and Nishijima (2011), Tavares and Almeida (2014) and Reis, Santana and Moura (2018), among others.

Terra, Givisiez and Oliveira (2007) analysed the redistributive potential of oil revenues by studying the pattern of inter-urban public investments in the Brazilian municipality that benefited most from oil revenues, namely Campos dos Goytacazes in the State of Rio de Janeiro. Their analysis revealed that budgetary slack in this "nouveau riche" municipality has not been exploited as a mechanism for reducing inter-urban inequalities; on the contrary, it is reinforcing them.

The method applied in the research by Givisiez and Oliveira (2011) includes compiling historical series of education indicators, based on school censuses and Prova Brasil. The authors compared the evolution of a defined group of municipalities with that of a control group, through logistic regressions. The results refute the hypothesis put forward in the paper, by indicating that the budgetary advantages of the municipalities in question were not reflected in better education indicators.

Postali and Nishijima (2011) used the FIRJAN Municipal Development Index (IFDM) as a measure of social development, to verify whether the royalties distributed under Law 9.478 of 1997 helped to improve the social indicators of the municipalities considered in 2000–2007, relative to the national average. The results showed that oil revenues did not have a significant impact on the social indicators of health and education in the beneficiary municipalities; but, surprisingly, they did generate negative effects on their formal labour sectors.

The study by Tavares and Almeida (2014) found that oil royalties increased education and health spending in the beneficiary municipalities by an average of R$ 2 billion and R$ 1.97 billion, respectively, in 2000–2009. However, the impact of royalties did not translate directly into increased social development

as measured by the human development index (HDI). Based on a panel data econometric approach, Reis, Santana and Moura (2018, p. 89) note that the Brazilian municipalities most dependent on oil royalties reduced their health and education shares of public expenditures on average between 1999 and 2011.

In short, the aforementioned studies show that the investment of oil royalties does not produce clearly positive effects in terms of development, social indicators or public finances in the beneficiary municipalities. In some cases, the effects are even strongly negative. In general, studies on oil royalties use econometric approaches to analyse their impact on the economy.

No studies that use input-output models to measure the effects of these revenues on the Brazilian economy were found in the literature. Moreover, research on the economic or social effects of oil royalties does not include an analysis of the effects on income distribution. This article contributes to the empirical literature on royalties by offering new findings for the debate, focusing on regional income distribution. The following section develops the interregional input-output model and the impact analysis.

III. Interregional input-output model and impact analysis

1. Interregional input-output model

The interregional input-output model, also known as the "Isard model" (Isard, 1951), requires a large amount of data, either real or estimated, mainly on intersectoral and interregional trade flows. The interregional system shows the trade relations existing between regions, in terms of exports and imports, which are expressed through flows of goods and services that are destined for both intermediate consumption and final demand (Guilhoto and others, 2010).

According to Miller and Blair (2009), equation (1) summarizes the basic structure of the model, which presents the intersectoral and interregional flows of goods for two regions, L and M, with n sectors. In matrix form, these flows can be represented as follows:

$$Z = \begin{bmatrix} Z^{LL} & \vdots & Z^{LM} \\ \cdots & \cdots & \cdots \\ Z^{ML} & \vdots & Z^{MM} \end{bmatrix} \quad (1)$$

where: Z^{LM} and Z^{ML} represent interregional flows and Z^{LL} and Z^{MM} represent intraregional ones. The matrix of intraregional technical coefficients (A^{LL}) for two sectors can be defined as $A^{LL} = Z^{LL}(X^{L})^{-1}$ and $A^{MM} = Z^{MM}(X^{M})^{-1}$. The first formulation would be valid for A^{LM} while the second would be valid for A^{ML}; that is, varying only the value of the corresponding production (X).

The solution of the basic model (equation (2)) required for the interregional analysis proposed by Isard (1951) results in the following interregional Leontief system:

$$X = (I - A)^{-1}Y \quad (2)$$

where the Leontief inverse matrix is specified as $(I - A)^{-1}$. Although equation (2) represents the same solution as the standard input-output model, the interregional model has advantages over regional models, mainly by capturing the effects in each sector and region, and modelling of interregional flows (Miller and Blair, 2009).

2. Impact analysis

Impact analysis aims to measure the shock generated by exogenous changes in final demand (Y) or in each of its components (household consumption, government expenditures, investments and exports) on total production, employment, imports, wages and value added, among variables.

This study calculates the impact of oil royalties on total production, employment, income and tax revenue of the Brazilian states. The calibrated magnitude of the shock (ΔY) in the simulation is defined from the values of royalties in each state. Hence:

$$\Delta X = (I - A)^{-1} \Delta Y \tag{3}$$

$$\Delta V = \hat{v} \Delta X \tag{4}$$

where ΔX and ΔY are $(n \times 1)$ vectors that represent the effects on the volume of production and the variation in final demand, respectively; while V is an $(n \times 1)$ vector representing the impact on any of the variables mentioned above, namely value added, employment, wages and taxes, among others. In addition, $\hat{v}$ is a diagonal (nxn) matrix in which the elements of the main diagonal are, respectively, the coefficients of value added, employment, wages and taxes, among other variables. The coefficients are obtained by dividing the value of these variables, for each sector, (e_i) by the total production (x_i) of the corresponding sector. In other words:

$$v_i = \frac{e_i}{X_i} \tag{5}$$

Hence, to estimate the impact on the total production volume and each of the variables analysed, all the elements of the vectors ΔX and ΔV are added together.

An increase in sectoral production in a given region of Brazil has an impact on the production of various industries outside the locality of origin, which are referred to as interregional spillovers (Sesso Filho and others, 2006, p. 2).

IV. Database and simulation strategy

1. Database

The main database used is the Brazilian interregional input-output table, with base year 2008, obtained from the Regional and Urban Economics Lab (NEREUS) of the University of São Paulo (Guilhoto and Sesso Filho, 2005; Guilhoto and others, 2010). This matrix consists of 26 sectors and 27 Brazilian states. The data on oil royalties were extracted from the InfoRoyalties site of Universidade Cândido Mendes (UCAM).[1]

2. Simulation strategy

The simulation strategy is based on Law 12,858 on oil royalties, which was adopted in 2013 and provides that 75% of royalties must be invested in education and 25% in health. Thus, only these two sectors (education and health) will suffer variations in their respective final demands. For this purpose,

[1] See [online] http://inforoyalties.ucam-campos.br/.

a simple average of the amounts of royalties received by the states in 2013, 2014, 2015 and 2016 is calculated, which represents an annual shock in the system.

In order to make the analysis more robust, sectoral deflators were constructed from data on sectoral gross value-added obtained from the information bulletin on Brazil's system of national accounts in 2016, published the Brazilian Geographical and Statistical Institute (IBGE, 2018) for the activities "Private and public education" and "Private and public health".[2] The aim of this procedure is to deflate the royalty values for the base year of 2008, in order to make them compatible with the prices prevailing in the base year of the matrix[3].

Could regional income disparities in Brazil be reduced if oil royalties were in fact allocated to education and health, as recommended by Law 12.858/2013? In an attempt to answer this question, this study adopted the methodology used by Domingues, Magalhães and Faria (2009) and Ribeiro and others (2018 and 2017). This entailed calculating the Gini coefficient from the distribution of state GDP both before and after the effects of oil royalties.

The rationale involves calculating the Gini coefficient to verify whether it has increased or decreased. An increase would indicate income concentration, while a decrease would suggest deconcentration. The index can be expressed mathematically as follows:

$$G = 1 - \sum_{k=0}^{k=n-1} \left(X_{k+1} - X_K\right)\left(Y_{k+1} + Y_k\right) \quad (6)$$

where: G = is the Gini coefficient; and X and Y are cumulative proportions of the population and GDP variables, respectively.

V. Results and analysis

This section makes an exploratory analysis of the data on oil royalty collection, the results of simulations using the interregional input-output model, and the effects of oil royalties on regional inequality. The simulation results initially analyse the macroeconomic effects in the macroregions and states; and, in a second stage, they present the sectoral effects. Lastly, the results on regional inequality are presented, based on the calculation of the Gini coefficient both ex-ante and ex-post with respect to the impact analysis, in order to observe whether royalties contribute to the regional concentration or deconcentration of income.

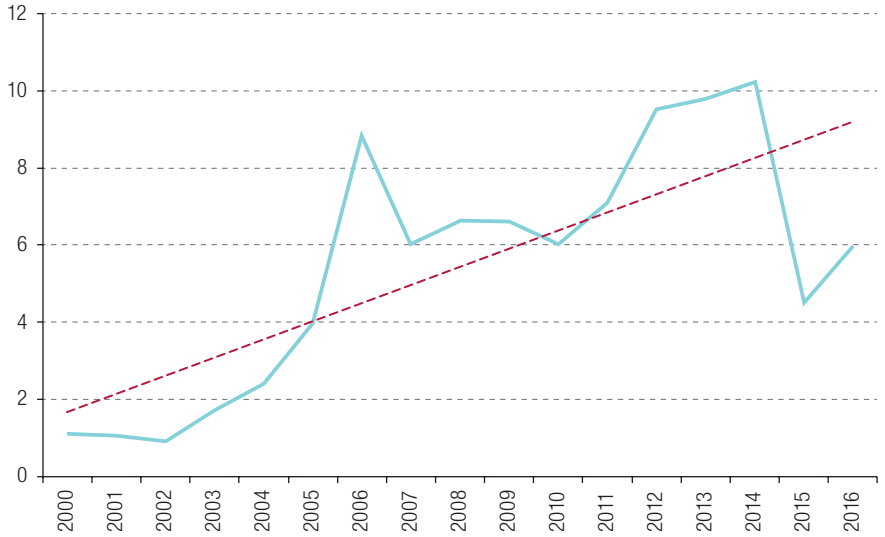
1. Exploratory analysis

Figure 1 shows the annual collection of oil royalties 2000–2016. In this period, revenue collection fluctuated; for example, between 2007 and 2009, it declined owing to the global economic crisis, low oil prices and the appreciation of the real against the dollar. In 2016, royalty revenues shrank by 29% to their lowest level since 2009.

[2] In this database, gross value added is available at current and constant prices for a set of 51 economic sectors spanning 2000–2016. Before calculating the sectoral deflators, the activities "Private education" and "Public education" and "Private health" and "Public health" were aggregated into "Private and public education" and "Private and public health", respectively. This was necessary to obtain the same sectoral aggregation as used in the input-output table.

[3] The sectoral deflators are presented in annex A1.

Figure 1
Brazil: annual oil royalty collection, state data, 2000–2016
(Billions of reais of 2008)

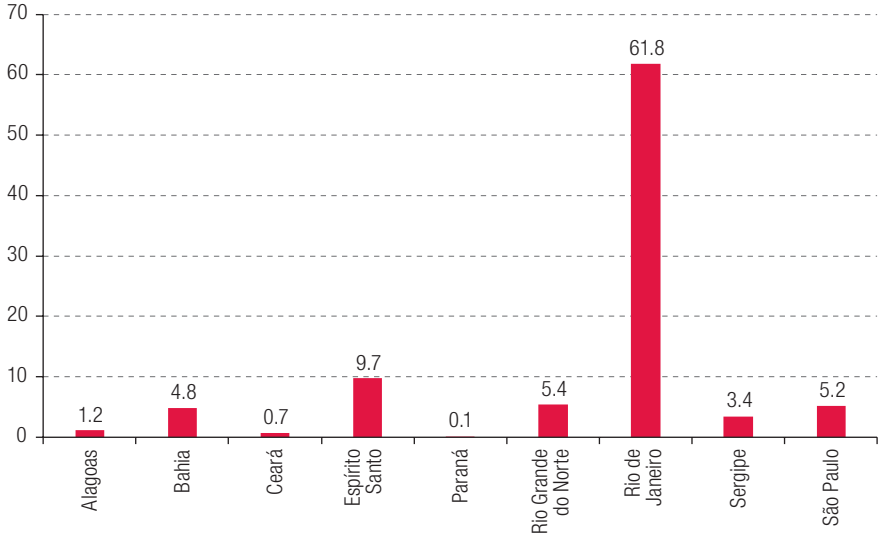


Source: Prepared by the authors on the basis of Info Royalties of the University of Cândido Mendes (UCAM) [online] http://inforoyalties.ucam-campos.br/.

In the period spanned by figure 1, there was a significant rise in the price of oil (commodity cycle), caused mainly by burgeoning demand from China and India (Jimenez and Tromben, 2006). However, according to Sessa, Simonato and Domingues (2017), commodity exports (including oil) contributed to real growth of 0.7% of Brazilian GDP between 2005 and 2011.

Figure 2 shows the sum total of royalty collection in 2000–2016. The State of Rio de Janeiro received the largest amount, absorbing an average of 95% of all oil royalties in Brazil. In contrast, the State of Paraná receives a small portion of these resources, and in 2010–2012 it received nothing.

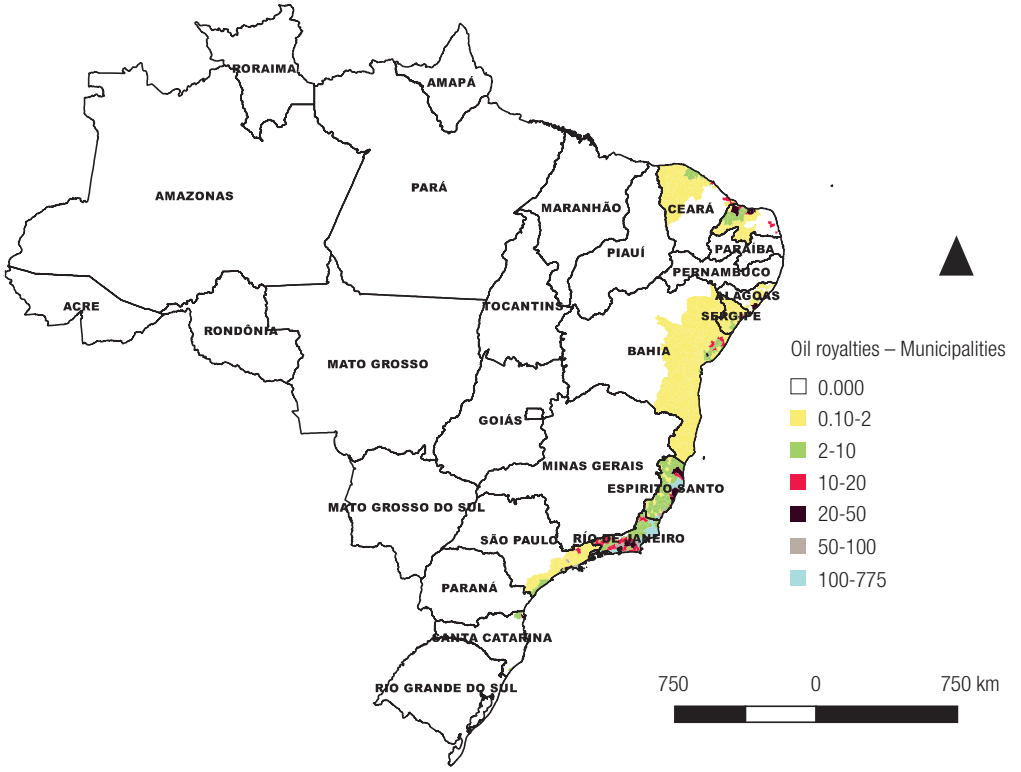
Figure 2
Brazil: total oil royalty collections, 2000–2016
(Billions of reais at 2008 prices)



Source: Prepared by the authors.

Only 969 or 17.4% of Brazil's 5,565 municipalities, distributed across nine states, receive oil royalties. Map 1 shows the spatial distribution of these revenues in 2013. It can be seen that royalties are concentrated on the coast, reflecting to the location of the offshore fields, which have the highest concentration of reserves in the country and, consequently, the highest rates of extraction and production of oil. The map also shows that all municipalities in the states of Sergipe, Espírito Santo and Rio de Janeiro receive royalties, although not all of them are producers.

Map 1
Brazil: spatial distribution of oil royalties, 2013
(Millions of reais at 2013 prices)



Source: Prepared by the authors.

The exploratory analysis identified the trend and distribution of oil royalties and the main royalty collecting states.

2. Analysis of the simulation results for the macroeconomic variables

As noted above, to evaluate the effects of oil royalties on the production structure of Brazil's states, an input-output table is used with base year 2008, covering 27 states and 26 sectors. For simulation purposes, the royalty values are considered as exogenous shocks on final demand. As noted in the previous section, the simulation strategy took into account the average value of oil royalties in 2013–2016 and was based on Law 12.858/2013, which requires 75% of these funds to be allocated to education and 25% to the health sector.

Table 1 shows the effects on the main macroeconomic variables considered in the model. These figures should be interpreted as potential effects relative to the base year of the matrix, 2008 (base-line scenario).

Table 1
Brazil: macroregional effects of oil royalties on selected macroeconomic variables
(Percentages)

Regions	Production	GDP	Income	Employment	ICMS[a]	IPI[b]
Brazil	0.050	0.070	0.110	0.070	0.050	0.040
North	0.010	0.004	0.003	0.004	0.010	0.010
Northeast	0.060	0.070	0.120	0.050	0.000	0.000
Centre-West	0.003	0.002	0.002	0.003	0.004	0.003
Southeast	0.080	0.100	0.170	0.120	0.070	0.050
South	0.010	0.010	0.010	0.010	0.010	0.010

Source: Prepared by the authors on the basis of the 2008 input-output table.
[a] ICMS = goods and services sales tax.
[b] IPI = tax on industrialized products.

The effects on the reference variables are greatest in the regions in which oil extraction takes place, in this case, the Northeast and Southeast. This is to be expected in the input-output simulations, owing to the linearity present in the model. Ribeiro and others (2013), Belo, Ribeiro and Simões (2017), and Ribeiro and others (2017) obtained similar results through input-output simulations for different recent applications. For that reason, this study makes a qualitative analysis to identify the distribution of the regional and sectoral effects.

In general, the low values of the impacts and spillovers, especially in regions that do not collect oil royalties, reflect the weakness of productive linkages with the simulated sectors (education and health), which minimizes the multiplier effects in the economy. These sectors belong to the services segment, most of which are targeted on final demand.

The magnitude of the effects on the macroeconomic variables relates directly to the structural coefficients of the model (Belo, Ribeiro and Simões, 2017). In other words, the coefficients of employment (ratio of the number of jobs to the gross value of sectoral production), income and GDP of the Northeast and Southeast regions would record higher values than those of Brazil as a whole. These regions have smaller economies, so they are more sensitive to impacts than the country at large. The taxation variables (goods and services sales tax (ICMS) and tax on industrialized products (IPI)) have structural coefficients below zero, which would generate relatively smaller effects in percentage terms.

If the oil royalties collected in the Northeast region were actually channelled into education and health they could have average annual impacts, between 2013 and 2016, of 0.06% on production, 0.05% on employment, 0.12% on income and 0.07% in GDP. In the Southeast region, the main recipient of oil royalties, this policy could have average annual impacts of 0.08% on production, 0.12% on employment, 0.17% on income and 0.10% on GDP. The other macroregions would report marginal impacts, mainly because they do not collect oil royalties themselves. Furthermore, as noted above, no significant spillovers are observed, owing to the weak productive integration of the sectors in question.

Recent studies published in the international literature provides evidence that oil activity affects employment and wages positively in some regions of the United States (Allcott and Keniston, 2018; Bartik and others 2017; Feyrer, Mansur and Sacerdote, 2017). These findings are therefore in line with the relative aggregate employment effects reported in table 1.

It should be noted that the impact on tax collection in the Southeast region is likely to be greater than in the Northeast region. According to Barros Júnior, Silva and Costa (2016), the ICMS rates applicable to interstate goods flows are 7% or 12%, depending on the states of origin and destination. The ICMS rate of 12% is destined for the South and Southeast regions, while the 7% rate is destined for the Northeast, North and Centre-West regions. Since the Southeast is the wealthiest and most productive region in Brazil and taxes are collected at the production stage, this region can be expected to benefit the most.

Figure 3 shows the effects of oil royalties on GDP and aggregate employment in the royalty-collecting states. It is worth noting that 97.4% of the effects on GDP are concentrated in these states, while just 2.6% spreads to the rest of Brazil; in other words, the impact in states that do not collect royalties themselves is marginal.

Figure 3
Brazil: effects of oil royalties on GDP and employment in royalty-collecting states
(Percentages)

Source: Prepared by the authors on the basis of the 2008 input-output table.

The effects of royalties on GDP and employment can be explained by the economic structure of the states analysed. Figure 3 shows that Espírito Santo, Rio de Janeiro, Sergipe and Rio Grande do Norte are the only states reporting above-average effects. According to the National Confederation of Industry, in 2016, the oil and natural gas extraction industry had a industrial GDP shares of 20.7% in Espírito Santo, 18.6% in Rio de Janeiro, 11.8% in Sergipe and 10.1% in Rio Grande do Norte (CNI, 2018). The oil industry is thus crucially important to the economy of these states, where the extraction of oil and natural gas has boosted this sector and, consequently, increased employment.

The states of São Paulo and Bahia, which have the largest and sixth largest economies in Brazil, respectively, would experience lower than average effects. Both have relatively more diversified economies and, therefore, are less dependent on the oil sector. In other words, although these states play an important role in the extraction and production of oil and natural gas, this is not their main economic activity. This confirms the relatively low impact of royalties on GDP and employment.

For the sectors specified in the 2008 input-output table, table 2 presents the effects of oil royalties on the sectoral GDP of the Brazilian states.[4] As expected, the greatest effects would be registered in the education and health sectors of the regions directly receiving the investments, namely Alagoas (0.5% and 0.25%, respectively), Bahia (0.76% and 0.31%), Ceará (0.09% and 0.05%), Sergipe (2.42% and 1.31%), Rio Grande do Norte (2.58% and 1.38%), Espírito Santo (6.46% and 2.70%), Rio de Janeiro (4.88% and 1.73%), São Paulo (0.19% and 0.07%) and Paraná (0.02% and 0.01%).

[4] The input-output model is constructed on the basis of the Leontief-type production function. In other words, it assumes fixed input proportions and constant returns to scale (Miller and Blair, 2009). Thus, sectoral effects on other variables, such as employment, will report the same values as shown in table 2 (impact on sectoral GDP).

Table 2
Brazil: effects of oil royalties on the sectoral GDP of the states, conclusion[a]
(Percentages)

Sectors	SE	RN	DF	GO	MT	MS	EN	MG	RJ	SP	PR	SC	RS
Agriculture, forestry, logging	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00
Livestock and fishing	0.03	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.03	0.02	0.01	0.01	0.01
Mining	0.02	0.01	0.01	0.01	0.01	0.01	0.04	0.01	0.03	0.01	0.01	0.01	0.01
Food, beverages and tobacco	0.03	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01
Textile, apparel and footwear	0.04	0.02	0.01	0.01	0.01	0.01	0.08	0.02	0.05	0.02	0.01	0.01	0.01
Wood, paper and printing	0.02	0.02	0.00	0.00	0.01	0.00	0.04	0.02	0.02	0.01	0.01	0.01	0.00
Petroleum, coke and alcohol refining	0.15	0.12	0.01	0.04	0.03	0.04	0.03	0.05	0.24	0.04	0.04	0.03	0.03
Other chemicals and pharmaceuticals	0.03	0.03	0.01	0.01	0.01	0.01	0.04	0.02	0.07	0.02	0.02	0.02	0.01
Articles of rubber and plastic	0.06	0.03	0.04	0.02	0.02	0.03	0.17	0.03	0.14	0.04	0.03	0.04	0.02
Cement and other non-metallic mineral products	0.18	0.14	0.02	0.03	0.03	0.04	0.08	0.07	0.10	0.04	0.04	0.04	0.02
Metallurgy	0.08	0.09	0.03	0.03	0.02	0.03	0.13	0.03	0.10	0.05	0.03	0.03	0.02
Machinery and equipment	0.04	0.02	0.01	0.01	0.02	0.01	0.02	0.01	0.03	0.02	0.01	0.01	0.01
Electrical and electronic equipment	0.02	0.02	0.01	0.01	0.01	0.01	0.05	0.01	0.03	0.01	0.01	0.00	0.01
Transport equipment	0.02	0.02	0.01	0.02	0.02	0.02	0.09	0.02	0.04	0.01	0.01	0.02	0.01
Miscellaneous industries	0.02	0.04	0.01	0.00	0.01	0.01	0.03	0.00	0.00	0.00	0.00	0.01	0.01
Electricity and gas, water, sewerage and street cleaning	0.13	0.06	0.02	0.05	0.06	0.08	0.42	0.07	0.21	0.08	0.07	0.04	0.06
Construction	0.18	0.34	0.00	0.02	0.01	0.01	0.40	0.02	0.37	0.04	0.02	0.03	0.01
Commerce	0.13	0.18	0.00	0.00	0.01	0.00	0.25	0.00	0.21	0.02	0.00	0.00	0.00
Transportation, warehousing and postal services	0.08	0.09	0.01	0.01	0.01	0.01	0.13	0.01	0.13	0.02	0.01	0.01	0.01
Private services	0.08	0.10	0.01	0.01	0.02	0.01	0.09	0.01	0.10	0.02	0.01	0.01	0.01
Financial intermediation and insurance	0.27	0.31	0.00	0.01	0.01	0.01	0.47	0.01	0.31	0.03	0.01	0.01	0.00
Real estate services and leasing	0.06	0.06	0.01	0.00	0.01	0.00	0.07	0.01	0.05	0.01	0.01	0.01	0.01
Accommodation and restaurant services	0.04	0.06	0.01	0.01	0.00	0.00	0.05	0.01	0.06	0.01	0.01	0.01	0.00
Private and public education	0.10	0.11	0.00	0.00	0.00	0.00	0.21	0.00	0.15	0.01	0.00	0.00	0.00
Private and public health	4.73	5.03	0.00	0.00	0.00	0.00	12.62	0.00	9.56	0.37	0.04	0.00	0.00
Public administration and social security	2.14	2.25	0.00	0.00	0.00	0.00	4.38	0.00	2.81	0.11	0.01	0.00	0.00

Source: Prepared by the authors on the basis of the 2008 input-output table.
[a] SE: Sergipe; RN: Rio Grande do Norte; DF: Federal District; GO: Goiás; MT: Mato Grosso; MS: Mato Grosso do Sul; ES: Espírito Santo; MG: Minas Gerais; RJ: Rio de Janeiro; SP: São Paulo; PR: Paraná; SC: Santa Catarina; RS: Rio Grande do Sul.

To examine the results shown in table 2 more effectively, the following criterion was adopted: the largest effects were selected considering all the states of the model; in other words sectors that would display the greatest variation relative to the base year of the input-output table. The following sectors are highlighted: financial intermediation and insurance; construction; cement and other non-metallic mineral products; petroleum refining, coke and alcohol; electricity, gas, water, sewerage and street cleaning; commerce; metallurgy; textile, apparel and footwear; transportation, warehousing and postal services; private services; and articles of rubber and plastic.

These activities are likely to be affected because of their commercial relations (direct and indirect) with the education and health sectors. According to this selection criterion, the greatest sectoral effects were also concentrated in the states that receive oil royalties. In other words, cross-sectoral spillovers are detected in these states.

The sectors that would be most affected are clearly those related to the distribution of oil royalties pursuant to Law 12.858/2013, namely education and health. However, private and public education would present the greatest variation of impact on GDP. At the national level, education is part of the government's policy agenda; and this sector has been highlighted as critical for the country's economic

progress and fundamental for reducing inequalities. However, the greatest obstacle still lies in harnessing these expenditures into development (Tavares and Almeida, 2014). Terra, Givisiez and Oliveira (2007) and Oliveira and Silveira Neto (2016) confirm that spending on education makes it possible to regional income inequalities. These authors advocate increasing education investments in the poorest states and increasing investment in the highest levels of education.

In non-collecting states, oil royalties seem to have only marginal effects on the sectors. Thus, it is possible to determine that the education and health sectors have local dynamics. All of the results showed negligible spillover effects, in both inter-sectoral and interregional terms, owing to the weak linkages of these sectors.

To complement the findings in terms of the effects on GDP, it is worth noting that public revenues are responsible for the maintenance of state functions. According to Silva (2007), the track record of oil-producing states is marked by advances and setbacks in the performance of public finances and the provision of public goods and services. The expenditures generated depend directly on the revenues collected or captured through various modes of financing, as well as partnerships that generate resources for the public purse. Inefficiency in this allocation of resources can be considered a setback in the performance of a state's public finances.

3. Analysis of the results of the simulation for income concentration

What impact does the collection oil royalties have on regional inequality in Brazil? Considering the distribution of GDP in the 27 states, the variation in the Gini coefficient reveals the concentration of income. That is, if oil resources were allocated to education and health, they would help reduce regional disparities, but only marginally (-0.002%). Pamplona and Cacciamali (2017) confirm that the concentration of natural resources —such as oil— can be a blessing or a curse for a country's economy.[5] In the case of Brazil, this concentration could generate a decrease in interregional inequalities, albeit a marginal one.

Ribeiro and others (2017) obtained a similar result. According to these authors, tourism expenditures in the Northeast region of Brazil in 2011 helped to reduce intraregional inequalities, as the Gini coefficient decreased between the scenarios.

Given the concentration of oil revenues in just a few Brazilian states, the foregoing analysis needs to be deepened to assess the impact of royalties on regional inequality. Thus, table 3 reports the Gini coefficient of the Brazilian macroregions, calculated in the baseline scenario, prior to the impact, and in the scenario affected by oil royalties. Its relative variation between these two scenarios is also shown.

Table 3
Brazil: effects of oil royalties on intra-regional inequality

Regions	Gini Coefficient		
	Ex ante	*Ex post*	Variation *(percentages)*
North	0.7044	0.7044	-0.001
Northeast	0.6408	0.6408	-0.008
Centre-West	0.7020	0.7020	-0.001
Southeast	0.6436	0.6433	-0.052
South	0.4786	0.4785	-0.003

Source: Prepared by the authors on the basis of the 2008 input-output table.

[5] See this discussion in Magalhães and Domingues (2014).

Table 3 shows that only the Southeast and Northeast regions show slightly greater variations in the Gini coefficient, -0.052% and -0.008%, respectively. In the other regions, the Gini coefficient remains almost constant; in other words, it displays marginal variations around zero. It is interesting to note that the magnitude of the variation in the Gini coefficient was correlated with the main royalty-collecting regions. Thus, the larger the amount of oil royalties, the lower the intra-regional income concentration. For the case of Turkey, Aydin (2012) states that half of the oil royalties are transferred to low per-capita income provinces, which helps to distribute income.

These results are consistent with those reported in the literature. According to Guimarães Neto (2009), the deconcentration of income that took place in Brazil was far from signifying a redefinition of the traditional division of labour among Brazilian regions. Nonetheless, it did help to consolidate trends, the emergence of regional specializations outside the Southeast, and the implementation of new activities through which less industrialized economies interact with the rest of the national economy, such as the Northeast region.

Following the logic of table 3, table 4 presents the results of the variation in the Gini coefficient calculated from the sectoral distribution of GDP in the baseline scenario and the scenario affected by royalties. The sectors that would display an increase in the Gini coefficient —thus contributing to an increase in regional disparities— are highlighted in bold. Brazil displays the largest sectoral increases in the mining (28.1%), machinery and equipment (22.2%), petroleum refining and coke (18.4%) and other chemical and pharmaceutical products (18.4%).

Table 4
Brazil: effects of oil royalties on sectoral concentration-Gini coefficient of sectoral GDP
(Percentages)

Sectors	Gini Coefficient		
	Brazil	Northeast	Southeast
Agriculture, forestry and logging	-23.55	**0.00**	-37.76
Livestock and fishing	-15.79	-21.15	-10.20
Mining	**28.09**	-8.58	**0.01**
Food, beverages and tobacco	**0.77**	-21.57	-28.72
Textile, apparel and footwear	**5.13**	-6.02	-19.42
Wood, paper and printing	**11.51**	**3.61**	-29.32
Petroleum, coke and alcohol refining	**18.43**	**0.12**	-9.54
Other chemicals and pharmaceuticals	**18.44**	**17.11**	-9.19
Articles of rubber and plastic	**8.96**	-0.03	-12.82
Cement and other non-metallic mineral products	**14.68**	**0.04**	-46.17
Metallurgy	-1.92	-12.47	-0.01
Machinery and equipment	**22.22**	0.15	-15.93
Electrical and electronic equipment	**6.36**	-0.11	**9.00**
Transport equipment	-0.57	**19.36**	**12.52**
Miscellaneous industries	**11.52**	**0.09**	-16.95
Electricity and gas, water, sewerage and street cleaning	-6.55	-29.04	-40.85
Construction	-28.25	-48.61	-0.18
Commerce	-27.70	-0.05	-0.17
Transportation, warehousing and postal services	-7.56	-12.37	-0.05
Private services	-11.26	-0.08	-0.20
Financial intermediation and insurance	**13.80**	-0.95	-0.02
Real estate services and leasing	-21.28	-0.03	-0.01
Accommodation and restaurant services	-2.06	-7.93	-0.14
Private and public education	-33.38	-2.99	-7.63
Private and public health	-23.39	-57.10	-2.50
Public administration and social security	**0.00**	**0.00**	-0.01

Source: Prepared by the authors on the basis of the 2008 input-output table.

In the other sectors, the Gini coefficient fall; that is, they could contribute to the reduction of regional disparities if the revenues from royalties were allocated to education and health. This can be seen in the sectors of the Southeast and Northeast regions, most of which would contribute to the intraregional deconcentration of revenues.

Contrary to the pattern prevailing in the Northeast, the deconcentration of income in the main industrial sectors in the Southeast region must be related to the fact that the largest industrial park in the country is located there. Greater investment in education tends to generate employment and income opportunities in the Southeast region, thereby helping to reduce income concentration.

The analysis of the Gini coefficient is important for targeting the design of public policies at regions with high levels of inequality. This analysis makes it possible to identify the sectors that could contribute to an increase or decrease in regional disparities, from the addition of oil royalties to states' revenues.

VI. Final remarks

This study set out to evaluate the effects of oil royalties on the Brazilian production structure and regional inequality. To that end, simulations were used with an interregional input-output model specified for the 27 Brazilian states, considering Law 12,858/2013, which requires 75% of these funds to be allocated to education and 25% to health.

As expected, the main results found greater effects in the royalty-receiving regions, the Southeast and Northeast. The sectors considered in the simulation, education and health, have few linkage effects, and this is reflected in weak spillovers, both in intersectoral and interregional terms. Although Rio de Janeiro accounts, on average, for 95% of total oil royalties collected, these have relatively less impact than in other states (Rio Grande do Norte and Espírito Santo) owing to the greater diversification of its economy.

It should be noted that, since all the values of the shocks were positive, all the effects would also be positive; that is, there would be no "losers". This represents a constraint on the results and occurs because in input-output models there is no substitution between factors of production; in other words the supply curve is perfectly elastic. For this reason, an attempt was made to conduct the analysis qualitatively, for example by evaluating the distribution of the effects at the regional and intersectoral levels.

In terms of the effects of oil royalties on regional inequality, it is possible to evaluate what would happen if these resources were, in fact, allocated to education and health. The results obtained show that the allocation of royalties to education and health could contribute to reducing intraregional inequalities in the Southeast and Northeast regions.

It is therefore important not to use royalties to cover current expenses, but instead channel them into sectors that represent investments that can compensate future generations for the extraction of resources by the current generation. Investing them in sectors such as education and health, which represent an investment in human capital, as well as in infrastructure and science and technology, which can provide increases in physical capital, is a desirable course of action. The evidence of this study with respect to the allocation of oil royalties to education and health shows that the country should continue on this path.

It is therefore of utmost importance that society and public managers be convinced of the importance of using resources in accordance with the law. It is important to maintain and improve oversight of the way both collecting municipalities and states use the funds, in order to ensure that current legislation is complied with; in other words, that these resources are fully channelled into education and health.

For future studies, it is proposed to evaluate the effects of these resources in the long run, which is interesting especially because of the time it takes for investments in the education sector to bear fruit. This will be done by developing a dynamic CGE model that explicitly takes account of changes in relative prices and capital accumulation over time.

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Annex A1

Table A1.1
Brazil: sectoral deflators, with base-year 2008

Activities	2008	2009	2010	2011	2012	2013	2014	2015	2016
Private and public education	1.00	0.89	0.80	0.67	0.61	0.51	0.44	0.40	0.37
Private and public health	1.00	0.92	0.87	0.81	0.70	0.60	0.53	0.49	0.47

Source: Prepared by the authors on the basis of Brazilian Geographical and Statistical Institute (IBGE), *Sistema de Contas Nacionais: Brasil 2016*, 12 March 2018 [online] https://biblioteca.ibge.gov.br/visualizacao/livros/liv101620_informativo.pdf.

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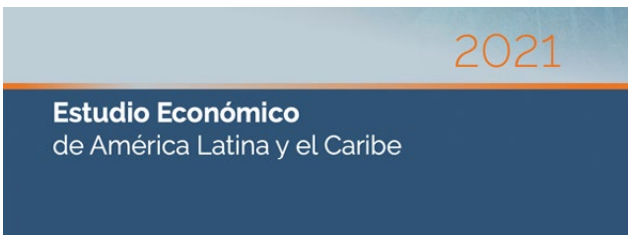

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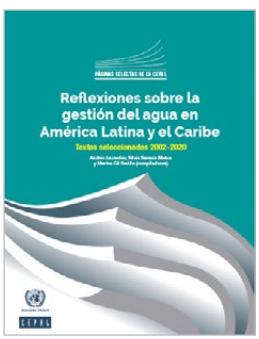

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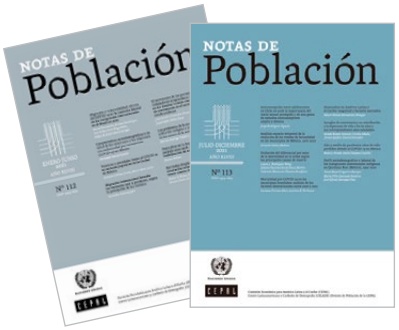

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