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SUMMARY

Explanatory notes

The following symbols are used in tables in the *Review*:

… Three dots indicate that data are not available or are not separately reported.

(–) A dash indicates that the amount is nil or negligible.
A blank space in a table means that the item in question is not applicable.

(-) A minus sign indicates a deficit or decrease, unless otherwise specified.

(.) A point is used to indicate decimals.

(/) A slash indicates a crop year or fiscal year; e.g., 2006/2007.

(-) Use of a hyphen between years (e.g., 2006-2007) indicates reference to the complete period considered, including the beginning and end years.

The word "tons" means metric tons and the word "dollars" means United States dollars, unless otherwise stated. References to annual rates of growth or variation signify compound annual rates. Individual figures and percentages in tables do not necessarily add up to the corresponding totals because of rounding.

KEYWORDS

Prebisch, Raúl
Economic development
Development policy
Economic policy
Economic dependence
Globalization
Social aspects

Raúl Prebisch and the dilemma of development

in the globalised world

Aldo Ferrer

Globalization poses both challenges and opportunities. Prebisch confronted this development dilemma in the global world and left three messages which form the great legacy of his work. Firstly, central countries form visions of the world order that serve their own interests; and peripheral countries need to rebel against this theoretical framework to resolve the dilemma. Secondly, it is possible to transform reality and achieve a symmetrical non-subordinate relationship with the world's power centres. Thirdly, the transformation requires a fundamental change in productive structures to incorporate knowledge into economic and social activity, since this is the fundamental instrument of development. These messages remain fully current to this day.

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I
Introduction[1]

In his analysis of development problems in Latin America, Raúl Prebisch always related the domestic conditions of the region's countries to their international context, and short-term instability to structural vulnerability in the longer term. His key concern was how to strengthen our capacity to respond to the challenges and opportunities of the world economy, which nowadays we call globalization. That approach to reality gave rise to his contributions on the centre-periphery approach, the terms of trade, industrialization, regional integration, income distribution and appropriate public policies.

The world system is currently facing a number of unresolved problems. The first of these consist of asymmetries in levels of well-being which stem from an unequal distribution of the fruits of technical progress between and within countries. The "historical" problems of globalization have now been transcended by the great financial crisis and its repercussions on the real economy. Three key issues arise in this scenario: firstly, the inviability of an unregulated global financial system based on speculation; secondly, the impossibility of continuing to use the external deficit of the United States to bridge the saving-investment gap, thirdly, the emergence of large Asian nations as key players in international relations.

The crisis has triggered transformations in the world system, causing changes to a number of its behaviour patterns. Nonetheless, the essential features of globalization remain, along with its links to the development of national economies. The ongoing changes cannot be expected to inaugurate a lengthy phase of relative stability in international relations, without addressing the consequences of extreme inequalities in well-being and resolving the most urgent environmental problems.

This essay seeks to identify the nature and scope of the ongoing global changes and their repercussions on the countries of the region. It considers how much the world order and Latin American development problems have changed between Prebisch's times and today, and, consequently, the extent to which his ideas and, in a broader sense, contributions of Latin America structuralist thinking based on his work and the contributions made by Celso Furtado, Aníbal Pinto and Osvaldo Sunkel, among others, remain relevant.

For that purpose, the second section of this paper outlines the main messages of Raúl Prebisch on the development dilemma, while the third relates the scope of this dilemma to its historical context: globalization. The paper continues with a fourth section that aims to synthesize the key aspects of the last quarter-century of economic history, as a basis for arguing in favour of the continued relevance of Prebisch's ideas today. Lastly, the concluding section discusses the importance of national density in the development process, which I consider crucial for achieving economic and social development in a globalization setting.

□ This paper is based on the lecture given by the author at the Economic Commission for Latin America and the Caribbean (Santiago, Chile, 22 April 2010), on the occasion of the Ninth Raúl Prebisch Memorial Lecture.

[1] The author of this essay has drawn extensively on his previous works: Ferrer (1996, 1997, 1998, 2004 and 2008, the latter referring to the fourth edition of *La Economía Argentina* (2008), on which M. Rougier collaborated.

II

The messages of Prebisch's work

The global world poses challenges and opportunities —threats but also new prospects. This was essentially Prebisch' belief throughout his life. From his youth until his final days, he approached this fundamental issue of the dilemma of development in the global world, formulating a set of ideas that enriched our country' heritage. But, most importantly, he left three messages which, are definitely the major legacy of his work.

The first is that the central countries form visions of the world order that serve their own interests. Consequently, we need to rebel against this theoretical scheme to resolve the problem of development and respond effectively to the challenges of growth in a globalised world. Prebisch referred to that rationalization of the international system as "centrist thought", which —from the theory of comparative advantages of the classical doctrine of international trade until the theory of rational expectations— has always served the interests of the centre. The same is true of economic policy, from free trade through to the Washington Consensus. These are ideological formulations of the developed centre, which conceive a systemic organization in which peripheral countries are merely segments of the world market rather than national systems capable of forming strategies, within their borders and integrated into a globalised world, to deploy their economic and social development potential and incorporate scientific and technological progress. This is Prebisch's first message: Rebellion against centrist thought.

The second is that transformation is possible; that, based on a realistic view of problems, it is possible to change reality, deploy potential and achieve a symmetric and non-subordinate relationship with the rest of the world —first and foremost with the centres of world power.

Prebisch's third message is that the transformation requires a far-reaching change in the productive structure to incorporate knowledge as a fundamental tool of development, in economic and social activity. This is only possible in a diversified and complex structure, and cannot occur in a country that specializes in exploiting natural resources without simultaneously deploying a complex web of industries and value-added chains operating at the frontier of knowledge. Once that is done it is possible to create employment, well-being, social inclusion, and a symmetric non-subordinate relationship with the international system.

These are Prebisch's three great messages. The question now, 25 years after his passing, is what relevance they still have in relation to the proposals of the Executive Secretariat of ECLAC. In an attempt to give an answer to this, I will briefly draw your attention to the core issue in Prebisch's thinking, namely the dilemma of development in a global system.

III

The dilemma and its history

Globalization is the first component of the dilemma: it constitutes a system of financial and trade networks, and integration of value chains, which have grown deeper through time under the effects of scientific and technological progress. Globalization coexists with the fact that countries' domestic markets remain the fundamental space for transactions and economic and social activity. Not much more than 20% of global production crosses national borders; and investments by the subsidiaries of transnational corporations account for no more than 15% of global capital formation. Accordingly, domestic markets and saving constitute the main components of the demand for capital accumulation and its financing.

Globalization is also a power system, in which the large States collaborate with transnational corporations and financial markets to exert a dominant influence and establish the systemic rules of the game. Lastly, as Prebisch argued in his first message, globalization is the space in which hegemonic thought, functional

to the interests of the centre, is formed. Hence the idea that the market is capable of rationally managing resources globally for the benefit of all, and that the forces of globalization are so overwhelming that any attempt to construct national development projects on the periphery is doomed to failure.

The second component of the dilemma is development, which consists of managing knowledge and incorporating it into the economic and social fabric. This is a cumulative process that unfolds through time. Not only does it include capital and technology, but it also involves simultaneously, organization of the State, education, public and private synergy, and the formation of national science and technology systems. It is a process of continuous accumulation of productive know-how and capacity through time. Development always takes place in the national space. To quote Professor Sunkel, the only possible development is development from within (Sunkel, 1991). Development cannot be imported. There is no case in world economic history in which a country has been developed from outside. Development is always a process that occurs in a national space, or not at all. When this happens, it is possible to exploit one's potential and attain the development frontiers of each era.

The fact that globalization penetrates into countries, and development always occurs in a national space, raises the dilemma of development in a global order. This national space is penetrated, from outside, by a division of labour decided upon by those who produce and dominate trade networks. It can penetrate the control of natural resources in less advanced countries and does so by dominating value chains through large corporations, and their influence on the process of knowledge-generation and application of technology. The relation between globalization and knowledge in particular is a fertile are of Latin American thinking on technology policy. Here I would call to mind Professor Jorge A. Sábato, former technology manager of Argentina's National Atomic Energy Commission, who, in various forums has repeatedly argued that the problem consists of how to make technological change endogenous in our countries.

The national space is also penetrated by more subtle mechanisms such as the exchange rate, which generates the problem of "Dutch disease". Countries that specialize in primary production tend to operate with overvalued exchange rates, especially if they are also targeted by financial speculation. This problem is the main obstacle to industrialization and productive transformation and has been studied by Latin American economists such as Luiz Carlos Bresser-Pereira (Bresser-Pereira, 2008 and 2010).

In conclusion, the fact that a country is penetrated by external phenomena forms the dilemma of development in the global order. If a country does not respond effectively to globalization, it becomes disconnected and cannot implement the cumulative processes of knowledge management that are inherent to the transformation. In contrast, if it responds appropriately, globalization opens up opportunities for trade, investment, employment and access to new knowledge.

Here we need to reflect briefly on the history of the dilemma, to set Prebisch's contribution in context. In the pre-technological-revolution world, before the European Renaissance and the takeoff of western Christian civilizations, relations between countries were irrelevant from the economic development standpoint. International trade existed or a space could be occupied and dominated by another country, but production conditions remained broadly the same everywhere. As technology levels were similar, international relations were irrelevant for economic activity.

The dilemma begins when technology impacts economic organization and generates continuous productivity growth. From then on, the type of relation that a given area maintains with the rest of the world is fundamental for its development. Consequently, the dilemma is at least five centuries old. It started in the last decade of the fifteenth century, when Columbus "discovered" the New World, and the Portuguese found the sea route to the east, bringing to a conclusion the enterprise embarked upon by Prince Henry the Navigator at the start of that century. At that time, the dilemma arose for two reasons. Firstly, there was the first planetary system; and secondly, knowledge management —in other words each country's development— is influenced by the nature of its international relations.

In the ensuing five centuries, several stages can be identified in the formation of the world system and the dilemma of development in the global order. A first world order was mercantilist capitalism, initially led by the Iberian countries and later by France, Holland and England. This was the start of western and Christian hegemony in the organization of the system. In fact, until recently, the domain of technology was concentrated in the North Atlantic.

At the end of the eighteenth century, the Industrial Revolution inaugurated a second world

order. New technologies and energy sources, new means of transport, the emergence of railways, undersea cables, telegraph, progress in metallurgy, agriculture, industries that we now call traditional, such as textiles, which then were dynamic industries, formed the new world order and gave an exceptional and unprecedented boost to globalization.

During the conquest and colonization period, Latin America joined the global order in a subordinate status. The centre-periphery relation, studied by Prebisch, became deeper in the second world order as our countries gained independence and were incorporated into the system as suppliers of primary products, importers of manufactured goods, and borrowers. This relationship continued during the following three decades (from 1914 to 1945), during which there were two world wars, the great crisis of the 1930s, the breakdown of the political system with the October Revolution in Russia, and the emergence of Fascism and Nazism. It is a period in which all indicators of globalization —trade, investment and financial flows— trended down. Countries turned in on themselves, and the crisis of the 1930s also resulted in the discrediting of neoclassical orthodoxy and the emergence of the Keynesian paradigm.

This period of "de-globalization" was followed by a new third world order. The new technologies gave rise to a phenomenal transformation and deepening of globalization networks. It can be divided into two subperiods: the first, the golden age of post-war recovery under the hegemony of the Keynesian paradigm and the welfare state; secondly, the neoliberal phase, heavily conditioned by the rapid growth of financial globalization and the formation of a giant speculative casino. This scenario re-established the ideological hegemony of the centre, the magic and omnipotence of the market and the supposed impotence of public policies subject to the empire of rational expectations —a phenomenon that culminated in the recent crisis.

How can Prebisch's thinking be located in this historical path of globalization and the transformation and permanent renewal of the dilemma of development in the global world? Prebisch started his training as an economist in the 1920s, in a scenario of apparent return to pre-war normalcy, which, culminated in the great crisis, the collapse of the international economic order, the discrediting of neoclassical orthodoxy and the emergence of the Keynesian paradigm. By then, Argentina had achieved the region's highest economic and social indicators, within the centre-periphery relation prevailing in the second world order. Consequently, the crisis hit the Argentine economy hard. In that domestic and world scenario) being a young man, Prebisch held important posts in the Argentine political regime that emerged from the *coup d'état* of September 1930. In 1935, as general manager of the Central Bank of the Republic of Argentina, he had the unique experience of managing monetary policy, and this was to prove decisive for the formation of his thinking.

Prebisch was a Professor at the School of Economic Sciences of the University of Buenos Aires, and he resigned from his chair for the same political reasons that caused him to quit the Central Bank in the mid-1940s. But, in the first half of 1948 he took up his chair once again, and I had the good fortune to be studying the subject at that time. In addition to his lecturing responsibilities, Prebisch also led a research seminar. I recall that in the first meeting of the seminar in April of that year, some 20 people met: Prebisch, two or three of his professorial assistants and students including myself. The professor started by explaining the problems he had encountered in managing monetary policy and he said: "My disenchantment with orthodox theory grew and grew." He then asked: "What do you think was the reason for this disenchantment? " I was bold enough to venture an answer, with which the Professor agreed: the reason was that theory did not help to resolve the problems. In that seminar, and on the course, Prebisch foreshadowed the ideas he would later deploy here in ECLAC, enhanced by the contribution of Celso Furtado, Aníbal Pinto and other masters of Latin American economic thought.

Set in their historical context, it can be seen that Prebisch's ideas and so-called Latin American structuralism developed during the phase of de-globalization of the international system, and achieved their greatest influence in the golden age of the third world order —when the orthodoxy of the centre and its hegemonic pretensions were being replaced by the Keynesian paradigm, public policies and the welfare state.

It was against that backdrop that Prebisch's thinking and his response to the dilemma of development in the global world bear fruit in Latin America and have a major influence on the economic policy of the region's countries. Starting in the 1970s, however, while Prebisch was still alive, things changed, and the hegemonic thought of the centre was restored, intensively penetrated by the financial dimension. To

a greater or lesser extent, our countries succumbed to the new situation, often in scenarios of extreme political tension. The transformation process, led by import-substituting industrialization, had not allowed us to construct sufficiently solid national situations. Consequently, we fell into the debt trap and, ultimately, the lost decade of the 1980s. These were the final years of Prebisch's life, in which his influence on theory and the economic policy of Latin American countries waned.

IV

The last 25 years

Profound changes have occurred since 1985, which need to be kept in mind when considering the currency of Prebisch's thinking. The most far-reaching event has been the consolidation of development in China and the emergence of India. Since the end of the Second World War, Japan, the Republic of Korea and Chinese Taipei have all furthered their industrial and technological development. Nonetheless, those countries jointly represent just 5% of the world's population. Now with the emergence of the two great Asian nations accounting for 40% of the world population, an alternative development pole is emerging and bringing to an end the indisputable western hegemony of the last five centuries. What specifically characterizes the emergence of these Asian nations is the structural transformation based on the incorporation of knowledge-intensive activities in their productive and social fabrics. The dynamic centre of the system has started to shift from the North Atlantic to the Asia Pacific basin.

At the same time, the world economy has been shaken by the collapse of the money markets; and it has become clear that maintaining the saving and international payments deficit of the United States as a way to bridge the saving-investment gap in the global economy is unviable. The insufficiency of domestic demand in certain countries (mainly China and Germany) to absorb their high levels of saving, has been covered largely by the North American deficit.

A further relevant fact is that the crisis in the world of money has generated a theoretical vacuum in centrist thinking. As in the 1930s, orthodoxy has been discredited because of its inability to generate an international framework and national policies that were viable. Argentina has to some extent played a pioneering role in certain problems. We noted earlier that Prebisch's thinking was founded on Argentine experience in the interwar period. More recently, Argentina has been the Latin American country that applied the neoliberal creed in greatest depth. It progressed further than any other country in the region in terms of privatization; it borrowed up to the limit of insolvency; overvalued its currency causing harm to the productive fabric; turned the central bank into an exchange house under the currency-board and fixed-exchange-rate regime; and reduced the goal of economic policy to "transmitting friendly signals to markets." The epilogue was the collapse in 2001-2002. This Argentine experience foreshadowed the crisis that erupted in the global system at the end of this decade, based on the same ideas and policies that inspired the neoliberal strategy in my country.

These changes in the global system raise questions about the resolution of the saving-investment gap, the United States deficit, the regulation of money markets and how to accommodate the emerging Asian countries into a new international scenario. What we have not seen are responses from the international system to address the challenges that continue to threaten peace, security and the environment. The debate in the Group of 20 and other international forums does not provide valid responses to these questions, let alone to the widening gaps in well-being in the global system and within most countries.

In this scenario of uncertainties, some things clearly do not change. The nature of globalization and development do not change, nor do relations between the two and the dilemma of development in the global world.

The presence of China in today's globalised world does not mean that is behaving differently towards the least advanced economies than mature industrial nations —that is, by exporting complex manufactures and capital and importing food and raw materials. It is predictable that the international division of labour between the old centre of the North Atlantic and the new Asia-Pacific centre, on the one hand, and what remains of the periphery following the takeoff

of emerging nations, on the other, will maintain the same trends as in the past.

At the same time, economic development is facing challenges caused by major changes in the world system and the continuous expansion of knowledge and technology frontiers. But development remains essentially what it always was, the incorporation of science and technology into the economic and social fabric, and the capacity to manage knowledge in the national space.

V
National density

This brings me to my final reflections on the dilemma of development in the global world and the conditions that determine the capacity of countries to respond to the challenges and opportunities of globalization. The comparative analysis of the experience of countries that have had success in various historical periods, responding effectively to those challenges and opportunities, reveals the presence of certain necessary conditions which, I collectively refer to as "national density". It can be argued that each country has the globalization it deserves, in relation to the strength of its national density. Countries with strong national density are capable of responding to the challenges and can take advantage of the opportunities provided by the global system.

The components of national density include, first and foremost, social cohesion. Societies that are deeply fragmented by inequality, and sometimes by religious and ethnic problems, lack the capacity to exploit their resource potential. The second component is the quality of leadership. In socially cohesive societies, leaders normally have strategies for accumulating power within the national space, and are not merely the commissioned agents of transnational interests. For example, in contemporary history, the experience of the emerging countries of Asia shows that local entrepreneurs and national Governments lead the process of capital and technology and accumulation. They also forge relationships with transnational corporations to develop value chains, without losing the capacity to conduct processes of accumulation and change. These two conditions are mutually linked. Highly fragmented societies tend to be led by minorities that are closer to transnational interests than the interests of their own people.

A third component of national density is long-term institutional stability, irrespective of the nature of the political regime. A sufficient degree of institutional stability is needed to be able to articulate responses to the dilemma. The fourth component consists of ideas. None of the successful countries conducted their national policies with the hegemonic vision of centre. All of them, including the emerging United States in the nineteenth century, always operated with ideas rooted in their national interest. This was true of Japan following the Meiji restoration and it happened after World War II in the heterodox ideas and policies of the Republic of Korea, Chinese Taipei, China and India. As Prebisch argued, the existence of *sui generis* thinking is a necessary and essential condition for a country to enter the path of development.

After two centuries of independence, Latin America is struggling with the weak national density of our countries. Our societies are based on social fragmentation, the domination of native population and the subsequent extraordinary phenomenon of slavery that characterized much of Latin America. In countries like Argentina, where the original peoples and Afro-Americans were rendered as a minority in the total population after the tidal wave of immigration, social fragmentation is reflected in the concentration of land ownership and other natural resources. The fact that Latin America is the region with the highest concentration of wealth and the most unequal distribution of income is largely a legacy of history. Our challenge in resolving the dilemma of development in the global world is greater than elsewhere, because here we have to respond to the problems of today and, simultaneously, repair the consequences of history.

Social fragmentation has had its corollary in long-term political instability and the existence of leaderships with power strategies linked to the hegemonic centre, serving as agents of transnational interests rather than leaders of endogenous, national processes of accumulation. The same reasons also explain why ideas subordinated to centrist thinking have

prevailed, to a greater or lesser extent depending on the countries and historical periods in each case.

After two centuries of independence, national density still needs to be constructed. The latest ECLAC report on inequality, social integration and inclusion highlights an essential condition for the development process in Latin America. Prebisch had stressed the same in his studies on peripheral capitalism and even earlier.

To resolve the dilemma of development in the global world, it is necessary to enrich our countries' national density in terms of social inclusion, leadership quality, democratic stability, and the consolidation of critical thought that flourishes, not because there is a hegemonic vacuum in the centre, but because we are capable of constructing original Latin American economic and social development thinking. All of this, to deploy effective development policies that include stability and sound macroeconomic fundamentals. Raúl Prebisch always emphasized this, sometimes to the disbelief of some of his disciples. It is impossible to base national policies on a framework of disorder; fiscal solvency is essential, as also are low levels of indebtedness and sound international payments. If there is insufficient capacity in the sovereign exercise of economic policy, no transformation is possible; and national density is necessary to be able to implement policies founded in the national interest.

The neoliberalism vernacular, epigone of the hegemonic thinking of the centre, sees us as a segment of the world market and condemns us, as Helio Jaguaribe (1979) argues, to a peripheral status. The globalizing fundamentalism that contaminated Latin America has caused, in some expressions of progressivism, a degree of resignation in the sense that globalization is so overwhelming that the only thing we can do is seek a few niches to accommodate ourselves. That was not Prebisch's message. There is no niche that enables us to generate development and social inclusion. The only way forward is to definitively break with the centre-periphery relation, generating capacity to make use of our resources and imagination and deploy a new style of engagement in the world system.

What, then, is the answer the question that I formulated initially? What validity do the three main messages of Prebisch have today? The answer is, even more than when he formulated them over 50 years ago with the collaboration of his young working colleagues in ECLAC. The first message, the crucial importance of critical thinking, is more valid today than it was at the time. Secondly, the fact that transformation is possible is verified by experience in other parts of the world. Prebisch transmits a message of hope. We have the means, capacity, resources, and the talent needed to construct development. There are no external factors that paralyze us and prevent it. The message of transformation and hope is as alive today as it was then. Lastly, the third message, that development is impossible without a profound structural change that incorporates activities on the frontier of knowledge seems ratified by historical experience and comparative development studies, particularly of emerging Asian countries. That transformation includes the issue addresses in the latest ECLAC report (2010) on the takeoff of small and medium-sized enterprises; their links with large value chains; the ties between science and technology systems and production; education and synergy between the public and private domains.

Lastly, Latin American density: the dimensions of national density are also valid at the regional level. The stronger our national densities, the deeper will be the links between our countries, infrastructure investments, the formation of value chains in dynamic sectors of regional scope, science and technology programmes, development financing; and more solid will be the institutions of integration capable of implementing community policies and integrating national processes within a broader continental space.

To construct Latin American density we must generate our own ideas on integration, develop appropriate visions of our realities, and abandon the fantasy of reproducing the experience of the European Union in the Latin American space. Our reality is different, the integration of our countries is different from that of other regional spaces. We have made significant progress in this area, probably more in the field of politics and coordination of Latin American diplomacy than in the economic development sphere. Latin American density is also based on social development, the quality of leadership, democratic consultation and critical thinking.

To conclude, 25 years after the Raúl Prebisch's death, his fundamental ideas, developed initially in Argentina and then propagated from ECLAC to the rest of the world, with collaboration from his professional colleagues, are more relevant today than ever.

(Original: Spanish)

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KEYWORDS

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Latin America: incorporating environmental factors into the measurement of production efficiency and technical change

Daniel Sotelsek and Leopoldo Laborda

This paper examines growth in a set of Latin American countries from 1980 to 2004 by analysing total factor productivity (TFP) from a twofold perspective: maximization of output (GDP) and minimization of the CO_2 emissions generated in the production process. Malmquist productivity indices are constructed for this purpose. In addition, kernel density functions are employed to analyse convergence (or divergence) in the efficiency estimated. The results obtained indicate that incorporating environmental factors into the measurement of efficiency and productive change significantly improves the estimates for certain countries in the region by comparison with those obtained by more traditional methods.

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I
Introduction

The purpose of this article is to consider and empirically analyse economic growth, convergence in efficiency levels and the environmental implications of these by studying and measuring changes in total factor productivity (TFP) in the countries of Latin America.

The main idea of the study is to see how technical efficiency in the use of resources can combine with the concept of environmental sustainability. This is done by estimating TFP growth in the Latin American economies between 1980 and 2004 and breaking this down into efficiency improvements and technological change by calculating Malmquist indices.

Non-parametric techniques such as data envelopment analysis (DEA) are used to measure productivity so that disaggregated country-by-country results can be arrived at for efficiency improvements and technical change, taking a number of externalities in the production function into account. Another aim is to detect possible convergent (or divergent) growth patterns in the Latin American countries during the 1980-2004 period.

We believe the subject to be important because growth in Latin America over the past 25 years has been modest; at the same time, it is not just the pace of growth that matters but its quality and stability too. It is in consideration of this that an effort is needed to analyse the causes of growth in a way that distinguishes the internal effects of technical efficiency change (catching-up) as opposed to just an aggregate index.

The environmental factor, among others, has become part of the debate about growth quality, and the quantitative analysis and methodologies used in this study provide a way of constructing a measure of growth that incorporates this variable with a view to analysing its influence when TFP is modified and being able to compare growth situations.

In pursuit of these goals, this paper is structured as follows. Section II analyses the major known facts about the relationship between growth, convergence and the environment. Section III provides an overview of the methodology used for decomposing TFP and analysing convergence. Section IV describes the data employed and presents the findings. Lastly, section V contains the conclusions of the study.

II
Some background

1. Total factor productivity (TFP), growth and efficiency convergence

Ever since the pioneering work of Solow (1957) on growth accounting (residual factor), TFP changes have routinely been measured as a way of identifying the causes of growth and thereby reducing what Solow called "the measure of our ignorance".

Progress in this field has been significant. Efforts were initially oriented towards distinguishing the determinants of factor accumulation by seeking to observe the quality of both labour and capital. The idea was essentially to answer the following questions: why did economies grow, and what were the prospects for convergence?

A second stage in growth theory began with the publication of an article by Romer (1986) proposing a production function with increasing returns external to the firm. In those years, in an attempt to provide answers to the same questions as before, so-called endogenous growth models made their appearance while work began on decomposing technical progress and efficiency as two distinct measures affecting TFP.

Work on the convergence hypothesis had taken an important new turn, meanwhile, and the empirical studies of Abramovitz (1986), Baumol (1986) and

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Maddison (1987) found evidence of convergence between developed countries, but this hypothesis did not hold up when the sample was extended to developing countries. Barro (1991), Barro and Sala-i-Martin (1992) and Mankiw, Romer and Weil (1992) also demonstrated the existence of convergence conditional upon the characteristics of the steady state.

As well as defining absolute and conditional β-convergence, Quah (1993) defines a third measure termed σ-convergence.[1] For the case of Latin America, Elías (2001) analyses the σ-convergence of seven countries in the 1960-1994 period and finds some degree of convergence between countries, but when the United States is integrated into the sample the situation is clearly divergent.

This paper introduces the idea of σ-convergence from the efficiency standpoint only and thus does not go thoroughly into the subject, since the important thing is to complement the idea of efficiency in Latin America from this perspective.[2]

The evidence shows growth in Latin America to have been modest and unstable over the last 40 years, with particular volatility in the 1980-2000 period. An initial guide to the analysis of growth in Latin America can be found in Hofman (2001), which undertakes a detailed analysis of the region's growth process in the twentieth century, convergence trends, and productivity and efficiency. Among other characteristics, the study takes an innovative approach to analysis of the growth process by distinguishing and relating what are considered to be the "proximate causes" (traditional analysis of the sources of growth and β-convergence) with so-called "ultimate causes" (institutions, income distribution and macroeconomic stability).

The conclusions are in line with those of other studies and are to the effect that there are clear convergence tendencies within the region and that the role of TFP has held steady over time at about 40%, a reflection of the fact that capital and labour are the variables which alter over time (Hofman, 2001, p. 12).

Where the 1980-2000 period is concerned, the study incorporates an explanation of the region's structural weaknesses and the way these affect the growth process, although this proves hard to quantify.

Along similar lines, Solimano and Soto (2005) seek to identify in significant detail the economic development process of Latin America and its relationship with development cycles in the closing decades of the last century. To this end, they first formulate some stylized facts concerning the region's economic performance: (i) the existence of heterogeneity and volatility in long-term growth, (ii) the deterioration of economic development after 1980 and (iii) major shifts in economic development between countries.

Secondly, the article focuses on analysing the sources of growth, concluding that the deterioration of gross domestic product (GDP) in the closing decades of the last century was essentially due to a drop in TFP. The study identifies TFP determinants that may be behind the fall-off in growth, including the business cycle, the quality of the workforce, external shocks and macroeconomic instability (Solimano and Soto, 2005, pp. 35-36).

Certain studies have proceeded along similar lines to our own work by estimating TFP using DEA and Malmquist indices, as these provide a way of distinguishing between technical progress and technical efficiency changes at the country level:

— For the 1970-2001 period, Lanteri (2002) estimates measures of change in TFP and its components for nine countries, including the United States and a number of Latin American and South-East Asian countries. Given the importance of measuring efficiency in TFP changes, it should be mentioned that Argentina presents an annual decrease of 0.5% over the period (the United States is the frontier), but when TFP is decomposed it transpires that efficiency increased at a rate of 0.3% annually over the period, the fundamental cause of the decline in TFP being an annual 0.7% reduction in technological change.

— Taskin and Zaim (1997) conducted a study on TFP changes for 23 high- and low-income countries in the 1975-1990 period, seeking to test the technical efficiency change hypothesis by measuring this change and assessing the rate at which methodology spreads. Overall, the countries saw a very small loss in productivity, but high-income countries gained 0.37% a year while low-income ones lost 0.38% a year.

— In the case of Organisation for Economic Cooperation and Development (OECD) countries, studies by Dowrick and Nguyen (1989) and Färe, Grosskopf and Norris (1994) show marked

[1] Sigma (σ) convergence measures the dispersion of income by taking the standard deviation of income (Y_{it}) in each country (i) over time (t) (Barro and Sala-i-Martin, 1992).

[2] See ECLAC (2008, pp. 17-51) for an analysis of convergence in Latin America.

convergence in efficiency changes, whereas the same is not found to be true of changes in TFP relative to the frontier.

— Ching-Cheng and Yir-Hueih (1999) study the sources of factor productivity growth in the Asian countries. Using distance functions based on the Malmquist productivity index, they reveal some interesting findings from a sample including 19 countries of the Asia-Pacific Economic Cooperation Forum (APEC), dividing productivity between technical efficiency changes and technical progress (innovation). The data indicate that the United States (included in the sample) is not the only innovator in the region; in the 1980s, both Hong Kong Special Administrative Region and Singapore proved able to adjust the country frontier, meaning that they are good not only at adaptation but at innovation too.

— Employing non-parametric techniques, and with a view to avoiding the efficiency biases that come with the use of production frontiers, Maudos, Serrano and Pastor (1999) consider the possibility of inefficient behaviour, as do Färe, Grosskopf and Norris (1994), who signal the importance of efficiency gains as a source of convergence in labour productivity for the OECD countries.

2. Total factor productivity, growth and the environment

The recent literature has incorporated the issue of the environment into the analysis, seeking to justify TFP changes and differentiating them into efficiency and technical progress.

Although the link between economic growth and the environment is not a new topic of research, it is not of very long standing either. It was in the 1970s that the idea of environmental problems being somehow necessarily related to economic development became well-established.

The history of the subject starts with *Silent Spring* (Carlson, 1962), a book which detailed the problems caused to the environment by the indiscriminate use of pesticides and insecticides. A few years later, Boulding (1966), in his essay "The Economics of the Coming Spaceship Earth", sought to show the dangers of unrestricted economic growth from the standpoint of resources and pollution.

The report by Meadows and others (1972) gave an early intimation of the existence of limits to economic growth, with the main hypothesis concerning non-renewable resources as a constraint. The debate focused on three points: the rate of change in technical progress, future changes in the composition of output, and the scope for substitution (Ekins, 1993, p. 271).

The debate is basically the same today; however, empirical studies on the existence of the environmental Kuznets curve (growth and the environment), scale decomposition of emissions and the composition effect have clarified the discussion somewhat. It has been argued that economic growth does not necessarily have to be associated with environmental deterioration but, on the contrary, can coexist with an improving environment (Cole, 2007).

In the 1980s, the Brundtland Commission report (WCED, 1987) consolidated the use of the term "sustainable development" (WCED, 1987).[3] Economically, the aim was to reconcile the social benefits of access to goods and services with the environmental costs deriving from their production.

Studies of the environmental Kuznets curve became widespread in the 1990s, not least because more data were available. Grossman and Krueger (1995) and Shafik (1994) found evidence for the environmental Kuznets curve (in terms of scale, composition and technical effects). There are reservations about the turning point, however, depending on the economic, cultural, political and social characteristics of each economy (Cole, Elliot and Shimamoto, 2005; Stern, 2002).[4]

Since then, much of the economic literature on changes in TFP, efficiency and convergence has included environmental topics, and the relationship between growth and the environment is accepted:

— Kumar (2006) analyses TFP change by considering goods and services output and the generation of negative environmental externalities, while others treat it as a pollution abatement cost. The traditional productivity measure ignores reductions in unwanted emissions because of abatement activity, as there is no price on the production of unwanted emissions unless a tradable goods market exists.

— The study calculates an adjusted Malmquist productivity index for 41 more- and less-developed countries in the 1971-1992 period and analyses the

[3] Although the central idea of sustainable development is to preserve equity between generations, this concept ignores concerns about income equity and poverty levels (intragenerational equity) (Markandya, 1992).

[4] Cole (2007, p. 245) analyses the results of estimating turning points in the environmental Kuznets curve.

components of TFP, dividing technical progress and efficiency (the null hypothesis of the indices being equal when emissions are ignored is not accepted), as a result of which it is found that just six countries (all developed) are innovators while lower-income countries are not.

— Färe, Grosskopf and Hernández-Sancho (2004, p. 349) propose an indicator to measure environmental behaviour using the data envelopment analysis (DEA) technique, consisting in the quotient between the index for the quantity of goods produced and the environmental externalities index. This indicator shows the extent to which a sector, firm or country can succeed by producing goods while simultaneously accounting for the negative environmental effects. To apply the index, they use data from a sample of 17 OECD countries for 1990, comparing GDP data with data on environmental emissions (carbon dioxide, nitrogen oxide and sulphur oxide) and energy consumption. The findings show France and Sweden to have the best quotients and Greece the worst.

— Ball and others (2005) consider the relationship between productivity growth and the adverse effects on the environment. To this end they consider a number of studies indicating that factor productivity growth is overestimated in the presence of rising negative externalities of an environmental nature (Denison, 1979 and Robinson, 1995). The authors set out by constructing an index they call the Malmquist cost productivity (MCP) index, the purpose of which is to establish a measure of higher productivity that takes account of externalities. Using panel data, they show how the productivity measure rises when negative environmental externalities are ignored. When the risks associated with production diminish, conversely, productivity increases (Ball and others, 2005, pp. 382-386).

— Starting from this basis, Färe, Grosskopf and Pasurka (2007) consider the possibility of generating a productivity measure taking into account the absence of data on inputs used in environmental externalities. For this they propose the traditional measure of productivity in a different context termed a "joint production perspective".[5] They use electricity plant data for the 1985-1995 period with one output, net electricity generation, and two externalities, carbon dioxide (CO_2) and nitrogen oxide (NO_x). The findings show that pollution abatement activities are associated with reductions in traditional productivity and technical change, although these differences are not statistically significant (Färe, Grosskopf and Pasurka 2007, p. 680).

— Schuschny (2007) analyses the energy performance of 37 countries in Latin America and the Caribbean by employing indicators of economic activity, CO_2 emissions intensity and energy consumption based on the use of fossil fuels or clean alternative sources. The findings show that there are countries which have made an effort to increase the level of activity in their economies while seeking to meet their energy consumption needs from clean technologies.

In contrast to the study by Schuschny (2007), this article treats pollutants (CO_2 emissions in this case) not as a factor to be minimized but as an undesirable output or externality. This different approach is taken because the main goal of this paper is to carry out an economic growth accounting exercise (whence the choice of traditional production factors such as capital and labour and of an output, GDP, that is also standard in this type of literature) from a broader perspective that also considers negative environmental effects associated with this economic growth.

To conclude this section, we should emphasize how important it has been for the present analyses to be set within the context of a region like Latin America and a very significant time period encompassing the "lost decade", the Washington Consensus and the recovery.

[5] This approach has some advantages: (i) no information on the cost of abatement technologies is required, (ii) there is no need to investigate actual abatement strategies and (iii) the measure captures the abatement effect for more than one pollution problem.

III

The efficiency analysis methodology

1. Measuring production efficiency and technical change: the Malmquist index

The analysis proposed in this investigation has required estimation of Malmquist TFP indices, and the methodology followed has been that proposed by Färe and others (1994) whereby the change in TFP between two time periods is measured by calculating the quotient of the distances of each data point in relation to a common technology. Given a technology in period t, the change in the (output-oriented) Malmquist TFP index between period s (the base period) and period t can be expressed as:

$$m_0^t\left(q_s,x_s,q_t,x_t\right)=\frac{d_0^t\left(q_t,x_t\right)}{d_0^t\left(q_s,x_s\right)} \tag{1}$$

Or alternatively, using the technology of reference in period s, the index can be defined as:

$$m_0^s\left(q_s,x_s,q_t,x_t\right)=\frac{d_0^s\left(q_t,x_t\right)}{d_0^s\left(q_s,x_s\right)} \tag{2}$$

In equations (1) and (2), the notation $d_0^s\left(q_t,x_t\right)$ represents the distance from the period t observation to the period s technology, in the terms already defined. Thus, a value for (m_0) that is greater than 1 indicates positive growth in TFP from period s to period t, while a value below one indicates a drop in TFP.

As Färe, Grosskopf and Roos (1998) have argued, these two indices are only equivalent if the technology is Hicks-neutral, i.e., if the distance functions of output can be represented as $d_0^t\left(q_t,x_t\right)=A\left(t\right)d_0\left(q_t,x_t\right)$ for any t.

To avoid imposing this constraint or arbitrarily choosing one of the two technologies, the Malmquist TFP index is often defined as the geometric mean of these two indices, in the sense of Fisher (1992) and Caves, Christensen and Diewert (1982). In other words:

$$m_0^s\left(q_s,x_s,q_t,x_t\right)=\left[\frac{d_0^s\left(q_t,x_t\right)}{d_0^s\left(q_s,x_s\right)}\text{x}\frac{d_0^t\left(q_t,x_t\right)}{d_0^t\left(q_s,x_s\right)}\right]^{\frac{1}{2}} \tag{3}$$

The distance functions in this productivity index can be reorganized to show that the above is equivalent to the product of the technical efficiency change index and the technical change index:

$$m_0^s\left(q_s,x_s,q_t,x_t\right)=\frac{d_0^t\left(q_t,x_t\right)}{d_0^s\left(q_s,x_s\right)}\left[\frac{d_0^s\left(q_t,x_t\right)}{d_0^t\left(q_t,x_t\right)}\text{x}\frac{d_0^s\left(q_s,x_s\right)}{d_0^t\left(q_s,x_s\right)}\right]^{\frac{1}{2}} \tag{4}$$

In the above equation, the quotient outside the brackets measures the change in the Farrell output-oriented technical efficiency measure between period s and period t. The remainder of the index in equation (4) is a technical change measure, i.e., the geometric mean of the technology change between the two periods, evaluated at (x_t) and also at (x_s).

Färe, Grosskopf and Roos (1994) suggest that technical efficiency change be broken down into two components represented by "scale efficiency and pure technical efficiency".[6] This decomposition involves adopting the efficiency change measure in the first term of equation (4)[7] and separating it into a pure efficiency change component and a scale efficiency change component, as expressed respectively by the following equations:

$$\text{Pure efficiency change}=\frac{d_{0v}^t\left(q_t,x_t\right)}{d_{0v}^s\left(q_s,x_s\right)} \tag{5}$$

$$\text{Scale efficiency change}=\left[\frac{d_{0v}^t\left(q_t,x_t\right)/d_{0c}^t\left(q_t,x_t\right)}{d_{0v}^t\left(q_t,x_t\right)/d_{0c}^t\left(q_s,x_s\right)}\text{x}\frac{d_{0v}^s\left(q_t,x_t\right)/d_{0c}^s\left(q_t,x_t\right)}{d_{0v}^s\left(q_t,x_t\right)/d_{0c}^s\left(q_s,x_s\right)}\right]^{\frac{1}{2}} \tag{6}$$

[6] This is only possible when the distance functions of the equations taken are estimated for a technology with constant returns to scale.

[7] In this case, it means assuming a quotient of two distance functions with constant returns to scale.

The scale efficiency change component of equation (6) is actually the geometric mean of two scale efficiency change measures, the first relating to the technology of period *t* and the second to the technology of period *s*.

Data envelopment analysis (DEA) will be used to estimate the above components.[8] The essence of this technique lies in the definition of an efficient frontier as a point of reference for evaluating the variations observed in the performance of different production units (countries in this case).[9] The DEA method does not create assumptions about functional forms, being a non-parametric performance evaluation approach; however, it does allow different inputs and outputs to be incorporated, something that is essential to the aims of the present study and the principal justification for its employment.

One of the major advantages of DEA is that it can be used to work with multiple inputs and outputs that have different units, while it does not create a need to consider full employment of production factors or require explicit functional forms. As for the drawbacks, the method is sensitive to measurement errors (the reference points are highly productive) and does not permit easy application of statistical tests, and relative rather than absolute inefficiencies are identified (Schuschny, 2007, pp. 22-23).

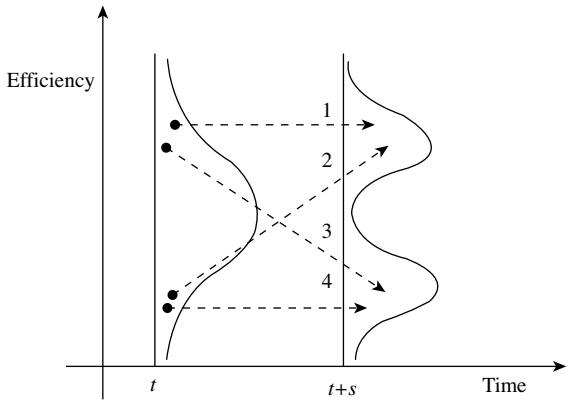
2. The efficiency distribution dynamic

To understand the dynamic of the whole efficiency distribution, the intention is to use stochastic kernel estimators in much the same way as Birchenal and Murcia (1997) employed them to analyse convergence.

Figure 1 illustrates this approach, showing a possible distribution of efficiency in two time periods, *t* and *t+s*. The distribution in period *t* indicates that there is an average efficiency level shared by most of the economies considered and that there are few with extremely high or low efficiency. By contrast, *t+s* has grouped the most and least efficient economies to create two clearly differentiated groups, while the medium-efficiency groups have disappeared.

FIGURE 1

Change in the efficiency distribution



Source: prepared on the basis of J.A. Birchenal and G.E. Murcia, "Convergencia regional: una revisión del caso colombiano", Archivos de macroeconomía, No. 69, Bogotá, D.C., National Planning Department, 1997.

The arrows in figure 1 show the internal dynamic of the distribution. For example, arrows 2 and 3 indicate the "mobility" of the economies within the distribution and arrows 1 and 4 the "persistence" of the economies that keep their original position between periods *t* and *t+s*.

To analyse this dynamic without distorting it, the idea is to divide the efficiency space into an infinite number of regions or continuum. In this case, the corresponding transition probability matrix will tend towards a continuum of rows and columns, becoming a stochastic kernel.

[8] Schuschny (2007) gives a detailed presentation of this technique and an excellent review of the concepts of productivity and efficiency.

[9] In other words, the starting assumption when applying this technique in the case before us is that all the countries in the sample ought to be able to function at an optimal level of efficiency, determined by the efficient countries included therein. In the specialist literature, these efficient countries are called "peer countries" and are the ones that determine the efficiency frontier, so that the distance to the efficient frontier represents the measure of efficiency or the lack thereof.

IV
Empirical data and findings

To apply this methodology to the analysis of productivity (TFP) growth in a set of Latin American countries between 1980 and 2004, use has been made of data on GDP (expressed in constant 2000 dollars) and CO_2 emissions (kt) as the main externality.[10] As for inputs, these are represented by the total workforce and gross capital formation (expressed in constant 2000 dollars). The data concerned were generated by the World Bank in collaboration with other international agencies.[11]

Table I of the statistical appendix presents a descriptive analysis of the basic statistics of the variables used for the 18 Latin American countries in the sample.

These variables have been used to estimate the change in TFP and its decomposition (efficiency change, technological change, pure efficiency change and scale efficiency change) for the set of countries considered in the sample. This estimate has been produced by a traditional approach (which we shall call normal), in which the only output considered is GDP, plus an alternative approach (which we shall call environmental) incorporating an undesirable additional output, represented by CO_2 emissions, which accompany this growth.

1. TFP and efficiency analysis

The analysis starts by considering the decomposition of annual TFP growth summarized in table 1. It first presents the results of the change experienced over the period (1980-2004), while also producing estimates of change in different subperiods with a view to providing greater information on the behaviour of these variables.[12]

Broadly speaking, there are no great differences in the magnitudes estimated using the two indices, with mean TFP falling slightly over the whole period in both cases (when TFP is decomposed and the normal index is used, this reduction is apparently explained by the decline in technical efficiency, pure technical efficiency and scale efficiency; when the environmental index is used, conversely, technological change is what accounts for this diminution of TFP). Although the final results are not disparate, the preliminary conclusions and thence policy and incentive recommendations may be different depending on what TFP measure is used.

When the full period is analysed, the 1981-1982 and 1982-1983 subperiods prove to be times of TFP growth (about 10%) in both scenarios, although growth is higher for the environmental index, especially in the 1981-1982 subperiod. The 1986-1987 subperiod is the time of greatest decline in TFP (about 7%) for both indices, apparently indicating a negative evolution in the main macroeconomic indicators during what has come to be called the "lost decade". In the 1990s, TFP declined substantially during the 1996-1997 subperiod and recovered in the 1998-1999 subperiod. This seems to coincide with the financial and banking crises and the recovery from them in Latin America and worldwide.

During subperiods of both rising and falling productivity, the greatest influence comes from technological change or, what comes to the same thing, the variation of technological change is much more pronounced than the variation of efficiency change.

For a more thorough analysis, table 2 shows the decomposition of TFP growth for each of the countries considered and for all of them as a group. It transpires that there are no great differences in the magnitudes estimated with the two indices employed much as with the data of table 1. There are some countries whose performance calls for comment, however. TFP in the Plurinational State of Bolivia shows a small mean increase when the normal index is used but declines when the environmental index is used.

In the case of Ecuador and the Bolivarian Republic of Venezuela, the situation is as follows. In Ecuador, TFP rises in both scenarios, but the environmental index shows a clear upward trend with a mean |rate of 2.3% for the whole period, well in excess of the GDP measure, apparently indicating a major efficiency effort by Ecuador when environmental externalities

[10] CO_2 emissions derive from fossil fuel use and cement production. We include CO_2 produced during the consumption of fuels in a solid, liquid or gaseous state.

[11] The authors especially wish to thank these institutions for their generosity in providing access to the World Bank World Development Indicators and Global Development Finance databases.

[12] A simple interpretation of the results is to consider values over 1 as representing improved growth and values under 1 as a deterioration in growth.

TABLE 1

Decomposition of TFP growth: mean annual increase, 1980-2004

Period	Malmquist index summary (normal index)					Malmquist index summary (environmental index)				
	EFFCH	TECHCH	PECH	SECH	TFPCH	EFFCH	TECHCH	PECH	SECH	TFPCH
1980-1981	1.032	0.958	0.983	1.05	0.989	1.023	0.972	1.007	1.016	0.995
1981-1982	0.959	1.141	0.96	0.999	1.093	0.961	1.157	0.977	0.983	1.112
1982-1983	0.942	1.169	0.958	0.983	1.101	0.918	1.207	0.911	1.008	1.108
1983-1984	1.038	0.938	1.061	0.978	0.974	1.117	0.871	1.097	1.018	0.973
1984-1985	0.955	1.05	0.977	0.978	1.003	0.99	1.006	1.02	0.971	0.997
1985-1986	1.028	0.951	1.037	0.991	0.977	0.986	0.971	0.977	1.009	0.957
1986-1987	0.965	0.956	0.986	0.979	0.923	0.986	0.943	1	0.986	0.93
1987-1988	0.861	1.179	0.922	0.934	1.016	0.906	1.141	0.945	0.959	1.035
1988-1989	0.916	1.123	0.836	1.095	1.029	0.807	1.287	0.789	1.022	1.038
1989-1990	1.081	0.895	1.182	0.914	0.967	1.03	0.947	1.146	0.899	0.975
1990-1991	1.332	0.713	1.153	1.155	0.95	1.348	0.705	1.164	1.158	0.95
1991-1992	0.976	0.958	0.998	0.978	0.935	1.068	0.884	1.043	1.024	0.944
1992-1993	0.992	0.98	0.97	1.023	0.971	0.911	1.076	0.932	0.977	0.981
1993-1994	0.77	1.255	0.888	0.868	0.966	0.759	1.274	0.873	0.869	0.966
1994-1995	1.189	0.823	1.096	1.085	0.978	1.188	0.818	1.103	1.076	0.971
1995-1996	0.962	1.086	1.01	0.952	1.044	0.963	1.09	1.019	0.945	1.049
1996-1997	1.078	0.855	1.029	1.047	0.922	1.214	0.76	1.09	1.113	0.922
1997-1998	1.047	0.909	1.019	1.028	0.952	1.058	0.908	1.035	1.022	0.96
1998-1999	0.957	1.155	1.035	0.925	1.105	0.91	1.207	0.998	0.912	1.098
1999-2000	1.002	1.014	0.955	1.05	1.016	1.041	0.963	1.002	1.039	1.002
2000-2001	0.98	1.028	0.954	1.027	1.008	1.014	0.994	0.968	1.047	1.008
2001-2002	0.843	1.205	0.874	0.964	1.016	0.87	1.164	0.935	0.93	1.012
2002-2003	1.12	0.911	1.127	0.994	1.02	0.988	1.043	0.966	1.023	1.031
2003-2004	1.035	0.945	0.999	1.036	0.978	1.126	0.862	1.082	1.041	0.971
Mean	0.996	1	0.997	0.999	0.996	1	0.998	1	1	0.998

Source: prepared by the authors on the basis of data from the World Development Indicators (WDI) and Global Development Finance (GDF) databases of the World Bank.

TFP: total factor productivity.
EFFCH: technical efficiency change.
TECHCH: technological change.
PECH: pure technical efficiency change.
SECH: scale efficiency change.
TFPCH: total factor productivity change.

are taken into account. In the Bolivarian Republic of Venezuela, meanwhile, although TFP declines in both scenarios, the trend is much better when emissions are included, as TFP falls by 2.8% when measured by GDP alone but by just 0.7% when the environmental index is included.

The TFP breakdown shows a behaviour pattern different to that discussed in table 1. In the case of Ecuador, some of the improvement can be seen to be due especially to the efficiency change, which in turn is mainly accounted for by the pure technical efficiency change in the case of the environmental index, whereas when the normal index is taken it is essentially technical progress that accounts for the (much smaller) positive change. In the case of the Bolivarian Republic of Venezuela, the conclusion is the same: the decline in the normal index is explained by both efficiency and technology, whereas when the environmental index is used, efficiency (pure efficiency) compensates for a decline in technical change.

In the case of the Dominican Republic, the situation is also fairly clear: in the environmental index, the good performance of (pure) technical efficiency helps to offset the decline in technical change, whereas in the normal index the two perform very much alike.

In summary, it can be said that the results obtained for the whole of the period considered are generally quite consistent when the two measures are compared (with the exception already mentioned of the Plurinational State of Bolivia). The countries where TFP increases most are Uruguay (which scores 1.015 on both indices) and Ecuador (1.006 on the normal index and 1.023 on the environmental index); TFP declines

TABLE 2

Decomposition of TFP growth by country: mean annual increase, 1980-2004

Country	Malmquist index summary (normal index)					Malmquist index summary (environmental index)				
	EFFCH	TECHCH	PECH	SECH	TFPCH	EFFCH	TECHCH	PECH	SECH	TFPCH
Argentina	1	0.997	1	1	0.997	1	0.998	1	1	0.998
Bolivia (Plur. St. of)	1.007	0.995	1	1.007	1.001	1	0.996	1	1	0.996
Brazil	0.994	1.009	1	0.994	1.003	0.999	1.001	1	0.999	1
Chile	0.999	1.004	0.999	1	1.002	0.997	1.002	1	0.997	1
Colombia	0.997	1	0.996	1.001	0.997	0.995	1.001	0.995	1	0.996
Costa Rica	0.985	1.004	0.989	0.996	0.989	0.985	1.002	0.99	0.995	0.986
Dominican Republic	0.998	0.997	1	0.998	0.996	1.005	0.992	1.004	1.001	0.997
Ecuador	1.001	1.006	1.005	0.996	1.006	1.013	1.009	1.012	1.001	1.023
El Salvador	0.987	0.998	0.987	1	0.986	0.99	0.997	0.99	1	0.987
Guatemala	0.991	0.998	0.991	1	0.989	0.997	0.995	0.995	1.002	0.992
Honduras	0.99	0.998	0.982	1.009	0.988	1	0.994	0.994	1.006	0.994
Mexico	1.006	0.99	1	1.006	0.995	1.004	0.984	1	1.004	0.989
Nicaragua	0.997	0.991	1	0.997	0.988	1	0.995	1	1	0.994
Panama	0.994	1.009	1	0.994	1.003	0.995	1.006	1	0.995	1.001
Paraguay	1.009	1.002	1.012	0.996	1.011	1.011	1.003	1.014	0.997	1.014
Peru	0.994	0.997	0.999	0.995	0.991	0.998	0.993	1	0.999	0.991
Uruguay	1.006	1.009	1.002	1.004	1.015	1.006	1.01	1.002	1.004	1.015
Venezuela (Bol. Rep. of)	0.984	0.989	0.986	0.997	0.972	1	0.993	1	1	0.993
Mean	0.996	1	0.997	0.999	0.996	1	0.998	1	1	0.998

Source: prepared by the authors on the basis of data from the World Development Indicators (WDI) and Global Development Finance (GDF) databases of the World Bank.

TFP: total factor productivity.
EFFCH: technical efficiency change.
TECHCH: technological change.
PECH: pure technical efficiency change.
SECH: scale efficiency change.
TFPCH: total factor productivity change.

in the Bolivarian Republic of Venezuela, meanwhile, with a score of 0.972 on the normal index and a more moderate 0.993 on the environmental index.

In conclusion, it can be said that the performance of the region has been rather weak as regards TFP growth over the years observed, from the standpoint of both technological change and technical efficiency, although the latter plays a far more important role when the environmental index is used. This comes out particularly clearly in the case of countries further from the mean.

2. Aggregate analysis of technical efficiency in Latin America

The use of non-parametric techniques to analyse TFP growth yields information on the past evolution of technical efficiency in Latin America (see figure 2). Comparing the magnitudes obtained with the two indices reveals a very similar trend over time, although on the whole the environmental index yields somewhat higher figures than the normal index.

Figure 2 shows a number of stages in the trend of this variable, with the two measures coinciding in 1989 and 1994 following large declines in TFP. Without setting out to perform a detailed analysis, it is possible to say that the first change of trend coincides with the end of the decade and the application of Washington Consensus policies, while the change of trend in 1994 might be explained by expansionary policies culminating in the 1995 financial crisis. Another change of trend occurs in 2002, when the performance of Latin America coincides with stable macroeconomic indicators in most of the region. Another point is that the difference between the environmental index and the normal one is greater in the 1990s than in the 1980s, suggesting that the emissions efficiency effort became much more substantial as a result of certain regulations, coinciding with a greater concern to improve environmental standards, although it should be borne in mind that this improvement (or lesser deterioration) was due more to technical efficiency (especially pure technical efficiency) than to technical progress.

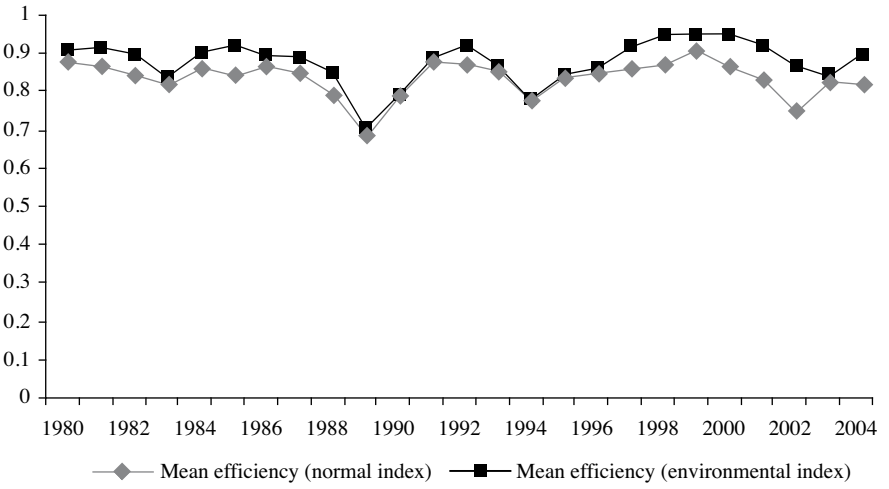
With the evolution of technical efficiency analysed, it is interesting to consider whether this has favoured the assimilation of technology that already exists in the countries closest to the frontier (convergence) and thence efficiency convergence.

To ascertain the degree of dispersion, figure 3 shows σ-convergence calculated from the standard deviation of the efficiency indicator logarithm.

Figure 3 shows that there were marked changes of trend in the evolution of technical efficiency during those years. When the magnitudes obtained with the two indices are compared, the trends once again prove very similar over time, although in terms of convergence the environmental index yields slightly higher figures than the normal index. This trend reflects stages of improving efficiency in 1983-1987, 1989-1992 and 1994-1998 that tended to reduce the differences between countries. Between those periods, efficiency improvements in the countries closest to the frontier widened the inequalities again.

FIGURE 2

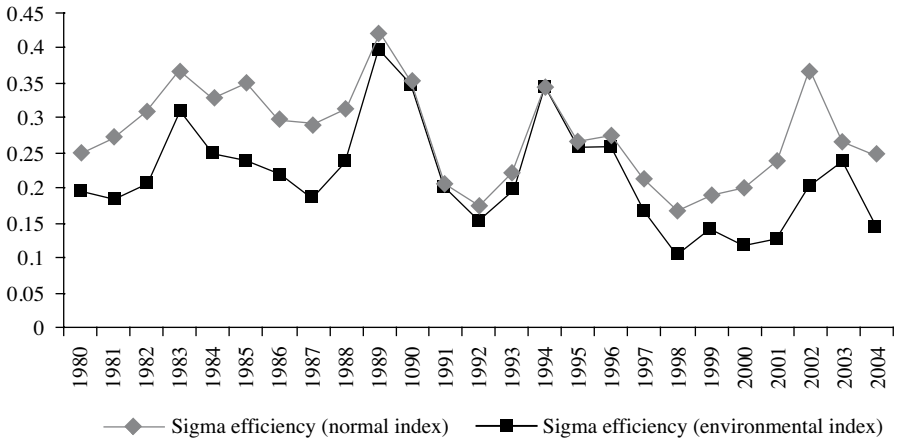
Annual change in the mean efficiency index, 1980-2004



Source: prepared by the authors on the basis of data from the World Development Indicators (WDI) and Global Development Finance (GDF) databases of the World Bank.

FIGURE 3

Annual change in σ-convergence of the mean efficiency index, 1980-2004



Source: prepared by the authors on the basis of data from the World Development Indicators (WDI) and Global Development Finance (GDF) databases of the World Bank.

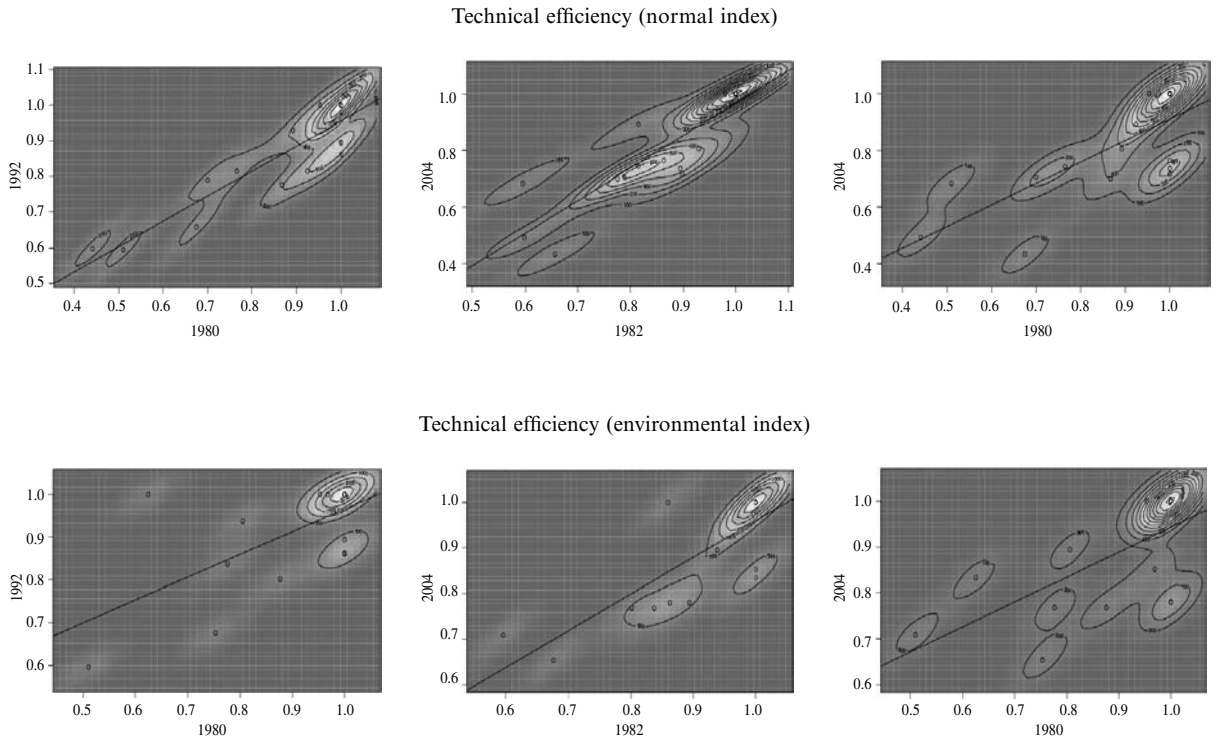
An important point is that convergence is greater on the environmental index than on the normal index over the whole period and that in the periods of greatest convergence (1987, 1992, 1998), if an interval of five years is taken (two years before and two after), the difference between environmental and normal convergence widens. Consequently, the greater the level of convergence, the greater the difference between the indices, apparently indicating that convergence takes place more easily on the environmental convergence index than on the normal convergence index.

Considering not just the convergence measures but also the distribution of technical efficiency (change in the form of the distribution and distributional dynamic within that distribution) (Quah, 1993 and 1997),[13] the dynamic of the technical efficiency distribution, based on estimation of kernel density functions as proposed by Lucy, Aykroyd and Pollard (2002), will now be presented. With the specifications noted, figure 4 shows convergence (divergence) and persistence (mobility) in the level of technical efficiency attained by the Latin American countries during the partial periods 1980-1992, 1992-2004 and 1980-2004.

[13] Quah (1997) argues that convergence coalitions or clubs can form endogenously across all countries, and the different convergence dynamics will depend on the initial distribution of country characteristics.

FIGURE 4

Efficiency distribution dynamic: kernel density functions



Source: prepared by the authors on the basis of data from the World Development Indicators (WDI) and Global Development Finance (GDF) databases of the World Bank.

To aid interpretation of this chart, one strategy is to illustrate the extreme cases in which the whole distribution variously presents mobility, persistence and convergence. In this situation, persistence would be reflected in the whole distribution maintaining its characteristics between periods t and $t+s$, with efficient countries remaining efficient and inefficient ones remaining inefficient. In the case of mobility, we would have a complete reversal of the countries' starting conditions, so that those deemed inefficient in period t would become efficient in period $t+s$, while those deemed efficient would become inefficient.[14] Lastly, if the distribution clusters around a plane parallel to the t axis over time, whereas efficiency was distributed normally in the whole of the cross-section to begin with (i.e., with grouping around the value $t+s=1$), the distribution is said to be converging on equality in the countries' efficiency levels.

While it is hard to generalize, given that the behaviour of the set of countries is quite heterogeneous over the period considered, what seems to come out is a pattern of mobility as regards the efficiency level attained over the years, with a degree of convergence upon higher efficiency levels (this is reflected in the increasing proximity of the dots marking out the different level curves to the axis drawn across the graphs).

When we consider the normal technical efficiency index over the whole period, we detect a pattern of convergence with a degree of polarization towards higher technical efficiency values. Distinguishing between subperiods, we observe mobility in the distribution, especially in the 1992-2004 period.

When considering the environmental technical efficiency index over the whole period, meanwhile, we find a pattern of convergence with polarization towards higher technical efficiency values although, by contrast with the previous case, this polarization is not strongly marked. Distinguishing between periods, we also observe greater mobility in the distribution in the 1992-2004 period. To conclude, it is interesting to observe how the countries in the upper part of the distribution do not clearly converge upon equality in efficiency levels, especially if the environmental technical efficiency index is used.

3. Disaggregated analysis of technical efficiency in Latin America at the country level

To obtain individual information on the technical efficiency of each of the 18 Latin American countries analysed, tables II and III of the statistical appendix give the normal and environmental indices, respectively, for each of the 25 years considered in the period from 1980 to 2004. From these tables it can be seen that Argentina is the country at the efficiency frontier throughout the period, so that movement towards the frontier in the remaining countries is going to be related to the technological development of Argentina.

From the efficiency estimates arrived at by year and by country for the indices considered, it is possible to determine whether the two proposed measures actually present significant differences at the country level. The Wilcoxon comparison is proposed as a non-parametric approach for paired samples.[15]

The results of the Wilcoxon comparison presented in table 3 allow us to infer that in the cases of the Plurinational State of Bolivia, the Dominican Republic and Ecuador the hypothesis of both indices producing the same technical efficiency estimates during the years considered is rejected.

[14] According to Birchenal and Murcia (1997), a simple way of appreciating these things is to observe whether the outlines of the distribution are concentrated on the 45 degree line marked on the t–$t+s$ plane (in this case, the distribution persists during the periods). If the outlines of the distribution are concentrated on a line perpendicular to the 45 degree line, there is total mobility within the distribution.

[15] In the present case, there are n pairs of values (x_i, y_i) that can be taken as a variable measured in each subject by two different methods. This is done by taking all the differences between the sample pairs, ordering their absolute values from lowest to highest and ranking them. Lastly, each rank is associated with the sign of the corresponding difference and the W statistic is the lower of the sum of positive ranks and the sum of negative ranks (H_o being rejected if W is too small).

TABLE 3

Wilcoxon comparison of differences between normal and environmental technical efficiency (TE) measures by country, 1980-2004

	Normal TE	Environmental TE	Normal TE	Environmental TE	Wilcoxon statistical comparison	P value
Argentina	-	-	-	-	-	-
Bolivia (Plur. St. of)	1.0	1.0	20.9	30.1	427.5	0.00613147[a]
Brazil	-	-	-	-	-	-
Chile	0.833	0.938	22.4	28.6	390.0	0.133593
Colombia	0.78	0.852	23.44	27.56	364.0	0.321335
Costa Rica	0.869	0.882	24.54	26.46	336.5	0.640475
Dominican Republic	0.704	0.847	18.62	32.38	484.5	0.000874616[a]
Ecuador	0.481	0.735	17.38	33.62	515.5	0.0000851074[a]
El Salvador	0.968	0.968	25.08	25.92	323.0	0.836961
Guatemala	0.814	0.832	24.36	26.64	341.0	0.586772
Honduras	0.566	0.679	22.76	28.24	381.0	0.182123
Mexico	-	-	-	-	-	-
Nicaragua	1.0	1.0	24.5	26.5	337.5	0.580007
Panama	-	-	-	-	-	-
Paraguay	0.56	0.564	24.94	26.06	326.5	0.793175
Peru	0.719	0.722	25.02	25.98	324.5	0.823365
Uruguay	-	-	-	-	-	-
Venezuela (Bol. Rep. of)	-	-	-	-	-	-

Source: prepared by the authors on the basis of data from the World Development Indicators (WDI) and Global Development Finance (GDF) databases of the World Bank.

[a] 95.0% confidence level.

V

Conclusions

This study has set out to provide evidence to determine whether consideration of efficiency and productivity measures incorporating environmental elements produces significant differences in the assessment of the region's economies. It began with a discussion of the importance of using these measures in the analysis of economic growth and supplementing this analysis with measures that take account of environmental externalities in pursuit of the goals of efficiency and convergence.

Accordingly, TFP growth in a set of Latin American countries between 1980 and 2004 was analysed, with the construction of Malmquist productivity indices incorporating environmental factors calculated using non-parametric linear programming techniques.

This approach has enabled us to obtain information on the behaviour of each of the Latin American economies in the light of the goal not just of maximizing a desirable output like GDP, but also of minimizing externalities such as environmental pollution associated with this growth process.

Specifically, it has been observed that the incorporation of environmental factors in the measurement of efficiency and productive change means that estimates for some countries in the region improve significantly when compared with those obtained by more traditional methods that only measure the magnitude of growth in terms of GDP generated.

It is also important to highlight the difference between "pure technical efficiency" and "technical progress" when considering modifications in TFP calculated with and without the environmental variable.

We believe that this new perspective incorporates an element of sustainability which it is important to consider when the region's efficiency and productivity growth are assessed and the relevant policies decided upon.

These measures are supplemented by a σ-convergence analysis, allowing the behaviour of the two measures (environmental and normal indices) to be analysed in a way that reflects the evolution of efficiency convergence. The additional inclusion of stochastic kernel analyses has made it possible to conclude that convergence patterns are different in the two cases.

Lastly, we conclude with a reflection on the concept of environmental sensitivity, using some earlier ideas set forth in studies such as those of Prieto and Zofío (1996), which model the effects of environmental regulation as technological frontiers constructed using non-parametric production functions estimated by DEA, permitting the development of what could be called an environmental efficiency sensitivity index (EESI):

$$EESI = \frac{E_A}{E_N} \tag{7}$$

In this index, environmental efficiency E_A is measured as the capacity to increase desired outputs such as gross national product (GNP) and reduced unwanted ones (CO_2), and normal efficiency E_N as the capacity to increase desired outputs (GNP) while ignoring unwanted ones.

The EESI shows the effect on the efficiency level when unwanted outputs are ignored. Table IV of the statistical appendix reveals that the index often takes a value of 1, indicating that normal and environmental efficiency are the same, so that ignoring the impact of negative externalities has not affected the measurement of efficiency using the two approaches suggested.

A value over 1 for the index, however, indicates that ignoring negative externalities leads to very different normal and environmental efficiency results (and the higher the value, the greater the difference). An example of a large disparity between the two proposed efficiency measures is provided by Ecuador, where the EESI takes values in excess of 2 in 1982, 1984 and 2002.

(Original: Spanish)

STATISTICAL APPENDIX

TABLE I

Basic output and input statistics by country, 1980-2004

Country	GDP (in constant 2000 dollars)				CO_2 emissions (kt)				Gross capital formation (constant 2000 dollars)				Workforce, total			
	Mean	Standard deviation	Maximum	Minimum	Mean	Standard deviation	Maximum	Minimum	Mean	Standard deviation	Maximum	Minimum	Mean	Standard deviation	Maximum	Minimum
Argentina	$2.33x10^{10}$	$3.85x10^{10}$	$2.97x10^{11}$	$1.82x10^{11}$	117 898.1	13 100.74	141 659.2	97 582.32	$3.79x10^{10}$	$9.46x10^{9}$	$5.65x10^{10}$	$2.14x10^{10}$	13 669 895	2 429 348	17 935 785	9 994 149
Bolivia (Plur. St. of)	$6.72x10^{9}$	$1.41x10^{9}$	$9.36x10^{9}$	$5.07x10^{9}$	6 413.327	2 175.794	10 315.01	3 772.89	$1.03x10^{9}$	$3.93x10^{8}$	$2.02x10^{9}$	$4.98x10^{9}$	2 790 266	662 825.5	4 030 275	1 904 508
Brazil	$5.44x10^{11}$	$9.22x10^{10}$	$7.17x10^{11}$	$4.02x10^{11}$	245 350.2	58 048.56	331 856.8	170 399.1	$8.97x10^{10}$	$1.83x10^{10}$	$1.18x10^{11}$	$5.22x10^{10}$	68 240 356	14 048 140	90 112 347	46 383 610
Chile	$5.19x10^{10}$	$2.12x10^{10}$	$8.82x10^{10}$	$2.54x10^{10}$	39 921.13	15 394.37	63 311.29	21 322.32	$1.05x10^{10}$	$5.99x10^{9}$	$2.02x10^{10}$	$2.25x10^{9}$	5 199 154	881 040.1	6 440 791	3 764 594
Colombia	$6.9x10^{10}$	$1.58x10^{10}$	$9.44x10^{10}$	$4.6x10^{10}$	54 977.97	7 340.267	67 882.72	39 816.81	$1.26x10^{10}$	$3.55x10^{9}$	$2.03x10^{10}$	$8.87x10^{9}$	15 005 980	3 938 424	21 624 471	8 767 824
Costa Rica	$1.14x10^{10}$	$3.74x10^{9}$	$1.84x10^{10}$	$6.77x10^{9}$	3 943	1 506.379	6 468.858	1 999.998	$2.11x10^{9}$	$1.02x10^{9}$	$4.12x10^{9}$	$7.12x10^{8}$	1 270 419	324 250.8	1 890 374	803 514
Dominican Republic	$1.37x10^{10}$	$4.34x10^{9}$	$2.14x10^{10}$	$8.77x10^{9}$	13 064.6	5 457.289	21 476.17	6 080.58	$2.59x10^{9}$	$1.26x10^{9}$	$4.91x10^{9}$	$1.18x10^{9}$	2 912 533	598 930.2	3 922 804	1 970 477
Ecuador	$1.42x10^{10}$	$2.48x10^{9}$	$1.96x10^{10}$	$1.09x10^{10}$	20 042.91	3 980	29 241.73	13 428.56	$3.95x10^{9}$	$7.24x10^{8}$	$5.65x10^{9}$	$2.49x10^{9}$	4 141 844	1 154 034	6 094 389	2 481 790
El Salvador	$1.01x10^{10}$	$2.48x10^{9}$	$1.42x10^{10}$	$7.3x10^{9}$	3 835.894	1 748.742	6 373.62	1 582.416	$1.51x10^{9}$	$6.41x10^{8}$	$2.45x10^{9}$	$7.01x10^{8}$	2 054 709	347 329.5	2 652 950	1 573 128
Guatemala	$1.5x10^{10}$	$3.57x10^{9}$	$2.17x10^{10}$	$1.12x10^{10}$	6 415.232	2 821.467	12 208.78	3 146.517	$2.39x10^{9}$	$9.12x10^{8}$	$4.08x10^{9}$	$1.24x10^{9}$	3 037 231	514 338.6	4 007 775	2 294 138
Honduras	$5.72x10^{9}$	1.33E+09	$8.41x10^{9}$	$4.05x10^{9}$	3 501.681	1 661.561	7 608.051	1 761.903	$1.36x10^{9}$	$5.85x10^{8}$	$2.36x10^{9}$	$5.22x10^{8}$	1 804 894	478 641.7	2 780 670	1 151 767
Mexico	$4.55x10^{11}$	8.76E+10	$6.18x10^{11}$	$3.46x10^{11}$	38 6262.6	4 4395.27	437 629.6	305 871.5	$9.52x10^{10}$	$2.66x10^{10}$	$1.39x10^{11}$	$5.8x10^{10}$	31 956 418	6 875 134	41 947 700	20 949 972
Nicaragua	$3.38x10^{9}$	$4.73x10^{8}$	$4.41x10^{9}$	$2.81x10^{9}$	2 719.997	769.3747	4 003.659	1 542.123	8.96E+08	$2.46x10^{8}$	$1.43x10^{9}$	$4.89x10^{8}$	1 473 547	297 830.1	2 005 893	1 048 795
Panama	$8.91x10^{9}$	$2.19x10^{9}$	$1.34x10^{10}$	$6.19x10^{9}$	4 202.047	1 389.2	6 996.33	2 457.873	$1.75x10^{9}$	$8.13x10^{8}$	$3.09x10^{9}$	$3.13x10^{8}$	1 010 102	240 724.1	1 429 199	650 672.8
Paraguay	$6.17x10^{9}$	$1.13x10^{9}$	7.8E+09	$4.51x10^{9}$	2 851.133	1 138.477	4 498.164	1 373.625	$1.41x10^{9}$	$3.01x10^{8}$	$2x10^{9}$	$9.55x10^{8}$	1 841 108	482 349.4	2 710 230	1 122 132
Peru	$4.54x10^{10}$	$7.53x10^{9}$	$6.13x10^{10}$	$3.61x10^{10}$	24 014.04	3 109.941	31 465.17	19 113.53	$9.13x10^{9}$	$2.44x10^{9}$	$1.31x10^{10}$	$5.02x10^{9}$	9 061 440	2 179 845	12 711 846	5 574 149
Uruguay	$1.7x10^{10}$	$2.84x10^{9}$	$2.16x10^{10}$	$1.25x10^{10}$	4 585.343	789.5953	6 161.166	3 139.191	$2.39x10^{9}$	$7.42x10^{8}$	$3.68x10^{9}$	$1.23x10^{9}$	1 422 088	166 220.8	1 658 579	1 145 160
Venezuela (Bol. Rep. of)	$1.02x10^{11}$	$1.36x10^{10}$	$1.21x10^{11}$	$8.25x10^{10}$	133 977.7	33 705.71	182 325.8	87 681.23	$1.8x10^{10}$	$6.95x10^{9}$	$3.22x10^{10}$	$7.87x10^{9}$	8 100 614	2 181 901	12 389 620	4 995 009

Source: prepared by the authors on the basis of data from the World Development Indicators (WDI) and Global Development Finance (GDF) databases of the World Bank.

TABLE II

Technical efficiency estimates by year and country: normal index, 1980-2004

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Argentina	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Bolivia (Plur. St. of)	1	1	1	1	1	0.558	1	1	0.626	0.566	0.988	0.943	0.98	0.994	1	1	1	0.86	0.768	0.93	0.962	1	0.663	1	1
Brazil	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chile	0.924	0.886	1	1	0.997	0.966	1	0.939	0.917	0.608	0.606	0.774	0.815	0.677	0.68	0.673	0.687	0.721	0.749	0.833	0.748	0.816	0.947	0.912	0.893
Colombia	0.892	0.85	0.696	0.554	0.613	0.755	0.775	0.87	0.827	0.61	0.59	0.939	0.93	0.683	0.504	0.557	0.604	0.843	0.918	1	1	1	0.685	0.78	0.806
Costa Rica	1	1	1	1	1	1	0.829	0.753	0.81	0.847	0.848	0.83	0.863	0.869	0.895	1	1	0.994	0.807	1	0.889	0.749	0.855	0.858	0.764
Dominican Republic	0.7	0.85	0.801	0.649	0.86	0.787	0.701	0.681	0.726	0.487	0.553	0.862	0.789	0.799	0.651	0.814	0.719	0.778	0.745	0.622	0.604	0.582	0.449	0.591	0.704
Ecuador	0.441	0.481	0.4	0.348	0.416	0.424	0.45	0.438	0.5	0.316	0.326	0.525	0.598	0.541	0.373	0.499	0.503	0.6	0.584	0.974	0.692	0.487	0.311	0.459	0.493
El Salvador	1	1	1	0.968	1	1	1	1	0.794	0.511	0.901	1	0.894	0.893	0.714	0.803	1	1	1	1	0.884	0.76	0.589	0.653	0.736
Guatemala	0.867	0.815	0.728	0.71	0.814	0.874	0.949	0.802	0.84	0.63	0.77	0.875	0.776	0.89	0.706	0.934	1	1	0.915	0.85	0.779	0.72	0.515	0.641	0.699
Honduras	0.675	1	1	1	1	1	1	1	0.489	0.398	0.596	0.663	0.657	0.536	0.467	0.549	0.56	0.566	0.703	0.559	0.547	0.53	0.399	0.466	0.434
Mexico	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Nicaragua	1	0.463	0.447	0.367	0.365	0.33	0.395	0.426	0.353	0.304	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Panama	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Paraguay	0.51	0.51	0.504	0.478	0.51	0.482	0.528	0.53	0.493	0.361	0.451	0.56	0.595	0.633	0.507	0.622	0.581	0.578	0.913	1	1	0.794	0.779	0.767	0.683
Peru	0.765	0.693	0.621	0.637	0.801	1	0.862	0.816	0.821	0.612	0.476	0.748	0.815	0.742	0.454	0.537	0.516	0.692	0.719	0.688	0.722	0.745	0.541	0.674	0.743
Uruguay	0.953	0.997	0.948	0.923	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Venezuela (Bol. Rep. of)	1	0.989	0.894	1	0.979	0.907	0.949	0.943	0.903	1	1	0.995	0.898	1	1	1	1	0.773	0.762	0.721	0.665	0.698	0.704	0.948	0.716
Mean	0.874	0.863	0.836	0.813	0.853	0.838	0.858	0.844	0.783	0.681	0.784	0.873	0.867	0.848	0.775	0.833	0.843	0.856	0.866	0.899	0.861	0.827	0.746	0.819	0.815

Source: prepared by the authors on the basis of data from the World Development Indicators (WDI) and Global Development Finance (GDF) databases of the World Bank.

TABLE III

Technical efficiency estimates by year and country: environmental index, 1980-2004

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Argentina	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Bolivia (Plur. St. of)	1	1	1	1	1	1	1	1	0.902	0.764	0.988	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Brazil	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chile	1	0.938	1	1	1	1	1	0.95	0.981	0.608	0.619	0.776	0.86	0.677	0.68	0.731	0.771	0.809	0.835	0.952	0.901	0.922	0.988	0.965	1
Colombia	0.968	0.94	0.88	0.554	0.716	0.809	0.802	0.888	0.897	0.61	0.59	0.941	1	0.683	0.504	0.557	0.604	0.926	1	1	1	1	0.804	0.787	0.852
Costa Rica	1	1	1	1	1	1	0.85	0.753	0.81	0.847	0.848	0.83	0.863	0.873	0.916	1	1	0.995	0.871	1	0.99	0.787	0.867	0.882	0.78
Dominican Republic	0.805	0.939	0.81	0.683	0.967	1	0.872	0.847	0.856	0.487	0.553	0.931	0.938	0.801	0.651	0.814	0.759	1	0.986	0.8	0.868	0.885	0.752	0.614	0.895
Ecuador	0.625	0.779	0.888	0.625	0.917	0.783	0.576	0.588	0.752	0.437	0.341	0.554	1	0.735	0.373	0.531	0.559	0.758	0.824	1	1	0.966	0.699	0.496	0.834
El Salvador	1	1	1	0.968	1	1	1	1	0.794	0.511	0.901	1	0.894	0.894	0.714	0.803	1	1	1	1	0.902	0.818	0.686	0.659	0.78
Guatemala	0.876	0.815	0.728	0.71	0.814	0.9	0.97	0.832	0.845	0.63	0.77	0.883	0.801	0.891	0.706	0.934	1	1	0.969	0.851	0.844	0.784	0.599	0.646	0.768
Honduras	0.753	1	1	1	1	1	1	1	0.507	0.398	0.596	0.679	0.676	0.536	0.467	0.549	0.568	0.639	0.764	0.639	0.689	0.696	0.697	0.574	0.654
Mexico	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Nicaragua	1	0.744	0.669	0.375	0.43	0.457	0.549	0.722	0.53	0.304	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Panama	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Paraguay	0.51	0.51	0.504	0.478	0.511	0.503	0.547	0.558	0.501	0.361	0.451	0.564	0.596	0.633	0.507	0.622	0.586	0.638	0.925	1	1	0.794	0.861	0.767	0.709
Peru	0.776	0.695	0.621	0.637	0.801	1	0.862	0.816	0.831	0.612	0.476	0.749	0.837	0.742	0.454	0.537	0.516	0.7	0.735	0.688	0.722	0.745	0.542	0.675	0.768
Uruguay	0.953	0.997	0.948	0.923	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Venezuela (Bol. Rep. of)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mean	0.904	0.909	0.892	0.831	0.898	0.914	0.89	0.886	0.845	0.698	0.785	0.884	0.915	0.859	0.776	0.838	0.854	0.915	0.939	0.941	0.94	0.911	0.861	0.837	0.891

Source: prepared by the authors on the basis of data from the World Development Indicators (WDI) and Global Development Finance (GDF) databases of the World Bank.

TABLE IV

Environmental efficiency sensitivity index (EESI) estimates by year and country: quotient between normal and environmental indices, 1980-2004

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Argentina	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Bolivia (Plur. St. of)	1	1	1	1	1	1.792	1	1	1.441	1.350	1	1.060	1.020	1.006	1	1	1	1.163	1.302	1.075	1.040	1	1.508	1	1
Brazil	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chile	1.082	1.059	1	1	1.003	1.035	1	1.012	1.070	1	1.021	1.003	1.055	1	1	1.086	1.122	1.122	1.115	1.143	1.205	1.130	1.043	1.058	1.120
Colombia	1.085	1.106	1.264	1	1.168	1.072	1.035	1.021	1.085	1	1	1.002	1.075	1	1	1	1	1.098	1.089	1	1	1	1.174	1.009	1.057
Costa Rica	1	1	1	1	1	1	1.025	1	1	1	1	1	1	1.005	1.023	1	1	1.001	1.079	1	1.114	1.051	1.014	1.028	1.021
Dominican Republic	1.150	1.105	1.011	1.052	1.124	1.271	1.244	1.244	1.179	1	1	1.080	1.189	1.003	1	1	1.056	1.285	1.323	1.286	1.437	1.521	1.675	1.039	1.271
Ecuador	1.417	1.620	2.220	1.796	2.204	1.847	1.280	1.342	1.504	1.383	1.046	1.055	1.672	1.359	1	1.064	1.111	1.263	1.411	1.027	1.445	1.984	2.248	1.081	1.692
El Salvador	1	1	1	1	1	1	1	1	1	1	1	1	1	1.001	1	1	1	1	1	1	1.020	1.076	1.165	1.009	1.060
Guatemala	1.010	1	1	1	1	1.030	1.022	1.037	1.006	1	1	1.009	1.032	1.001	1	1	1	1	1.059	1.001	1.083	1.089	1.163	1.008	1.099
Honduras	1.116	1	1	1	1	1	1	1	1.037	1	1	1.024	1.029	1	1	1	1.014	1.129	1.087	1.143	1.260	1.313	1.747	1.232	1.507
Mexico	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Nicaragua	1	1.607	1.497	1.022	1.178	1.385	1.390	1.695	1.501	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Panama	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.	1
Paraguay	1	1	1	1	1.002	1.044	1.036	1.053	1.016	1	1	1.007	1.002	1	1	1	1.009	1.104	1.013	1	1	1	1.105	1	1.038
Peru	1.014	1.003	1	1	1	1	1	1	1.012	1	1	1.001	1.027	1	1	1	1	1.012	1.022	1	1	1	1.002	1.001	1.034
Uruguay	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Venezuela (Bol. Rep. of)	1	1.011	1.119	1	1.021	1.103	1.054	1.060	1.107	1	1	1.005	1.114	1	1	1	1	1.294	1.312	1.387	1.504	1.433	1.420	1.055	1.397
Mean	1.034	1.053	1.067	1.022	1.053	1.091	1.037	1.050	1.079	1.025	1.001	1.013	1.055	1.013	1.001	1.006	1.013	1.069	1.084	1.047	1.092	1.102	1.154	1.022	1.093

Source: prepared by the authors on the basis of data from the World Development Indicators (WDI) and Global Development Finance (GDF) databases of the World Bank.

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KEYWORDS

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Economic performance clubs in the Americas: 1955-2003

Juan Gabriel Brida, Silvia London and Wiston Adrián Risso

The aim of this paper is to study the economic dynamics of a set of countries of the Americas during the 1955-2003 period. It does this by introducing an alternative concept of economic performance based on the idea of dynamic regimes. These regimes are defined by the level and growth rate of per capita gross domestic product (GDP). By introducing a non-parametric clustering method, the study identifies two main performance clubs whose evolution is studied. One of them, identified as the club of high-performing countries, displays a relatively homogeneous structure. The second group, conversely, presents a high level of dispersion in performances, suggesting the existence of subclusters with a degree of divergence between them. The study also finds that there is mobility between the low- and high-performing groups and that the distance between clusters increases over time.

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I
Introduction

During the 1980s and 1990s, one of the most topical subjects in the economic growth literature was the convergence hypothesis. Its main claim was a corollary of the neoclassical Ramsey-Solow model indicating that poor countries are, at least potentially, able to achieve higher growth rates than rich ones because of the free movement of technology and know-how. Numerous empirical studies supported this hypothesis, either wholly or in part (Barro and Sala-i-Martin, 1995).

Nevertheless, the great disparity observed in growth rates and large increases in per capita income inequality between countries around the world called into question the existence of endogenous mechanisms inexorably reducing international differences (Lucas, 2002). Quite to the contrary, the empirical evidence revealed divergent trends in economic performance between countries. This finding and other powerful theoretical and empirical criticisms of the neoclassical growth model gave rise to a new field of research in the area of economic growth theory: endogenous growth theory (EGT) (Romer, 1994).

This new theoretical perspective provided clues as to why different economies, even if setting out from similar initial conditions and parameters, could come to diverge in their aggregate performance. Despite these advances, the first econometric studies were not wholly satisfactory, their explanatory power being not substantially different from that of earlier growth models (Amable and Guellec, 1992; Solow, 1992). For over two decades, EGT continued to make theoretical progress, focusing on endogenous sources of growth as an explanation for international divergence (Aghion and Howitt, 1999).

In parallel with the theoretical and empirical advances of EGT, D. Quah (1996 and 1997) introduced a new methodology of analysis based on identifying convergence clubs (groups of countries that present a similar long-term economic performance) and directly modelling the dynamics of countries' cross-sectional distribution. Through this work, Quah was able to show that convergence was compatible with both stable and increasing per capita incomes. The dynamics of convergence clubs and the forces giving rise to them, and the existence of inexorable poverty traps, became the bottom line of economic research (Howitt and Mayer-Foulkes, 2004, among others).

The main difference between standard works on economic convergence and the above approach is that whereas the former posit their analysis on the existence of an underlying theoretical model, the latter concentrates on the dynamic itself, irrespective of the model sustaining that dynamic.

The study conducted here follows this latter line of investigation. Its aim is to analyse the dynamic of convergence clubs from the perspective of economic performance, with a view to identifying performance clubs. It introduces the economic regime concept, whose two-dimensional character extends the interpretation of economic performance. To this end it analyses the behaviour of per capita income levels and growth rates for a group of countries in the Americas using a non-traditional (non-parametric) statistical model: the minimum spanning tree and the hierarchical tree.

This paper is organized as follows. Section II presents a brief discussion of the concept of convergence and its empirical tests, with particular reference to the countries of the Americas. Section III describes the proposed method, while section IV expounds the results. Lastly, section V sets forth the main conclusions and future directions for research.

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II

Some background on the convergence hypothesis

An initial approach to convergence analysis is provided by the idea that, given the international circulation of technology and know-how, poorer countries ought to grow faster than richer ones, causing per capita output to converge in the long run. This idea was outlined by classical economists such as Adam Smith and John Stuart Mill, who considered an equitable distribution to be the natural outcome of economic evolution and progress (De Long, 1997). From a theoretical standpoint, the concept of convergence arose with the development of the neoclassical growth model, which predicts that if all countries have the same parameters as regards production functions and utility, the countries that are least advanced will grow faster than those with higher incomes, causing per capita incomes to even out in the long run.

The key to this prediction is capital productivity: since poor countries have a smaller stock of capital than rich ones, its productivity will be greater there. Physical investment in such countries will accordingly be high, driving a high rate of growth. Thus, setting out from a single difference between countries, namely their initial per capita income level, and given decreasing marginal returns on the cumulative factor (capital), poor countries will tend to catch up with rich ones in the long run.

Convergence is not altogether straightforward to interpret. Accordingly, following Barro and Sala-i-Martin (1995), the analysis incorporates the concepts of β-convergence and σ-convergence: absolute β-convergence is said to be taking place if poor countries are tending to grow more quickly than rich ones, while σ-convergence is occurring in a group of countries if the dispersion in their real per capita GDP levels is diminishing. Clearly, the two concepts are intuitively related: if per capita GDP levels are evening out over time (σ-convergence), this is because the poorer economy is growing faster than the rich one (β-convergence). β-convergence is a necessary condition for σ-convergence and will tend to generate it, although it is considered a necessary but not sufficient condition for σ-convergence.

Criticisms of the convergence concept have been widely aired from both a theoretical and an empirical standpoint (see Barro and Sala-i-Martin, 1995; Lucas, 2002; Quah, 1997, among others). However, it is important to stress that the neoclassical model predicts convergence on the crucial assumption that the only difference between countries is their initial level of capital per person. The economic reality is that countries differ in much more than their initial endowments, and they also vary greatly in respect of other key parameters such as technology, propensity to save, population growth rates and institutional parameters, among other things. If different economies have different parameters of both behaviour and technology, they will present different steady states. Given that the theory refers to convergence to steady state (conditional β-convergence), different steady states should reveal differences in economic performance. This opens up an immense range of possibilities that confound linear predictions: it is possible to find rich countries that are below their steady state and accordingly growing faster than poor countries that are above their steady state. Retaining all the other assumptions of the neoclassical model, analysis based on the steady state concept can yield non-trivial realizations (Durlauf and Quah, 1999).

Meanwhile, numerous empirical studies have found convergence to be absent, with σ-divergence the rule: the lack of convergence between countries suggests that inequality is not only not disappearing, but is actually on the rise (Ros, 2001).

In view of this finding, in the first half of the 1990s a number of authors reformulated the relationship between the convergence hypothesis and the neoclassical model (Barro, 1991; Mankiw, Romer and Weil, 1992; Barro and Sala-i-Martin, 1995, among others). Since the neoclassical model predicts that an economy's growth rate is inversely related to its own steady state (conditional convergence), it is only valid to argue that poorer countries will grow faster than advanced economies so long as all economies have the same steady state. Thus, both a theoretical and an empirical equivalent need to be found if the

approach applied in the study of convergence is to be retained.

Empirically, two ways of "conditioning the data" have been found: confining the study to sets of similar economies on the assumption that they have the same steady state (Barro and Sala-i-Martin, 1995; Barro, 1997), and running the data through multiple regressions with the introduction of additional variables as proxies for the steady state, which is kept fixed (Mankiw, Romer and Weil, 1992). Using this new empirical method, the studies mentioned have found conditional β- and σ-convergence for certain sets of countries.

In the specific case of the Americas and Latin America, the studies carried out using cross-sectional regressions have been extremely sensitive to the variables selected: Helliwell and Chung (1992) and Utrera (1999), for example, find conditional β-convergence for 20 countries of Latin America, while Dobson and Ramlogan (2002) find absolute and conditional β-divergence when, for a single group of countries, they incorporate sectoral composition and a dummy variable for oil-exporting countries. The same contradictory findings appear in studies using unit root tests in panel data (Dobson, Goddard and Ramlogan, 2003; Cáceres and Núñez Sandoval, 1999; Utrera, 1999, among others). The last of these authors conducts a convergence analysis for 20 Latin American countries between 1950 and 1990, finding conditional β-convergence in cross-sectional regressions, β-divergence in tests for unit roots and β-divergence in dynamics of distribution (Quah-style).

However, the main point when it comes to analysing the relative performance of poor and rich countries is not to validate or invalidate the neoclassical model, but to seek an economic explanation for the causes of inequality in global income distribution. Focusing the analysis on discussion of a particular model (often poorly interpreted) would not appear to be the right way of achieving this aim. The same point was made by Durlauf and Quah (1999), who present an exhaustive review of the literature on empirical techniques for analysing convergence.

In this discussion, the pivotal role of the steady state concept imposes a limitation on the analysis. By contrast with the previous case, however, it is possible to develop a method of empirical analysis that dispenses with any specific underlying model.

As mentioned in the introduction, the first contribution of this kind was made by D. Quah (1993). That author's work focuses on the instrumental aspect of empirical convergence analysis, and his principal criticism is that convergence tests are affected by Galton's Fallacy of regression to the mean.[1]

In these tests it is said that regression to the mean, interpreted together with the idea of convergence, could describe the (theoretically posited) fact that countries with higher levels of output tend to present lower growth rates. As part of his critique of conventional convergence analysis, however, Quah shows that a negative coefficient in a cross-sectional regression on initial output levels is perfectly consistent with a lack of convergence. Consequently, he proposes an alternative way of evaluating the presence of convergence, which consists in directly examining the evolution over time of the cross-sectional distributions of per worker output (Quah, 1996). On the basis of his research, Quah concludes that while the gap between poor and rich countries widened in the period considered, the intermediate class tended to become poorer (twin peaks hypothesis).

Quah also considers it highly likely that there are stochastic tendencies in incomes within economies which ensure that the process of estimating the convergence coefficient is uniform and thus not derived from genuine convergence. Another even more general point is that convergence estimates do not consider aspects of the dynamics of economies as they move towards equilibrium states. The absence of these dynamic aspects may lead to faulty conclusions about the presence of a phenomenon in which economies tend to a steady state (Moncayo, 2004).

The dynamic is crucial in this type of analysis. Accordingly, and in the light of what has been said here, the following section will present a statistical method for describing performance and performance clubs that is based on the behaviour dynamics of the different countries, making it possible to establish convergence or divergence between groups and subgroups of economies without the need for prior conditioning of the data.[2]

[1] The fallacy is known by this name because of the research by Francis Galton in 1885 entitled "Regression toward Mediocrity in Hereditary Stature", where Galton noted that the sons of tall fathers regressed to the mean height, since on average these people were shorter than their parents.

[2] Standard econometric or multivariate models of convergence analyse this phenomenon on the assumption that a particular steady state exists and incorporate a group of variables that describe the economy with a view to validating or invalidating the underlying model. The data are thus "conditioned" to an existing idea of a steady state. With our model, although two types of variables are worked with (per capita GDP and its growth rate), no model is presupposed, the data being grouped by a purely statistical process.

III

Convergence in regime dynamics

This section proposes a new way of defining convergence, considering dynamics in terms of regimes that provide a qualitative description of the evolution of economies (Brida, 2008). In this case, the space of states is defined using per capita GDP and GDP growth rates, which are classic variables in economic growth theory. A distinctive feature of the method presented here that sets it apart from most of the studies described in the previous section is that a "multidimensional analysis" is conducted.

The present study defines four regimes on the basis of the observed dynamics. In particular, the regimes are represented by the division of the space on the basis of two threshold values, which are taken to be the means of per capita GDP and the growth rate of this value for all the countries and the whole sampling period.[3] If these values are m_y and m_g, then our regimes are represented by the following subsets of the space of states:

$R_1 = \{(y, g_y): y < m_y, g_y < m_g\}$, $R_2 = \{(y, g_y): y < m_y, g_y > m_g\}$, $R_3 = \{(y, g_y): y > m_y, g_y < m_g\}$, $R_4 = \{(y, g_y): y > m_y, g_y > m_g\}$

where, for example, R_1 is the regime of low GDP and low growth, so that a country occupying that period would be deemed poor and slow-growing. The other regimes can be interpreted similarly. Figure 1 shows the grid characterizing the four regimes.

At this point we can ignore the precise values for GDP levels and growth rates and describe an economy's evolution on the basis of the regime changes that have occurred over its history. This gives us a rough description of the dynamic, telling us only what regime an economy was in at a given point in time.

This dynamic can be described in terms of symbolic time series as follows: a time series is constructed from the values of the regime in each country and year, yielding a matrix of N x T data (N countries and T periods), in which each value of the regime $R_{n,t}$ is located. The regime dynamics in each country can be analysed with techniques like those used in Brida, Puchet and Punzo (2003), Brida and Garrido (2006) and Accinelli and Brida (2007). The following characteristics can be observed in table 1:

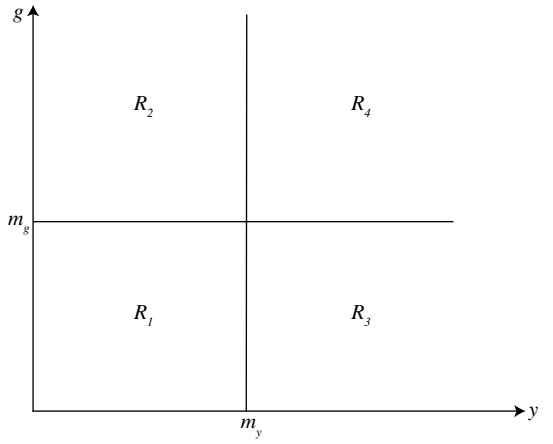
(i) Canada and the United States are the countries that spend the most time in regime 4, approximately 66%, only temporarily passing through regime 3 in the other periods.

(ii) The opposite situation is found in countries such as Haiti and Honduras, which spend most time in regime 1 (more than 60%), passing over to regime 2 in the remaining periods. The question arises here as to how a country like Haiti, which is in a low-GDP and low-growth regime for 66% of the time, could converge with a country like the United States, which spends 66% of its time in a high-GDP and high-growth regime.

(iii) Other countries, on the other hand, seem to have made the transition from low-performance to high-performance regimes. Argentina, for example, passed through regimes 1 and 2 in the early years before moving into 3 and 4. The same is true of Mexico, which was in regimes 1 and 2 in the first 24 years before moving into 3 and 4.

FIGURE 1

Performance regimes



Source: prepared by the authors.

[3] This paper has used a division into regimes based on threshold values for both variables, calculated from observations. This is an example of endogenous partition, i.e., partition based on a property of the data (and thus varying with the set of observations). An exogenous partition is predetermined; it does not depend on the dataset and in many cases it is induced by an economic theory describing the process being analysed (Brida and Punzo, 2003).

TABLE 1

The Americas (25 countries): percentage of visits to each regime

Country	R_1	R_2	R_3	R_4
CAN	0.00	0.00	33.96	66.04
USA	0.00	0.00	33.96	66.04
TTO	5.66	5.66	26.42	62.26
PRI	1.89	28.30	16.98	52.83
ARG	1.89	5.66	45.28	47.17
VEN	0.00	0.00	54.72	45.28
CHL	22.64	28.30	7.55	41.51
URY	18.87	9.43	35.85	35.85
MEX	11.32	33.96	24.53	30.19
PAN	18.87	47.17	20.75	13.21
BRA	20.75	50.94	16.98	11.32
CRI	26.42	52.83	9.43	11.32
COL	39.62	49.06	5.66	5.66
DOM	30.19	69.81	0.00	0.00
PER	41.51	58.49	0.00	0.00
ECU	47.17	52.83	0.00	0.00
BOL	49.06	50.94	0.00	0.00
CUB	49.06	50.94	0.00	0.00
JAM	52.83	47.17	0.00	0.00
SLV	54.72	45.28	0.00	0.00
GTM	54.72	45.28	0.00	0.00
NIC	54.72	45.28	0.00	0.00
PRY	54.72	45.28	0.00	0.00
HND	62.26	37.74	0.00	0.00
HTI	66.04	33.96	0.00	0.00

Source: prepared by the authors on the basis of data from the appendix.

CAN: Canada. USA: United States. TTO: Trinidad and Tobago. PRI: Puerto Rico. ARG: Argentina. VEN: Bolivarian Republic of Venezuela. CHL: Chile. URY: Uruguay. MEX: Mexico. PAN: Panama. BRA: Brazil. CRI: Costa Rica. COL: Colombia. DOM: Dominican Republic. PER: Peru. ECU: Ecuador. BOL: Plurinational State of Bolivia. CUB: Cuba. SLV: El Salvador. GTM: Guatemala. JAM: Jamaica. NIC: Nicaragua. PRY: Paraguay. HND: Honduras. HTI: Haiti.

To compare the evolution over time of the different dynamics followed by the countries of the Americas, it is necessary to have some notion of the neighbourhoods of these evolutions. Different notions of distance can be defined in the space of the symbolic successions (see Brida and Punzo, 2003, and Brida, 2006).

In this exercise we shall take a distance d, which considers the regime overlaps of two different countries, with weightings. In other words, if two countries are in the same regime at time t, this will add a 0 in place t to the total sum, whereas if they are in different regimes, this will add a positive value p in place t of the addition. The number p may be 1, 2 or 3, depending on how far apart the regimes of the two countries are. This metric is defined by equation (1).

$$d(i,j) = \sqrt{\frac{\sum_{t=1}^{t=T} (S_{it} - S_{jt})^2}{T}} \qquad (1)$$

where S_{it} and S_{jt} are the regimes that countries i and j are in at time t, respectively, while T is the period studied.

On the basis of this metric, the countries can be regrouped using a clustering technique. Given the distance determined, the minimum spanning tree (MST) connecting the countries in the sample is constructed using Kruskal's algorithm.[4] The basic idea is to successively choose the edges of minimum weight. If the sample has n time series, the algorithm derives from the following steps:

(i) Initiate the MST with n nodes and no MST arcs[5] = ($\{1,2, ...,n\}, \varnothing$).

(ii) Create a list L of arcs in ascending order of weight (in this case, the distances between the time series). Arcs with the same weight are ordered randomly.

(iii) Select the arc (i, j) which is at the beginning of L. It is transferred to T and deleted from L.

(iv) If L is non-empty, go back to step 3; otherwise the process ends.

Table 2 gives the list T of the relevant distances after applying the algorithm for this problem.[6]

The procedure for constructing the minimum spanning tree graphically is as follows. Table 2 shows that the shortest distance is $d(CAN, USA)$=0.3885, so that Canada (CAN) is connected to the United States (USA) in one group. This is followed by the second-shortest distance, which is $d(GTM, PRY)$=0.5140, connecting Guatemala (GTM) to Paraguay (PRY) in another group, after which the third-shortest distance $d(HTI, GTM)$=0.5494 is taken, connecting Haiti (HTI) to the group of Guatemala and Paraguay. The process goes on until all the countries are connected in a tree, as shown in figure 2. In this way, the arcs of the minimum spanning tree represent the connections

[4] Kruskal's algorithm is an algorithm in graph theory for finding a minimum spanning tree for a connected weighted graph. This means it finds a subset of the edges that forms a tree that includes every vertex, where the total weight of all the edges in the tree is minimized. The algorithm was first published in 1956 and was written by Joseph Kruskal (Kruskal, 1956).

[5] The arcs are graphically represented by the lines joining the nodes or vertices in the MST.

[6] The total number of distances obtained is 46, including a country's distances from itself; the relevant distances for the eight countries are seven in number, however.

TABLE 2

The Americas: main connections between countries

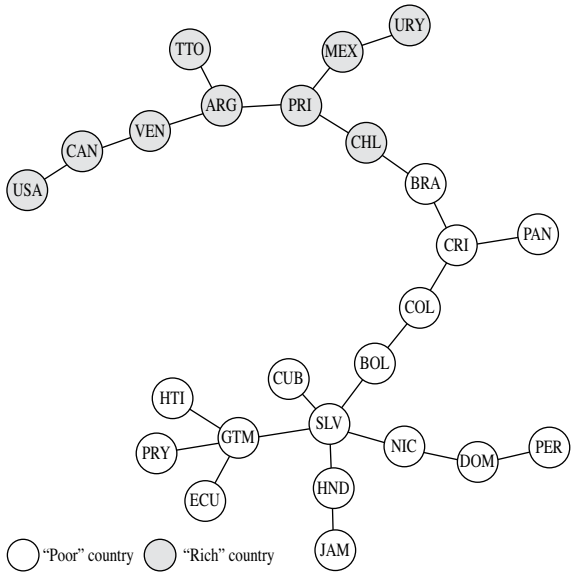
Connection	Country i	Country j	Distance	Connection	Country i	Country j	Distance
1	CAN	USA	0.3885	13	VEN	CAN	0.7137
2	GTM	PRY	0.514	14	ARG	TTO	0.7524
3	HTI	GTM	0.5494	15	BRA	CRI	0.8578
4	SLV	GTM	0.5828	16	COL	BOL	0.8687
5	NIC	SLV	0.5828	17	ARG	VEN	0.8687
6	HND	SLV	0.5828	18	CRI	COL	0.9007
7	ECU	PRY	0.528	19	MEX	URY	0.9316
8	DOM	NIC	0.5987	20	PAN	CRI	0.9517
9	CUB	SLV	0.5987	21	PRI	MEX	0.981
10	BOL	SLV	0.5987	22	PRI	ARG	1.0187
11	PER	DOM	0.6143	23	CHL	PRI	1.1159
12	JAM	HND	0.6295	24	CHL	BRA	1.1655

Source: prepared by the authors.

URY: Uruguay. TTO: Trinidad and Tobago. MEX: Mexico. USA: United States. CAN: Canada. VEN: Bolivarian Republic of Venezuela. ARG: Argentina. PRI: Puerto Rico. CHL: Chile. BRA: Brazil. CRI: Costa Rica. PAN: Panama. COL: Colombia. BOL: Plurinational State of Bolivia. HTI: Haiti. CUB: Cuba. PRY: Paraguay. GTM: Guatemala. SLV: El Salvador. NIC: Nicaragua. DOM: Dominican Republic. PER: Peru. ECU: Ecuador. HND: Honduras. JAM: Jamaica.

FIGURE 2

Minimum spanning tree for the countries of the Americas
(Unweighted)



Source: prepared by the authors.

URY: Uruguay. TTO: Trinidad and Tobago. MEX: Mexico. USA: United States. CAN: Canada. VEN: Bolivarian Republic of Venezuela. ARG: Argentina. PRI: Puerto Rico, CHL: Chile. BRA: Brazil. CRI: Costa Rica. PAN: Panama. COL: Colombia. BOL: Plurinational State of Bolivia. HTI: Haiti. CUB: Cuba. PRY: Paraguay GTM: Guatemala. SLV: El Salvador. NIC: Nicaragua. DOM: Dominican Republic. PER: Peru. ECU: Ecuador. HND: Honduras. JAM: Jamaica.

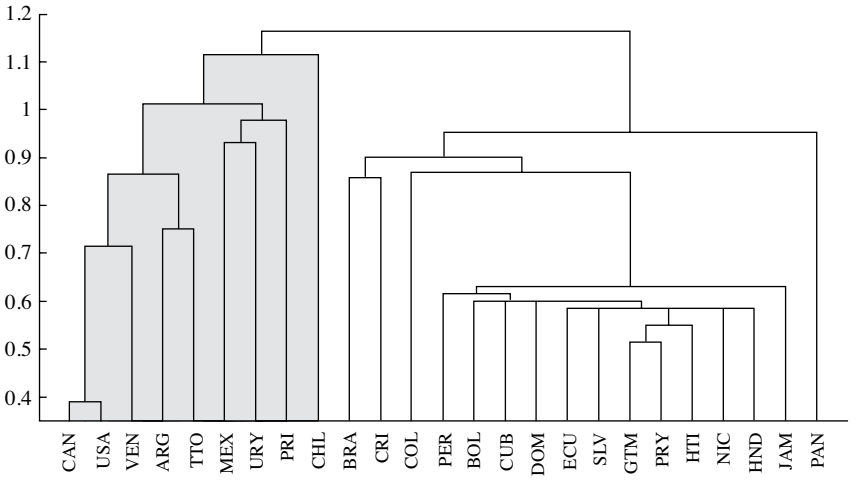
between the countries and their length is the distance between the countries connected. To create a chart that is easier to view, the lines in figure 2 are not weighted by distances, but these can be observed in the hierarchical tree of figure 3.

The minimum spanning tree (MST) is thus progressively constructed by relating all the countries of the sample in a graph characterized by the minimum distance between the time series, starting with the shortest distance. The main appeal of this tree is that it provides an arrangement of the countries in which the most important connections are selected for each element in the sample. Any two vertices of the MST can be connected either directly or through one or more vertices. In any event, the connections represent the shortest routes between these. The MST thus reveals any clusters that form and shows which countries are most connected with the rest and which are most isolated in their dynamic, establishing a topology between their growth dynamics. This same procedure allows the ultrametric distance (see Mantegna, 1999) to be constructed from the MST, and this can be used to study the degree of hierarchical organization of the vertices of the graph—of the countries in the sample, for instance. The ultrametric distance $d<(i,j)$ between i and j is the maximum of the distances $d(k,l)$ (i.e., the distances that are represented by the arcs or lines in the MST) from node (or vertex) i to node j by the

FIGURE 3

Hierarchical tree for the 25 countries of the Americas

(Grey = "rich" countries, white = "poor" countries)



Source: prepared by the authors.

CAN: Canada. USA: United States. VEN: Bolivarian Republic of Venezuela. ARG: Argentina. TTO: Trinidad and Tobago. MEX: Mexico. URY: Uruguay. PRI: Puerto Rico. CHL: Chile. BRA: Brazil. CRI: Costa Rica. COL: Colombia. PER: Peru. BOL: Plurinational State of Bolivia. CUB: Cuba. DOM: Dominican Republic. ECU: Ecuador. SLV: El Salvador. GTM: Guatemala. PRY: Paraguay. HTI: Haiti. NIC: Nicaragua. HND: Honduras. JAM: Jamaica. PAN: Panama.

shortest route connecting vertex i with j in the MST.[7] In other words, using the MST the distance $d^<(i,j)$ between i and j is given by

$$d^<(i,j) = Max\left\{d_0(w_i;w_{i+1});1 \le i \le n-1\right\}$$

where $\{(w_1;w_2), (w_2;w_3), ..., (w_{n-1},w_n)\}$ denotes the unique minimum path in the MST that connects i and j, where $w_1=i$ and $w_n=j$ (see Ramal, Toulouse and Virasoro, 1986). This formula can be used to calculate the value of $d^<(i,j)$ for each pair of countries. The MST makes it possible to construct the hierarchical tree (HT) from the ultrametric distances. To find out the ultrametric distance between the United States and Panama, for example, it will be necessary to observe all the distances that are on the path from the United States to Panama. Figure 2 reveals that the path is composed by the set shown in the following expression:

$$\left\{\begin{matrix}(USA,CAN);(CAN,VEN);(VEN,ARG);(ARG,PR);\\(PR,CHL);(CHL,BRA);(BRA,CRI);(CRI,PAN)\end{matrix}\right\}$$

This shows that the maximum distance is $d(CHL,BRA)$=1.1655, and this will be d<(USA,PAN)=1.1655. Figure 3 shows the hierarchical tree for the full period.

[7] If we have two points i and j that are joined by l *(i-j-l)*, the ultrametric distance meets the following condition, which is more restrictive than triangular inequality: $d^<(i,j)=max\{d^<(i,l),d^<(l,j)\}$, i.e., it will be the maximum between the two distances joining i and l via j.

IV
Analysis of the findings

Two clearly differentiated clusters can be observed in the hierarchical tree, and these are distinguished in figures 2 and 3 by the colours grey and white, respectively.[8] The "grey" cluster comprises Canada, the United States, the Bolivarian Republic of Venezuela, Argentina, Trinidad and Tobago, Mexico, Uruguay, Puerto Rico and Chile. An initial interpretation of the countries in this group is that they are those which historically have performed best so that, stretching a point, we shall call them "rich" countries. Note that we can distinguish two subclusters within this cluster, one of which is formed by Canada and the United States, the countries closest together in the sample. These are without a doubt the best-performing countries, as they are the only ones to have been in regime 4 (high per capita GDP and high growth) on more than 60% of occasions, and they have never been in the low-GDP regimes (regimes 1 and 2).

The "white" cluster ("poor" countries) comprises Brazil, Costa Rica, Panama, Colombia, the Plurinational State of Bolivia, El Salvador, Honduras, Jamaica, Cuba, Haiti, Guatemala, Paraguay, Ecuador, Nicaragua, the Dominican Republic and Peru. Within this cluster it is likewise possible to distinguish some differences between the constituent countries. A compact subgroup of countries that are very close together can be observed, formed by Panama, the Plurinational State of Bolivia, El Salvador, Honduras, Jamaica, Cuba, Haiti, Guatemala, Paraguay, Ecuador, Nicaragua, the Dominican Republic and Peru. These are the countries that historically have performed worst within the group of "poor" countries. Meanwhile, Brazil, Costa Rica and Colombia stand some way apart from this subgroup, but not far enough away to enter the "grey" cluster or form another cluster; they might be considered a "white" subcluster. The economic record of Brazil, Colombia and Costa Rica shows these countries to be in an intermediate situation between those defined here as "poor" and "rich" countries, so that they clearly stand further apart (in terms of distances) from the other members of their own group.

Consequently, while the findings bring out two well-differentiated groups, something that can be visualized in a superficial initial analysis simply by observing table 2, the dynamics within the groups are not homogeneous, so that a finer examination of the evolution of the groups or clusters constructed will be needed to obtain a more detailed analysis.

Evolution of the groups

In view of the above, and on the basis of the clusters constructed, what needs to be studied is how these have evolved —whether there have been countries that have changed cluster or if the clusters have remained stable over time. Again, if there are countries that have remained in the same groups, the idea is to investigate whether they have moved closer together or further apart. This analysis can be carried out by taking a moving time window in the time period we are considering, i.e., by taking a window $v<T$ in length and considering all subperiods of duration v encompassed within the time arc being analysed, and then repeating this technique to construct the respective trees and identify groups within them. This will show how the clusters have evolved.[9] When the exercise was carried out, trees were obtained for windows 5, 10, 20 and 30 years long.

To study whether the countries in a group are moving together or apart over time, an overall measurement of distance is needed. Following the methodology proposed by Onnela (2002), this measurement can be obtained by adding together all the distances in the tree. This represents the diameter of the group. Figure 4 represents the evolution of the distance between all the American countries for windows of 5, 10, 20 and 30 years.

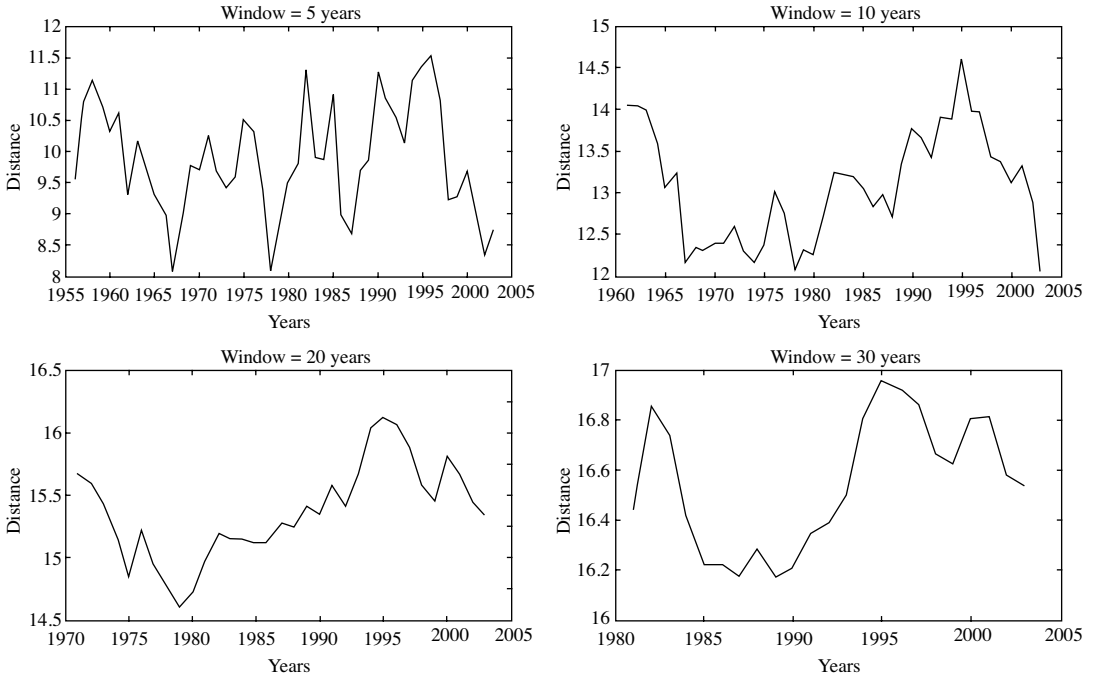
In figure 5, the window technique is applied to the "grey" group. Note that the distance between the nine countries defined as "rich" decreases over time, which could be interpreted as their converging upon a common dynamic.

[8] It should be noted that, once the clusters are formed, the condition of the distance between countries within a given cluster being shorter than the distance between clusters is met.

[9] For reasons of space, this paper does not include the tables and trees obtained.

FIGURE 4

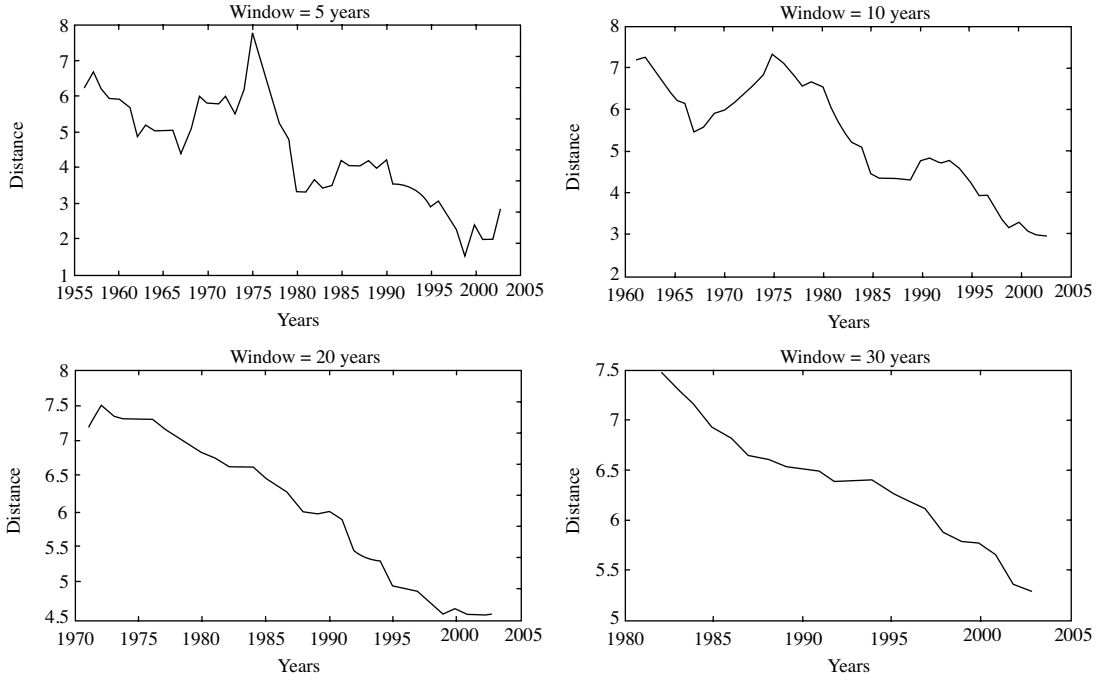
Evolution of the overall distance between the countries of the Americas



Source: prepared by the authors.

FIGURE 5

Evolution of the distance between the nine richest countries of the Americas



Source: prepared by the authors.

Figure 6, meanwhile, presents the evolution of the overall distance for the 16 "poor" countries; as can be seen, these countries present a distance that has increased over time. This can be interpreted as an increase in the heterogeneity of the group, with some countries set apart by a performance that has improved in relative terms in recent periods.

Figure 7, lastly, seeks to show what has happened between an average country in the "rich" group and one in the "poor" group. An initial observation seems to suggest that, on average, the "poor" countries have been moving away from the "rich" ones.

The results obtained would seem to bear out the studies by Quah (1993 and 1997), who concludes from his "mobility matrices" analysis that there is a degree of convergence between "poor" countries and between "rich" countries, while the likelihood of convergence towards one or other of the states is more equitable for middle-income groups. These studies gave rise to the well known "twin peaks hypothesis", according to which there is a long-run tendency for convergence clubs to form.

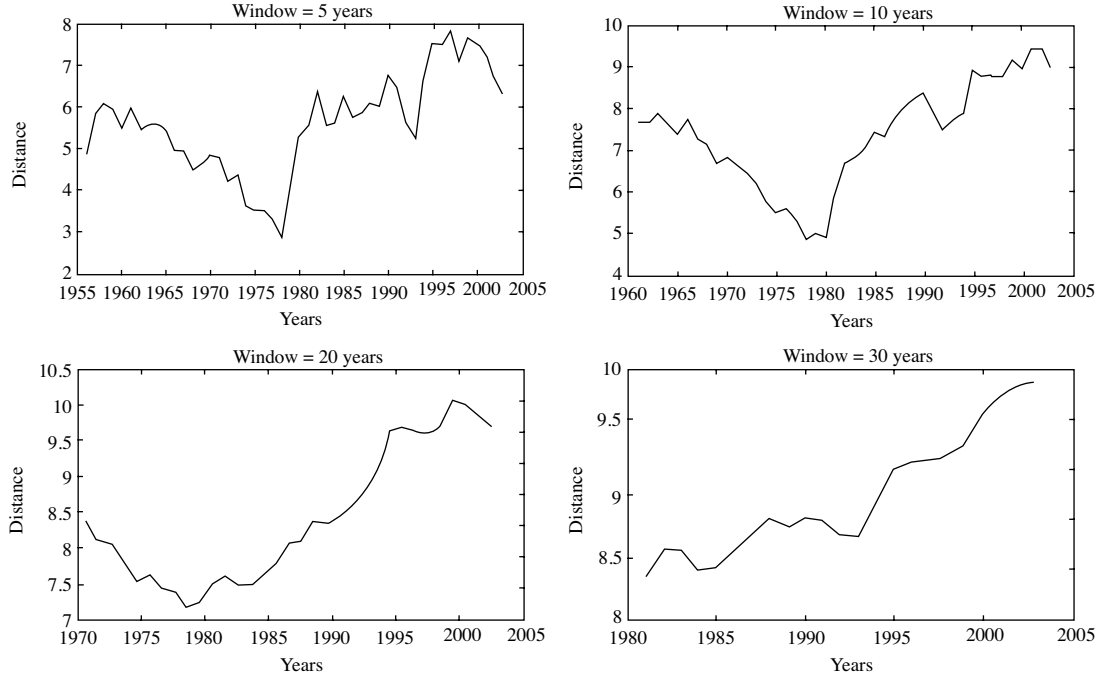
There is, however, a crucial difference in the analysis proposed here, which uses a broader concept of convergence: the convergence encountered is related not only to the level of GDP attained, but to the general performance of the countries throughout the period of analysis, which is why we speak of performance clubs.

To make the result of the analysis conducted here more robust and to bring out the differences from a traditional convergence study, 20,000 Monte Carlo simulations were generated for "poor" and "rich" countries over 51 years. The function obtained from these simulations is a probability distribution simulated for constant distances between two countries. In particular, a 5% and 95% confidence interval can be selected; thus, if two countries are moving apart (together), but remain within the confidence interval, it can be said that this increase (decrease) in distance was not significant and their distances can therefore be considered to have remained constant.

The simulated probability distribution function for average distances between the "rich" and "poor" country, which is obtained from the simulation, therefore makes it possible to analyse whether these are moving together or apart. Figure 7 shows the 5% and 95% confidence intervals as dotted lines. In the 1990s, the distances fall outside the confidence intervals, marking a significant movement apart.

FIGURE 6

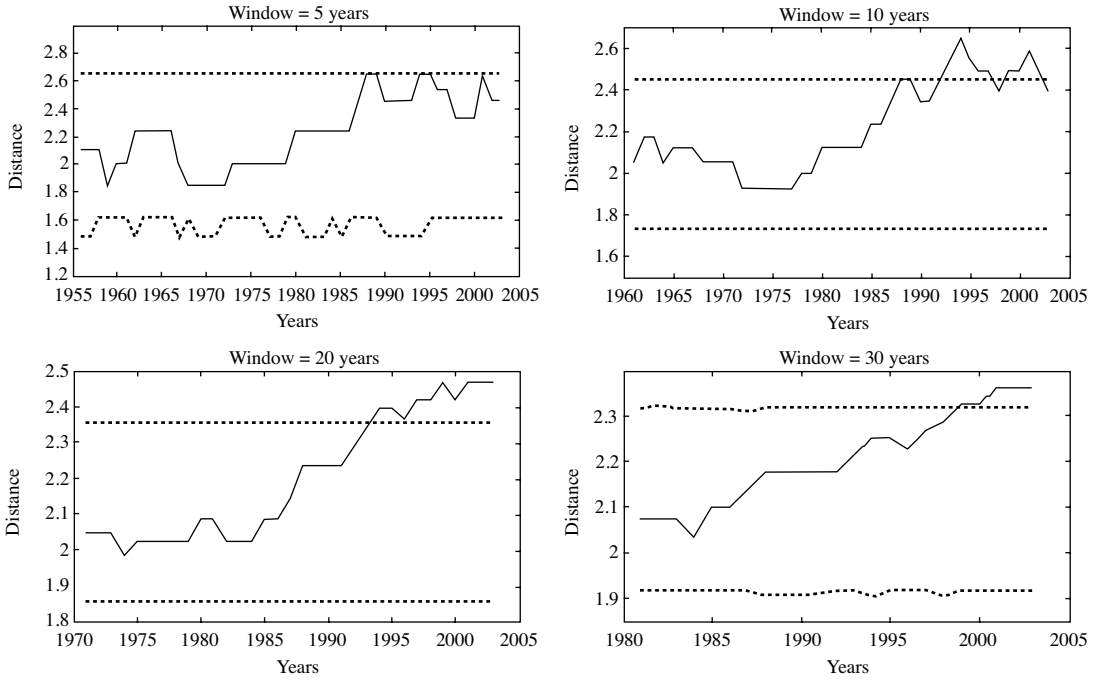
Evolution of the distance between the 16 poorest countries of the Americas



Source: prepared by the authors.

FIGURE 7

Evolution of the distance between the average "poor" country and the average "rich" country



Source: prepared by the authors.

This last analysis clearly shows that the countries made differential adjustments to their macroeconomic policies after the 1980s debt crisis, resulting in a kind of temporary divergence in performance. In the dynamic analysis, these differences could mark the emergence (or disappearance) of new clusters. The simulation thus bears out the findings of the initial analysis for the average countries.

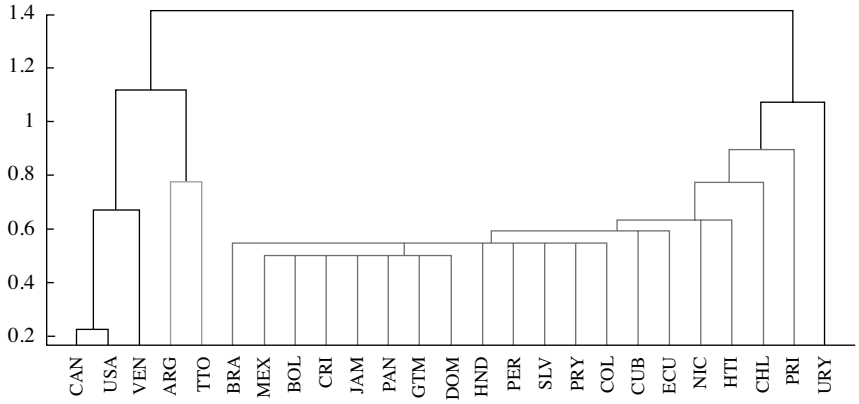
To progress with the study of "cluster dynamics", the minimum spanning tree has been calculated by taking time intervals (windows) of 20 years. It transpires that the only link to survive intact over the 33 years of analysis is the one between Canada and the United States, indicating a very close relationship between the two countries and a dynamic different to that of the rest of the sample. The Latin American countries do not present such strong links, the longest-lasting being those between Colombia and Brazil and between Cuba and El Salvador.[10] As shown by a subsequent analysis, however, the country groups are relatively stable and tend to perpetuate themselves, although some countries display a tendency to change group.

When the hierarchical trees are analysed, certain developments can be appreciated. The first tree is for 1971 and deals with the previous 20 years. Two major groups are observed. First there are the "rich" countries, comprising two subgroups, the first of which contains Canada and the United States and the second Argentina, the Bolivarian Republic of Venezuela and Trinidad and Tobago. Then there is the group of "poor" countries, with Uruguay in a relatively favourable position, as to a certain degree are Chile and Puerto Rico. The situation remains stable until 1976, when Puerto Rico shows a tendency to join the group of "rich" countries and Mexico starts to pull away slightly from the "poor" countries. By 1982 we find that Puerto Rico belongs to the "rich" group along with Canada, the United States, Trinidad and Tobago, Argentina and the Bolivarian Republic of Venezuela. Meanwhile, Mexico and Uruguay have formed a new cluster separating them from the "poor" countries and Chile continues to perform in a way that sets it apart from the "poor" countries, just as Panama does the following year.

[10] As noted earlier, the persistence of the proximity between Colombia and Brazil and between El Salvador and Cuba is due to macroeconomic similarities in industrial and structural conditions between the two pairs of countries.

FIGURE 8

Hierarchical tree for the Americas, 1971
(Taking a 20-year window)

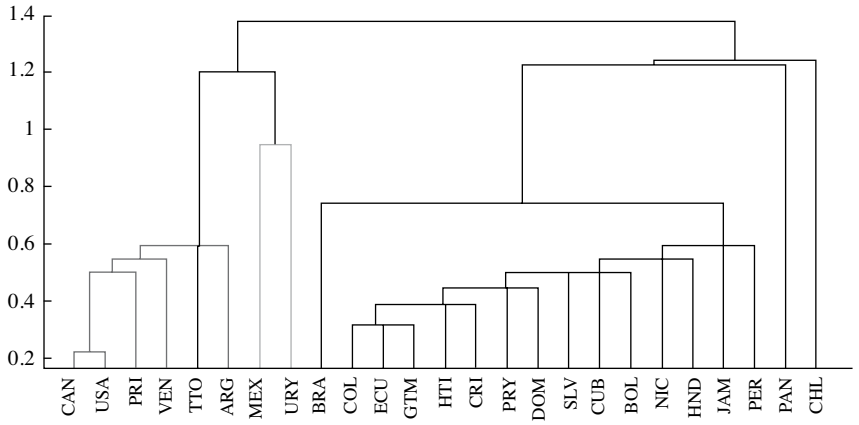


Source: prepared by the authors.

CAN: Canada. USA: United States. VEN: Bolivarian Republic of Venezuela. ARG: Argentina. TTO: Trinidad and Tobago. MEX: Mexico. URY: Uruguay. PRI: Puerto Rico. CHL: Chile. BRA: Brazil. CRI: Costa Rica. COL: Colombia. PER: Peru. BOL: Plurinational State of Bolivia. CUB: Cuba. DOM: Dominican Republic. ECU: Ecuador. SLV: El Salvador. GTM: Guatemala. PRY: Paraguay. HTI: Haiti. NIC: Nicaragua. HND: Honduras. JAM: Jamaica. PAN: Panama.

FIGURE 9

Hierarchical tree for the Americas, 1987
(Taking a 20-year window)



Source: prepared by the authors.

CAN: Canada. USA: United States. VEN: Bolivarian Republic of Venezuela. ARG: Argentina. TTO: Trinidad and Tobago. MEX: Mexico. URY: Uruguay. PRI: Puerto Rico CHL: Chile. BRA: Brazil. CRI: Costa Rica. COL: Colombia. PER: Peru. BOL: Plurinational State of Bolivia. CUB: Cuba. DOM: Dominican Republic. ECU: Ecuador. SLV: El Salvador. GTM: Guatemala. PRY: Paraguay. HTI: Haiti. NIC: Nicaragua. HND: Honduras. JAM: Jamaica. PAN: Panama.

In 1987, the group formed by Mexico and Uruguay joined the "rich" country club, while Panama and Chile pulled away considerably from the "poor" countries and Brazil showed a performance that began to distance it from that group. In 1992, although still some way behind, Chile entered the group of "rich" countries, and in 1997 Panama presented a similar performance. In 2001, Brazil and Costa Rica formed a group whose performance differed from that of the "poor" countries, and Colombia moved in a similar direction.

In 2003, at the end of the period, we find three groups: that of the "rich" countries comprising the United States, Canada, Argentina, Uruguay, Mexico, Trinidad and Tobago, Puerto Rico, the Bolivarian Republic of Venezuela and Chile; a group of intermediate countries (which join the club of "rich" countries) comprising Brazil, Costa Rica and Panama; and lastly, the club of "poor" countries, from which Colombia is evidently diverging.

The analysis reveals that there have always been basically two clubs of countries, and that countries originally belonging to the "poor" club have gone over to the "rich" club. This happened with Puerto Rico first, followed by Mexico and Uruguay and, lastly, Chile. Panama, Costa Rica and Brazil form a group that has still not fully caught up with the "rich" countries by the end of the period. Interestingly, there is no movement in the other direction, i.e., no country belonging to the "rich" countries' club has gone over to the club of "poor" countries.

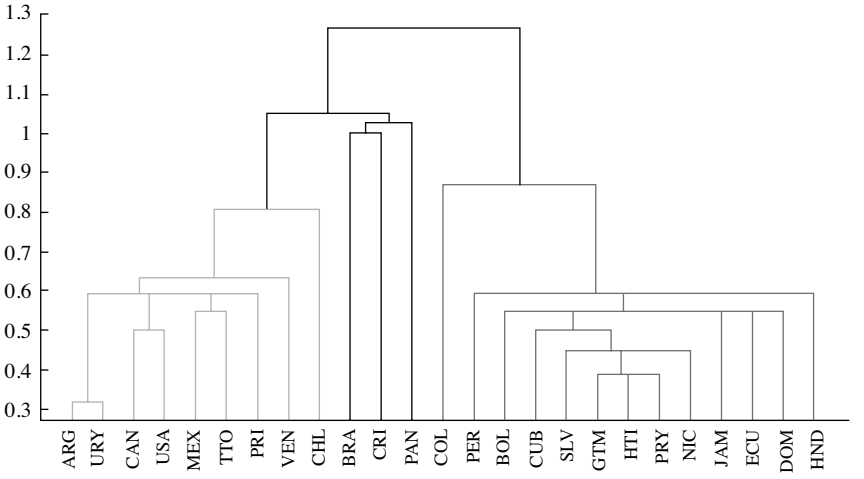
The findings are reinforced when the evolution of the groups is studied on the basis of 30-year windows. The first thing that is observed is that besides the link between Canada and the United States, which remains intact in the 23 years following 1981, the other connection that remains unchanged is the one between Mexico and Uruguay.

Certain facts stand out when the hierarchical trees are studied. The first appears in 1981, when we find the "rich" group of countries being formed by Canada, the United States, the Bolivarian Republic of Venezuela, Argentina and Trinidad and Tobago. Meanwhile, Puerto Rico, Uruguay, Mexico and Chile are pulling away from the "poor" countries but without leaving the cluster. In 1984, Puerto Rico makes the jump into the cluster of "rich" countries and Mexico and Uruguay form a group whose performance sets it apart from that of the "poor" countries. In 1990, the group containing Mexico and Uruguay is observed to join the "rich" country club, while Chile and also Panama are trying to distance themselves from the "poor" countries. In 1993, Chile succeeds in entering the "rich" country cluster, while Panama and to some extent Brazil perform in a way that sets them apart from the "poor" countries.

In 2003, the cluster of "rich" countries is found to be composed of Canada, the United States, Puerto Rico, the Bolivarian Republic of Venezuela, Trinidad and Tobago, Mexico, Uruguay, Argentina and, albeit some way behind, Chile. In the "poor"

FIGURE 10

Hierarchical tree for the Americas, 2003
(Taking a 20-year window)



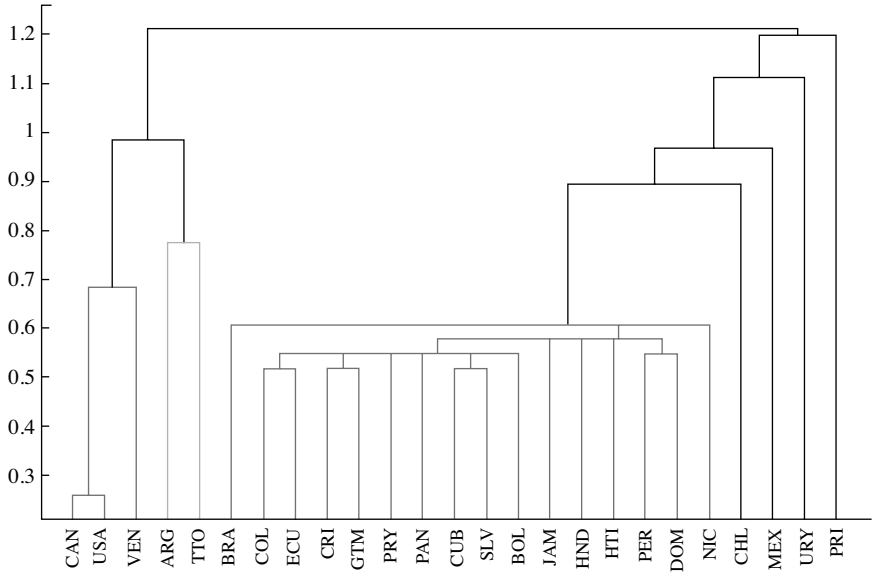
Source: prepared by the authors.

ARG: Argentina. URY: Uruguay. CAN: Canada. USA: United States. MEX: Mexico. TTO: Trinidad and Tobago. PRI: Puerto Rico. VEN: Bolivarian Republic of Venezuela. CHL: Chile. BRA: Brazil. CRI: Costa Rica. PAN: Panama. COL: Colombia. PER: Peru. BOL: Plurinational State of Bolivia. CUB: Cuba. SLV: El Salvador. GTM: Guatemala. HTI: Haiti. PRY: Paraguay. NIC: Nicaragua. JAM: Jamaica. ECU: Ecuador. DOM: Dominican Republic. HND: Honduras.

FIGURE 11

Hierarchical tree for the Americas, 1981

(Taking a 30-year window)



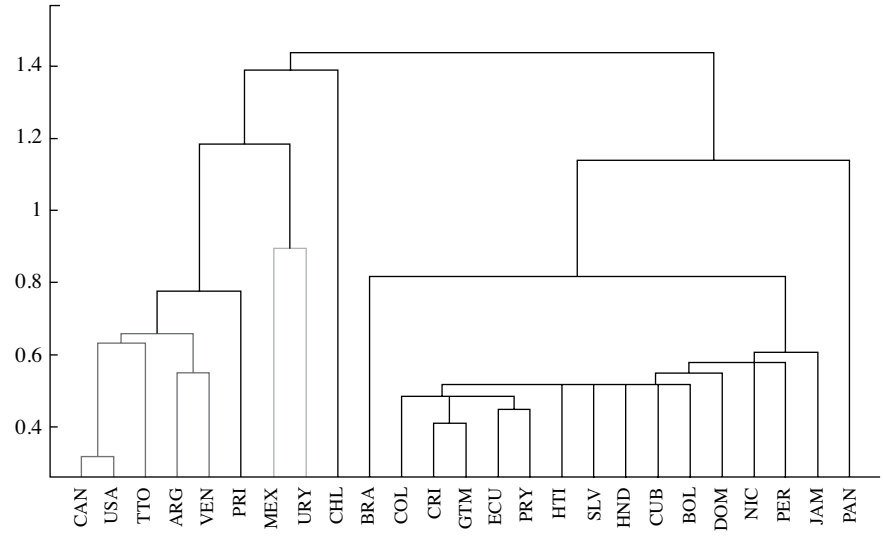
Source: prepared by the authors.

CAN: Canada. USA: United States. VEN: Bolivarian Republic of Venezuela. ARG: Argentina. TTO: Trinidad and Tobago. BRA: Brazil. COL: Colombia. ECU: Ecuador. CRI: Costa Rica. GTM: Guatemala. PRY: Paraguay. PAN: Panama. CUB: Cuba. SLV: El Salvador. BOL: Plurinational State of Bolivia. JAM: Jamaica. HND: Honduras. HTI: Haiti. PER: Peru. DOM: Dominican Republic. NIC: Nicaragua. CHL: Chile. MEX: Mexico. URY: Uruguay. PRI: Puerto Rico.

FIGURE 12

Hierarchical tree for the Americas, 1993

(Taking a 30-year window)



Source: prepared by the authors.

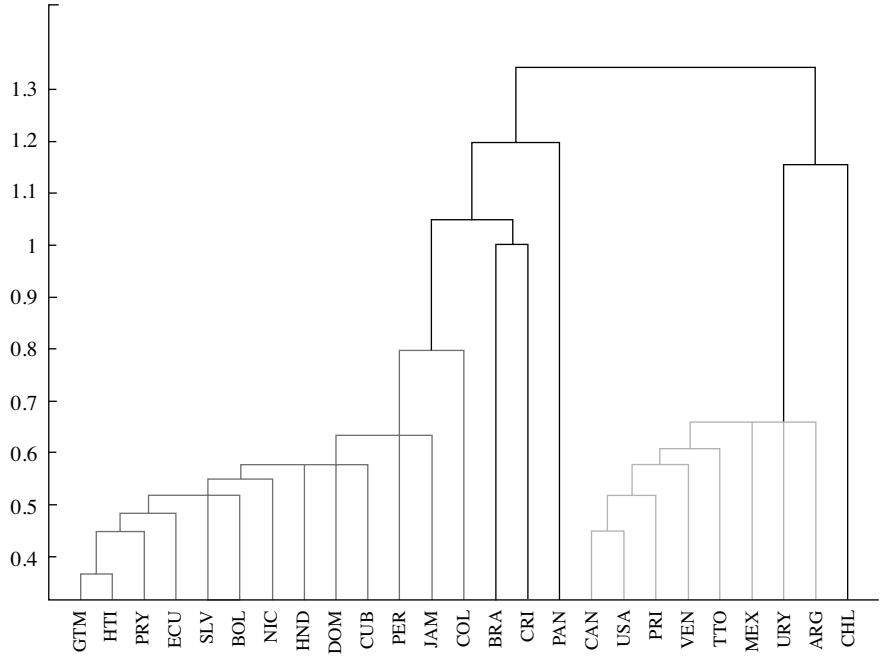
CAN: Canada. USA: United States. TTO: Trinidad and Tobago. ARG: Argentina. VEN: Bolivarian Republic of Venezuela. PR: Puerto Rico. MEX: Mexico. URY: Uruguay. CHL: Chile. BRA: Brazil. COL: Colombia. CRI: Costa Rica. GTM: Guatemala. ECU: Ecuador. PRY: Paraguay. HTI: Haiti. SLV: El Salvador. HND: Honduras. CUB: Cuba. BOL: Plurinational State of Bolivia. DOM: Dominican Republic. NIC: Nicaragua. PER: Peru. JAM: Jamaica. PAN: Panama.

countries group, meanwhile, we find Brazil and Costa Rica forming a subgroup of countries which, with Panama, still display a performance that sets them apart from that group.

Here again, the leaps are only from "poor" to "rich" and not back the other way. Puerto Rico, Mexico, Uruguay and Chile are the countries that move from one club to another over the entirety of the period. This analysis is once again found to coincide with that conducted by Quah (1993), although it represents an advance in explanatory power and the breakdown of the dynamic. As that author notes, the likelihood of "rich" countries becoming "poor" countries is extremely low, while the likelihood of "poor" countries converging on the "rich" category is higher. Middle-income countries behave more erratically, however, so that the transition from "poor" to "rich" country is not assured in terms of traditional convergence. This last finding is reinforced by the time window analysis, which shows that Quah-style mobility is conditioned by the relative performance of each country.

FIGURE 13

Hierarchical tree for the Americas, 2003
(Taking a 30-year window)



Source: prepared by the authors.

GTM: Guatemala. HTI: Haiti. PRY: Paraguay. ECU: Ecuador. SLV: El Salvador. BOL: Plurinational State of Bolivia. NIC: Nicaragua. HND: Honduras. DOM: Dominican Republic. CUB: Cuba. PER: Peru. JAM: Jamaica. COL: Colombia. BRA: Brazil. CRI: Costa Rica. PAN: Panama. CAN: Canada. USA: United States. PRI: Puerto Rico. VEN: Bolivarian Republic of Venezuela. TTO: Trinidad and Tobago. MEX: Mexico. URY: Uruguay. ARG: Argentina. CHL: Chile.

V
Conclusions

This study has presented a non-parametric method of clustering based on the dynamic regime concept. The technique was applied with a view to contributing to the economic convergence debate. In particular, a new idea of convergence is used that differs from the traditional one, based on convergence towards a steady state. With this new concept of convergence, two countries "converge" if their regime dynamics become more similar, without their variables necessarily tending towards a steady state.

In the exercise, the technique is applied to a group of countries in the Americas, including countries deemed to be both developed and undeveloped, and what come out are a number of results that a traditional convergence analysis would not bring to light. First, while two well-differentiated groups have been marked out (what we call "poor" and "rich" countries), heterogeneous performances have been found within them. Two subgroups can be found inside each of these two groups: among the "rich" countries we have a subgroup comprising the United States and Canada (the closest together in the sample), which present a dynamic different from that of the rest of the "rich" country group. Among the "poor" countries, meanwhile, there is a compact group which we might consider the poorest, and then there are Brazil, Costa Rica and Colombia which, without graduating to the "rich" group, stand considerably apart from the "poorest".

A second interesting behaviour pattern that can be found in this analysis is the presence of larger disparities in the "poor" country group than in the "rich" one. While the "richest" countries have converged among themselves, the "poorest" countries have shown something of a tendency to diverge over time.

By studying the evolution of the distance between the average "poor" and "rich" country and carrying out 20,000 Monte Carlo simulations for "poor" and "rich" countries, we obtained the result that the distance between the average "poor" country and the average "rich" one fell outside the confidence interval (of a constant distance) in the 1990s. This suggests that much of the separation between "rich" and "poor" countries in the Americas took place in that decade.

The wealth of findings, which enable the economic performance of the countries of the Americas to be described in accordance with their economic history, would seem to account for the failure to find a unique result in the traditional convergence analyses mentioned in previous sections. In any event, the findings partially match those presented by Mayer-Foulkes (2001) and Howitt and Mayer-Foulkes (2004), who identify convergence clubs on the basis of a specific model.

In summary, this new methodological proposal has made it possible to establish patterns and trends in the economic performance of the countries of the Americas. What has been analysed in particular is the convergence or divergence in the economic performance of these countries, allowing performance clubs to be identified without the need to "condition the data" in advance in order to adapt the convergence analysis to the traditional tools, or specify a concrete model. From a methodological standpoint, the main difference is that all the results encountered (groups of countries, divergence/convergence between and within groups, etc.) are ex post, which eliminates any selection bias.

Lastly, the proposed method allows other variables (economic, institutional, social and others) to be incorporated into the analysis so as to compare the influence of these variables on the formation of clubs in the light of changes in performance. In particular, it is possible to carry out a comparative analysis of the dynamics of growth clubs and development clubs by taking qualitative variables such as the Human Development Index or detailed analysis of human capital accumulation, among others. An initial hypothesis is that a number of countries in Latin America and the Caribbean present a profound duality in their quantitative and qualitative historical performance: per capita income figures alone give no clue to the possibility that income distribution may be becoming increasingly unequal even as a country develops or that its economy may be tending towards dualism in its economic and social structure, with qualitative development variables thus potentially returning increasingly negative values. This is an area for further research.

(Original: Spanish)

APPENDIX

Data used

This study uses per capita GDP (GDP divided by population) in constant 1990 dollars and per capita GDP growth, both for the 1951-2003 period, in 25 countries of the Americas. These data were obtained from "Historical statistics for the world economy: 1-2003 AD", prepared by Angus Maddison (2001a).

According to Maddison, the data are contained in three books: *Monitoring the World Economy, 1820-1992* (Maddison, 1995), *The World Economy: A Millennial Perspective* (Maddison, 2001b) and *The World Economy: Historical Statistics* (Maddison, 2003). All these books have detailed notes.

The GDP of Latin America in 2000-2003 was revised and updated by ECLAC in the *Statistical Yearbook for Latin America and the Caribbean, 2004* and a preliminary version of the *Statistical Yearbook for Latin America and the Caribbean, 2005*, supplied by Andre Hofman (ECLAC, 2005 and 2006). For Chile, 1820-2003 GDP was provided by Rolf Lüders in *The Comparative Economic Performance of Chile 1810-1995* (Lüders, 1998), with population estimates by J. Díaz, R. Lüders and G. Wagner in "La República en cifras: Chile 1810-2000" (Díaz, Lüders and Wagner, 2005). For Peru, the figures are from "PIB 1896-1990 y población 1896-1949", by Bruno Seminario and Arlette Beltrán, in *Crecimiento económico en el Perú 1896-1995* (Seminario and Beltrán, 1998).

The Americas (25 countries): per capita GDP and annual growth averages, 1951-2003

Country	Per capita GDP	Average annual growth
United States	18 133.77	2.14%
Canada	14 634.00	2.24%
Venezuela (Bol. Rep. of)	9 310.72	-0.02%
Trinidad and Tobago	9 071.34	3.04%
Puerto Rico	7 680.12	3.71%
Argentina	7 002.68	0.94%
Chile	5 961.25	2.22%
Uruguay	5 930.91	0.81%
Mexico	5 000.49	2.16%
Costa Rica	4 124.87	2.36%
Panama	4 090.70	2.19%
Brazil	3 903.59	2.35%
Colombia	3 773.94	1.71%
Peru	3 548.00	1.17%
Guatemala	3 297.49	1.30%
Ecuador	3 242.75	1.24%
Jamaica	3 202.38	2.04%
Paraguay	2 451.82	1.24%
Cuba	2 349.87	0.61%
El Salvador	2 192.45	1.19%
Bolivia (Plur. St. of)	2 182.55	0.65%
Dominican Republic	2 107.32	2.57%
Nicaragua	2 106.95	0.12%
Honduras	1 710.50	0.78%
Haiti	992.29	-0.54%

Source: authors' calculations.

GDP: Gross domestic product.

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KEYWORDS

Physical infrastructure
Financing
Investments
Public sector
Private sector
Financial institutions
Statistical data
Comparative analysis
Latin america
Asia

Latin America: problems and challenges of infrastructure financing

Patricio Rozas

This article seeks to quantify basic infrastructure trends in the region, and assess the extent to which they have fallen behind those in Southeast Asian countries, which were clearly less developed than their Latin American counterparts in the late 1970s. The specific aim is to identify the main general characteristics of basic infrastructure development in Latin America, highlighting the problems faced by the investment process, with a view to identifying the main consequences of those problems and thus specify the challenges facing the region's countries.

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I

Basic infrastructure development in Latin America

Various empirical studies have found a positive and significant correlation between infrastructure investment and economic growth, without that necessarily indicating a direction of causality between the two variables (Rozas and Sánchez, 2004). The dynamic that underpins this relation is relatively clear, however: more readily available and better quality infrastructure services —telecommunications; road network and transport services; power generation, transmission and distribution; and the supply of drinking water and sanitation services— raise factor productivity and lower production costs. The resulting higher profitability stimulates investment and thus enhances potential GDP growth. Recent studies point out that shortcomings in road and telecommunication networks significantly raise transport and logistic costs generally, which are above international standards, thereby undermining the competitiveness of firms, industries, and entire economies (Guasch and Kogan, 2001; ECLAC, 2004).

In the 1990s, the Latin American infrastructure services sector underwent a major structural transformation that affected telecommunications, energy, health services and transport. Most of the region's countries abolished State monopolies and encouraged the private sector to participate in markets hitherto reserved for State enterprises, by removing the legal barriers to entry in certain segments of industry.

The redefinition of the State's role in infrastructure provision meant that most of the region's countries privatized the State firms in each sector (many of which were legally protected monopolies) and introduced institutional and legal regulatory frameworks. In many cases, regulatory bodies were set up to oversee the activities undertaken by the private firms in each sector.

The liberalization of infrastructure-service markets and the privatization of State enterprises allowed foreign competitors to enter the market, many of which brought with them new production techniques, technologies, and modes of business organization, which proved decisive for modernizing infrastructure and locally produced services. This modernization was crucial for obtaining higher gains from systemic competitiveness and attracting new investment flows into other productive sectors.

Despite the broad scope of these trends, the restructuring of services spawned a variety of models that differ not only between sectors, but also from one country to another in the same sector. This diversity reflects sharp differences stemming from market size and structure, the real degree of competition that can be introduced in each country and each service, price-setting processes, service coverage and quality, and even their environmental impacts.

Thus, between 1985 and 2007, most Latin American countries improved the coverage and quality of services that depend on the availability of physical infrastructure and networks. Over the last 10 years, the expansion has been spectacular in the cellular phone and Internet markets, where the region has achieved one of the highest development indices worldwide (Rozas, 2008a). The coverage of electricity services has also grown, and many ports have been modernized under concession schemes (Doerr and Sánchez, 2006). In contrast, there has been little change in coverage in the road segment (ECLAC, 2004; Fay and Morrison, 2005; Sánchez and Wilmsmeier, 2005).

Despite these improvements, which have improved conditions for economic development, the expanded coverage of infrastructure services has been insufficient, as will be discussed below.

If shortcomings in economic infrastructure, caused by problems of industrial organization in markets or physical shortcomings, are not already undermining Latin America's capacity to sustain growth, increase factor productivity and enhance the competitiveness of their economies and reduce poverty, they could certainly do so in the near future. The region needs to overcome the infrastructure constraint to assure conditions providing a sustainable basis for growth. This explains the need for investment in the sector.

☐ The author gratefully acknowledges assistance provided by Mauro Gutiérrez, who helped compile and process the statistical data.

The divergent behaviour of infrastructure supply and demand is causing two main effects, which are worrying in themselves: (i) a widening gap between the region and other emerging economies; and (ii) a trend towards insufficient provision of infrastructure services.

II

Infrastructure investment: an unresolved challenge

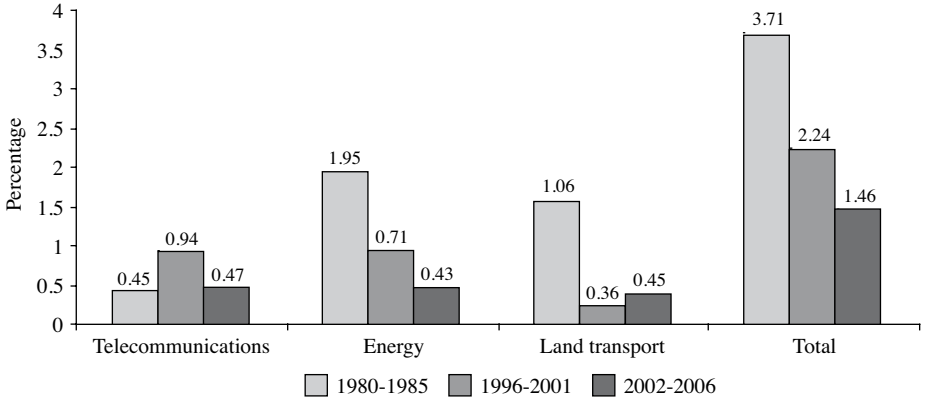
The main reason for the inadequate development of basic infrastructure in Latin America over the last two decades stems from the difficulties countries have faced in maintaining an adequate pace of investment in the sector's various activities.

The average annual investment rate in infrastructure in the leading Latin American economies fell from 3.7% to 2.2% and 1.5% of gross domestic product (GDP) in successive five-year periods 1980-1985, 1996-2001 and 2002-2006, respectively. This is a steep drop considering that, in the first five years of the 1980s, the region was hit by the balance of payments crisis and high levels of external debt, which drastically contracted aggregate demand, including investment. Accordingly, the parameter against which average investment in 1996-2001 and 2002-2006 is compared, namely the average value for the five-year period 1980-1985, was not very demanding, since it had been lowered by the crisis affecting the region in the first half of the decade. Nonetheless, average investment in the periods 1996-2001 and 2002-2006 still declined sharply in relation to that baseline value.

Figure 1 shows that the decline in infrastructure investment throughout the 1980-2006 period was particularly acute in the areas of energy and land transport, although the latter recovered somewhat in 2002-2006 compared to 1996-2001, rising from 0.36% to 0.45% of GDP on average for the countries in the sample. In contrast, investment in telecoms grew strongly in the second half of the 1990s compared to the early 1980s, before falling back almost to the initial levels in 2002-2006.

FIGURE 1

Latin America:[a] Investment in infrastructure areas as a percentage of GDP, 1980-1985, 1996-2001, 2002-2006



Source: For 1980-1985 and 1996-2001: César Calderón and Luis Servén, "Trends in infrastructure in Latin America, 1980-2001", *Working Paper*, No. 269, Santiago, Chile, Central Bank of Chile, September 2004. For 2002-2006: prepared by the author on the basis of figures from the World Bank and national statistics.

[a] Includes Argentina, Brazil, Chile, Colombia, Mexico, Peru and the Plurinational State of Bolivia.

GDP: Gross domestic product.

Much of the most recent economic literature on this subject has sought to explain the decline in investment flows into the sector. Explanatory factors suggested include public-expenditure cuts, the smaller contribution made by multilateral and bilateral lending agencies, and the reduction in private contributions. Discussion on the problems underlying the behaviour of the components of aggregate investment in infrastructure clearly remains an unresolved topic in the literature. Thus far, most analyses of the factors causing this situation have been conducted at the sector level, with very few considering the structural reforms implemented in the 1980s and the first five years of the 1990s. These should form the main focus of the analysis to identify the dynamic of the various ongoing processes both in the basic infrastructure industry and in the provision of related services.

An additional complication has been the partial nature of the information available —only approximations in some cases— and the tendency of some analysts to extrapolate situations that occur more intensively in the region's larger and more important countries, by assuming they are also valid for the other countries as part of more general trends, which is not necessarily the case.

On this point, the study made by Calderón and Servén (2004) helps to specify the varied trends that can be discerned in the region, behind the trend of aggregate investment variables. The two authors compare total investment in the early 1980s with its counterpart in the first 10 years of this century in the leading economies of Latin America (Argentina, Brazil, Chile, Colombia, Mexico and Peru), together with the Plurinational State of Bolivia. The results obtained show that most countries suffered a sharp fall, which, in some cases, had barely been reversed by the early 1990s. The study sees Chile and Colombia as exceptions to that trend, since those countries saw significant growth in infrastructure investment during the decade (Calderón and Servén, 2004).

The data presented also show that total infrastructure investment fell off sharply in the largest economies (Brazil, Argentina and Mexico), where annual average expenditure on infrastructure halved in 1996-2001 compared to 1980-1985; but it rose in the smaller economies (Chile, Colombia, Peru and the Plurinational State of Bolivia), and particularly sharply in Chile and Colombia, by 5.6% and 5.8%, respectively. In the ensuing period (2002-2006) the data show that the infrastructure investment rate fell even more sharply in all countries of the sample except Mexico —even in those countries that had performed better in the preceding period (see figure 2).

The relevant questions therefore relate to this disparity. Why was infrastructure investment in the second half of the 1990s higher than in the early 1980s in some countries, but lower by half in others? Why does the infrastructure investment rate fall so sharply in Chile and Colombia, countries that displayed average rates of around 6% of their respective GDPs in the late 1990s? Is an infrastructure investment rate of 6% of GDP sufficient to satisfy the demands generated by the internal dynamics of economic growth and development?

Some analysts may seek to underestimate the observed reductions and highlight both the growth of GDP in the 2004-2007 period, way above the average for the two previous decades, with the possible maturity of markets in certain infrastructure industry areas, as the factors causing the decline, thereby validating the non-linear nature of the estimated relation between infrastructure and long-term growth (a positive but decreasing effect).

In Latin America, both arguments are debatable. Firstly, it is wrong to assume autonomous behaviour by infrastructure investment in relation to GDP growth, particularly in countries that have a major infrastructure deficit, without knowing the elasticity of output with respect to the provision of related services, which has been measured in numerous studies under various circumstances (Rozas and Sánchez, 2004); and particularly the close two-way causal relationship between the two variables detected by Canning and Pedroni (1999), when controlling for heterogeneous short-term interactions between infrastructure and GDP.

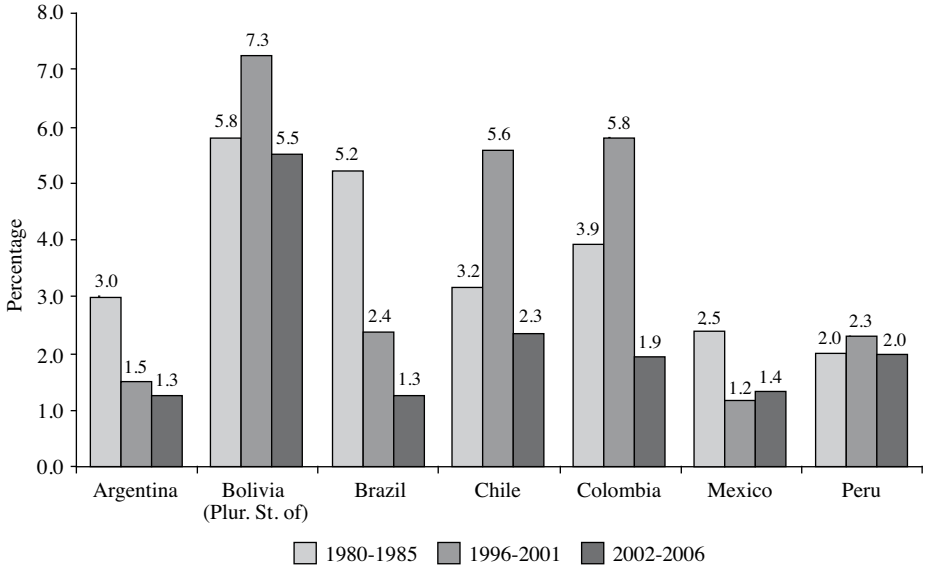
Secondly, the countries of the region are given an unduly short horizon in terms of the maturity of infrastructure service markets, as shown by a comparison of coverage and density indicators achieved by such services in Latin America, compared to their counterparts in more developed countries. It therefore seems more reasonable to seek factors to explain this decline by analysing the behaviour of the leading components of infrastructure investment. To do this general policy guidelines and the relevant measures need to be defined.

1. Public investment

Various studies have found a close correlation between the growth of primary public-sector deficits

FIGURE 2

Latin America (selected countries): infrastructure investment as a percentage of GDP, periods 1980-1985, 1996-2001 and 2002-2006



Source: For 1980-1985 and 1996-2001: César Calderón and Luis Servén, "Trends in infrastructure in Latin America, 1980-2001", *Working Paper*, N° 269, Santiago, Chile, Central Bank of Chile, September 2004. For 2002-2006: prepared by the author on the basis of figures from the World Bank and national statistics.

GDP: Gross domestic product.

and budget cuts for public investment generally and infrastructure in particular.

The weak performance of infrastructure investment reflects the financial difficulties faced by most of the region's governments since the external debt crisis that erupted in 1982. The need to make fiscal adjustments, compounded by external debt service, led countries to significantly cut their public expenditure, particularly investment.

There is sufficient evidence to state that, faced with fiscal crises in the 1990s, Latin American finance ministries and governments found it easier to suspend or cancel the implementation of major infrastructure projects, rather than reduce external debt service payments, or cut pensions or public-sector pay.

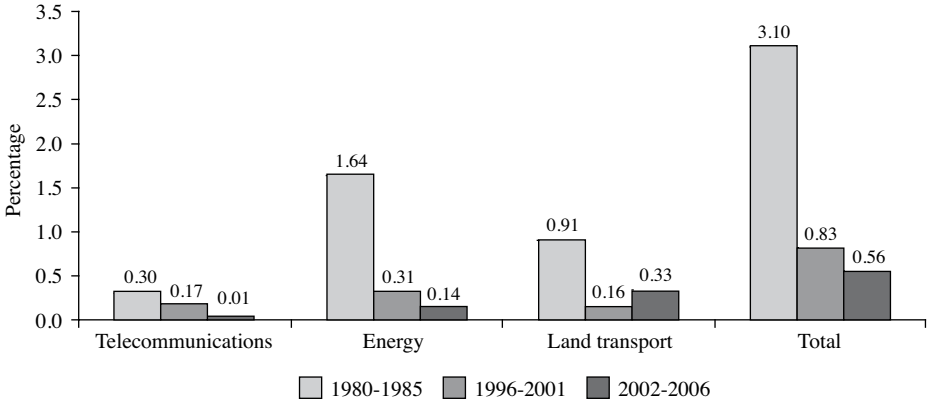
Accordingly, between 1988 and 1998, public investment in infrastructure decreased from 3% to 1.8% of GDP in Latin America, falling below the level needed to catch up the so-called Asian "tigers" (Fay and Morrison, 2005). The most recent data confirm the downward trend: in 2002-2006, annual average public investment in infrastructure in the same group of countries was equivalent to just 0.6% of GDP, which means that public investment in the sector in that period was just one fifth of what it was in the early 1980s.

These figures show that the decline in public investment was particularly steep in the land transport and energy sectors. In the first case, public investment fell from 0.91% of GDP (annual average for the period 1980-1985) to 0.16% (annual average for 1996-2001), which reflects the low priority given by the region's largest countries to this type of infrastructure in policy in the second half of the 1990s. This decline was not offset by greater private investment, which only grew from 0.15% of GDP to 0.20%, as noted below. As a result, total investment in that area declined sharply (see figure 1).

The drop in public investment in the energy sector (from 1.64% to 0.31% of GDP) basically reflects the privatization of electric power companies in most of the region's countries, except Mexico, which meant that the State ceased to be a relevant player in this basic infrastructure area. As was the case in land

FIGURE 3

Latin America:[a] public investment in infrastructure as a percentage of GDP, periods 1980-1985, 1996-2001, 2002-2006



Source: For 1980-1985 and 1996-2001: César Calderón and Luis Servén, "Trends in infrastructure in Latin America, 1980-2001", *Working Paper*, N° 269, Santiago, Chile, Central Bank of Chile, September 2004. For 2002-2006: prepared by the author on the basis of figures from the World Bank and national statistics.

[a] Includes Argentina, Brazil, Chile, Colombia, Mexico, Peru and the Plurinational State of Bolivia.

GDP: Gross domestic product.

transport infrastructure, private investment in the energy sector was unable to make up for the decline in public investment.

The most recent data show that the declining trend in public investment gathered pace in the period 2002-2006, in both the electric power and telecommunications areas, reflecting the consolidation of privatizations in both activities; but the trend reversed in the case of land transport, which absorbed over half of all public investment in infrastructure in 2002-2006.

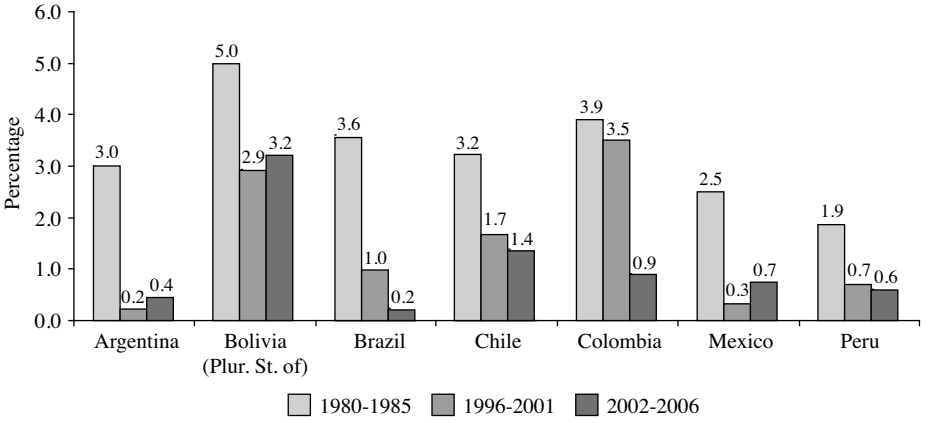
The decline in public investment in infrastructure is thus explained not only by the causes identified by Fay and Morrison (2005), who relate it mainly to the fiscal crisis in the region's countries. Apart from the repercussion of privatizations —which meant the State ceased to participate directly in activities such as energy and telecommunications— public investment budgets in the 1990s were cut on the assumption that much of basic infrastructure could be financed and supplied through private investment. This was reflected in policy criteria that guided the profile of the budget in the periods being compared; and much of the debate involved defining the most appropriate institutional and regulatory arrangements for such investment to take place.

Information on the trend of public investment in infrastructure in the region's leading countries provides some very important figures for evaluating the infrastructure deficits in the sector. Figure 4 shows that the decline in public investment in the second half of the 1990s was widespread, occurring in all Latin American countries in the sample. The reduction was particularly sharp in Argentina, Mexico and Peru, where public investment fell to below 1% of GDP as an annual average for the period 1996-2001. In Brazil, public investment also dropped steeply and barely reached 1% of GDP in that period. In contrast, the fall was slight in Colombia and moderate in Chile, where investment remained strong (1.72% of GDP). The situation was partly reversed in some countries in the next five-year period, particularly in Argentina and Mexico, and in the Plurinational State of Bolivia, where public investment in infrastructure grew as part of a major expansion of the corresponding economies, albeit without regaining the levels of the early 1980s.

In fact, despite the recovery, public investment in infrastructure in 2002-2006 did not exceed 1% of GDP as an annual average, in any of the Latin American countries considered, except for the Plurinational State of Bolivia and Chile. Unlike Argentina, the Plurinational State of Bolivia and Mexico, the downward trend in public investment in infrastructure in the other countries of the sample persisted in the latter five-year period —particularly in Colombia, which had been one of the two countries with the

FIGURE 4

Latin America (selected countries): public investment in infrastructure as a percentage of GDP, periods 1980-1985, 1996-2001, 2002-2006



Source: For 1980-1985 and 1996-2001: César Calderón and Luis Servén, "Trends in infrastructure in Latin America, 1980-2001", *Working Paper*, No. 269, Santiago, Chile, Central Bank of Chile, September 2004. For 2002-2006: prepared by the author on the basis of figures from the World Bank and national statistics.

GDP: Gross domestic product.

highest levels of public investment in the sector until then. This trend also intensified, particularly in Brazil, and somewhat less so in Peru.

The figures reviewed above clearly reveal the particular situation of countries such as Chile and Colombia, which posted infrastructure investment rates close to 6% of GDP in 1996-2001, as noted in the previous section. It would thus seem that countries with the smallest historical deficits in total infrastructure investment are those that maintained high levels of public investment (Columbia), or suffered smaller reductions (Chile). This was true despite the fact that both countries had introduced far-reaching reforms in the various infrastructure areas, privatizing firms and developing business opportunities for private enterprise, by introducing unconventional participation mechanisms such as highway concessions and other public-private partnership arrangements.

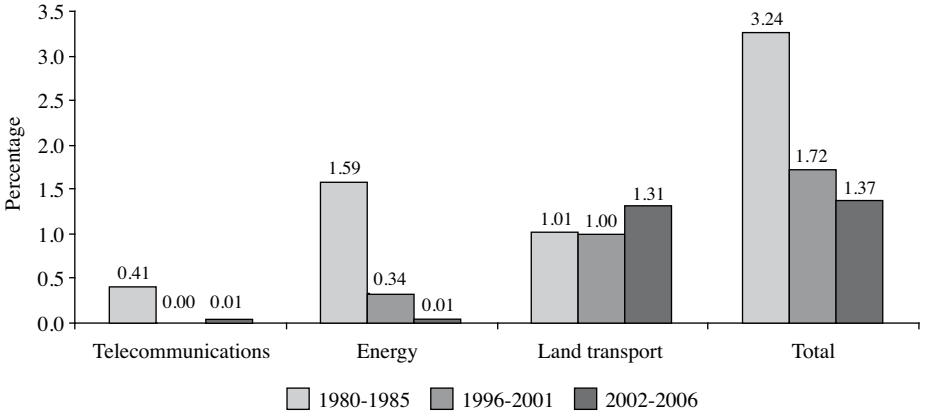
This suggests that public investment not only plays a fundamental role in the sector's development, but its decline to minimal levels could also cause serious investment deficit problems in the sector, owing to the shortcomings and difficulties faced by private enterprise in replacing public investment at the levels required by the growth process.

A sector breakdown of public investment in the two countries confirms this idea. The available data for Chile show that public investment in basic infrastructure was mainly channeled into the transport sector, and this occurred at the same level (1% of GDP) in all five-year periods being compared (see figure 5), thus helping to cushion the sharp drop in private investment between 2002 and 2006, as shown below. This means that the weakening of public investment in infrastructure occurred mainly in telecoms and energy, areas where the State privatized its main assets; and public investment was maintained in areas where the State continues to play a more active role, both in the strategic design of the sector and in the planning of works and their partial or total financing, which depends on the private participation mechanism implemented.

In the sample of economies reviewed, Chile strikes a clear contrast with the region's other countries, except for the Plurinational State of Bolivia, where public investment in land transport infrastructure slumped to almost negligible levels (see figure 6). This adversely affected both conservation and renewal of the existing road infrastructure (in some states of deterioration, the cost of repair may even be greater than building a new road), and also its expansion to meet the growth requirements of the economy as a whole (Bull, 2003). In the most recent period, the effort made by the Chilean government continued to differ significantly from that of other countries in the region, except for the Plurinational State of Bolivia, despite the fact that Argentina, Brazil and Peru significantly increased public investment in land

FIGURE 5

Chile: public investment in infrastructure areas as a percentage of GDP, periods 1980-1985, 1996-2001, 2002-2006

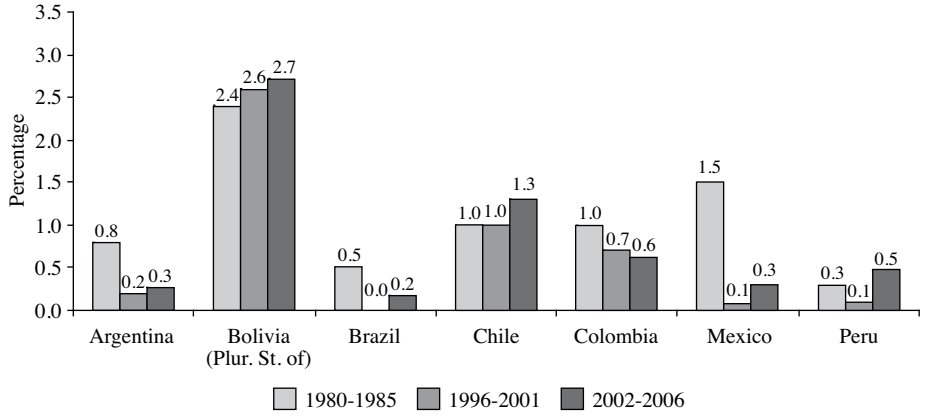


Source: For 1980-1985 and 1996-2001: César Calderón and Luis Servén, "Trends in infrastructure in Latin America, 1980-2001", *Working Paper*, No. 269, Santiago, Chile, Central Bank of Chile, September 2004. For 2002-2006: prepared by the author on the basis of figures from the World Bank and national statistics.

GDP: Gross domestic product.

FIGURE 6

Latin America (selected countries): public investment in land transport infrastructure as a percentage of GDP, periods 1980-1985, 1996-2001, 2002-2006



Source: For 1980-1985 and 1996-2001: César Calderón and Luis Servén, "Trends in infrastructure in Latin America, 1980-2001", *Working Paper*, No. 269, Santiago, Chile, Central Bank of Chile, September 2004. For 2002-2006: prepared by the author on the basis of figures from the World Bank and national statistics.

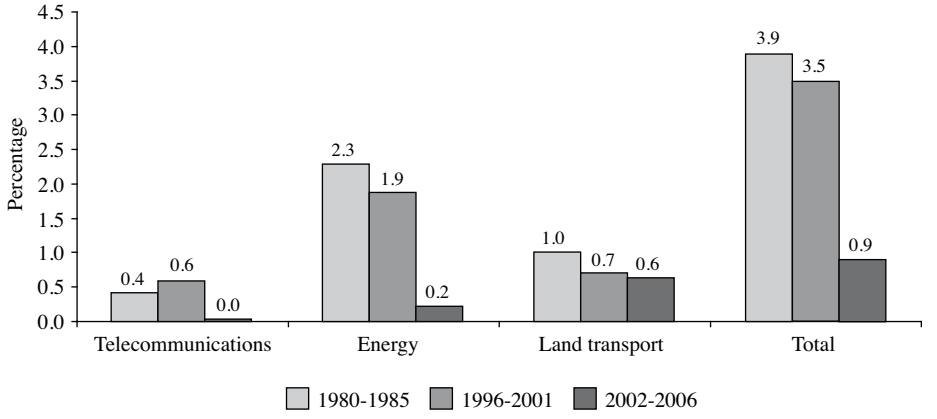
GDP: Gross domestic product.

transport infrastructure, but without reaching the average levels recorded in 1980-1985.

The specific features of Colombia illustrate the situation even more clearly. Unlike Chile, public investment in infrastructure in Colombia was not targeted on a given sector, although the energy area remained the leading recipient; in general it maintained slightly lower levels in the key areas, but actually grew significantly in telecoms (see figure 7). All of this meant that the reduction in public investment in

FIGURE 7

Colombia: public investment in infrastructure areas as a percentage of GDP, periods 1980-1985, 1996-2001, 2002-2006



Source: For 1980-1985 and 1996-2001: César Calderón and Luis Servén, "Trends in infrastructure in Latin America, 1980-2001", *Working Paper*, No. 269, Santiago, Chile, Central Bank of Chile, September 2004. For 2002-2006: prepared by the author on the basis of figures from the World Bank and national statistics.

GDP: Gross domestic product.

basic infrastructure generally differed from the other countries in the region, which, in conjunction with the opening up of the sector to private participation, resulted in an average infrastructure investment rate of 6%.

Nonetheless, in the most recent period (2002-2006), State investment in the sector shrank significantly, mainly owing to the decreased State involvement in the provision of energy and telecommunications services. Nonetheless the Colombian government maintained virtually the same level of investment in land transport, which made that sector the leading recipient of public funds.

In Colombia, this pattern of public investment contributed decisively to the fact that private investment added significantly to total investment in the sector, and was not just a partial substitute for a sluggish public investment. When the latter faltered in the ensuing five-year period, the average investment rate in the sector dropped sharply, in line with the pattern in the other countries in the region.

2. Trend of private investment

In general, the 1990s saw major flows of private investment in infrastructure, with particularly strong growth in this process in Latin America, which received half of all private investment in this activity in the developing world. The peak flow of private investment in infrastructure, along with privatizations, concessions and other public-private partnership (PPP) modalities, occurred in 1998, totalling almost US$ 67 billion. Despite its unprecedented scale in Latin American history, this was only equivalent to 3.87% of regional GDP and therefore did not succeed in offsetting the cutback in public investment, particularly in the region's larger economies.

In the 1999-2001 triennium, private investment in infrastructure dropped to almost half of the level recorded in 1998, as a consequence of the difficulties faced by some of the region's countries in the energy sector, and the impact of certain macroeconomic imbalances and the completion of the privatization process in the leading Latin American economies. Moreover, this decline intensified in 2002-2003 as a result of the crisis that erupted mainly in South America's Atlantic-coast countries, which seriously affected the behaviour of aggregate demand in those countries —particularly personal incomes and consumer spending as a result of wage compression and higher unemployment— and investment. The subsequent recovery, which began in 2004, only regained pre-2002-2003 crisis investment levels in 2007, and even this achievement may prove ephemeral in the international scenario prevailing since 2008.

Some analysts prefer to focus the topic from a different standpoint by claiming that the decrease in public investment in infrastructure that occurred

in the 1990s has been partly offset by greater private participation in the activity. Although true in itself, this line of analysis serves to minimize the drop in investment in the sector and overstate the importance of asset transfers (privatizations and takeovers) — an essential component of private investment that does not have direct repercussions on fixed capital formation (the stock of infrastructure capital).

It should be remembered, however, that privatization processes that began in the region's countries in the late 1980s gave the initial impulse to the introduction of private capital in the infrastructure sector. Roughly 55% of the value of privatizations undertaken in the 1990s entailed the sale of State assets in sectors that had traditionally been closed to private enterprise (Lora, 2001; Rozas, 2005). Moreover, concessions have been another mechanism for involving private enterprise in the financing, construction and management of infrastructure services, particularly since the mid-1990s. To some extent, these schemes replaced privatizations as a mechanism for attracting private capital, particularly from abroad, which the governments of some of the region's countries used to ease pressure on their respective balance of payments, once the physical assets available for sale had been used up.

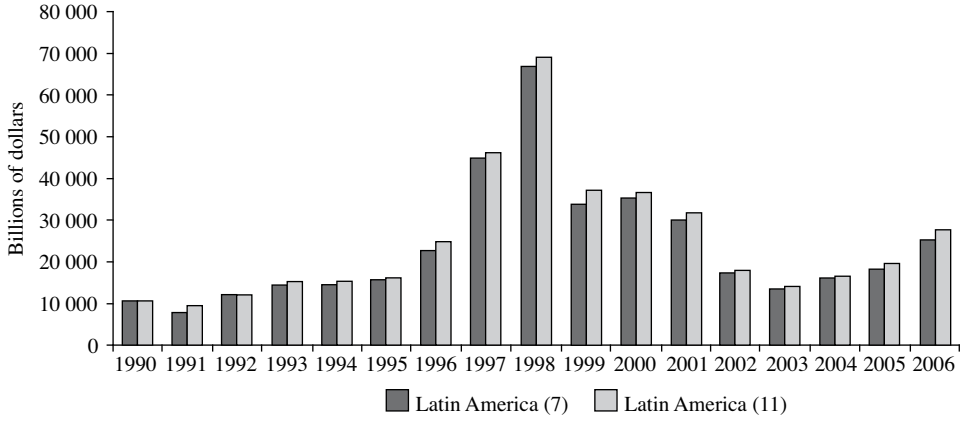
Driven by privatizations, particularly in Brazil, and takeover operations in the energy sector, private investment flows in infrastructure grew significantly between 1995 and 1998, from US$ 14 billion to US$ 67 billion The highest figures for aggregate investment in the sector were recorded in 1997 and 1998, mainly reflecting the sale of telecommunications and electric power firms in Brazil, the takeover of the Chilean energy group Enersis by Empresa Nacional de Electricidad, S.A. (ENDESA), and the development of highway concessions in several of the region's countries, including Argentina, Chile, Colombia and Mexico.

Private investment in infrastructure increased in nearly all the region's countries, which is unsurprising given that private ownership had been prohibited or restricted in most infrastructure areas until the reforms were implemented. According to World Bank figures, private investment mainly targeted the energy and telecom areas, sectors that absorbed 46.2% and 32%, respectively, of the total amount invested by private agents in the sector in 1990-2006. In the most recent period, from 2002 to 2006, the trend gathered strength, particularly the telecoms share, which accounted for 52.1% of private investment in the sector.

The figures presented in the study by Calderón and Servén (2004) downplay the importance of private investors in the region's total infrastructure investment. According to these authors, private investment in the sector grew from 0.61% of GDP (annual average for

FIGURE 8

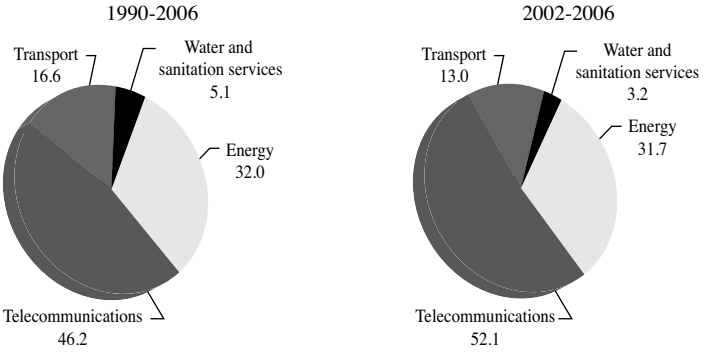
Latin America (selected countries): private investment in infrastructure, 1990-2006
(Billions of dollars)



Source: Prepared by the author on the basis of World Bank figures.
Note: Latin America (7) includes Argentina, Brazil, Chile, Colombia, Mexico, Peru and the Plurinational State of Bolivia; Latin America (11) adds the Bolivarian Republic of Venezuela, Ecuador, Paraguay and Uruguay.

FIGURE 9

Latin America:[a] distribution of private investment by infrastructure areas in the leading economies



Source: Prepared by the author on the basis of World Bank figures.

[a] Includes Argentina, Brazil, Chile, Colombia, Mexico, Peru and the Plurinational State of Bolivia.

1980-1985) to 1.41% of GDP (annual average for 1996-2001). Although this increase in private investment in infrastructure between the two five-year periods has been seen as reflecting the more active role of private enterprise in sector development (a 131% increase), it should not be forgotten that the increase amounted to just 0.8 percentage points of GDP —far less than the fall in average public investment between the two periods (-2.27 percentage points). Subsequent data confirm that its share in infrastructure financing was even smaller in the subsequent period (2002-2006), when private investment accounted for just 0.9% of GDP on average in the region's leading economies.

Private investment grew substantially in the telecoms area, but not in energy or land transport, where private participation has not varied much (see figure 10). In contrast, the relative weight of private investment in telecoms quadrupled, from 0.2% to 0.8% of GDP This increase largely reflects the Brazilian government's success in privatizing Telecomunicações Brasileiras, S.A. (TELEBRAS) —a milestone for the sale of State firms in Latin America— and in organizing the mobile phone industry, which triggered a major influx of foreign investment into the sector (Rozas, 2005).

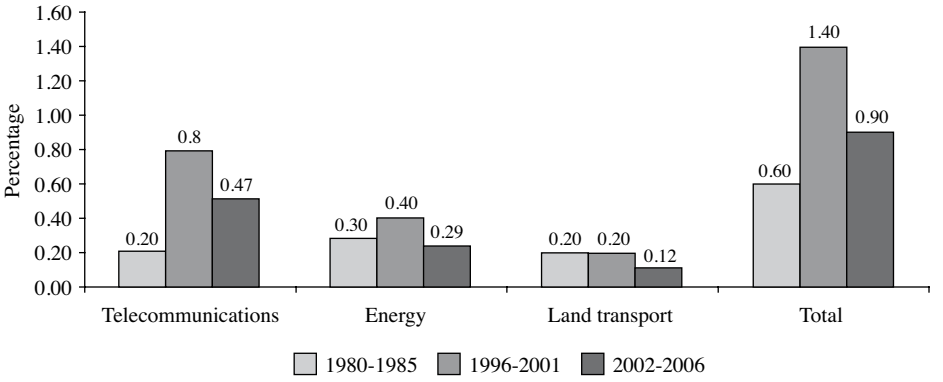
This increased relative weight of private participation in the telecoms sector also encouraged the other countries, particularly Argentina, Chile, Colombia, Mexico and Peru, to increase private investment in the sector, by privatizing the main phone operators. A study of this process (Rozas, 2005) found that the sale of telecom monopolies between 1986 and 2004 generated fiscal revenue of US$ 42 billion, mostly in the 1990s.

In the ensuing period, private investment in telecoms fell sharply from 0.77% to 0.47% of GDP, reflecting the completion of the privatization of public enterprises in the sector in most of the region's countries. Nonetheless, this activity remains the infrastructure area that has received most private investment, associated with the development of new businesses, together with the skills scenarios provided by the new technologies and progressive deterioration of economies of scale in basic telephony. This reduction occurred in all the countries of the sample analysed, particularly Chile, which has one of the region's highest telephony penetration rates, which suggests that investments in telecommunications have started to reach a ceiling as the corresponding markets steadily mature.

Certainly, it is worth discussing how acceptable it is to consider the investment of capital relating to transfers of ownership of privatized State firms, and which constitute a large part of what some analysts recognise as "private investment", even though such transactions did not have a direct effect on gross capital formation or increasing productive capacity. Strictly speaking, the resources generated by the sale of such firms were most often used to finance current government expenditure rather than increase the sector's infrastructure. It would thus be advisable for countries to differentiate between resources used by investors to buy shares or ownership rights, and those used to constitute, expand, or modernize productive capacity in the enterprise acquired. On that basis, Latin American countries would probably display very different statistics.

FIGURE 10

Latin America:[a] private investment in infrastructure as a percentage of GDP, periods 1980-1985, 1996-2001, 2002-2006



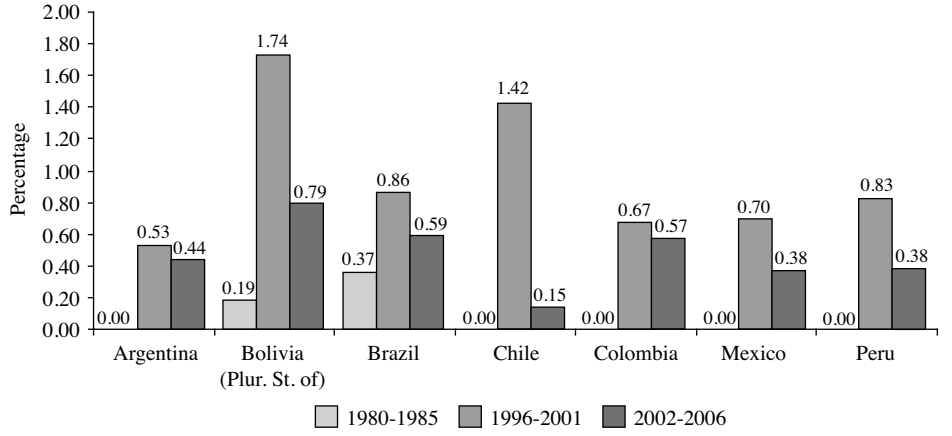
Source: For 1980-1985 and 1996-2001: César Calderón and Luis Servén, "Trends in infrastructure in Latin America, 1980-2001", *Working Paper*, No. 269, Santiago, Chile, Central Bank of Chile, September 2004. For 2002-2006: prepared by the author on the basis of figures from the World Bank and national statistics.

[a] Includes Argentina, Brazil, Chile, Colombia, Mexico, Peru and the Plurinational State of Bolivia.

GDP: Gross domestic product.

FIGURE 11

Latin America (selected countries): private investment in telecommunications infrastructure, as a percentage of GDP periods 1980-1985, 1996-2001, 2002-2006



Source: For 1980-1985 and 1996-2001: César Calderón and Luis Servén, "Trends in infrastructure in Latin America, 1980-2001", *Working Paper*, No. 269, Santiago, Chile, Central Bank of Chile, September 2004. For 2002-2006: prepared by the author on the basis of figures from the World Bank and national statistics.

GDP: Gross domestic product.

It is also worth asking what caused the quadrupling of the relative weight of private enterprise in the average investment made in the telecoms industry, aside from any spurious conclusions that might be obtained from the available figures, when the same did not happen in other infrastructure areas.

ECLAC has argued that the reasons for this difference can be found in the different amounts needed

to generate an annual unit of revenue (ECLAC, 2004). Using World Bank estimates, ECLAC has shown that telecommunications and energy enterprises, mainly electric power companies, are the infrastructure activities that need the least amount of capital to generate an annual unit of revenue (ECLAC, 2004). Thus, activities such as road building and conservation, and the construction of drinking water supply networks and other sanitation services, are less attractive for private investors, either because of the larger amount they need to invest to generate an annual unit of revenue, or because of the longer time needed to achieve a return on the investment.

This explanation is not applicable to the energy sector, however, where the relative weight of private investment grew only slightly, from 0.31% of GDP (annual average for the period 1980-1985) to 0.37% of GDP (annual average for 1996-2001) and to 0.29% of GDP (annual average for 2002-2006). The likely causes of this performance concern various problems relating to the regulatory framework and organization of international energy markets, as shown by a number of recent studies (Rozas, 2008a).

TABLE 1

Financing needed to generate an annual unit of revenue

	2002
Energy	3
Telecommunications	3 – 4
Transport	7
Water and sanitation	10-12

Source: Economic Commission for Latin America and the Caribbean (ECLAC), *Productive development in open economies* (LC/G.2234(SES.30/3)), Santiago, Chile, 2004 (2004 on the basis of World Bank estimates.

TABLE2

Latin America: Investment in infrastructure as a percentage of GDP
(Percentages)

Country	Period	Telecommunications			Energy			Land transport			Total infrastructure		
		Total	Public	Private	Total	Public	Private	Total	Public	Private	Total	Public	Private
Argentina	1980-1985	0.33	0.33	0.00	1.57	1.57	0.00	0.84	0.84	0.00	2.96	2.96	0.00
	1996-2001	0.53	0.00	0.53	0.40	0.03	0.36	0.32	0.15	0.17	1.45	0.22	1.24
	2002-2006	0.44	0.00	0.44	0.46	0.12	0.34	0.32	0.27	0.04	1.26	0.42	0.83
Brazil	1980-1985	0.69	0.32	0.37	3.32	2.53	0.79	0.84	0.47	0.37	5.17	3.64	1.53
	1996-2001	1.16	0.30	0.86	0.76	0.37	0.39	0.14	0.04	0.10	2.39	1.02	1.37
	2002-2006[a]	0.60	0.01	0.59	0.43	0.00	0.43	0.23	0.18	0.05	1.31	0.23	1.08
Chile	1980-1985	0.41	0.41	0.00	1.59	1.59	0.00	1.01	1.01	0.00	3.24	3.24	0.00
	1996-2001	1.42	0.00	1.42	1.78	0.34	1.44	1.96	1.00	0.96	5.58	1.72	3.86
	2002-2006	0.16	0.01	0.15	0.14	0.01	0.13	1.79	1.31	0.48	2.28	1.37	0.91
Colombia	1980-1985	0.36	0.36	0.00	2.32	2.32	0.00	0.99	0.99	0.00	3.85	3.85	0.00
	1996-2001	1.25	0.58	0.67	3.32	1.91	1.41	0.89	0.69	0.21	5.76	3.48	2.28
	2002-2006	0.60	0.02	0.57	0.28	0.21	0.07	0.84	0.63	0.20	1.88	0.92	0.96
Mexico	1980-1985	0.24	0.24	0.00	0.49	0.49	0.00	1.54	1.54	0.00	2.45	2.45	0.00
	1996-2001	0.73	0.03	0.70	0.11	0.11	0.00	0.34	0.08	0.27	1.24	0.27	0.98
	2002-2006	0.38	0.00	0.38	0.44	0.31	0.13	0.41	0.28	0.12	1.37	0.73	0.64
Peru	1980-1985	0.31	0.31	0.00	1.29	1.28	0.01	0.33	0.30	0.03	1.98	1.94	0.04
	1996-2001	1.07	0.24	0.83	0.94	0.32	0.63	0.25	0.12	0.13	2.28	0.68	1.60
	2002-2006	0.39	0.00	0.38	0.65	0.07	0.58	0.88	0.47	0.41	2.02	0.61	1.41
Bolivia (Plur. St. of))	1980-1985	0.89	0.70	0.19	1.90	1.75	0.14	2.81	2.40	0.41	5.79	5.04	0.76
	1996-2001	1.74	0.00	1.74	1.75	0.22	1.53	2.78	2.61	0.17	7.28	2.93	4.35
	2002-2006	0.80	0.00	0.79	1.66	0.17	1.49	2.71	2.71	0.00	5.50	3.21	2.29
Average	1980-1985	0.45	0.30	0.15	1.95	1.64	0.31	1.06	0.91	0.15	3.71	3.10	0.61
	1996-2001	0.94	0.17	0.77	0.71	0.31	0.37	0.36	0.16	0.20	2.24	0.83	1.41
	2002-2006	0.47	0.01	0.47	0.43	0.14	0.29	0.45	0.33	0.12	1.46	0.56	0.90

Source: For 1980-1985 and 1996-2001: César Calderón and Luis Servén, "Trends in infrastructure in Latin America, 1980-2001", *Working Paper*, No. 269, Santiago, Chile, Central Bank of Chile, September 2004. For 2002-2006: prepared by the author on the basis of World Bank data and national statistics.

[a] The level of public investment refers to the period 2004-2006.

GDP: Gross domestic product.

In short, the sharp increase in private investment in infrastructure was targeted on telecommunications —the only activity where it succeeded in replacing public investment and significantly boosting sector development and modernization. In the other activities, the increased relative weight of private enterprise in investment levels was of less significance, which, in a scenario characterized by fiscal austerity policies, resulted in a sharp contraction of infrastructure investment in several of the region's economies, particularly the larger ones.

Despite the shortcomings noted above, policies to promote private investment in the infrastructure industry did succeed in transforming the economic structure of the related services markets. According to Andrés, Foster and Guasch (2006), in the early part of 2000, 86% of telecoms customers, 60% of electricity customers and 11% of drinking water customers were served by private firms. This contrasts with the small proportion of customers served by private firms before 1990, estimated at under 3%.

3. Multilateral financing

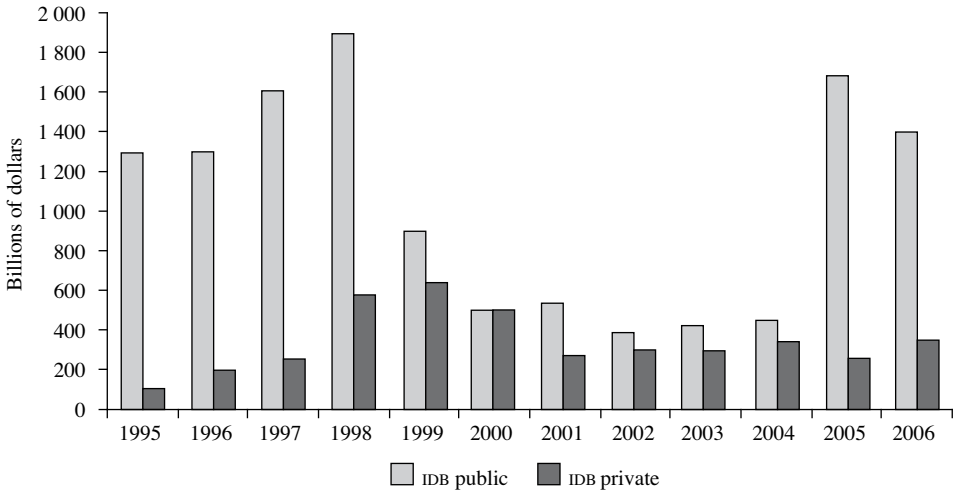
In the 1990s, multilateral lending agencies significantly cut back on their funding of infrastructure works in Latin America, while increasing loans to improve sector policies and strengthen government institutions. The reduction in loans to finance infrastructure works generally reflected a policy that prioritized objectives of assisting the sector authorities in each country of the region, to the detriment of the investor role played by the State in the sector. Consequently, the assistance provided focused on designing policies and instruments aimed at multiplying private investment flows in the sector.

This decision was based on a clear diagnostic error from two points of view: Firstly, insufficient importance was attached to creating and conserving infrastructure as a key factor for growth and development, given its effects on the productivity of economic agents and the competitiveness of enterprises, industries, and whole economies. Secondly, the role played by private agents in creating and conserving infrastructure once the main sector assets had been privatized or handed over in concession, was overstated.

In the particular case of the Inter-American Development Bank (IDB), the strategy of providing greater institutional assistance and less participation in multilateral financing intensified strongly in the late 1990s, as shown in the following figure; and the trend was reversed only in 2005. Before that year, lending to governments in the six-year period 1999-2004 declined to a very small fraction of the loans extended in 1997 and 1998. Moreover, credits granted to private firms also shrank in the same period.

FIGURE 12

Loans made by the Inter-American Development Bank (IDB) in Latin America, by type of recipient, 1995-2006
(Billions of dollars)



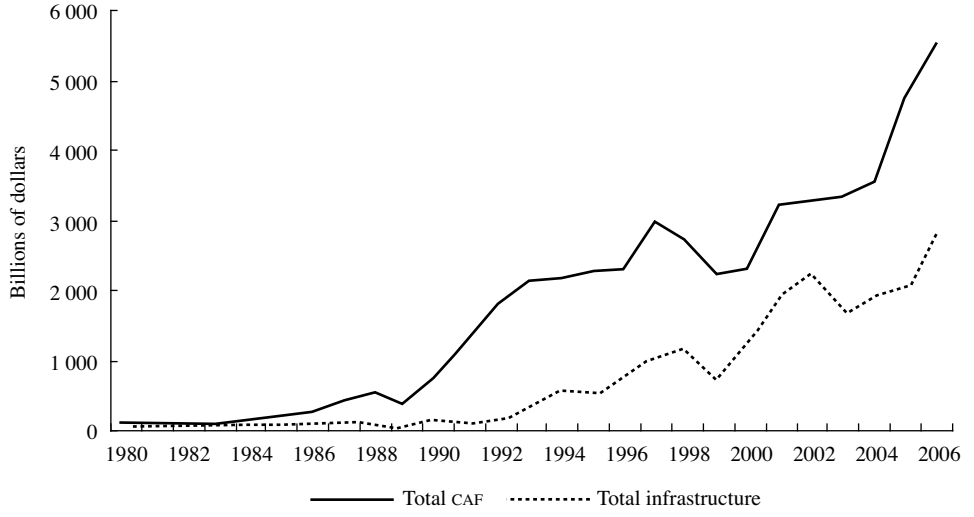
Source: Roberto Vellutini, *Financiamento a infraestructura e parceiras público-privadas no setor de energia*, Rio de Janeiro, 2007.

Nonetheless, the region's own multilateral lending agencies performed differently than the World Bank or IDB in this period, implementing a lending policy that was more aligned with the needs of shareholder countries. Such was the case, for example, of the Andean Development Corporation (CAF), which significantly increased its lending in Latin America as from 1990, from US$ 500 million in 1990 to US$ 5.5 billion in 2006 (see figure 13).

A large proportion of CAF lending to Latin America took the form of loans to finance infrastructure, a line of business that had begun to develop in 1990. In the five-year period 2002-2006, CAF loans for infrastructure had gained a clear pre-eminence with respect to other sectors, accounting for 52% of total loans approved. This is well above the equivalent amounts in earlier periods (47% in 1997-2001; 25% in 1992-1996), thereby revealing the growing importance of infrastructure in the areas of business that the CAF supports (Kogan, 2008). In 2006, the latest year for which information is available, CAF infrastructure loans amounted to just under US$ 3 billion, substantially more than lending by the IDB. Loans targeting the sector have generally followed a rising curve, except in 1999 and 2003, when some of the region's countries faced a variety of difficulties and consequently reduced their demand for credit to finance infrastructure projects. Nonetheless, it should be noted that lending is concentrated a small group of countries (the Bolivarian Republic of Venezuela, Colombia, Ecuador, Peru and the Plurinational State of Bolivia account for 78% of all loans approved), and is mainly targeted on one sector (transport: 68%).

FIGURE 13

Annual approval of loan applications by the Andean Development Corporation (CAF), 1980-2006
(Billions of dollars)



Source: J. Kogan, *Financiamiento de la infraestructura: principales desafíos de las alianzas público privadas y de la regulación de los mercados*, presentation made at the international seminar entitled "Infraestructura 2020: avances, déficits y desafíos" [Infrastructure 2020, progress, deficits and challenges] (ECLAC, Santiago, Chile, 10 November 2008), 2008.

III

Effects of the difficulties in infrastructure investment in Latin America

The decline of infrastructure investment —particularly in land transport infrastructure, and more intensively in some Latin American countries than in others— has had two types of effect that undermine both economic agents' productivity and the competitiveness of the region's industries and economies, while also impeding an improvement in people's quality of life:

(i) A growing deficit in the stock of infrastructure and in the provision of services, compared not only to developed countries, but also to other developing (or emerging) economies which in the early 1970s had lower levels of service provision than those of Latin America; and

(ii) The drop in investment in the various infrastructure areas, except for telecommunications, has had various effects on the quality of the services provided, which are also seen by users as inferior to those in other emerging economies.

1. Deficit with respect to other emerging economies

Despite progress achieved in the infrastructure sector in most of the region's countries over the last 25 years, there is a clear deficit with respect to developed countries and the fastest growing countries in Southeast Asia, in terms of the evolution of the stock and quality of infrastructure systems, and in the coverage of public services.

As table 3 shows, differences in the infrastructure capital stock between Latin America and Southeast Asia grew significantly between 1980 and 2005, widening the gap that already existed in favour of Asian countries in the electric power and telecommunications segments, and reversing the advantage that Latin American countries held over their Asian counterparts in land transport.

In the energy area, although Latin American countries increased their power generating capacity per capita by 57.7% between 1980 and 2000, and by 80.8% between 1980 and 2005, the countries of Southeast Asia grew theirs by 239% between 1980 and 2000, and by 300% between 1980 and 2005. This meant that the 38.5% gap that existed in 2005 widened to 197.6% in 2000 and to 206.4% in 2005 (see figure 14).

In other words, the countries of Southeast Asia easily outpaced their Latin American counterparts in 1980-2005 in terms of increasing their electric-power generating capacity, to the point where in 2005, their generating capacity was triple that of Latin American countries, compared to an advantage of just 36% in 1980.

TABLE 3

Latin America and South-east Asia:[b] infrastructure capital stock, selected years

	1980	1990	1995	2000	2005
Energy[c]					
Latin America (22)	0.26	0.36	0.38	0.41	0.47
Latin America (7)	0.27	0.34	0.36	0.40	0.47
South-east Asia	0.36	0.67	0.84	1.22	1.44
Telecommunications[d]					
Latin America (22)	39.4	61.7	97.0	271.5	618.0
Latin America (7)	41.2	64.3	100.8	287.1	647.7
Southeast Asia	108	324.5	476.2	1 232	1 464.1
Land transport[e]					
Latin America (22)	1.1	1.18	0.93	0.86	0.83
Latin America (7)	…	…	…	0.77	0.76
Southeast Asia	0.58	0.87	0.95	1.71	2.06

Source: Prepared by the author on the basis of data obtained from the Energy Information Administration of the Department of Energy of the United States; the International Telecommunications Union (ITU); the International Road Federation (IRF) and the Energy Information Administration, DOE; and the Economic Commission for Latin America and the Caribbean (ECLAC), *Desarrollo productivo en economías abiertas* (LC/G.2234(SES.30/3)), Santiago, Chile, June 2004.

[a] Latin America (22 includes Argentina, the Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, the Plurinational State of Bolivia, Suriname, Trinidad and Tobago, Uruguay and Latin America (7) includes Argentina, Brazil, Chile, Mexico, Peru and the Plurinational State of Bolivia.

[b] Southeast Asia includes the Republic of Korea, Hong Kong (Special Administrative Region of China), Singapore and Taiwan Province of China.

[c] Measured as generating capacity in kilowatt per capita.

[d] Measured as the number of fixed and cellular phones (since 1995) for every 1,000 inhabitants.

[e] Measured as kilometres of paved roads per capita.

The trend has been similar in the telecoms area, although with a number of significant differences owing to the tendency for the widening gap between the two groups of countries to be reversed.

By the early 1980s, Southeast Asian countries had already achieved sufficiently greater development than their Latin American counterparts in this activity, with a connectivity difference of 162.4% between the two groups of countries (see figure 14). At that time, Latin America had a telephone density of just 4.1 telephone line subscribers for every 100 inhabitants, while the equivalent figure in Southeast Asian countries was already of 10.1.

This gap widened significantly in the 1980s, as a result of the rapid development of this activity in Southeast Asian countries (200.5%), four times the expansion of telecommunications in Latin America during that period (56.6%), to establish a 405% gap between their development levels. Thus, whereas in Latin America, phone density increased to 6.2 subscribers per 100 inhabitants, in Southeast Asian countries, the equivalent figure grew to 32.4.

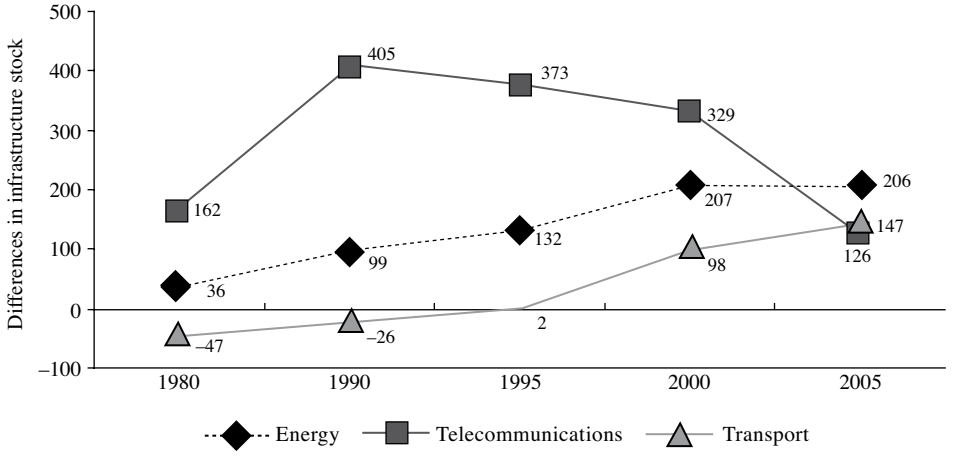
Since then, slowly to start with and later more quickly, the gap narrowed significantly in the first five years of the 2000 decade, to 126%, which was less than in 1980 (see figure 14). Nonetheless, despite this reduction, the countries of Southeast Asia still had more than double the number of phone line subscribers per 100 inhabitants recorded in Latin America in late 2005, and consequently displayed significantly higher connectivity in an area that is essential for modernizing each country's productive and commercial structures.

The facile explanation that tends to be offered for this significant reduction in the gap since 1990, and since 2000 in particular, highlights private participation and accords a primary role to privatization of the sector in many of the region's countries. Clearly, that process has been important in countries such as Argentina, Brazil and Chile; but in others, such as the Bolivarian Republic of Venezuela and Panama, privatization has not had the desired effect. In contrast, some countries that maintained the original structure of their phone industry have also achieved rapid rates of expansion of their telephone connectivity, such as Costa Rica and Uruguay, although others countries that also chose to maintain the State monopoly have seen a significant retreat (Rozas, 2005; 2008a).

The backdrop to the narrowing of the gap would seem to stem from two groups of factors: the first linked to the far-reaching productive restructuring experienced by the telecoms industry in the last decade; and the second related to the forms of market organization that were made possible following the productive restructuring of the activity. Introduction of fibre optics, particularly broadband, not only lowered the cost of voice transmission to levels unimaginable in the previous period; but it also made it possible to transmit images and data, resulting in a diversification of the traditional telephony business, which rapidly

FIGURE 14

Infrastructure gaps between Latin America and Southeast Asia by activity, 1980-2005
(Percentages)



Source: Prepared by the author on the basis of the data shown in table 3.

extended to pay TV and Internet service provision, generating significant economies of scope and new revenue sources for fixed telephony operators.

It also caused a mass expansion of mobile telephony through the introduction of the calling-party-pays and prepayment systems as modalities for collecting revenue and expanding the business. The main effects of these developments were the rapid erosion of economies of scale and the appearance of market niches in which it was possible for several players to participate simultaneously under competitive conditions, sometimes very fierce, which led to progressive increases in investment levels aimed at penetrating market and/or defending positions and developing new products. All of this led to an expansion and diversification of the supply of telecom services to levels that make its development self-sustaining, irrespective of the public or private origin of the capital of the operating firms.

Unlike what happened in the telecoms industry, the available information shows that the development of transport infrastructure in Latin America — probably the area that felt the reduction of investment between 1980 and 2001 most severely — lags far behind that of other emerging economies. In 1980, the number of kilometres of paved roads per inhabitant in Latin America (1.10) was almost double the equivalent figure in the Southeast Asian economies (0.58); by 2000, however, the situation had reversed in favour of the Asian economies, which now had over 50% more kilometres paved per inhabitant than the Latin American economies. Worse still: in Latin America, the number of kilometres of paved roads per inhabitant decreased in absolute terms, from 1.10 in 1980 to 0.86 in 2000. This largely shows that Latin American countries not only failed to create new infrastructure, but also were unable to adequately conserve existing infrastructure during the period under analysis. This trend may even have accentuated in the first five years of the 2000 decade, owing to the fiscal difficulties affecting several of the region's countries.

2. Lower-quality infrastructure

One of the consequences of inadequate infrastructure investment in the region's countries over the last two or three decades concerns the quality of the services provided, which are below the international standards prevailing not only in developed countries but also in other emerging economies. While there are clearly no objective indicators for this variable —a complex problem in itself that contains many dimensions in each of the basic infrastructure areas —it is possible to gain a rough idea from the country ranking prepared by the World Economic Forum, based on a global index of the quality of infrastructure services.

According to this ranking, the countries of Southeast Asia, including recently industrialized economies, are generally considered to have better-quality indices than Latin American countries. The former group are ranked between positions 3 and 28, with scores of between 6.6 and 5.1 points. In contrast, no Latin American country is among the 28 highest ranked countries, and their scores vary between 1.9 and 5, which puts them in places 30 to 129 (see table 4).

The best rated Latin American country is Chile (in 30th place), whose infrastructure services received five points, immediately behind Thailand, the lowest rated recently industrialized Asian economy. Much further behind come Uruguay and Argentina (61st and 80th, respectively) with ratings of 3.7 and 3.1 points.

This is a particularly worrying situation for Latin American countries: the quality of infrastructure services is not only seen as inferior to that of Asian countries, but also it is rated worse in absolute terms, except in Chile.

TABLE 4

Index of the quality of infrastructure in Asian and Latin American economies, 2007

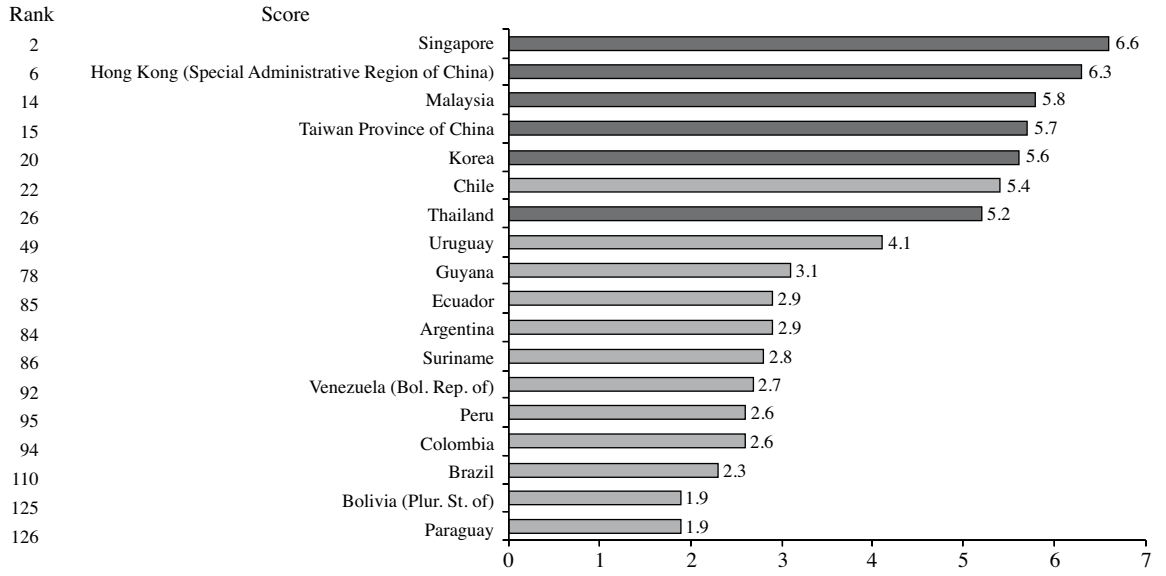
Country	Rating	Average score
Singapore	3	60.6
Hong Kong (Special Administrative Region of China)	8	60.2
Malaysia	18	50.7
Republic of Korea	19	50.6
Taiwan Province of China	22	5.4
Thailand	28	5.1
Chile	30	5.0
Uruguay	61	3.7
Argentina	80	3.1
Colombia	89	2.8
Suriname	91	2.8
Ecuador	92	2.8
Brazil	97	2.7
Guyana	100	2.7
Peru	104	2.5
Venezuela (Bol. Rep. of)	105	2.5
Bolivia (Plur. St. of)	123	2.1
Paraguay	129	1.9

Source: M. Porter, Klaus Schwab and X. Sala-i-Martin, *The Global Competitiveness Report 2007-2008*, Nueva York, Palgrave Macmillan, 2007.

FIGURE 15

Quality of highway infrastructure

(7= better and 1= worse)

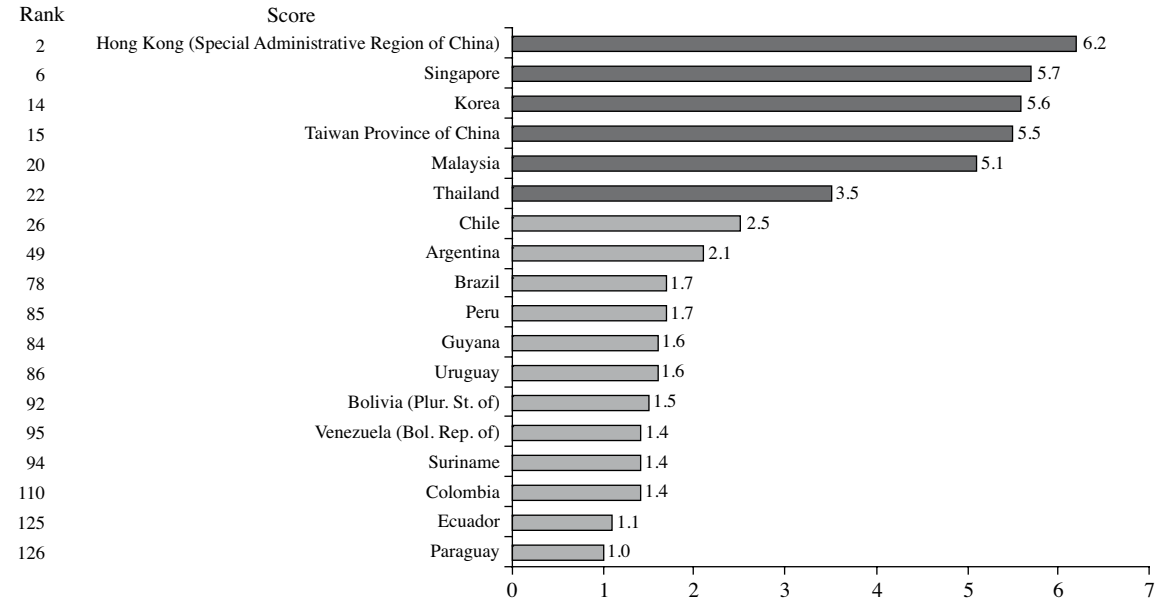


Source: M. Porter, Klaus Schwab and X. Sala-i-Martin, *The Global Competitiveness Report 2007-2008*, Nueva York, Palgrave Macmillan, 2007.

FIGURE 16

Quality of raiway infrastructure

(7= better and 1= worse)

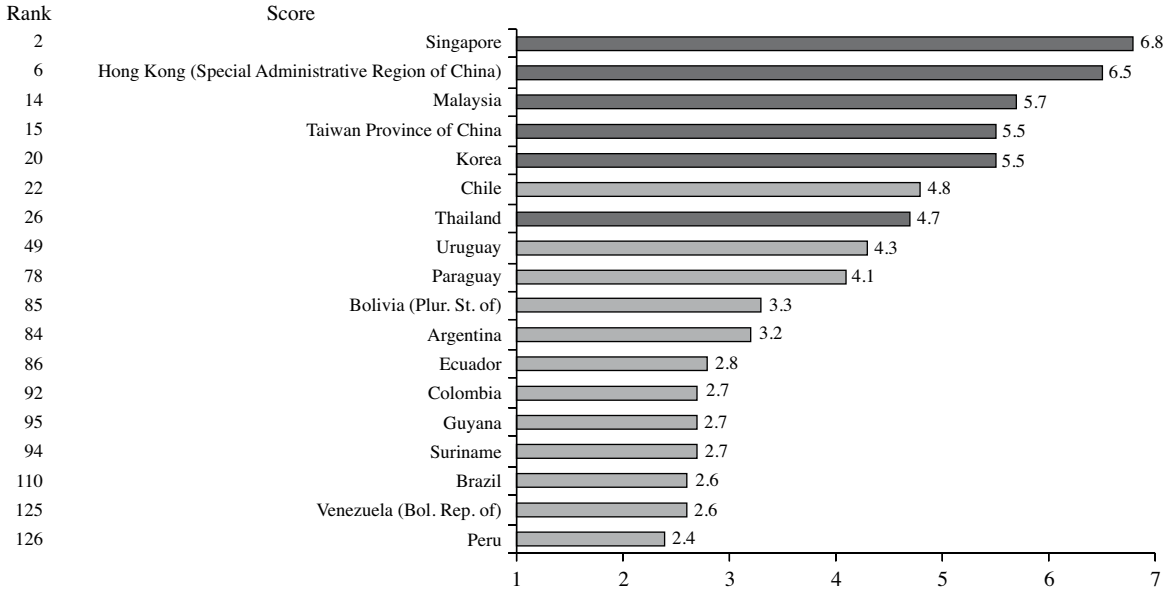


Source: M. Porter, Klaus Schwab and X. Sala-i-Martin, *The Global Competitiveness Report 2007-2008*, Nueva York, Palgrave Macmillan, 2007.

FIGURE 17

Quality of port infrastructure

(7= better and 1= worse)

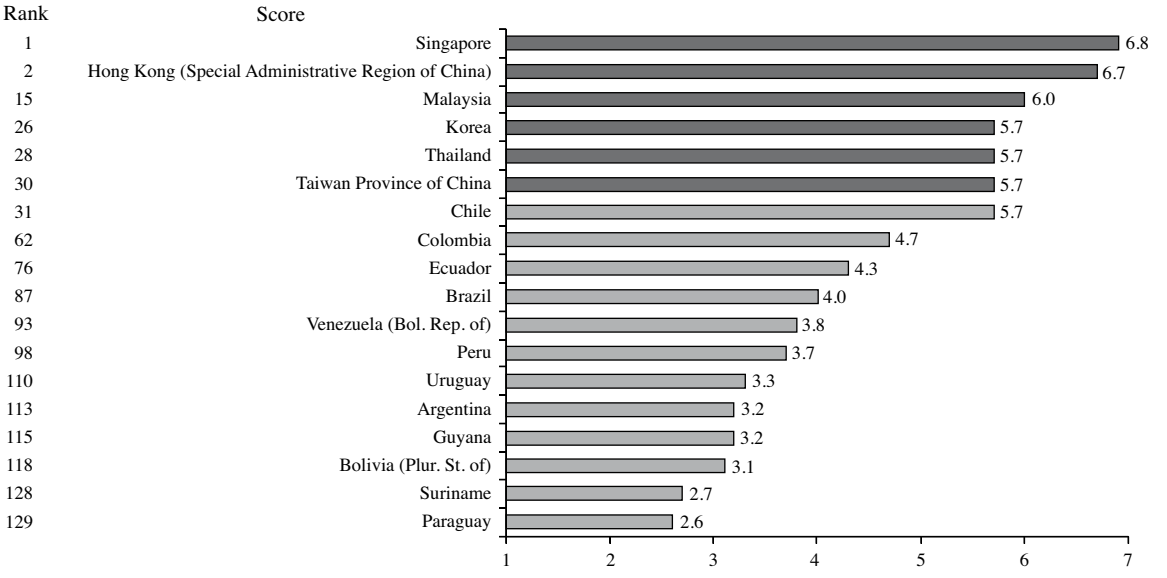


Source: M. Porter, Klaus Schwab and X. Sala-i-Martin, *The Global Competitiveness Report 2007-2008*, Nueva York, Palgrave Macmillan, 2007.

FIGURE 18

Quality of air transport infrastructure

(7= better and 1= worse)

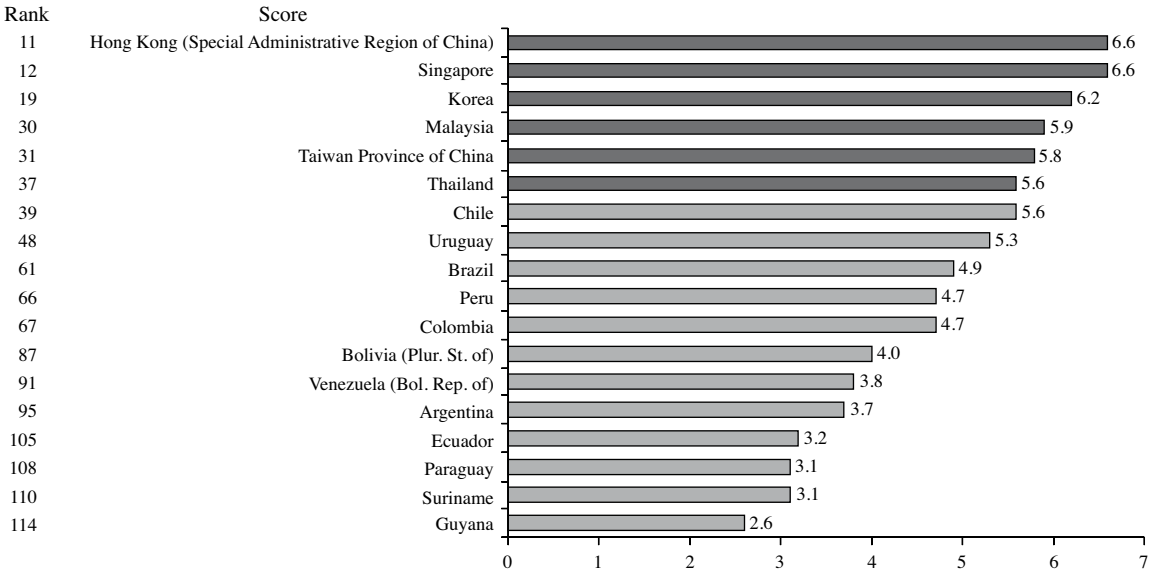


Source: M. Porter, Klaus Schwab and X. Sala-i-Martin, *The Global Competitiveness Report 2007-2008*, Nueva York, Palgrave Macmillan, 2007.

FIGURE 19

Quality of telephony infrastructure

(7= better and 1= worse)

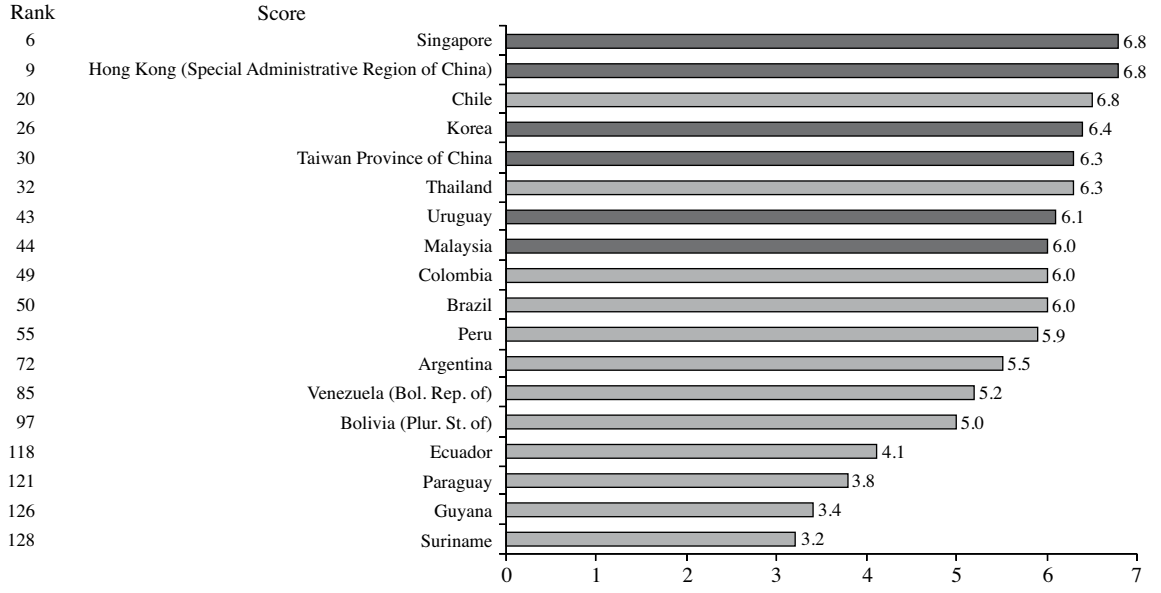


Source: M. Porter, Klaus Schwab and X. Sala-i-Martin, *The Global Competitiveness Report 2007-2008*, Nueva York, Palgrave Macmillan, 2007.

FIGURE 20

Quality of electric power supply

(7= better and 1= worse)



Source: M. Porter, Klaus Schwab and X. Sala-i-Martin, *The Global Competitiveness Report 2007-2008*, Nueva York, Palgrave Macmillan, 2007.

The data on specific infrastructure services display a broadly similar trend. As shown in the figures presented on the previous page, road, railway, port, air transport and telecommunications infrastructure in the newly industrialized countries of Southeast Asia display better quality indices than Latin American countries. Chile is the only Latin American country to have obtained better ratings than some Southeast Asian countries in the provision of road and port infrastructure services (better than Thailand). Chile also surpasses the Republic of Korea, Malaysia, Thailand and Taiwan Province of China in terms of the quality of its electricity services, while Uruguay is also better than Malaysia and Thailand in this area.

The figures on the previous page also show that the largest deficit in Latin American countries occurs in railway, port and highway infrastructure, and not in electric power, since eight of the region's countries (Argentina, the Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Peru, the Plurinational State of Bolivia and Uruguay) obtained scores above five points. Particularly worrying is the perception of railway infrastructure quality, where the best rated Latin American country is Chile, with just 2.5 points. The port infrastructure situation should also be a cause for concern, since no Latin American country obtained a score of over five points. Moreover, Chile was the only country to obtain a rating above this level in road infrastructure. The countries of the Latin American region are clearly lagging in the provision of services in all infrastructure areas, except for the electric power industry, where the gap is substantially smaller. This situation also extends to telecoms, the only sector for which investment rates have risen, as discussed above.

IV

How can the infrastructure gap be closed?

Latin America is facing the urgent challenge of narrowing the gap that currently exists between it and the fastest growing economies of Southeast Asia in terms of the availability and quality of infrastructure services, to avoid being overtaken by the growth dynamic of other Asian emerging economies. These already have competitive advantages, which could impair Latin America's possibilities to participate in the new international economic order.

The specialized literature and experts both agree that Latin America needs to increase its annual investment in infrastructure. Fay and Morrison (2005) estimate that if the region's countries invest 0.25% of GDP each year, they could achieve universal coverage in a reasonable period of time, both in electricity and in water and sanitation, which already have a high level of coverage, but not including wastewater treatment where there is a considerable backlog.

The same authors also point out that adequate maintenance of existing assets in the drinking water, sanitation, electric power, highways, railroads and telecom areas would require the equivalent of 1% of regional GDP. Lastly, Fay and Morrison estimate that 1.3% of GDP would be needed to undertake new investments to satisfactorily meet the greater demand that is likely to arise from conservative projections of economic growth.

The Latin American region clearly needs to invest around 2.5% of GDP in infrastructure to respond to international demand growth, but a slightly higher proportion of GDP (between 4% and 6%) to reach the current standards of the fastest-growing economies of Southeast Asia.

Sector specialists have pointed out in various forums that Latin American countries need to set an annual infrastructure expenditure target of 7% of GDP, to ensure adequate maintenance of the existing stock and reduce the gap with respect to developed countries and the most dynamic emerging economies of Southeast Asia. According to the World Bank, setting a target infrastructure investment equivalent to 7% of GDP would not be unrealistic, since that was the level achieved by countries such as China, Indonesia, the Republic of Korea and Malaysia between 1970 and 1990, which today have high infrastructure-development levels. Even countries such as China have invested the equivalent of 9% of GDP in infrastructure in recent years.

Nonetheless, a target of this type should not be set equally for all Latin American countries, given

their structural heterogeneity and the different rates of investment in infrastructure they have maintained over the last few years. Clearly, the repercussions on other key economic management variables will be different in a country that raises its infrastructure investment rate from 6% to 7% of GDP, compared to another that raises it from 2.1% to 7%.

Nonetheless, time is of the essence. Since 2003, Latin America has significantly expanded its productive capacity, as reflected in GDP growth rates that are twice the average rate achieved between 1980 and 2002 (2.2%). This means that the demand for infrastructure services has also grown rapidly, outpacing its supply; and demand will continue to grow as the economic upswing as a whole spreads. Given the behaviour of investment in this sector, it is highly likely that significant mismatches will occur between supply and demand for these services, thereby impairing the development possibilities of other productive activities.

Latin America cannot ignore the fact that the expansion of productive capacity has been fuelled mainly by external factors linked to the globalization of the world economy, which is reflected in growing demand for tradable goods, greater liquidity on international financial markets and significant changes in international trade patterns and the terms of trade. The latter have enabled Latin American countries to diversify their trade flows, increase their number of trade partners, expand exports and obtain better prices for their products.

Consequently, the possibility of Latin American countries' maintaining this expansion and growth cycle, and preserving their participation on international markets, depends, among other factors, on a substantial improvement in their basic infrastructure, in terms of both the coverage of and access to the services provided and their quality and prices.

The challenge of overcoming the historical deficit in infrastructure development and narrowing the gaps that separate Latin American from developed countries and the fastest growing countries in Southeast Asia means not only increasing public investment in the sector, but also making a major effort to attract new private investment, which above all should aim to increase the sector's capital stock, rather than merely transfer asset ownership. For that, it is essential to expand and diversify public-private partnership schemes, and to obtain more decisive support for infrastructure development in the region from multilateral lending agencies. These organizations should self-critically review the policies promoted in the last decade and wholeheartedly support infrastructure creation in the region's countries.

The figures mentioned in the foregoing pages highlight the scale of the task facing Latin American countries. First and foremost, governments must accept that the rate of infrastructure investment currently prevailing in the region is clearly insufficient, and that in the best of cases it will only make it possible to conserve existing facilities.

The region's governments must also accept that private investment, generally, has not succeeded in replacing public investment, and has failed to serve as the basis for financial sustenance of the sector's development —except in the telecoms industry in some Latin American countries, thanks to competition and industrial organization policies that were implemented in conjunction with the privatization of the State enterprises that previously dominated the market.

In fact, the figures compiled show that countries with the largest deficit in terms of infrastructure investment compared to international standards are those that most faithfully applied the recommendations of the "Washington Consensus" and which, consequently, cut public investment in the sector most drastically. In contrast, countries that succeeded in raising their infrastructure investment rates are those that maintained high levels of public investment and simultaneously opened up areas for private investment, choosing a heterodox path in relation to those recommendations.

Compared to other expansionary phases in the Latin American economy, the countries of the region are now ideally placed to increase public investment in infrastructure and promote dynamic growth in the sector, given their sound public finances and the balanced state of the main macroeconomic accounts. Latin American economies today generally have higher levels of saving and investment than in the past; moreover, their public finances are healthier, and they have large current account surpluses, while external vulnerability has decreased considerably. This once again places the governments of the region's countries at the centre of the challenges to be faced to improve infrastructure services.

(Original: Spanish)

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KEYWORDS

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Reforming the pension reforms:

Argentina and Chile

Rafael Rofman, Eduardo Fajnzylber and Germán Herrera

This article describes the most recent pension reforms in Argentina and Chile. The previous reforms, implemented in the 1980s and 1990s, aimed to improve long-term fiscal sustainability and institutional design of the systems, shifting part of the social and economic risks away from the State and on to participants. In recent years, the authorities in both countries identified the main problems facing current pension systems as inadequate coverage for older adults and the low level of benefits. The two countries have responded differently, however, owing to institutional and political divergences. In Chile, a lengthy participatory process resulted in a wide-ranging reform targeting medium-term effects through carefully calibrated adjustments. In contrast, the reforms in Argentina were made through a succession of corrections, with little public discussion of their implications or effects on coverage and fiscal needs.

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I
Introduction

Having pioneered pension reform in Latin America in the 1980s and 1990s, Argentina and Chile have recently undertaken a new round of revisions and adjustments to their retirement systems. This article describes key elements of the recent reforms, explains why and how they were implemented and discusses their potential effects and remaining challenges.

Chile was the first country in the region to make structural reforms to its retirement pension system in the early 1980s, based on a funded mechanism under private management. Wage-earners were required to participate in the system, while self-employed workers could join on a voluntary basis. In Argentina, the 1993 reform introduced a similar funded scheme, but without completely eliminating the defined-benefits/pay-as-you-go component. The Argentine reform was viewed at the time as more advanced than its Chilean counterpart; both the design process and political debate, as well as various technical aspects of the new system were considered sounder and more sustainable.[1]

While sharing certain design features, the Argentine and Chilean pension systems also suffered from a number of problems in common, such as low coverage rates, a structure of excessively high administrative costs, major uncertainty for participants and problems of equity. Some of these problems stemmed from macroeconomic and labour-market trends, whereas others were inherent in the system design itself.

Although many reports have been produced on the problems identified over the last 15 years —and several specific actions and small-scale reforms have been implemented— more fundamental reforms were postponed largely because of macroeconomic and political constraints. The more robust fiscal position prevailing in recent years, however, together with a political climate that was more amenable to reconsidering the role of the State, created conditions for proceeding with a new wave of reforms.

Although the reforms in Argentina and Chile over the last few years have a similar origin, the policy measures and processes sustaining them have been different, apparently reflecting institutional and political disparities between the two countries. Chile promoted public debate with widespread participation, to forge a broader consensus. In contrast, Argentina took a different course, in which the political process was limited, closed to debate and implemented through decrees or laws that were fast-tracked through the National Congress, thereby curtailing discussion on the aims, contents and effects of the proposed reforms.

This article has five sections. Sections II and III outline the workings of the Argentine and Chilean retirement pension schemes up to the middle of the current decade, and then go on to describe and analyse the recent reforms, their potential repercussions and outstanding challenges. Section IV discusses the implications of the political and institutional processes, analysing how and why the distinctive features of policy-making in the two countries have affected aspects of their recent retirement-pension policy. Lastly, section V puts forward a number of conclusions.

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[1] For example, Arenas de Mesa and Bertranou (1997) claim that the Argentine model displayed: (a) greater inter- and intra-generational solidarity; (b) relatively lower transition costs payable by the State; (c) higher coverage of self-employed workers; (d) a better defined regulatory framework; and (e) fewer gender inequities.

II
The reforms in Argentina

1. The Argentine retirement pension scenario up to 2005

The Argentine pension system is one of the oldest in the world, with origins dating back to the early years of the twentieth century. Following the creation of a number of occupational pension schemes, the system grew steadily until a major boost given by the Peronist government in the late 1940s triggered a rapid expansion of coverage. A few years later, practically all workers in Argentina (including wage-earners and the self-employed) were covered by a number of relatively generous partial capitalization schemes.

In the late 1960s a major reform integrated the various schemes into one, and the national government was given authority to run it. The new unified scheme was a pay-as-you-go mechanism with common parameters. Nonetheless, since the 1970s, the system has faced growing financial problems, and by the late 1980s further reform was clearly needed. Serious doubts regarding the fiscal sustainability of the system and debates on the role of the State in society resulted in a structural reform being introduced in 1993.

This section discusses the situation of the system up to the middle of the current decade, considering both design and operational aspects.

2. A brief overview of the system

Following the 1993 reform, the Argentine retirement pension system became a multi-pillar scheme featuring capitalization and pay-as-you-go components, public and private involvement in its management mechanisms, and a combination of the defined-benefits and defined-contribution models for calculating the pensions actually paid to retirees.

In no way can it be claimed that the changes introduced at that time constituted a "definitive" reform. Since the original law was passed in October 1993, some 850 new regulations on the retirement pension system have been approved, including 34 laws and 135 decrees. Although many of these were adopted to complement the original system design, the tendency was clearly to make short-term corrections and amendments.

The design of the Argentine retirement pension system in 1993 consisted of two basic pillars and a transition scheme.[2] In the second pillar, workers could choose between a fund capitalization scheme with individual accounts managed by private commercial companies, and a smaller pay-as-you-go scheme run by the State. The most important parametric reforms included a higher retirement age and a longer contribution history needed to receive a pension. The reforms also abolished special regimes which, for various reasons, set differential retirement conditions for certain occupations; and they promoted the integration of provincial schemes into the national framework. Lastly a complementary non-contributory system provided a basic income for older adults living in poverty.

3. Recent trends

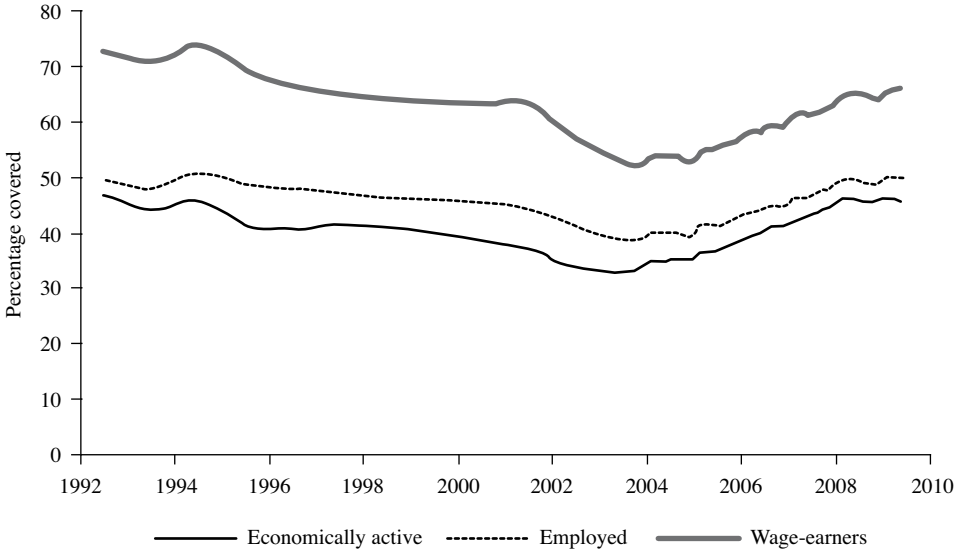
Following the 1993 reform, the Argentine pension system evolved closely in line with the macroeconomic trends prevailing in the country. The steady deterioration of labour-market conditions in the 1990s meant that fewer workers contributed to the system; the number of beneficiaries also shrank (although the older adult population was expanding rapidly); and the value of pension benefits remained broadly fixed. Pension assets collapsed in real terms in the 2001-2002 crisis, but have since been staging a recovery. The fiscal scenario was reflected in the trend of retirement pension benefits, because the average pension asset is the key determinant of the financial balance of the public system. Lastly, the financial situation of the capitalization scheme behaved extremely erratical, as a result of the economic and financial crisis in the first few years of the new century and various regulatory adjustments.

Argentina has maintained one of the region's highest levels of pension coverage throughout its history. Nonetheless, since the 1980s, as unemployment and informality began to spread, pension coverage started to retreat. Figure 1 shows that the proportion

[2] For a detailed discussion of its characteristics, see Rofman (2003).

FIGURE 1

Coverage of the economically active, employed, and wage-earning populations, 1992-2009
(Percentages)



Source: Rafael Rofman, Leonardo Lucchetti and Guzmán Ourens, "Pension systems in Latin America: concepts and measurements of coverage", *SP Discussion Paper*, No. 0616, Washington, D.C., World Bank, 2009; National Institute of Statistics and Censuses (INDEC), *Continuous Permanent Household Survey. First semester 2009*, Buenos Aires, 2009.

of employed workers covered by the system dropped from 50% in the early 1990s to under 40% by 2003.[3] Once the worst of the crisis had passed, coverage started to grow again, and by 2006 it was approaching late-1990s levels. Nonetheless, these coverage trends did not affect the various social groups equally. While the general deterioration in coverage in the 1990s did not affect the higher-income segment even at the height the crisis, it was catastrophic for the lowest income quintile, which suffered a drastic 40 percentage-point fall in coverage levels between 1992 and 2003. Since then it has regained just five percentage points.

While the coverage of active workers declined sharply in the 1990s, the impact on the coverage of older adults was slower. The relatively low contribution density of many workers (a study using 2002 data shows that most active workers in Argentina had fragmented and incomplete contribution histories, implying potential exclusion from future pension benefits), together with regulatory changes introduced in the 1990s, were the main determinants of this (Farall and others, 2003). A lengthening of the required contributions period to 30 years, in a clearly weakening labour market, affected many workers who were close to retirement. Consequently, the number of retirees under the national system fell from 2.1 million in late 1992 to 1.6 million in 2005.

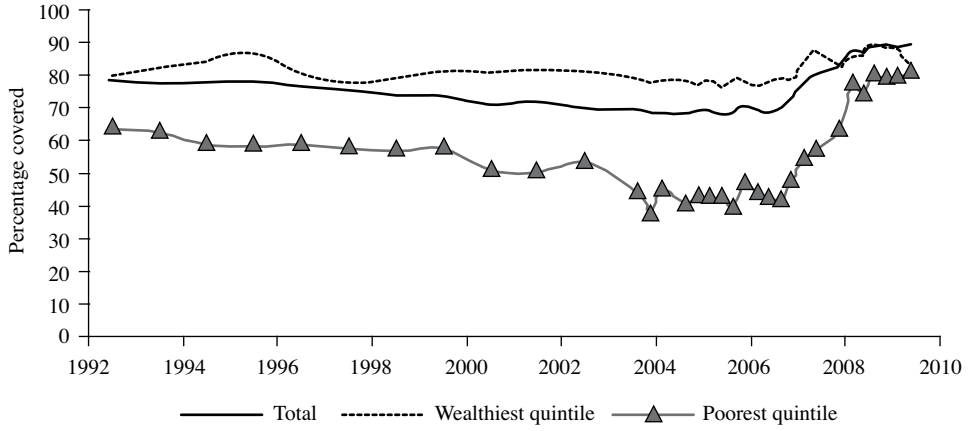
In Argentina, for every 100 individuals over 65 years of age, roughly 80 were receiving a pension in 1992; but this proportion declined slowly to reach 68% by 2003. Moreover, the reduction was not distributed evenly across income levels, but affected the poorest groups much more acutely. While older adults in the wealthiest sectors of the population did not suffer any significant change, the coverage of the poorest quintile fell from 63% in 1992 to a low of 38% in 2003 (see figure 2).

As figure 3 shows, the trend of pension fund assets was more stable in the 1990s. The average asset level rose slowly, but the minimum pension remained unchanged. After a sharp decline in the real value of pension benefits caused by the inflationary shock of 2002, the Government pursued an aggressive policy to raise the minimum pension. In 2003 this had already recovered its previous average values in real terms, and by the end of 2006 it was 65% above its level of five years earlier. In contrast, other assets

[3] Information on the coverage of pension fund assets in Argentina does not include the share pertaining to self-employed workers, so the coverage rates quoted for economically active and employed persons understate the true figures.

FIGURE 2

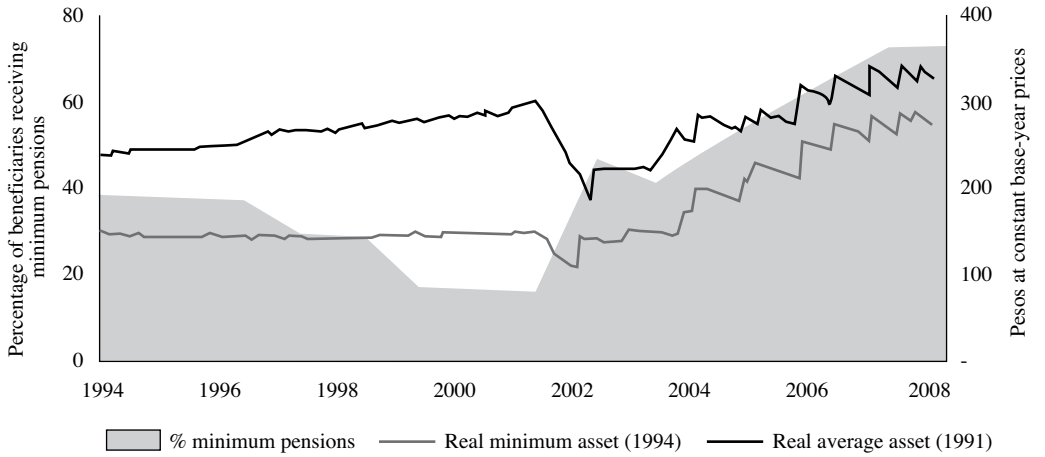
Coverage of the older adult population: total and by income quintile, 1992-2009



Source: Rafael Rofman, Leonardo Lucchetti and Guzmán Ourens, "Pension systems in Latin America: concepts and measurements of coverage", *SP Discussion Paper*, No. 0616, Washington, D.C., World Bank, 2009; National Institute of Statistics and Censuses (INDEC), *Continuous Permanent Household Survey. First semester 2009*, Buenos Aires, 2009.

FIGURE 3

Average and minimum benefits, and percentage of beneficiaries receiving minimum benefits, 1994-2008



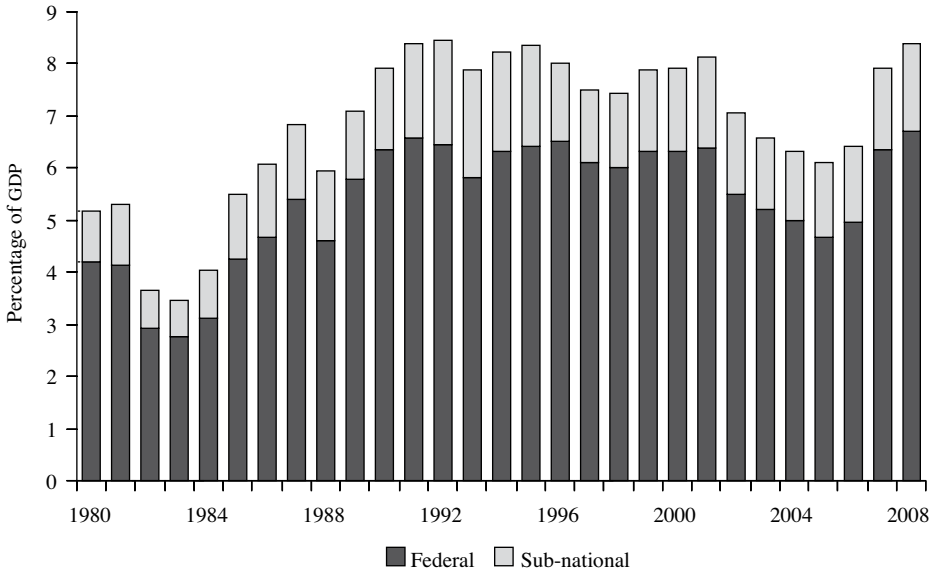
Source: Juan Martin Moreno, "Se acuerda, abuelo, cuando las jubilaciones en Argentina eran Bismarckianas?", paper presented at the IXth Argentine Seminar on Population Studies, 2007; Administración Nacional de la Seguridad Social (ANSES), *Social Security report. Fourth-quarter 2009*, Buenos Aires, 2009.

were only adjusted slightly, such that in late 2006 the value of the minimum asset was 83% of the average. Consequently, about 75% of system beneficiaries receive the minimum pension.

Figure 4 shows the trend of pension expenditure since the 1980s. The very sharp increase between the mid-1980s and early 1990s reflects government efforts to promote reform at that time. Once the new system was approved, total expenditure stopped growing and then dropped sharply in the wake of the 2001-2002 crisis and the freezing of assets until 2005. Since then, pension fund assets have recovered and coverage has expanded, and by 2008 expenditure was at levels close to the highs of the early 1990s.

FIGURE 4

Pension expenditure as a percentage of GDP, by jurisdiction 1980-2008



Source: Ministry of Economy and Public Finance (MECON), "Series de gasto público consolidado", Buenos Aires, 2009.

GDP: Gross domestic product.

4. Recent reforms and their potential impacts

Taken as a whole, the pension reforms recently implemented in Argentina aim to change the coverage and level of benefits provided by the system, along with its fiscal parameters, the roles played by the State and the private sector in managing the system, and also a number of regulatory aspects of the private scheme. The reforms were implemented through various legal instruments, including several decrees, laws and regulations. The main laws were Nos. 26222, passed on 27 February 2007; 26417, passed on 1 October 2008; and 26425, passed on 4 December 2008. In some cases, these regulations affect the provisions of earlier reforms. This section describes each of the changes in greater detail, and, where possible, estimates the expected short- and medium-term effects.

(a) *Coverage*

Affiliation reforms for active workers

Since the start of the decade, various amendments led to a progressive transfer of workers from the capitalization system to the pay-as-you-go scheme. The first sign of this trend was the restoration of special pension regimes for teachers, researchers, diplomats and justice officials — which had been abolished by decree in 1994, but had been a permanent source of litigation ever since. In 2001, the authorities restored the special scheme for diplomats and then did the same successively for the other regimes, so that by March 2005, the four programmes mentioned above were operating once again. In May 2007, it was decided that workers belonging to those regimes would have to pay their contributions into the public pay-as-you-go scheme, and roughly 174,000 contributors (1.5% of total affiliates in the capitalization system at that time) were transferred as a result of that ruling (SAFJP, 2007).

A second group of active workers who transferred to the pay-as-you-go system were individuals over 50 years of age (men) or 55 (women) who had less than $ 20,000 in their individual accounts. Law 26222 provided that those workers would be transferred to the pay-as-you-go system, unless they explicitly stated their desire to remain in the capitalization scheme. Between July 2007 and March 2008, about 1.1 million affiliates were transferred under this law, representing nearly 10% of all affiliates of the individual capitalization system (although no official information is available on how many of those affiliates actually made regular contributions to their accounts). The same law made it possible for workers to request transfer from one system to the other every five years, and provided that the first period in which that option could be

exercised would last until December 2007. During those months, nearly 1.3 million affiliates chose to switch from the individual capitalization system to the public pay-as-you-go system.

These three measures jointly meant that about 2.5 million affiliates of the capitalization system (21% of total affiliates in late 2006) transferred to the pay-as-you-go system in early 2008. Many of them may have had highly fragmented contribution histories, but unfortunately no official information is available to verify this.

A final reform was introduced through Law 26425 in December 2008, which completely eliminated the capitalization scheme, transferring all contributors to a single public pay-as-you-go system. The transfer included beneficiaries of the private management system (unless they were receiving their pensions through a life annuity) and accumulated financial assets.

Reforms of coverage for older adults

Three major actions have been taken for this group of beneficiaries in recent years: (i) an easing of restrictions on access to non-contributory pension benefits; (ii) the pension moratorium programme, which enabled a huge number of older adults with insufficient or no contributions to the system to retire immediately; and (iii) an early retirement programme.

Argentina has had non-contributory pension benefits for many years, but access to these benefits has been restricted, both in terms of the effective conditions for obtaining those benefits (they were heavily rationed and those requesting them were put on a waiting list) and the low level of pensions they paid. Meanwhile, the coverage of the traditional retirement pension system among older adults steadily declined, and pressure grew to review the non-contributory scheme and make it more accessible.

In March 2003, the national government created the Senior Citizens Plan (*Plan Mayores*), a programme that sought to incorporate the over-70s into the Heads of Household Plan (*Plan Jefes y Jefas de Hogar*). A few months later, in August 2003, the restriction on the number of non-contributory pensions was eliminated, and this triggered a sustained increase in the total number of beneficiaries. Thus, in late 2006, the number of beneficiaries was more than twice that of three years earlier, while the real value of benefits had also doubled.

The second change, which introduced a massive pension moratorium programme, had greater repercussions. This programme enabled all individuals of minimum retirement age to apply for a retirement pension, by "paying" the contributions needed to satisfy the minimum system requirements. The key law in this reform was passed in December 2004, but the response was slow in terms of benefits granted until May 2007. Since then, application procedures and their processing has been speeded up, generating about 2.1 million new beneficiaries by mid-2009. Figure 5 shows how the number of pension beneficiaries grew until the mid-1990s, before stalling and then decreasing. Nonetheless, thanks to the moratorium, the total number of beneficiaries has grown rapidly since 2005.

Lastly, the third reform affecting coverage levels for older adults was based on the introduction of an early retirement scheme in December 2004. This enabled workers who had completed the minimum number of years of required contributions, but were up to five years younger than the established retirement age, to retire on a reduced pension. As of December 2008, roughly 46,000 workers had joined this programme.

(b) *Level of benefits*

In the case of pension payments, actions have been taken in three areas over the last few years. Firstly, minimum pensions have been increased significantly; secondly, the benefits expected by pay-as-you-go system affiliates have been altered; and thirdly, an automatic indexation mechanism has been reintroduced after 13 years for pay-as-you-go system benefits.

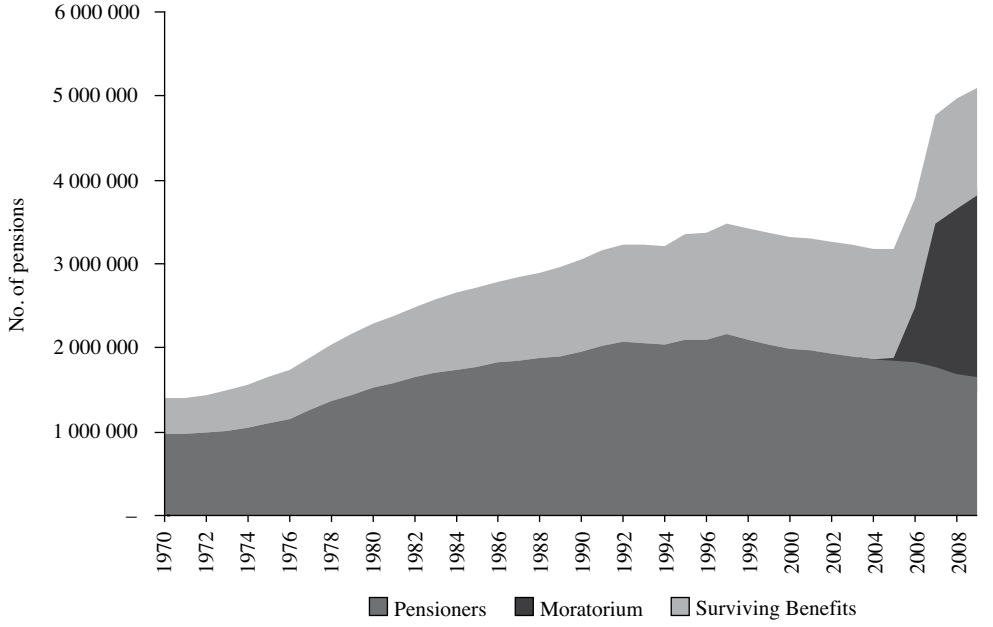
The key policy in relation to the level of benefits involved a sustained increase in the minimum asset level and, more recently, a discretionary adjustment in the other benefit scales. Figure 3 showed how minimum pension assets grew steadily in real terms between 2004 and 2007. By the end of that period, the real value of the minimum pension paid had doubled in relation to six years earlier. The other assets also grew, but at a slower rate, which caused a flattening of the benefits pyramid and weakened the contributory nature of the system.

The reforms made to the system in 2007 and 2008 also included increases in parameters corresponding to the additional benefit for permanency (paid to those who chose to remain in the PAYG scheme after the 1993 reform). Based on this amendment, the benefit corresponding to contributions made since 1994 increased by 76%.

Lastly, following years of political and legal controversy, the Government introduced an automatic

FIGURE 5

Pension benefits in the national system, by type of benefit, 1970-2009



Source: Administración Nacional de la Seguridad Social (ANSES), *Informe de la seguridad social. Cuarto trimestre 2009*, Buenos Aires, 2009.

pension asset indexation mechanism in 2008. This involved two annual adjustments in which all benefits of the pay-as-you-go system are increased in line with a composite index that takes account of wage increases and social security revenue. The law also provides that the same index will be used in future to raise benchmark wages for the purpose of calculating the initial benefit for workers taking retirement.

(c) *Investments of the assets of the public regime*

Thanks to an improvement of the financial performance of the public regime since 2003, the National Social Security Administration (ANSES) started to generate increasingly large surpluses. ANSES receives the contributions made by workers and their employers, together with other tax revenues that were assigned to it in the early 1990s to cover its deficit at that time. The surplus was generated by a rapid increase in pension contributions and tax revenues, while most benefits were increased by smaller amounts. In 2007, the Government created the Sustainability Guarantee Fund, to manage these surplus resources. When affiliates of the capitalization regime transferred to the pay-as-you-go scheme, the corresponding assets were deposited in this fund managed by ANSES. Law 26425 introduced additional regulations including the creation of a legislative supervision committee and a council with civil society representatives. The investment policies to be followed under the new reform were not regulated in detail in the law.

The Fund maintained a low profile until late 2008, when it received nearly 100 billion pesos, about 10% of GDP. Since then, the Government has made several announcements about the destination of these funds, including their investment in trust funds for consumer finance, automobile purchase, the financing of small and medium-sized enterprises, and others.

(d) *Potential fiscal effects of the reforms*

Owing to the political and institutional processes through which all of these reforms were adopted, there has been no formal and painstaking consideration of their potential short-or medium-term fiscal effects. None of the recent reforms was adopted in response to a fiscal need, nor was the topic aired through presentations or public debates. Until now, no agency or official organization has published a document or analysis on the short- and medium-term fiscal implications of the reforms; and official statements and references on the subject have been extremely vague.

Among the reforms implemented, transfers from the capitalization scheme to the pay-as-you-go regime

and the moratorium seem to be the two most important elements from the fiscal standpoint. Naturally, the transfers had an immediate effect on the income of the public system. Firstly, the transfer of the balances of individual accounts to ANSES, between 2007 and 2009, meant an injection of assets valued at 100 billion pesos, equivalent to roughly two years of system outlays. Nonetheless, most of these assets are not liquid, so their short- and medium-term availability is limited. At the same time, the incorporation of some 5 million contributors to the pay-as-you-go regime, means an additional annual revenue for ANSES of 18 billion pesos (2% of GDP).

On the expenditure side, the cost of the moratorium programme was similar, so in the short term, the two measures would seem to offset each other. Nonetheless, the medium-and long-term effects are less clear, since they will depend on decisions made by future Governments on the possibility of keeping the moratorium scheme open quasi-permanently, or closing it (and consequently resuming a declining coverage trend).

The construction of a projections model that makes it possible to estimate medium- and long-term fiscal trends relative to the Argentine retirement pension system is a complicated task, but not impossible; and its preparation and dissemination should be one of the authority's priorities. A number of trends seem clear: the fiscal impact of the 2006-2008 moratorium will fade and eventually disappear in 15 or 20 years' time; whereas the positive fiscal effects caused by the closure of the capitalization regime should be offset as the number of retirees in the pay-as-you-go system increases.

III

The reforms in Chile

Twenty-eight years after the pioneering pension reform that replaced the traditional pay-as-you-go system with one based on individual accounts with a capitalization mechanism under private management, the Chilean National Congress passed a second comprehensive reform of the pension system in January 2008. This section will describe the political and social backdrop to this reform, analyse its main contents and preliminary results, and identify some of the outstanding challenges.

1. The Chilean pension system up to 2005

(a) *Overview of the system*

The current Chilean pension system can be divided into three main components: the poverty-prevention, contributory and voluntary pillars.

Prior to the 2008 reform, the poverty-prevention pillar was based on two programs: (i) the non-contributory assistance pension system (PASIS); and (ii) the State guaranteed minimum pensions system (PMG). The latter targeted individuals who, despite having contributed for at least 20 years to the individual capitalization scheme, had failed to accumulate the minimum amount needed to retire.

The contributory pillar was reformed drastically in 1980. The previous system was based on a series of pay-as-you-go schemes, with defined benefits calculated as a proportion of the wages received during the last period of employment. These schemes generated burgeoning deficits, reflecting major imbalances between the benefits promised and the contributions actually paid into the system. In 1980, the military government created a single national scheme based on individual accounts, in which each worker's savings were deposited and invested in financial instruments by specialized firms, known as pension fund managers (the AFP system).[4] These fund managers are free to set their commission for the various services provided (collection and recording of contributions, investments, calculation and payment of benefits, and assistance to the public); and individuals can opt to change their AFP at any time.[5]

Tax incentives are available for individuals who make additional voluntary contributions, through a special set of financial products, to supplement the

[4] Only military and security-force personnel remained in their previous pay-as-you-go systems.

[5] For a detailed description of the current AFP system see Berstein (2007), available at www.spensiones.cl. There is an extensive literature on the repercussions of the 1980 pension reform on coverage, financial development, national saving and economic performance. See, for example: Corbo and Schmidt-Hebbel (2003); World Bank (1994); Holzmann and Hinz (2005).

mandatory savings made in the contributory scheme. Funds can be withdrawn before retirement, but persons doing so are penalized through an addition to their income tax liability at the time of the withdrawal.

(b) *Recent trend in pension coverage*

As the Chilean pension system has been based essentially on the contributions paid into it by wage-earners in the formal sector, the contributory scheme is one of the key determinants of pension coverage. Since the early schemes in the 1930s, between 60% and 70% of the Chilean labour force has been affiliated to the pension system (Arenas de Mesa, 2000), although the indicator varies somewhat according to business cycles and conditions in the labour market. Following the 1981 reform, the available data have provided information on real contributions made and not just the number of workers affiliated. Figure 6 shows the proportion of contributors in the labour force, which has grown slowly over the last two decades.

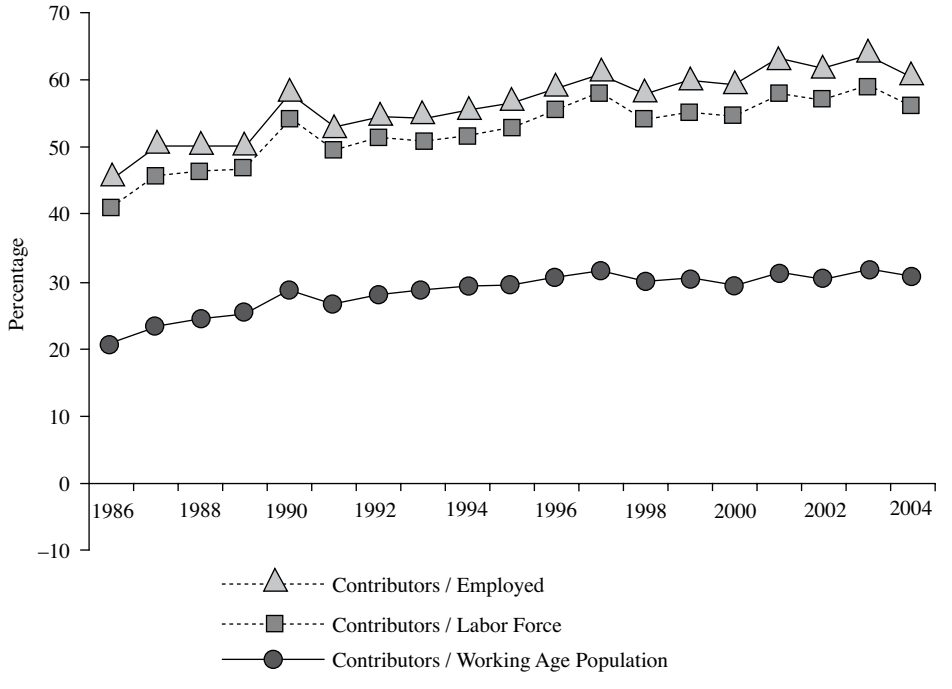
Nonetheless, it has been claimed that the density of worker contributions, or the fraction of a person's working life for which he or she makes contributions to the social security system, is more important than contributory coverage. Figure 7 shows the distribution of this measure for Chilean men and women and highlights tremendous heterogeneity in contributory histories, which range from individuals who contributed throughout the entire period to those who hardly made any contribution at all. This heterogeneity is particularly notable among women, who display a clearly bimodal distribution, with a significant concentration at the two extremes (0% and 100%).[6]

Lastly, figure 8 shows the distribution of coverage for older adults in the Chilean population. Half of all over-70s receive a pension from a contributory scheme (currently, most of this coverage is provided by pensions from pay-as-you-go regimes, but these will become less important as the new system gains maturity). The right-hand figure shows the different

[6] Contribution density was estimated on the basis of real data for 24,000 workers considered active while they were between 16 and 59 years of age.

FIGURE 6

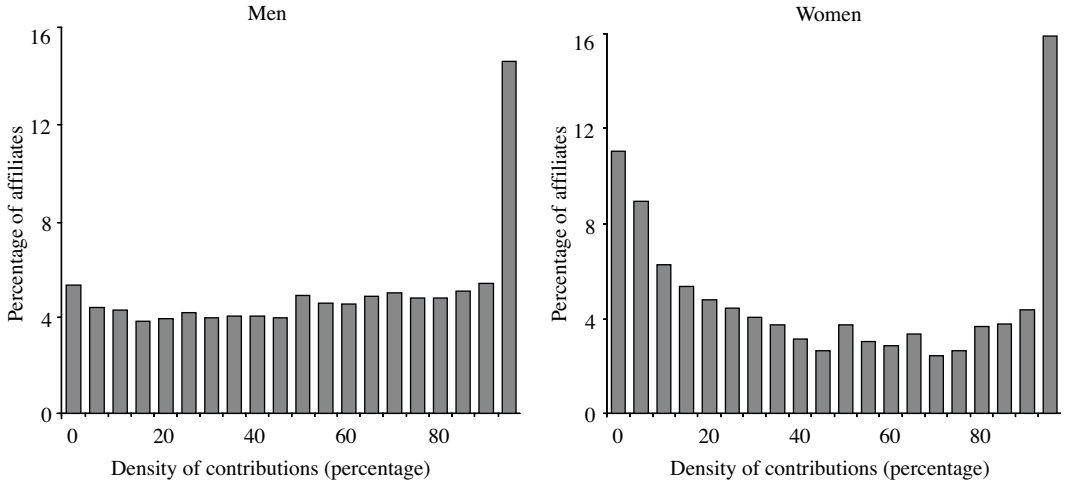
Historical contributory coverage in Chile, 1986-2004
(Percentages)



Source: Solange Berstein, Guillermo Larraín and Francisco Pino, "Chilean pension reform: coverage facts and policy alternatives", *Economía*, vol. 6, No. 2, Baltimore, Brookings Institution Press, 2006.

FIGURE 7

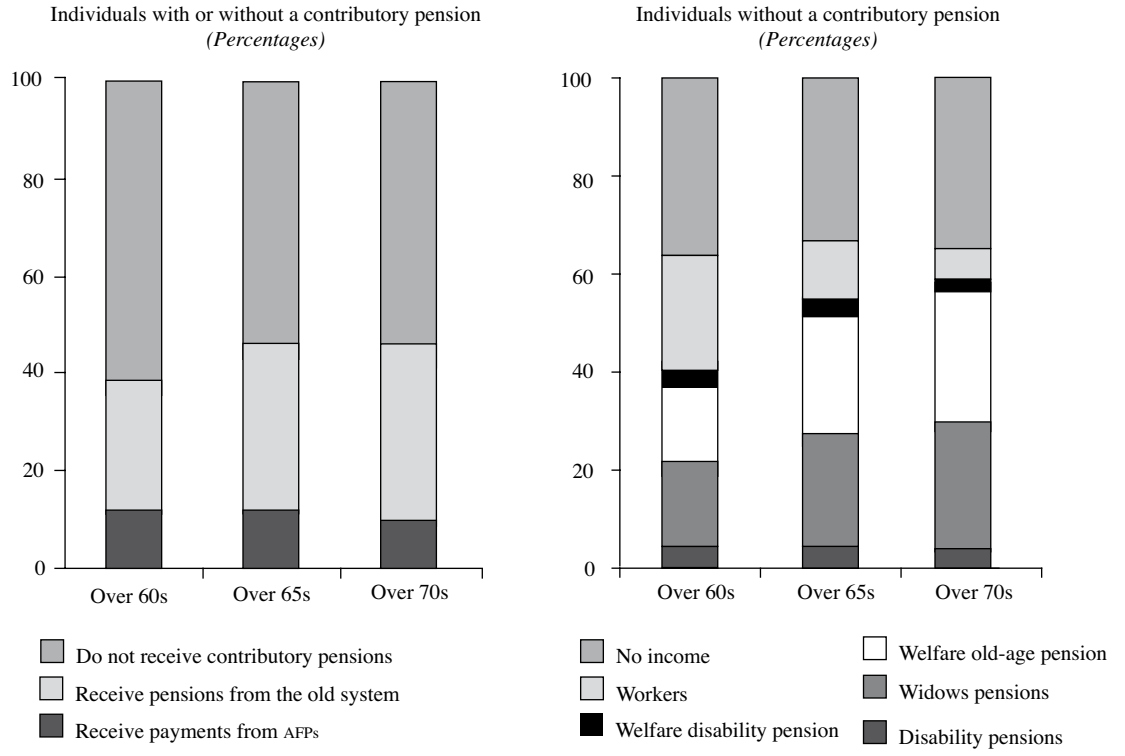
Density of contributions to the pension system
(Percentages)



Source: Solange Berstein, Guillermo Larraín and Francisco Pino, "Chilean pension reform: coverage facts and policy alternatives", *Economía*, vol. 6, No. 2, Baltimore, Brookings Institution Press, 2006.

FIGURE 8

Income sources in old age



Source: Solange Berstein, Guillermo Larraín and Francisco Pino, "Chilean pension reform: coverage facts and policy alternatives", *Economía*, vol. 6, N° 2, Baltimore, Brookings Institution Press, 2006.

AFP: Administradora de Fondos de Pensiones (Pension fund management firms).

income sources for individuals who do not receive direct pensions from the contributory scheme. As can be seen, assistance pensions, widows pensions and disability pensions provide some degree of coverage to around 60% of this group.

(c) *The political climate: Motives for the reform*

Several factors may have led the 2005 presidential candidate Michelle Bachelet to make pension reform one of her key campaign promises. Since the return to democracy, the centre-left coalition had won three consecutive elections promoting at least one important reform of the policies or institutions created during the 17 years of Pinochet government. Reform of the pension system, particularly its non-contributory component, was one of the outstanding debts of the coalition government. The demand for a reform to improve coverage was justified partly by studies on the subject published in 2005 and 2006, which suggested that a large sector of the population would be unable to finance a minimum pension and would not qualify for the minimum guaranteed pension.[7]

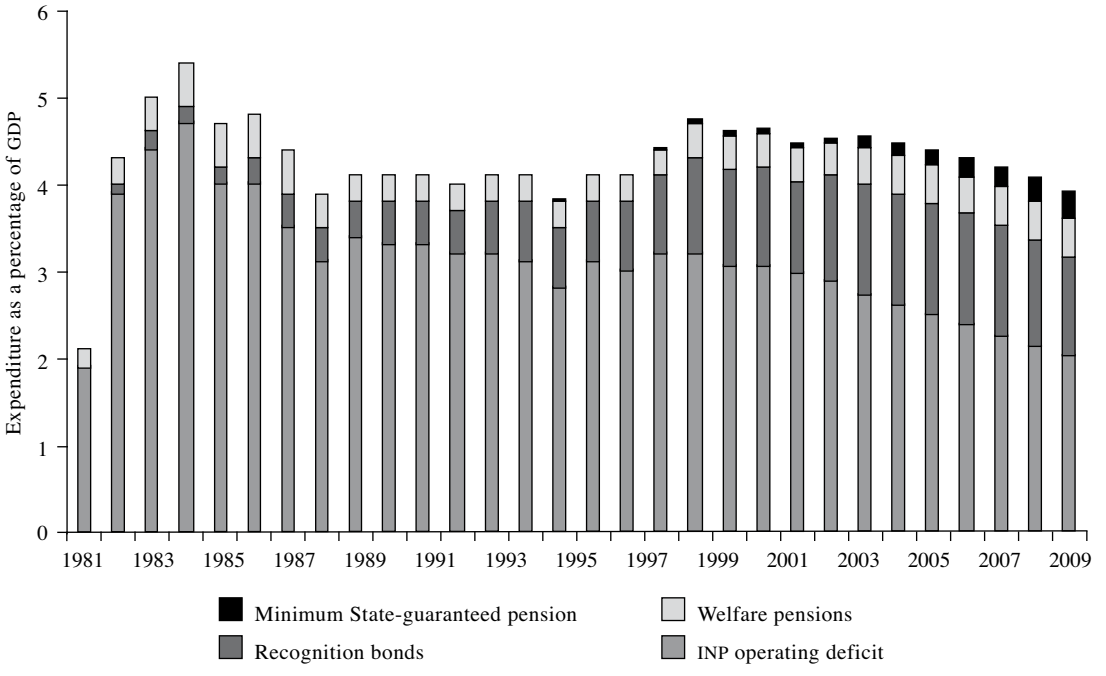
A second key factor in the decision to undertake a significant reform of the non-contributory component was the fiscal slack created by a gradual reduction in the transition costs generated by the original reform of 1980. As shown in figure 9, both the operating deficit arising from the gradual elimination of the pay-as-you-go system, and the liabilities contracted (through recognition bonds) with contributors to the old system who had transferred to the individual capitalization scheme, had already started to shrink by 2005. This provided an opportunity to introduce a broad social safety net for older adults.

Lastly, there was concern at the increasing concentration occurring in the AFP industry. Despite the extraordinary returns that participating firms were

[7] See Berstein, Larraín and Pino (2006) and Arenas de Mesa and others (2006).

FIGURE 9

Relation between pensions and fiscal expenditure in Chile



Source: Economic Commission for Latin America and the Caribbean (ECLAC), *La protección social de cara al futuro: acceso, financiamiento y solidaridad* (LC/G.2294(SES.31/3)), Santiago, Chile, February 2006.

earning on their assets, no new firm had entered the market for a long time, which suggested that price competition was not functioning adequately in this particular market. These were certainly some of the factors that influenced President Bachelet's decision to make reforming the system her main contribution to Chile's economic and social development.

2. The Chilean pension reform of 2008

In March 2006, the recently elected President Bachelet formed a presidential committee of 15 professional experts drawn from different areas related to the pension system, with a mission to produce a report making recommendations for reform.[8] Two years later, an exhaustive legislative bill was finally approved by Congress, which constituted the most substantial reorganization since the original 1980 reform creating the AFP system. The new reform maintained the original essence of the system, while introducing significant improvements to increase the coverage of the poverty-prevention pillar, improve gender equity, encourage greater competition in the AFP industry, and introduce a more flexible investment regime for the fund managers.

(a) *Description of the reforms*

— *Measures to improve the scope and quality of coverage of the pension system*

The individual nature of the AFP system creates a direct link between the frequency, timing and amount of the contributions made by an individual, and the benefits obtained. Benefits tend to be less when individuals fail to make contributions for long periods owing to occupational decisions or labour informality, if they enter the formal labour market late, or if they make contributions that are not proportional to their real income. Moreover, actuarial calculations suggest that longer life expectancy requires larger savings to allow for reasonable replacement rates. The additional savings needed could be generated by increasing voluntary saving, postponing retirement, or reducing the periods for which the pension is actually received. The 2008 reform addresses these problems through a series of measures, as described below.

— *The new solidarity pillar (NPS)*

The 2008 reform replaces the existing welfare pensions (PASIS) and minimum guaranteed pension (PMG) programmes, with a single scheme that guarantees all individuals over 65 years of age in the poorest 60% of the population access to a basic guaranteed pension irrespective of their contribution record.[9,10] This new programme pays old-age and disability subsidies financed by the State.

Individuals who have not made any contributions at all will be entitled to a basic old-age solidarity pension (PBS), if they are over 65 and satisfy the corresponding affluence and residency requirements.[11] Individuals whose contributions are sufficient to finance a pension below a given threshold, are entitled to receive a solidarity pension supplement (APS) subject to the same affluence and residency requirements.[12] The disability programme provides benefits under similar conditions, but its target population is individuals between 18 and 64 years of age. Once disabled persons reach 65 years of age, they are eligible for the old-age solidarity benefits.

Figure 10 illustrates the subsidy scheme, in which solidarity subsidies and total pensions are shown as a function of the contributory pension.

Two elements of this design need to be highlighted: integration of the contributory system with the new solidarity pillar, and concern for the contributory incentives that this integration generates. Integration ensures that all individuals in the first three quintiles will receive a pension equivalent to at least the PBS. If the benefit had been defined with a ceiling (as is the case with disability pensions), this would have created incentives for low-income individuals not to contribute, since their pension would not rise with the number or amount of contributions made. Under the chosen design, total old-age pensions rise monotonically with

[8] See *Consejo Asesor Presidencial para la Reforma Previsional* (2006).

[9] For an analysis of the poverty-prevention pillar and alternative designs, see Fajnzylber (2006).

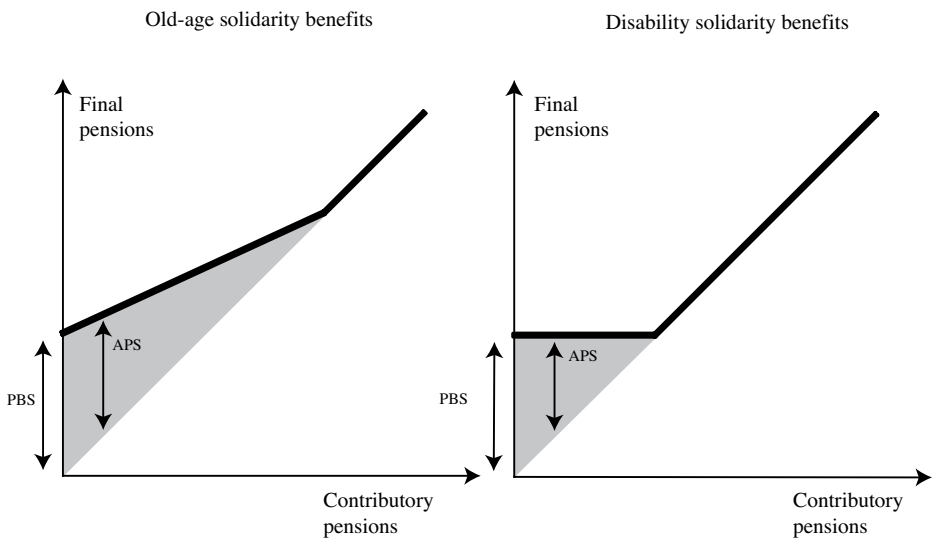
[10] The scheme will be applied gradually. In the first year, starting in July 2008, the basic solidarity pension will be equivalent to US$ 137, and will be limited to the poorest 40% of the population; it will then rise to roughly US$ 172 in July 2009, covering the lowest 45% income group. The final benefits scheme will enter into force on July 2012, covering the poorest 60% of the population.

[11] The affluence test is a means of verifying income to ensure that the person does not belong to the wealthiest 40% of the population (60% in the first year). Initial implementation (two years) will be based on the "Ficha de Protección Social". The residency test requires individuals to have lived in Chile for at least 20 years since their 20th birthday and for at least three of the five years prior to application for the benefit.

[12] The Solidarity Pension Supplement will be paid firstly to individuals whose contributory pensions are below US$ 161 and who were among the poorest 40% of the population in July 2008. The supplement will be steadily increased until 2012, when it will cover those who receive less than US$ 586 through their contributory pensions and belong to the 60% lowest-income group.

FIGURE 10

Final subsidies and pensions under the new solidarity pillar



Source: Prepared by the authors.

APS: Solidarity pension supplement
PBS: Basic solidarity pension

the savings financed by the individuals in question: every peso saved always increases the pension, although the relation is not one to one.

— *Compulsory contributions by self-employed workers*

To be consistent with the extension of coverage resulting from the introduction of the NPS, the reform requires all self-employed workers who receive taxable income to make social-security contributions based on their annual earnings. This requirement will be introduced gradually, starting with a three-year informative period, followed by another equal period in which contributions will be deducted from self-employed workers, unless they expressly choose otherwise (the default choice will be to participate in the system). During this transition period, the fraction of taxable income subject to this requirement will increase from 40% in the first year to 70% in the second, and then to 100% in the third year. From 2015 onwards, compulsory participation will be implemented in full.

— *Collective voluntary savings plans (APVCs) and incentives for middle- and lower- income workers.*

In Chile, as in many other countries, voluntary savings for old age can benefit from tax exemptions. This type of voluntary pension saving is known as *Ahorro Previsional Voluntario* (APV). APV plans can be implemented through a special account in an AFP, through special mutual funds offered by banks or other financial institutions, and through life insurance contracts with saving components. Given their design, this type of tax break mostly attracts voluntary savings from high-income individuals who are subject to the highest marginal income-tax rates. For most low- and middle-income workers, who are not liable for income tax, regular tax allowances do not provide incentives to participate in these plans.

The reform includes two mechanisms to increase the voluntary savings of dependent workers generally, and the savings of workers who do not benefit from regular tax exemptions in particular. Firstly, it creates the APVC scheme which provides tax incentives for firms to offer their workers saving plans in which the firm makes complementary contributions.[13] Secondly,

[13] APVC plans follow the same principle as private 401K pension plans in the United States, or other defined-contribution occupational plans implemented in other countries. Employers can set up saving contracts in an institution offering individual APV plans (AFPs, banks, mutual funds and insurance companies), supplement the contributions made by workers, and define a minimum number of years of contribution to benefit from the contributions made by the firm. The conditions need to be the same for all workers, and employers may in no circumstances restrict benefits to certain groups.

the reform contains two additional incentives for individual voluntary saving:

(i) workers can choose whether the tax exemption is applied at the time of making contributions or when they are withdrawn.

(ii) workers can benefit from a State-financed supplement worth 15% of the voluntary contributions (either individual or collective), which is added to the amount of the pension, subject to an annual ceiling, or else retire earlier.

— *Subsidies on the pension contributions of young workers*.

A specific feature of defined-contribution systems is that compound interest over a long period means that early contributions can have a significant effect on the pension eventually received. For this reason, and with a view to reducing youth unemployment, a special subsidy was created to partly pay for the pension obligations of employers hiring workers between 18 and 35 years of age. Specifically, employers will receive a subsidy equivalent to 50% of the pension cost (contribution plus commission) of a worker on the minimum wage, during the first 24 contributions made by young workers whose pay is no higher than 1.5 times the minimum monthly wage.

Those workers will also receive a State-financed supplement equivalent to the hiring subsidy, which will be deposited directly in their individual account. This supplement will be in effect for the first 24 contributions between 18 and 35 years of age, made on pay below 1.5 times the minimum wage.

(b) *Measures to improve the gender equity of the pension system*

The reform put special emphasis on measures to increase gender equity. In general, women tend to:

(i) Go long periods without making contributions while they look after their children or other dependent relatives.

(ii) Be employed in lower paying jobs (compared to men with similar education levels).

(iii) Retire before men.

(iv) Live longer than men.[14]

These elements create significant gender differences, when combined in a pension system that does not involve redistribution between the sexes during the retirement phase.

— *Introduction of the new solidarity pillar (NPS)*

To tackle these differences, the reform implements a number of measures, in particular introduction of the NPS. By design, the solidarity benefits will most often be paid to women, who are more likely not to have made any contributions ever, or to have done so less frequently than men. Moreover, the benefits are independent of a person's sex, which tends to benefit women more, since they usually live longer than men.

— *State-financed bonus for mothers for each live-born or adopted child*

The reform introduces a subsidy for each live-born or adopted child, equivalent to the contribution on a full-time minimum wage for 18 months. This is increased by an annual rate of return —equivalent to the net average return on type-C funds in the AFP system— from the date of birth until the mother is 65 years old. The benefit is subject to a residency requirement but not to the income test.

As Chile has one of the longest maternity leave periods (18 weeks) in the region, and also has one of the lowest female labour-force participation rates, the introduction of this benefit is important to obtain adequate retirement pensions, particularly for low-income female workers. Apart from the financial benefit, the measure is valued as a way of giving social recognition to the (unpaid) activities of giving birth and looking after children in their early years of life.

— *Economic compensation in the case of divorce or annulment of marriage*

The reform introduces the legal concept of pension compensation in the event of divorce or annulment of marriage, whereby, if necessary, a judge may order the transfer of pension funds between individual accounts, as a way of providing economic compensation to the party who loses out during marriage. This transfer may not exceed 50% of the funds accumulated during the marriage in the account held by the spouse that is required to compensate.

— *Separation of disability insurance contracts between men and women and transfer of the premium difference to the individual accounts of the lower-cost group*

Prior to the reform, the premium charged for the disability and survivor insurance (SIS) to participants in the AFP system was the same for men and women, even though women are less likely to become disabled

[14] The minimum retirement age is 60 for women and 65 for men. The report of the Presidential Advisory Committee on Pension Reform proposed raising the retirement age for women to 65, but this recommendation was not included in the legislation sent to Congress.

and do not generate survivor benefits for their spouses, unless the latter are disabled. To avoid this cross-subsidy, the reform requires an AFP to sign separate insurance contracts for men and women, charge affiliates the higher of the new premiums (probably corresponding to the contract for men) and deposit the difference with respect to the lower premium in the savings accounts of the lower-risk group (most likely women). As a result, women's final contribution to their pension funds will be slightly higher than the 10% indicated in the law. This can be viewed as a way to maintain a single-cost insurance for all participants, while increasing the amount of saving available for women at the time of retirement.

— *Pensions for widowers*

One of the main gender asymmetries prevailing in the pension system is the impossibility of generating survivor pensions for widowers, unless they are disabled. As part of the reform, both the requirement to reserve part of the accumulated pension funds to pay survivor pensions, and the low coverage of the survivor insurance are applicable to men and women alike. In the first case, the inclusion of widowers will actuarially reduce the retirement pension for women in return for the additional benefit. In the second case, the additional coverage will be financed by a single insurance premium corresponding to all women in the system, thus eliminating the current cross-subsidies from insured women to insured men.

The measures described here reflect the many steps that can be taken to improve pension equity between men and women by adjusting the design of the system. Nonetheless, pension inequality largely stems from cultural factors that govern the division of labour within households and labour-market distortions that operate through job or wage discrimination. Such factors cannot be adequately addressed through pension system reforms.

(c) *Measures to make the AFP industry more competitive*[15]

One of the main pillars of the 1980 reform was the introduction of competition between AFPs as a measure to discipline the fund managers and ensure good performance, high-quality service and low cost. The reality has shown that competition in an industry where the service is compulsory and extremely complex for the average consumer to understand, and in which the benefits are only perceived in the long term, does not always adopt the desired form. In recent years there has been a trend towards market concentration (five firms manage pension funds equivalent to 60% of GDP), high returns on assets earned by AFPs, and no new market entrants in the last nine years.[16]

— *Bidding for affiliates*

The reform addresses these problems by influencing both the demand and supply sides of the market.[17] On the demand side, elasticity is increased substantially by the introduction of an affiliate bidding process. All new participants in the pension system will automatically be assigned to the AFP offering the lowest commission during the most recent bidding process; and they must remain in that AFP for a minimum period.[18] The successful AFP will thus receive a constant flow of affiliates for a two-year period, without having to incur expenses on marketing or sales personnel. This measure also creates an attractive starting point for potential entrants, since incumbent firms are not allowed to charge a different commission for different groups of participants (current affiliates or new workers).

— *Commission structure*

Another explanation for the low sensitivity of demand, particularly in relation to the fees charged, is the complexity of comparing commissions between different fund managers, which may charge in different ways (partly through a fixed charge and partly as a set percentage of eligible income). In an attempt to facilitate price comparison between AFPs, the reform simplified the commission structure, with the result that the AFPs may only charge a single commission expressed as a fixed percentage of eligible income.

— *Requirement or facilities for subcontracting some AFP functions*.

On the supply side, a series of measures aim to facilitate the outsourcing of certain AFP functions, and the range of services that can be subcontracted has been significantly expanded. One of them, the SIS, must now be contracted by the AFP system as a whole, unlike the previous situation in which each

[15] For an exhaustive analysis of these measures, see Reyes and Castro (2008).

[16] For a detailed description of the returns on assets obtained by AFPs, see Valdés and Marinovic (2005).

[17] The legislative bill sent to Congress included a proposal to enable local banks to enter the AFP industry by creating subsidiary firms. Nonetheless, this was rejected by opposition parties partly to avoid creating a State AFP as a subsidiary of Banco Estado.

[18] The affiliate may switch to another fund manager if the winning bidder does not fulfill the regulation or underperforms other fund managers by more than can be explained by the difference in commission.

AFP had to take its own insurance, and contracts were designed so that most of the risk fell on the AFP itself.[19] This created a powerful incentive to compete on the ability to selectively attract low-risk individuals, to the detriment of good investment management, cost reduction, or better-quality service. The requirement to sign a systemic insurance contract means the risk effectively falls on the insurance companies, and the incentive to "hive-off" risky individuals is eliminated. The design of the SIS auction will be regulated in detail by the Pension and Securities and Insurance Supervising Authorities. By law, the insurance coverage must be tendered separately for men and women, although it is possible to form groups of affiliates chosen at random and assigned to different firms to avoid undue concentration of risks.

(d) *Greater flexibility for the AFP investment regime*

With the aim of limiting the absolute exposure of investment portfolios, the original regulation included a complex set of quantitative limits: per issuer, per issue, by type of asset (including limits on variable income), by fund origin (national or foreign), among others. Most of these limits were included in the law regulating the system, and there was little scope for interpretation or flexibility. The reform relegated most of these limits to secondary regulations, and a Technical Investment Board (*Consejo Técnico de Inversiones*) was set up to make recommendations on AFP investment and regulation policies.[20]

Greater flexibility will be matched by enhanced transparency requirements, in terms of explicit investment policies and the resolution of conflicts of interest. The reformed law includes the possibility of setting limits based on indicators of investment portfolio risk, instead of quantitative limits by type of asset.

e) *Expected effects and fiscal sustainability of the reform*

Given that the benefits of the new solidarity pillar were proposed as entitlements, the reform means a significant State commitment towards future pensioner generations. Although detailed information on the fiscal repercussions of the reform in the medium and long term is scarce, the available data suggest the cost could be significant. The draft reform bill was accompanied by a financial report containing estimates of fiscal cost between 2008 and 2025. Table 2 shows the expected effects of all the provisions included in the reformed law, including some that cannot be considered part of the pension reform, strictly speaking. Projections show that the fiscal cost of the reform should be less than 0.5% of GDP in the first few years, rising to roughly 1% of GDP by 2025.[21]

— *Preliminary results of the new solidarity pillar*

Pensions under the new solidarity system started to be paid on 1 July 2008 (Fajnzylber, 2010). Initially, only basic solidarity pensions (PBS) were paid, both for old age and disability, to beneficiaries mainly coming from the welfare and old-age and disability pension system.[22] As from October 2008, the solidarity pension supplements (APS) started to be paid, although these still represent a small fraction of total benefits.

As shown in table 1, a total of 623,296 solidarity subsidies were paid in September 2009, of which 95% corresponded to the PBS (62% old-age and 33% disability), with 64% of benefits being paid to women.

The small size of the APS compared to the PBS is thought to be transitory, stemming from the following phenomena:

(i) Most current PBS beneficiaries were originally recipients of welfare pensions, some of whom took their pension, used up their balance, and then applied for the welfare benefit. Once the system is operating, low-balance affiliates will be covered by an APS pension from the outset.

(ii) On a temporary basis, affiliates who were over 65 years of age and were already receiving a programmed retirement pension when the reform

[19] The insurance contracts included ex post adjustments equivalent to a risk transfer between the insurance company and the AFP, relegating the coverage provided by the insurance to extreme cases only.

[20] Only the main structural limits remained in the law, subject to an upper limit under which the Central Bank of Chile has authority to set the real limits: a variable income limit by type of fund; a total foreign investment limit (which could be as high as 80% of the funds) replaceable by specific limits by type of fund; specific limits by type of fund regarding the amount of investments not covered in foreign currencies; and lastly, a limit on investments in financial instruments issued by institutions that have been operating for less than three years.

[21] For further details, see *Dirección de Presupuesto* (2008).

[22] Between January and June 2008, an average of 228,065 old-age welfare pensions were paid, as well as 212,327 disability pensions (www.suseso.cl). Some of the disability pensions were paid to persons over 65 years of age, so the figures are not directly comparable with the basic solidarity old age and disability pensions for which payment began in July 2008.

TABLE 1

Number of PBS and APS paid per month, between July 2008 and September 2009

	Men				Women				Total			
	Old age PBS	Disability PBS	Old age APS	Disability APS	Old age PBS	Disability PBS	Old age APS	Disability APS	Old age PBS	Disability PBS	Old age APS	Disability APS
July 2008	101 418	84 277	-	-	189 152	108 433	-	-	290 570	192 710	-	-
August 2008	101 669	84 831	-	-	190 467	109 473	-	-	292 136	194304	-	-
September 2010	108 162	84 559	-	-	221 383	108 959	-	-	329 545	193 518	-	-
October 2008	110 075	84 437	955	229	230 808	108 604	2 444	217	340 883	193 041	3 399	446
November 2008	111 136	84 286	1 159	294	236 178	108 404	3 067	290	347 314	192 690	4 226	584
December 2013	113 630	84 823	1 234	348	244 815	109 628	3 251	352	358 445	194 451	4 485	700
January 2010	114 748	85 291	1 765	481	249 383	110 901	4 434	468	364 131	196 192	6 199	949
February 1995	115 183	85 481	2 132	584	251 808	111 775	5 048	596	366 991	197 256	7 180	1 180
March 2009	115 759	85 609	2 584	703	254 074	112 459	5 703	787	369 833	198 068	8 287	1 490
April 2009	116 177	85 787	3 131	922	255 795	113 104	6 499	1 119	371 972	198 891	9 630	2 041
May 2009	116 638	86 085	3 842	1 125	258 094	114 003	7 208	1 372	374 732	200 088	11 050	2 497
June 2009	116 982	86 441	4 373	1 346	260 086	114 983	7 817	1 674	377 068	201 424	12 190	3 020
July 2009	117 124	86 710	4 882	1 670	261 334	116 028	8 395	2 118	378 458	202 738	13 277	3 788
August 2009	117 348	87 229	5 603	1 969	261 917	117 514	9 052	2 469	379 265	204 743	14 655	4 438
September 2010	117 430	87 678	15 010	2 203	267 244	118 761	12 193	2 777	384 674	206 439	27 203	4 980

Source: Prepared on the basis of information available at www.spensiones.cl.

PBS: Basic solidarity pension.
APS: Solidarity pension supplement.

took effect can apply for the APS benefit when they wish, with the pension calculated on the basis of the balance at the time the request is filed. This means that many individuals with low account balances may prefer to stay with the minimum pension (currently around Ch$105,000) until they use up their balance, and then apply for the APS benefit (which will be equivalent to a PBS pension of Ch$75,000, because the individual would not have any asset balance remaining).[23] As this process will occur gradually, the number of APS beneficiaries should gradually rise.

In terms of the amount of benefits, the law provided that the PBS benefits would initially be Ch$60,000 per month. These were increased to Ch$75,000 per month as from July 2009. Table 2 shows the average amount of benefits paid each month, by type of benefit and the sex of the beneficiary.[24]

It should be noted that average APS benefits should always initially be less than those of the PBS. In table 2, this is not the case because of the initial payments, which can include more than one monthly payment and therefore tend to be higher. The situation should normalize itself through time.

— *Remaining challenges*

The most important aspect of the reform described above is that, instead of replacing the AFP system created in 1980, it improves it, by integrating a State-financed poverty-prevention pillar, extending the voluntary pillar to middle-income workers, and introducing a number of measures to extend coverage and enhance competition in the AFP market. This is the outcome of a lengthy two-year participatory process, preceded by exhaustive research and various evaluation efforts.

A number of challenges remain to be addressed in the coming years, relating both to implementation of the reform and to longer-term issues. In the

[23] As an example, persons whose pension calculated on a programmed retirement basis would be equivalent to Ch$ 30,000 could choose to apply for the APS pension, in which case they would receive Ch$ 96,000 for the rest of their life; or else they could opt to keep the minimum pension (Ch$ 105,000) until the balance is used up (which would occur in about four years five), and receive the PBS of Ch$ 75,000 from then on.

[24] The average amounts include payments made retroactively from the moment of filing the request. For example, if a person requested an APS benefit on 1 July 2008, and the first payment was made in October 2008, that payment would include the amount corresponding to four payments. This explains why the averages are higher than the maximum benefit (US$ 60,000 before July 2009 and US$ 70,000 thereafter) and in the initial APS payment months, average amounts are way above the maximum benefit.

TABLE 2

Average amount of PBS and APS per month
(Dollar equivalent) [a]

	Men				Women				Total			
	Old age PBS	Disability PBS	Old age APS	Disability APS	Old age PBS	Disability PBS	Old age APS	Disability APS	Old age PBS	Disability PBS	Old age APS	Disability APS
July 2008	120	120			120	120			120	120		
August 2008	120	120			120	120			120	120		
September 2010	120	120			120	120			120	120		
October 2008	126	121	401	314	132	120	316	326	130	121	340	320
November 2008	124	121	148	134	128	121	126	142	127	121	132	138
December 2013	129	125	175	116	132	129	122	120	131	127	137	118
January 2010	124	125	221	182	125	130	174	163	125	128	188	172
February 1995	123	124	147	150	124	129	118	158	124	127	126	154
March 2009	123	124	156	135	123	129	116	157	123	127	129	147
April 2009	122	125	180	173	122	129	146	195	122	127	157	185
May 2009	122	126	172	148	123	131	121	151	122	129	139	150
June 2009	122	127	140	140	123	133	113	147	123	130	122	144
July 2009	152	157	174	207	152	164	151	210	152	161	160	209
August 2009	154	159	207	183	152	168	163	187	153	164	180	185
September 2010	152	159	132	169	158	166	157	173	156	163	143	172

Source: Prepared on the basis of information available at www.spensiones.cl

PBS: Basic solidarity pension.
APS: Solidarity pension supplement.

[a] The equivalence calculation used an exchange rate of Ch$500 per dollar.

former category, the progressive application of the new solidarity pillar will probably face risks. Firstly, there is no clear knowledge of the real number of potential beneficiaries, since that depends on wage trends, compliance with the regulations, and the return earned by the pension funds. Moreover, organizing new institutions, creating conditions to fully integrate self-employed workers into the system, and implementing systems to identify the beneficiaries of the new solidarity benefits and make the corresponding payments, will require a major government commitment.

Among the longer-term challenges, not necessarily addressed by the recent reforms, the most important is a problem shared by most middle- and high-income countries: longer life expectancy and higher medical costs for older adults. The technological progress made in recent decades has meant longer life expectancy, based on increasingly sophisticated treatment and equipment. Although there is a reasonable idea of how long current pensioners are likely to live, little is known about the life expectancy of individuals who are entering the labour market today. The current contribution rate of 10% of taxable income will likely be insufficient to finance pensions in the future; and it is unclear whether generational differences will enable workers to remain in the labour market for long enough to compensate for this increase. Most of the burden will fall on the capacity of individuals to foresee these deficits and increase their voluntary savings. Given that pension systems were created to ease short-term tensions, is not obvious that this voluntary reaction will have the necessary timing and force. Greater effort is needed to improve knowledge on this uncertain future and, consequently, to adopt the (usually unpopular) measures of raising contribution rates or the minimum retirement age.

IV

Notes on the political processes behind the reforms

This article has thus far analysed the recent pension reforms in Argentina and Chile. Having reached this point, we will now briefly outline the relevance of the political processes underlying the retirement policy discussed above. The authors' interest in this aspect stems from the fact that several substantive elements that define the functioning of the Argentine and Chilean pension systems, seem to originate from the characteristics of the political institutions that design and manage them, rather than their inherent "technical" problems.

Issues relating to the relevance and consequences of political institutions and public policy-making processes clearly transcend pension policy. Much of the current public-policy literature concerns the idea that a degree of policy-making capacity is needed for policies to be effective; specifically that several significant aspects of public policies depend on the ability to consolidate inter-temporal policy agreements (Spiller, Stein and Tommasi, 2003). In the case of pension policy, this is aggravated by a number of distinguishing factors, since it is an explicitly distributive policy, with multiple objectives involving opportunity costs between them, and which unfold in a time sequence that makes the policy unique. Bearing in mind that the transfers involved are large, that the entire pension system is essentially founded on a type of promise, by organizing claims on future social production (Barr, 2002), and that the complete duration of the pension-policy cycle is quite exceptional, one can infer the decisive importance of the political dynamics surrounding it.

In very general terms it can be argued that institutional arrangements in Argentina have frequently been considered unfavourable and adverse for achieving and sustaining cooperative political behaviour, or they have been characterized by political actors facing short time horizons or inadequate incentives, or both (Spiller, Stein and Tommasi, 2003). In contrast, Chile seems to have displayed more solid policy-making processes since the restoration of democracy, in which changes have been incremental and have generally emerged out of a relatively intense and institutionalized process. In brief, Chile seems to have found policy-making dynamics that tend to facilitate cooperative responses in the political transaction game.

In terms of pension policy, it can be argued that the course of the recent reforms in Argentina and Chile is consistent with this differential diagnostic. The recent reforms in fact provide a range of circumstances where the capacity to articulate interests and inter-temporal political commitment seem to have been unequal. Returning to the structural reforms implemented in Chile (1980) and the Argentina (1993) as a similar starting point for analysing the most recent processes, both reforms were presented at the time as icons of broader reform processes. In Chile, pension reform was probably the most famous of the "modernizations" of the military dictatorship, whereas in Argentina, they were a cornerstone of the move to orthodoxy led by the first Menem government. Thus, as "icons" the reforms were surrounded by a major communication battle between promoters and opponents over what came to be called the privatization of retirement pensions.

But in Argentina, the 1993 reform did not completely replace the old system. Unlike the Chilean system and the one originally proposed by the Argentine Government, the law passed by the National Congress did not definitively close down the pay-as-you-go system, but founded a multi-pillar model. This fact seems not to have been trivial: from the very outset of the reform and until the present day, under the recent "revisionist" spirit that has surrounded it, the general debate on the pension system has (almost exclusively) been confined to a simplistic dichotomy of "private" versus "public". When that reform was introduced, the political authorities explicitly promoted the new individual accounts regime as "new" in terms of retirement pensions, and encouraged people to join it; but there was a glaring absence of a serious and objective information strategy targeting workers in different situations (Isuani and San Martino, 1995). In contrast, for several years, popular discourse has veered drastically towards the second of these positions; in fact, the key message transmitted by the authorities in relation to the recent reforms was the idea that workers would regain the chance to

transfer from the "private" to the "public" system; and lastly, that reunification under a public pay-as-you-go scheme would generate improved benefits for retirees. In particular, neither then nor now do suitable political channels seem to exist, which —transcending the superficial and mechanistic debate over that false dichotomy— shape a deeper and systematic social dialogue that seeks to penetrate the (highly complex) dynamics of negotiation and inter-temporal cooperation required by any retirement system that aims to be efficient, inclusive and sustainable.

In Chile, meanwhile, once in power, the coalition governments chose continuity over radical change in this as in other public policy areas; and they decided to support the reformed pension system. Only minor reforms have been made to the system since 1990, mainly aimed at altering investment regulations. In recent years however, the issue of coverage emerged as a key element and has taken centre stage in policy debates. As noted above, in March 2006, the Government created the Advisory Council on Pension Reform, to analyse the evolution of the system, study its shortcomings and develop a public hearings process lasting 90 days. The Council, consisting of prestigious experts in this field, provided an in-depth diagnostic assessment and proposed a number of substantive reforms. The Government then set up a Ministerial Committee to evaluate the Council's recommendations, which finally produced a reform bill which was sent to Congress and passed in January 2008.

In contrast, the most recent reforms of the Argentine system, analysed in detail in section II, arose from a closed-door process involving a succession of steps (which were not always coordinated) from which key pensions stakeholders were excluded, where only a few political figures decided the course to be followed. As seen above, the moratorium for self-employed workers, which ultimately developed into an unprecedented mass transfer, proved to be one of the most significant reforms to the Argentine pension system in recent years. This was built on a combination of laws and decrees that led to a massive increase in the number of beneficiaries. The institutional process underlying this important reform was very unusual: for example, the legislative bill that led to the most recent amendment which triggered the mass of nature of the moratorium, originated in Congress and was passed without discussion —in other words without any debate by legislators, who voted for the bill as it emerged from the commissions. As a result, the new law did not attract the attention of the press or the political authorities; and, in particular, there was also no announcement or formal act to launch the initiative. One year later, the programme was made operational by a regulatory decree issued in November 2008. The subsequent abolition of the individual capitalization component under private management, and its replacement by a reunified public pay-as-you-go system, were announced as a surprise in late October 2008 and became law in December that year. The law abolished the capitalization scheme and provided that all taxpayers, beneficiaries and assets affiliated to it would be transferred to the public pay-as-you-go system. Once again, debate on the bill in Congress was extremely brief, since it received rapid support from all political sectors.

It is now possible to discern a reasonably clear pattern in recent pension policy in the two countries. In keeping with the characteristics of the systems described above, pension reforms have been seen to need not only scrupulous technical analysis but also a process for collecting and disseminating accurate information to gain support and build consensus (IDB, 2007). In the recent pension reforms, Chile seems to have come closer to those standards than Argentina, where changes were introduced in a disorderly sequence, with little mutual consistency. Many of the key announcements came as a complete surprise and were rapidly processed through Congress. Unlike the Chilean case, the Argentine reforms did not involve major efforts to promote broad debate and careful examination among the various pension-policy stakeholders (direct or indirect). Nor was there any consideration or detailed discussion of the present and future fiscal implications of the measures being implemented.

V
Conclusions

Argentina and Chile have traditionally been two of the region's social-policy pioneers. Both are among a small group of countries that introduced pension systems in the early twentieth century; since when they have moved forward by providing progressively broader coverage to a growing number of workers. In 1980, Chile once again took pioneering steps by introducing a structural reform which, among other important changes, set up a private pension-fund management system. A decade later, Argentina followed the Chilean model with a number of differences, when a traditional pay-as-you-go scheme was transformed into a multi-pillar scheme.

The progress made in adopting reforms has continued in recent years, with both countries again making significant changes to their systems. These clearly share several common objectives, such as the expansion of old-age coverage and redefinition of the role of the State in facilitating access to the benefits. Nonetheless, there are significant differences in other respects, including the institutional organization of the systems, partly owing to certain different political approaches towards the workings of the previous structures, and the implementation of different policy-making processes in the two countries.

The reforms in Argentina produced an immediate increase in coverage, sharply breaking with the previous trend. The total number of retirees rose by over 70% in two years, following the introduction of a moratorium that led to a massive inclusion programme. This made it possible for any individual over the established retirement age to apply for a pension, regardless of his or her past contributions record and irrespective of whether he or she was the beneficiary of some other type of pension currently in force.[25] The reforms also meant the annulment of a key part of the changes introduced in 1993, by abolishing individual capitalization accounts and returning to a unified form of operation managed by a public agency, in a system that reverted to a defined benefits framework. The existence of private pension-fund managers thus ended. Nonetheless, it is important to note that the changes did not represent a complete return to the pre-1993 situation, since most of the parameters of the system (including current contribution rates, retirement ages and replacement rates) were not reset to their previous levels. Moreover, the public agency responsible for managing the new reunified system will continue to receive a portion of general tax revenue (originally assigned to finance the transition cost). Consequently, this agency can be expected to manage a growing fund: in 2008 it amounted to over 10% of Argentine GDP. Lastly, to this day, there is no official estimate of the fiscal impact of the reforms, in either the short or medium terms.

In Chile, meanwhile, most of the reforms will produce their effects gradually through time. The beneficiaries of the new solidarity pillar will be few at first, but their number will gradually increase as the system is implemented. Clearly, this is the main novelty of the recent reforms, since they will lead to a universal coverage system in the near future. Another set of reforms affect operational aspects of the existing system and the institutional structure of government supervision and oversight agencies. Moreover, a number of changes aimed to eliminate systemic inequities, such as those relating to gender differences.

The process of designing and approving these reforms was very different in the two countries, reflecting different current institutional contexts. In Chile the process began when President Bachelet announced her intention to reform the system and appointed a Council of Experts. Two years later, following various debates, publications and analyses, the reform was approved. In Argentina, most of the decisions were made very quickly at the top government decision-making level, with a very brief and limited consultation and discussion process. These differences may help explain differences in the results and, therefore, deserve more detailed study and analysis in the future.

The more cautious and careful approach taken by the Chilean authorities in introducing pension reforms will probably help achieve more sustainable results through time. Nonetheless, the execution of a more rapid reform in Argentina managed to give an immediate response to the major problem of the massive

[25] As the programme advanced, a restriction was introduced to avoid duplication of benefits, although this did not include limits on persons receiving a survivor pension.

decrease in coverage. Most older adults excluded from the system were receiving a pension within a year, thereby achieving an immediate improvement in relation to their previous situation. In Chile, by contrast, the process that means covering all registered beneficiaries will be slower and more gradual.

Clearly, neither of the two systems has attained a position or a design that could be seen as "definitive"; and policy challenges remain to be addressed by the authorities in the near future. New problems and difficulties will also inevitably arise. The ability of future Governments to respond adequately to these problems will be decisive for the well-being of future generations of Chilean and Argentine people.

(Original: Spanish)

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KEYWORDS

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Social coordination through public policies:
the Chilean case

Aldo Mascareño

Social complexity involves inter-relationships between various actors and systems that enjoy considerable autonomy to define their own interests and operating procedures. This provides a backdrop for the development of models of social coordination that combine autonomous actors and systems pursuing coherent objectives. Drawing on examples from Chile, this article reviews: (i) policy-network models (public works concession system); (ii) deliberation systems (presidential advisory commissions); and (iii) reflexive law systems (international trade arbitration). It is found that the high level of reflexiveness of these models makes it possible, albeit with limitations, to combine principles of autonomy and coherence in the implementation of public policies.

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I
Introduction

From sociological point of view, one of the most characteristic processes in contemporary society is its growing trend towards greater social complexity (Habermas, 1990; Luhmann, 2007). This can be described in three dimensions:

(i) At a practical level, it involves the proliferation of multiple private, public, quasi-private or semi-public organizations; national and supra-national corporate stakeholders; transnational protest movements; local or regional representative groupings; and an individualized mode of participation in a variety of differentiated social spaces that are not always consistent but often fragmented.

(ii) In the social dimension, the trend towards greater complexity (hereinafter referred to as "complexification") means that each of these fields organizes itself on the basis of its own interests and operating procedures, the most likely outcome of which is a collision of substantive interests and conflicts between each field's procedures.

(iii) Lastly, in a temporal dimension, increasing social complexification means that substantive interests and their related procedures establish precise temporal priorities with their own self-regulating mechanisms to achieve the fulfilment of their own objectives, pursuant to requirements ensuring the continuity of each field.

In a word, complexification involves the differentiation of contemporary society in terms of systems and actors that have increasingly autonomous expectations and operating procedures.

Latin America, and Chile in particular, have not been immune from this complexification process. In Chile, over the last three decades at least, classical labour-union organizations and grassroots actors have been joined by a variety of new groupings based on diverse interests: youth groups, senior-citizen groups, feminists, homosexuals, migrants, environmentalists, local community groupings; activists in the fields of urban, consumer, human and citizens rights and others of a neo-religious nature; artistic communities, and various types of indigenous and student movements. In addition to this, public agencies have diversified to serve the interests of these actors (new ministries, under-secretariats, superintendencies, regulatory bodies); mechanisms such as negotiating forums, expert committees, study commissions, ethical commissions; and a proliferation of so-called third sector organizations, non-governmental organizations (NGOs), national and transnational economic organizations, and diverse private agents operating in various transnational social fields (Domingues, 2008).

> *All of this concrete diversification of systems, organizations, and actors spawns substantively mutually contradictory interests, which gain autonomy by establishing their own operating procedures and temporal agendas to achieve their expectations. This begs the question as to the State's capacity to use public policies to absorb and articulate various demands that are mutually conflictive and have expectations of fulfilment that do not allow much temporal flexibility. The concept of public policies can be seen as a set of administrative and legal measures deployed within the State framework to address social problems and guide agents towards certain forms of conduct* (Kraft and Furlong, 2009).

In the twentieth century, public policies in Chile followed contradictory models in different historical periods: one of these was of the centrist-state type, involving considerable State intervention of a developmentalist orientation, based on planning and aimed at incorporating the middle classes and low-income sectors (1932-1973). Another model was defined by the withdrawal of the State and an emphasis on macroeconomic policies (1973-1989) (Arellano, 1985). The ensuing period was characterized by a dual movement: firstly, the (political) attempt to return to the pre-1973 centrist-state formulas and, the structural impossibility of doing so in a model based on neoliberal reforms. This can be seen particularly in the domains of education, labour, collective goods and services, health, pensions and social security systems, all of which involve high levels of privatization in their mode of operation (Hecht-Oppenheim, 1993).

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The hypothesis of this article is that, given the impossibility of recreating a centrist-state matrix based on public-policy planning, and the high level of autonomy gained by different systems and actors, a new alternative for deploying public policies started to emergein Chile from 1990 onwards, in which State's guiding role uses public policies to combine the coordination of systems and actors (unlike centrist-state intervention), with substantive interests and autonomous operating procedures.

To develop this hypothesis, this article firstly identifies the key elements of a view of social coordination implemented through public policies in complex settings (section II). It then reviews three coordination models, in terms of their theoretical underpinnings and examples relating to their emergence in Chile: the policy networks model for the case of the public works concessions system (section III); the deliberation systems model for the case of presidential advisory commissions (section IV); and the reflexive law or options policy model in the case of arbitration on trade issues (section V). The article ends with a provisional assessment of these models in Latin America (section VI).

II

Key elements for a social coordination perspective

Drawing on principles of consistency and autonomy, Norbert Lechner (1997) has identified three basic forms of social coordination: political coordination, market coordination, and coordination by networks. Characteristics of the first include centralization, hierarchy, and an exclusively public orientation; the second form is identified by its decentralized, horizontal, and non-directed nature. The third form, which combines vertical and horizontal communication, involves reciprocal dependency, and aims to articulate interests in a common subject through competitive cooperation. This article reserves the term "coordination" solely for the third case. Expanding this concept to embrace hierarchical-state regulation and market modes merely dilutes its specific and innovative nature. What Lechner calls "political coordination" has generally been recognized as State intervention or social control (Beyme, 1994); and, for the case of "market coordination", Hayek (1986) referred to "Catallactics" or market self-regulation. The fact that market agents also display autonomy of interests and procedures, makes them a case for analysis, rather than the social coordination paradigm. Coordination, in the sense used here, only arises when some public or private agent seeks to relegate the autonomous dynamic of actors and systems by directing their performances in practical, social, and temporal terms.

The concept of coordination as proposed thus needs to be distinguished from other models of public-private relations:

(i) Developmentalist interventionism, the preferred model in the Latin American context for much of the twentieth century, which involves State control of the productive structure.
(ii) Corporatist control, which is distinguished by State co-option and the definition of objectives and orientations for the action of private agents (visible in populist settings).
(iii) Normative institutionalism, which pertains to analyses of conflicts of interest and power regulations.
(iv) Self-regulation, which is characteristic of the functioning of markets in neoliberal contexts.

Coordination involves highly complex relations between actors and systems, their substantive and procedural autonomy, and mutual asymmetry of interests. It therefore recognizes that these actors cannot be directed in an authoritarian way (as in the interventionist and corporatist model); and that conflicts of interest can be addressed by deliberation and not only through power transactions (as is the case in normative institutionalism). Nonetheless, coordination diverges from pure self-regulation (which is specific to the emerging market order) to establish general criteria for pursuing specific aims in relation

to problems of public interest. Coordination is a balance between autonomy and coherence.

This balance seems an appropriate way to address the complex dynamic of actors and systems. Two dimensions present themselves in this regard: one sociological and the other historical. The sociological substrate of social coordination is found in the deployment of the functional differentiation process, namely: "The constitution of various relatively autonomous functional systems, structured around certain internal rationales" (Lechner 1999, p. 49). Its historical substrate relates to the crisis in the centralized planning model and the European welfare state, which led to financial atrophy and the "juridification" of social domains known as "euroschlerosis" (Willke, 1995; Peruzzotti, 1999, for the Latin American case). The process of functional differentiation gives rise to systems, organizations, and actors that question the State's capacity to direct their actions through authoritarian planning or interventions aiming to define their own interests and procedures. The planning crisis raises the need for an alternative which, respecting systemic autonomy, is capable of targeting its operations on the parallel achievement of expectations. In the debate on social coordination, three candidates fulfilling these conditions have clearly emerged: policy networks (Mayntz, 1992 and 1993; Lechner, 1997; Messner, 1999; Scharpf, 2001; Heydebrand, 2003), contextual orientation through deliberation forums (Willke, 1995, 1997), and the reflexive law or policy options model (Teubner, 1993). In synthesis, as social coordination strategies, all of them:

(i) Involve the capacity to introduce coherence in the inter-relationships between autonomous systems and actors, steering them towards specific tasks.
(ii) Develop a common vision around a problem area with a view to constructing positive-sum relations.
(iii) Promote a tolerable level of self-limitation on autonomy, without this putting the core of each participant's interests at stake.
(iv) Are made operational by articulating procedures rather than through generalized regulatory principles.
(v) Seek to increase the reflexiveness of systems and actors by considering the consequences of their autonomous operations.

Social coordination through public policies thus involves a combination of two principles: firstly, the coherence that can provide a panoramic view of the interests and procedures of various systems and actors; and secondly, the autonomy for them to define their own interests and to self-organize (Scharpf, 1993; Mayntz, 1993; Willke, 1995). Coherence is provided by State view of social problems; autonomy pertains to systems and actors in complex situations. By combining the two, the aim is to create hybrid zones, in which public policies can promote and guide the production of a good or service, without this meaning the centrist-state intervening in autonomous systems and actors to achieve that. While coherence aims to establish coordinated efforts between the parties involved, autonomy seeks to enable the different systems and actors committed to obtain outcomes for their interests and to operate with their own procedures in most cases. Coordination through policies is, in this sense, a double-contingency situation (Luhmann, 2007); in other words, both State operations and those of autonomous systems and actors maintain their differentiated expectations, but are linked concretely, socially and temporarily in a policy issue, from which they can obtain differentiated but coordinated outcomes. This is a positive-sum aspiration, rather than a zero-sum game. Social coordination, in this sense, responds to the integration compulsion of centrist-state planning-based policies, while rejecting the impossibility of a "common view" of social problems that are relevant for the actors involved (Willke, 1995, 1997).

The following sections individually describe three coordination models: policy networks, deliberation forums, and reflexive law. Their functioning is exemplified with Chilean cases drawn from the last decade.

III

The policy networks model and its emergence in Chile

The topic of the inter-relationships between autonomous mechanisms has a long tradition in organizational analysis, in which dichotomous relations can be distinguished (Hasenfeld, 1972), action sets (Whetten and Aldrich, 1979) and organizational sets (Granovetter, 1973). When applied to the policies problem, this approach gives rise to the policy-networks model. In principle, this involves defining rules for fulfilling commitments between public and private agents, which allow for a distribution of the costs and benefits of a common decision or solution of problems —rules that require participants to voluntarily restrict their freedom of action in each case. This can lead to a model of organizational identities, competencies, and mutually accepted spheres of interest (Mayntz, 1992, p. 27 and ff.). There is no single definition on this subject, however. David Marsh and Rod Rhodes (1992) distinguish between policy networks among communities (few participants, strongly integrated, with high levels of continuity and focused on one or two shared interests), and thematic policy networks (larger number of participants, multiple interests, and greater conflictiveness).

Tanja Börzel (1998) has described two fundamental trends in detail: the German case, which sees policy networks as an alternative form of coordination to the hierarchical control and the market; and the Anglo-Saxon tendency that conceives of policy networks as a model for the State-society relationship in a given area. Mark Bevir and David Richards (2009) draw on ethnographic studies to add a third type, the de-centred policy network, based on the traditions and situated agency of the participants. A similar trend is followed by Pater de Leon and Danielle Varda (2009) with their notion of collaborative policy networks, in which they review not only the composition of actors but also their degrees of institutionalization and discursive exchanges.

The approach has also been extended to coordination problems in transnational spaces, such as the relation between multiple governance levels —local, regional, national, supra-national, global (Scharpf, 2001; Pal and Ireland, 2009)— or to legitimizing topics relating to global constitutionalism (Kjaer, 2009). Nonetheless, these trends can be defined as "a set of relatively stable relationships which are of a non-hierarchical and interdependent nature, linking a variety of actors, who share common interests with regard to a policy and who exchange resources to pursue these shared interests, acknowledging that cooperation is the best way to achieve common goals" (Börzel, 1998, p. 254).

Joop Koppenjan, Kars and van der Voort (2009) have clearly identified the political-sociological problem underlying this model. Firstly, political-democratic actors stress the relation between principal agents and political authorities, while the relevant execution decisions are taken at decentralized governance levels (private, quasi-private). Secondly, decentralized actors have the expertise and capacity to pursue their objectives (again Willke, 1995), but they find it hard to generate political support to avoid interventions from above. In this sense, a policy network can be seen as a linkage between the vertical nature of representative democracy and the horizontal nature of multiple forms of governance among private actors outside the domain of representative democratic relations. To achieve this linkage, Koppenjan, Kars and van der Voort (2009) propose developing a framework setting to regulate relations between participants and define the procedural limits of joint action. In doing so, they have to face three types of problem: complexity, interdependence, and the dynamic of any policy issue. The first of these must be overcome through a constant dialogue between the participants; the second, by considering the framework of conditions as loose coupling (Weick, 1976), which allows for deviations in response to possible contingencies; and, the third, through openness to learning based on the internal dynamic of policy implementation.

Even in the case of loose couplings, policy networks contain elements that encourage their maintenance. One of these is mutual resource dependency: funds, legitimization, executive capacities, information, and political-institutional elements (Park, Rethemeyer and Hatmaker, 2009); other very important elements are

socio-structural resources, in other words "patterns of communication and resource exchange between three or more actors" (Hatmaker and Rethemayer, 2008, p. 430), the stability of which depends on the returns accruing to the people sustaining them. The social capital of the participants would also contribute to a better network performance and thus to its continuity (Sandström and Carlsson, 2008). Nonetheless, an essential aspect of network operations seems to be that they function by producing collateral goods —goods that the State wants to produce but it cannot owing to a lack of resources and expertise, and private agents do not produce owing to the lack of an appropriate framework of conditions and guarantees against the emergence of free riders (Willke, 1996). The term "collateral goods" represents a structural reformulation of collective goods, whose lack of competitiveness discourages their production. In policy-network terms, collateral goods involve mutual (public-private) resource dependency, a framework for their operation, relatively stabilized patterns of communication and exchange, focus on a policy issue, and intensive use of knowledge and executive capacities. The infrastructure concession system in Chile reflects these characteristics.

Lack of financial resources, specialized knowledge and executive capacity, compounded by the infrastructure deficit that prevailed in Chile in the early 1990s, were key incentives for the development of collateral goods in the public-works sector. Until the passing of the 1996 Concessions Law (MOP, DS No. 900), financing and execution were in State hands. In the late 1970s, however, outsourcing was introduced for the building and maintenance of public works, but the design and management of the works remained centralized (Engel, Fischer and Galetovic, 2001). Under the concession system, the public sector basically plays a regulatory role, while other functions are in private hands in the various regulatory domains: highways, airports, water systems, prisons, ports and others.

As previously stated, this is a policy network in formation. Public and private agents are brought together to produce collateral goods under a specific regulation, in which the costs and benefits are distributed in a self-regulated fashion by a legal and deliberative framework. This consists of the relevant legal instruments (Concessions Law, regulation, mandate agreement, bidding documents, technical bid and award decree), standard build-operate-transfer (BOT) type contracts, or design, build, operate, transfer (DBOT) type contracts, and conciliation and arbitration commissions. While the first two of these contain contract award and implementation procedures, the latter target the disputes that may arise in the execution and operation phases (Figueroa, 2003). The deliberative space that these two mechanisms open up is crucial for their constitution as a policy network, since they afford reflexiveness to the specific legal framework in response to the changing conditions in the contractual environment. With the conciliation panel particularly, patterns of communication and exchange are stabilized between agents in response to disputes that arise and, if not resolved, are heard by the same commission now acting as an arbitration commission. Both parties can appeal to the conciliation panel: for contractual non-compliance for reasons of force majeure or destruction of the works, for example, in the case of the State; or because of changes in services or rates, delays caused by the State, or suspension of the concession, in the case of private agents (Figueroa, 2009).

A framework of this type may seem inflexible for a loose coupling of actors. Nonetheless, there are broad margins of flexibility and strong incentives to form policy networks:

(i) BOT-DBOT type contracts involve private agents acting in consortia. This does not involve direct outsourcing by the State; private actors self-define their partners and roles.
(ii) The reconciliation panel consists of "university professionals", in other words experts that are appointed by the parties, but not necessarily related directly to them.
(iii) The commission decides on its own rules and applicable procedures, as well as its evidence, complaint and notification mechanisms.
(iv) Any other parties may request establishment of the conciliation panel.
(v) The concession holder may choose between an arbitration panel or the Appeals Court of Santiago, if within 30 days there is no conciliation (DS MOP No. 900 art. 36; Also Presidential Message No. 358-355, 2007, p. 14).

These elements are characteristic of policy networks. Firstly, knowledge is distributed in projects involving high levels of complexity and technological investment. Not only is the State aware of its limitations in this regard, but the formation of consortia and expert panels (conciliation panel) reveals the distribution of knowledge between private agents. Not only does social capital contribute to the performance of the

network, but also and mainly, to cultural capital in the form of knowledge (Willke, 2007). Secondly, the self-constitution of the panel in terms of rules and procedures, and the flexible dispute settlement channels that it offers, reveal an operation based on an "autonomy of will" of the parties (Mereminskaya and Mascareño, 2005), which indicates a reflexive exercise of self-linkage and self-limitation on the part of the actors involved. Thirdly, this means that the widely debated issue of contract renegotiation (Guasch, Laffont and Straub, 2007; Rivera, 2008; Engel and others, 2009) is inherent to contracts of the BOT type and the flexible nature of a policy network. Numerous risks flow in them and raise the dilemma of proceeding or not proceeding (*go/no-go*), which is a problem of risk modelling and, hence, knowledge management (Ock and others, 2005). The proliferation of side agreements is an outcome of this risk management, and the draft amendment to the Concessions Law was its institutionalized response.

This amendment draws attention to certain constraints on consolidating a policy network. It proposes to create a concessions council as a consultative body to guide policy, and therefore, formulate meta-decisions that involve both representatives of various public agencies under inter-ministerial coordination, and independent "specialists" from the public sector and concession holders, but appointed centrally by the President of the Republic (Presidential Message, No. 358-355, Art. 1 No. 2).

Fundamental in any policy network is the multiplication of observations, particularly on public-works issues that have repercussions for other fields. Moreover, knowledge incorporation is decisive for better network performance. Nonetheless, a failure to include private actors in the process makes governance relations vertical and imposes a constraint on the decentralized nature of a policy network. It is not only concession-holder representatives that are excluded but mainly the public affected by the works; and a failure to incorporate people who are potentially affected heightens the risk of decisions, since they are taken without explicitly considering the affected public (Luhmann, 2006). This leads to ex post reactions and, ultimately, higher transaction costs.

The introduction of a Superintendency of Public Works to inspect service levels (Presidential Message, No. 1.194-356, Art. 2), is intended as a response to these risks. Nonetheless, policy networks require deliberative mechanisms as well as regulatory ones. Nor is much achieved by changing from an arbitrator in equity (*árbitro arbitrador*) to an arbitrator in law (*árbitro mixto*) (Art. 36). The former has a broader space of deliberation, since it can diverge from the law by drawing on interpretive norms, general legal principles, comparative legislation and equity. In contrast, the latter must adhere to the law in its ruling on the substance of the issue in question (Figueroa, 2003). This excludes consideration of the network environment from arbitral decisions, and also the evaluation of international experience of these global issues, which is crucial for consolidating hierarchical policy networks.

In brief, if the key dilemma of policy networks is the encounter between the vertical nature of democratic-representative institutions and the horizontal nature of private forms of governance (Koppenjan, Kars and van der Voort, 2009), the changes proposed seem to stress lines of verticality rather than horizontality. This tends to reduce the degrees of freedom available to actors, and even their alternatives for participation in a policy network, with consequent disincentives to join it. If the legislation tends to reduce degrees of freedom once opened up, policy networks may become ritualistic and ineffective as a decentralized coordination mechanism.

IV

The deliberation systems model: the case of presidential advisory commissions

Forms of interrelationship between actors such as the Concessions Council, represent what are referred to here as deliberation systems (Beyme, 1983; Scharpf, 1993; Willke, 1995; Parkinson, 2006; Whitman, 2007; Dryzek, 2009). These are commissions, councils, dialogue roundtables, forums, and discussion and expert panels

that bring together a variety of corporate and technical actors or agents representing the various mechanisms that can be affected by policy decisions. Deliberation systems are a constituent component of policy networks, but they can also be formed independently of them for policy discussion purposes.

Deliberation systems theoretically aim to combine multiple observations on the topic of interest for the actors involved. They serve as a decentralized articulating mechanism that involves high degrees of freedom in participating mechanisms, in terms of substantive interests and the procedures for achieving them. Deliberation specifically recognizes this heterarchy of actors and the need for their mutual reference and interpolation to achieve —through an act of balance— commitments on the subjects within their competency, without this necessarily meaning a change in preferences, although it is certainly possible to refer politically to greater legitimacy (Habermas, 2000; Ulbert and Risse, 2005). To produce this effect, a political system needs to possess —apart from parliamentary representation— mechanisms for procedural deliberation (not coercive, principles-based), inclusive (open to multiple interests) and with consequences (in other words with repercussions on policy decisions) (Dryzek, 2009). The capacity to produce consequences may stem from direct participation in policy formulation (strong public space), or else from an indirect influence of informal forums on decision-makers (weak public space) (Janssen and Kies, 2005). In either case, elements of a deliberative system are a public space with minimal limitations on participation by institutional actors, or a (private) space empowered with communication channels with the former, more accountability mechanisms, and influence on decisions (Dryzek, 2009, pp 1,385-1,386). Thus, the conditions for the emergence and operation of deliberative systems are: (i) recognition of a problematic situation for public-private actors; (ii) tolerance of ambivalence and initial imbalances that are only resolved through long-term calculated action; (iii) development of trust stemming from long-term interaction, acceptance of surprises and new options; and (iv) reflexive capacity to incorporate the perspectives of others into a future combinatory gain (Kaldor optimum), limiting the present maximization of benefits (Pareto optimum) (Willke, 1995 and 1997; Barabas, 2004).

The coordination mechanism that prevails in these situations involves a contextual orientation that is opposed to purely hierarchical-authoritarian intervention, and an autarchy of actors independent of all contextual consideration (Willke, 1997). The contextual orientation in deliberation systems establishes the conditions and options through which the actors, without ignoring their own autonomy, can mutually orient themselves by combining options in a flexible framework of possibilities. In other words, they link principles of consistency and autonomy. In the best of cases, its results are: (i) feelings of internal efficiency, an aspect of autonomous citizenship; (ii) perceptions of greater government response capacity, as part of political legitimacy; (iii) political participation, which is fundamental for good representation; and (iv) civic commitment, community and neighbourhood identity, which contribute to a democratic community (Searing and others, 2007, p. 612).

Nonetheless, deliberation systems should not be seen as an infallible solution to problems of representativeness; they are subject to various constraints. Firstly, reflexiveness and trust in other actors is formed during the process. For autonomous actors it is not obvious that present benefits should be limited in exchange for future gains. In particular, if there is a problem involving current costs that differ for each individual, the tolerance of ambivalence and initial imbalances will depend on the trust that actors place in the procedure itself and, hence, their past results with deliberation systems. Secondly, the above leads also to the figure of a "third-party" —an impartial actor within the deliberation system or an external source of authority. In policy-oriented deliberation systems, this position is filled by a convening government agency, which restores centralization through ideological attributions and generates incentives for the impartial agent; and, through actors, it is always possible to have recourse to a specific idea of "common good" as an external source to sustain individual interests (Luhmann, 2005). Thirdly, as they combine argumentation and negotiation rationales, one cannot invariably expect consensus from deliberation systems. Elements of argumentation, persuasion and negotiation operate jointly in them, and these are interpenetrated in communicative action (Ulbert and Risse, 2005) and constitute parallel targets (commitments without consensus) as a most likely outcome (Willke, 1996 and 2002).

The deliberation systems mechanism has been used in Chile since 1990, particularly in the form of advisory commissions and dialogue forums (Fuentes, 2006), the latter particularly on human rights issues.

According to Carolina Aguilera (2007a, 2007b and 2009), a distinctive feature of the Government led by Michelle Bachelet was its implementation under a discourse of "citizen participation" in the formulation of policy ideas. For the author, commissions in the Bachelet period can be classified as those aimed at a participatory democracy and those targeting public-policy efficiency. In the explicit intention of the government, these criteria are combined with three objectives: promotion of dialogue between stakeholders, creation of a participation space, and formulation of policy recommendations (Aguilera, 2009). The author's evaluation of this is nuanced. Firstly, a vertical relation would have been caused if the government processed the proposals of the commissions *a posteriori* and only incorporated experts but no stakeholders in any of them, although consultation mechanisms existed (Aguilera, 2007b; Moulian, 2006). Secondly, it is recognized that many experts are also sociopolitical actors, and that the commissions made it possible, at least, to bring positions closer together, reach minimal agreements and legitimize policy recommendations.

Her general conclusion is that: (i) they were effective in providing dialogue and policy-proposal spaces; (ii) they had a limited effect in terms of broadly representing interests; (iii) they included social actors in cases of protests (such as the Education Quality Commission following the student protests, or the Employment and Equity Commission following protests by subcontractors, among others); (iv) they allowed for a change in political style, but in general continued to be linked to relevant actors; and (v) it was political debate in Congress that ultimately defined the draft laws on public policies.

Aguilera's assessment is interesting because it reflects the possibilities and limitations of deliberation systems in the Chilean case. They are a proven mechanism for harnessing actors with different interests and operating procedures around a specific topic that affects them; and their incorporation is recognition of their autonomy. Moreover, the fact that the processes culminated reports shows that significant degrees of reflexiveness were achieved, and the fact that consensus was not reached (for example of the case of education, where students and teachers dissented from the report) shows that a negotiating approach makes it more likely to expect an orientation towards parallel targets. Similarly, the trend towards expertise in deliberation systems should not itself be understood as technocratization; instead, it shows that the complexity and specialization of the problems currently being faced by Chile require meta-political visions, with intensive use of specialized and interdisciplinary knowledge, supported by comparative international experiences.

Nonetheless, the absence of important social stakeholders in some cases (commissions on pensions, early childhood, higher education, probity) imposes a significant constraint for achieving higher levels of reflexiveness in deliberation systems, contrasting expert knowledge with that of the affected parties. As in the case of policy networks, this increases the risk for the sectors of the public which the decisions taken will eventually affect, since their direct experience is not incorporated. Whether owing to the logistical complexity of including the affected parties or the lack of development of corporate actors in certain fields in Chile, their exclusion from certain deliberation systems reduces the latters' effect as a decentralized coordination mechanism, tending to make them more technocratic and reducing the plurality of perspectives on a given policy issue.

Nonetheless, the potentials and limitations of the experience with deliberation systems in Chile are intrinsic to this model. In other words, they can contribute to policy evaluations and recommendations through expert knowledge and that of the affected parties, but they are not intended to replace other democratic-deliberative mechanisms such as parliamentary or inter-ministerial debates, and a classical public, mediatic or daily domain, none of which, for that matter, passes the most demanding democratic tests (Johnston and Searing, 2005; Ulbert and Risse, 2005). In other terms, the problems of the verticalization of deliberative systems stem not from the fact that their proposals can be discussed in other democratic forums, but, in the Chilean case, from the centralized way their members are chosen, the exclusion of unorganized affected parties, or the incompetency of the impartial third party to be steer towards a balance of emerging asymmetries in negotiation processes, as also stressed in the empirical analysis made by Aguilera (2009).

The risks of verticalization are also present in deliberation systems. Nonetheless, as these are mechanisms for coordinating systems and actors with high degrees of normative and procedural autonomy, the balancing process that is attempted will always be subject to asymmetries and confrontations, particularly in their initial phases of development, such as in Chile.

V

The reflexive law model for the arbitration in trade disputes

An interesting way to address these asymmetries, and at the same time generate hierarchical social coordination mechanisms, is "reflexive law". According to Gunther Teubner (1993), this consists of implementing a policy of options whereby the law, abandoning all-embracing pretensions, would produce an optional regulation that stakeholders can either accept or reject. In this framework, reflexive law is binding if the affected parties decide to make it so. The underlying premise is that in a context of highly autonomous actors and systems, the law cannot oblige, integrate, or direct conducts; but it can serve as a way to manage disputes between private actors. The aim is to make the law more effective, by offering actors the possibility of feeling motivated to operate with it.

The emergence of various supra-national private legal regimes is proof of this: *lex mercatoria*, *lex sportiva*, *lex digitalis*, *lex financiaria*, *lex constructionis* (Fischer-Lescano and Teubner, 2006 and 2007). These develop substantive and procedural forms of self-regulation, which at times collide with and at other times are coupled to national legal systems (Mascareño, 2006a and 2006b). Their common feature is the formation of supra-national decision-making panels for dealing with disputes —one of these being international trade arbitration in *lex mercatoria*. This is a mechanism for resolving contractual disputes between private agents of different nationalities, although it also operates for disputes between foreign investors and the State. Its key characteristics are:

(i) Neutrality of the tribunal since this does not form part of any national structure.
(ii) Temporal efficiency by generating "tailor-made" procedures without higher instances for reviewing rulings.
(iii) Flexibility, which stems from the principle of "autonomy of will" of the parties to autonomously define arbitrators, the place and language of the arbitration, deadlines, acceptable evidence and the applicable substantive law.
(iv) Intensive use of knowledge, since the arbitrators are selected for their specialization and experience in the issues of the dispute.
(v) Regulatory optionality made available to the parties through clauses in contracts and treaties (Buchanan, 1988; Guzmán, 2000; Mereminskaya, 2005).

Although trade arbitration has developed over a long period, the intensification of trade relations and consequent proliferation of private contracts and agreements between States and regions of the global society, over the last few decades, has introduced new consequences that can be analysed in public-policy terms. The incentive of commercial activity and attraction of investments are not merely a private issue. The welfare consequences are also of public interest (employment, knowledge, infrastructure). Just as an unfavourable tax structure can lead investors to choose a foreign alternative (Agostini and Jalile, 2009), a rigid domestic legal regime can also discourage commercial activity and foreign investment (Mereminskaya, 2004). The law itself then becomes a public good (Casella and Feinstein, 2002), whose flexibility can favour and its localism can restrict economic relations between private agents of different nationality, and between them and States.

As a form of reflexive law, arbitration is a mechanism that is highly adaptable to the conditions and various disputes that arise between autonomous economic agents. This gives it legitimacy among users, and a greater reduction of uncertainty; and it builds an environment that is favourable for trade and investment (Mereminskaya, 2005). Encouraging its use, therefore, cannot be excluded from policy objectives.

Since the ratification of the Convention on the Recognition and Enforcement of Foreign Arbitral Awards (1958), the Conventions of Panama (1976) and Washington (1965), which set up the International Centre for the Settlement of Investment Disputes (ICSID), and particularly since promulgation of the law on International Trade Arbitration (No. 19.971) in 2004, Chile has understood it in this way. This law is comprehensively adopted on the basis of the so-called Model Law, drafted by the United Nations Commission on International Trade Law (UNCITRAL) and recommended to member States in

1985 (UNCITRAL, 1985). Its objective is to implement international arbitration independently of national courts, as explicitly indicated in its Article 5: "In the matters governed by this Law, no court shall intervene, except where so provided in this Law". Domestic arbitration has a long tradition in Chile. As an alternative mechanism, it has seemed compatible with highly integrated institutional reciprocity structures (Mereminskaya, 2006; Xiao and Huo, 2005), and this may currently predispose agents towards it. Nonetheless, the jurisdictional restriction established by Law 19.971 for domestic courts necessarily entails a phase in which they adapt to supra-national criteria, and this will have consequences for the economic and political domain.

One of the most important parts of this adaptation phase is the construction by national courts of the notion of public order (mandatory rules that set contractual limits) adapted to supra-national criteria. In terms of the review of rulings of annulment in the Court of Appeals or the recognition of foreign arbitral rulings by the Supreme Court, it is not possible to mechanically apply the domestic notion of public order, which is always more restrictive than its international counterpart, the supra-national one or that implicit in *lex fori* (Buchanan, 1988). In the international arbitral regime, the only non-repealable regulation is "good faith" (UNIDROIT, 2004, art 1.7; Mereminskaya, 2003; Mereminskaya and Mascareño, 2005).

In the domestic domain, in contrast, even Article 16 of the Civil Code (application of Chilean laws to property located in the country) has been considered a norm of public order (Mereminskaya, 2006). Application of this criterion is an obstacle to the recognition of foreign arbitral rulings in Chile, which destabilizes, in terms of judicial practice, the politically and legislatively constructive institutional order that favours judicial linkage with a transnational order and, ultimately, promotes international commercial relations and foreign investment. Given this restriction, anchored in Chilean legal doctrine, it seems necessary, in public policy terms, to give guidance to domestic judicial bodies, on how to apply the aforementioned conventions and the implications of Law 19.971.

As in the previous cases (policy networks and deliberation systems), there is both private and public responsibility. Accordingly, the formation of policy networks in this field may be very useful for greater coordination between the private sector and the State. In such a dynamic, the former are responsible for coordination and efficient administration of international arbitration in its procedural dimension, whereas the State would be responsible for supervision and correct functioning of its legal institutional framework in relation to inter- and supra-national criteria. This is increasingly necessary following the signing of multiple bilateral agreements over the last decade, which contain arbitration clauses (Direcon, 2009). These two dimensions are reviewed successively below.

Firstly, in the private domain, international commercial arbitration may be ad hoc (organized by the parties) or institutional (in arbitration centres). The first avoids the monetary cost of the second, but its transaction costs may be too high, because it requires the parties to plan the arbitration before the dispute arises. This encourages the use of institutional arbitration. This being the case, it is essential to structure the arbitral process efficiently from a procedural standpoint, giving clarity and simplicity to the arbitral clause (Millet, 2006), ensuring expertise among administrators and stability in the organizational conditions under which they operate. This includes keeping its members academically up-to-date, presence at meetings of the international arbitration community, convening capacity to at the institutional headquarters, and organizational adaptation to international quality standards.

Since 1992 Chile has had the Santiago Arbitration and Mediation Centre (CAM-Santiago) of the Santiago Chamber of Commerce, which is highly efficient in the national domain and now open to international arbitration. Other centres in Latin America have also grown in importance (in Mexico, Peru and Brazil). Given the processes of economic liberalization in Latin America and the high degree of regional and national variability, it does not seem advisable to form an arbitration centre for the region, as might be viable in Asia (Koh, 2000). Nonetheless, institutional informality and the specific regulatory features prevailing the region remain a procedural constraint (Mascareño, 2006b). It would therefore seem essential for these arbitration centres to form policy networks, to enable them to exchange knowledge and experiences of arbitration administration, comparable procedural levels and transparency in their operations. This interaction also allows for specialization in the future and cooperative thematic differentiation between the various arbitration centres, with a constant reduction in opportunity/alternative costs.

Secondly, the proliferation of bilateral investment agreements at the State level also requires coordination in the form of policy networks between arbitration

institutions and the State agencies responsible for designing and supervising them. Various doctrinal and procedural restraints that tend to concentrate dispute settlement within the national legal domain can be addressed in this way, for example: (i) elimination of the Calvo doctrine (dispute settlement in national courts); (ii) review of the most-favoured-nation clause when the laws in dispute are not stipulated in the bilateral investment agreement; and (iii) the stabilization of umbrella clauses used in cases that need to reconcile differences between contract and treaty courts (Cremades, 2004). Lastly, the formation of supra-national public-private policy networks in this field could result in higher levels of transparency, information and trust in international arbitration —constraints that currently exist in Chile and other countries of the region, given the relatively recent creation of the system (in Chile this has been possible since 2004, with Law 19.971). An alternative to the above may be coordinated criteria for publishing rulings handed down by arbitration institutions (an aspect of international arbitration that has been criticized (Lord, 2001; Vandenbergh, 2005)), or a procedure to control the consequences of the use of privileged information, corruption, or family and friendship privileges in the public domain —common issues in Latin America that discourage investment and make the system less predictable.

In short, the dynamics generated by the reflexiveness of law in Chile and Latin America promote the principle of autonomy among actors and systems, as shown in the case of international arbitration. The development of policy networks in this field is important to counteract the doctrinal constraints of national juridical openness to supra-national criteria, build confidence in the model and coordinate the political-legislative field of treaties with that of domestic judicial orders.

VI

An approach to evaluating these models in Latin America

Social coordination through public policies is an appropriate way to deal with the increasing social complexity of actors and systems in the current Chilean, Latin American and global context. The high levels of substantive and procedural autonomy gained by these actors is reactive in the face of a vertical mode of relationship between policies and publics. At the same time, autonomy involves risks unless it is accompanied by reflexive mechanisms that take account of the consequences of the actions of systems and actors in the framework in which they operate. Autonomy also means consistency through reflexiveness.

Policy networks, deliberation systems and reflexive-law models aim to combine those two principles and articulate private and public actors and systems through negotiations, roundtables, exercises in which expectations are self-limited by external expectations, problem-oriented approaches, optional contracts and self-coupling, in relatively stable social coordination structures. Three Chilean cases show the effectiveness and also the limitations of these strategies for dealing with complex social contexts. The autonomy gained by various actors and systems in the Latin American context over the last few decades is undeniable; but equally clear is the survival of centrist-state tendencies in the sociopolitical matrix of Latin America, either in the form of a high degree of presidentialism, corporate populism or authoritarian trends (Garretón, 2000).

Moreover, conditions of social inequality also act against the formation of autonomous actors and open up spaces for constructing strong community identities that are resistant to deliberation or for resolving conflicts through coercion or corruption (Mascareño, 2009). Under these conditions, the development of heterarchical coordination strategies is difficult to sustain. Mechanisms such as the community councils in the Bolivarian Republic of Venezuela aim at the ideological consolidation of Bolivarian socialism, rather than the formation of participatory mechanisms for policy design and supervision (Romero, 2007). Something similar is happening with the constituent assemblies in the Bolivarian Republic of Venezuela,

Ecuador, and the Plurinational State of Bolivia: they aim to legitimize a prior political construction rather than articulate perspectives. In addition, the high level of armed conflict in Colombia makes authoritarian forms of decision-making attractive. In contrast, the cronyism present in the Argentine model is resistant to the construction of autonomous actors; and, in the case of Chile — as in Brazil with its industrial policy sector chambers (Diniz, 1995) — while there are signs of relative success in the construction of these mechanisms, their tendency towards political concentration in final decision-making and the exclusion of potentially affected parties in some cases demonstrates their current limitations.

Any centrist-state trend limits the formation and effectiveness of decentralized mechanisms such as policy networks, deliberation systems, and the policy options of reflexive law for supra-national disputes. Presidentialism concentrates decisions; populism absorbs them in the face of institutional incapacity to respond to demands; and authoritarian models conceal them. The question in the Latin American case is how far these vertical political constructions can resist, without opening a window in response to the region's growing social complexity. The effects of economic globalization are expressed in various bilateral and multilateral trade and investment agreements; different private agents develop their action strategies in regional or global terms rather than national ones; different actors demand their rights with a transnational rather than local perspective; and transregional mobility (to Europe, North America or Asia) is far greater now than it was at the end of the twentieth century.

Despite its current limitations, in the Chilean case one can discern the incipient formation of social coordination mechanisms through public policies in the Latin American context. This seems to be a reasonable and necessary option for deploying such policies, when recourse to vertical State control proves inappropriate for dealing with increasing social complexity. Proceeding in this way has advantages both for the State and for private actors. Without losing the general orientation of thematic priorities, the former is partly relieved of the task of an exhaustive society design and increasing bureaucracy, with the investment of time that this involves; the second can make its practical and technical knowledge available to that design, along with its experience as parties affected by policies, and thereby gain recognition and autonomy of action. Coordination mechanisms such as policy networks, deliberation systems, and reflexive law policy options are an attractive alternative in the Latin American context, where traditional political structures are put under pressure by actors and systems that demand, or already exercise, autonomy and ambitions for participation and recognition. Nonetheless, those same structures restrict their realization, so tension is more likely than change in this regard. How that that tension is channelled will determine their future viability in the Latin American region.

(Original: Spanish)

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KEYWORDS

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Chile: Interaction between the State and civil society in policies on childhood

Carlos Andrade and Sara Arancibia

This article discusses the public-private links that exist in Chile to collaborate on childhood policies. It analyses the role played by the two sectors and the dimensions and components that are needed to ensure that their collaboration puts the best interests of the child at the forefront. It considers expert opinion through an analysis of content, which makes it possible to identify the relevant dimensions and components of the interaction, which are then prioritized quantitatively using the analytical hierarchical process (AHP) methodology to ensure a positive effect on childhood. The article shows that this interaction is top-down, with the State defining policies and civil society implementing them, which mainly reflects the fact that the public domain manages resources that are largely sustained by the private sector. The conclusion is that there is a challenge in generating horizontal dialogues, in which interaction is not constrained by economic resources but by shared purpose with regard to children.

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I
Introduction

The child protection system in Chile has been adopting new forms in response to the changing and emerging needs of each stage in the child development cycle.

In this regard, possibly the most important milestone affecting these new forms of child protection has been the signing and ratification of the Convention on the Rights of the Child (1989 and 1990, respectively), hereinafter referred to as the Convention, which obliges signatory States to use the legislative, administrative and other means available to them to ensure conditions exist for those rights to be exercised effectively (Convention on the Rights of the Child, Article 4).

The rights in question exist a global setting framed by the deregulation of financial markets and boom in communications and inter-connectivity. These factors generate new societal dynamics and ultimately redefine the conception of child welfare systems and the role of the State and society at large in visualizing and constructing a social policy that would no longer see the State as the universal supplier of social programmes (Serrano, 2005).

From a historical standpoint, this is not entirely new. Studies such as Pilotti (1994), Anríquez (1994) and Farías (2003) showed that Chile has several long-standing initiatives aimed at addressing the needs of children, sometimes coordinated with the State, but other times implemented independently and targeting the most vulnerable children in particular.

This article analyses the mechanisms that exist for State and civil society to collaborate to produce and implement policies and programmes targeting children in socially vulnerable situations. Its purpose is to generate public-policy recommendations that are applicable to any State agency that articulates and coordinates with civil society in the task of improving the living conditions of children, hereinafter referred to as "co-responsibility".

This co-responsibility necessarily implies the willingness of each of the participating domains to bring not only its knowledge, but also its economic, technical and institutional resources to this joint task, to improve the reality of the children being targeted, safeguarding or restoring the rights enshrined in the Convention. With this as a backdrop, the article is guided by the following questions: How is co-responsibility generated in practice between the State and civil society on policies targeting vulnerable children? What are the roles of State and civil society in the current context with regard to targeted policies? In what domains does the State-civil society nexus function in this public-policy space? And, lastly, what are the relevant dimensions and components that need to be strengthened or generated for this public-private relation to best serve the best interests of the child?

The organization of this article reflects these questions as follows: Section II discusses childhood policies; Section III discusses public policies on childhood in a framework of State-civil society interaction; Section IV refers to the dimensions and components of this interaction; Section V makes a number of observations on the public-private interaction in the childhood domain; Section VI sets out the most important conclusions of the article; and, lastly, an annex describes the methodology used in the analysis.

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II
Childhood policies

1. Universal and targeted policies

The specialized social-policy literature frequently publishes studies of the various areas of welfare systems: education, health, pensions, housing and others.

This article does not focus on sector policies, however, mainly because children's problems and needs are multidimensional *per se*, so considering them separately would only make it possible to address one domain of the problem.

Research on childhood issues validates and highlights the importance of the setting in which children develop. Their problems are observed from multidimensional standpoints ranging from the most basic needs to validation of the importance of the territorial space in which children live their lives.

García Sánchez (2001), a specialist on early childhood education and childcare issues, argues that the ecological-model approach, developed by Urie Bronfenbrenner in the late 1970s, visualizes the evolutionary journey of children as "a process of progressive differentiation of the activities they undertake, their role and the interactions they maintain with the environment" (García Sánchez, 2001, p. 3). If we extrapolate this idea to the reality in which socially vulnerable children live, this implies an urgent call to develop favourable conditions for adequate growth. Accordingly, this article will define the category of children living in situations of social vulnerability as encompassing all children under 18 years of age (Art. 1. Convention on the Rights of the Child, 1989) who have difficulties in effectively exercising their rights in the family, and also in the affective, economic, socio-community, school-educational, and health domains, and in terms of relations between peer groups (Andrade, 2009b).[1]

From this point of view, what we see today is that both universal and targeted childhood policies —whether executed jointly by the State and civil society organizations or implemented independently— recognize the importance of the environment into which children are born and in which they grow up. This represents a paradigm shift in approaches to meeting children's needs, from actions that have historically been focused on providing assistance, to an approach that currently focuses on the exercise of rights and overcoming vulnerabilities —including those present in the environment— which put the adequate development of children at risk.

With regard to the distinction between universal and targeted policies, the Inter-American Children's Institute (IIN, 2003) provides a definition which helps to internalize what will subsequently be understood by these concepts. The two types of policy are reviewed below:

(a) *Universal policies*

These express a duty of the State to uphold the rights of children, young people and families in any society. In many countries, the policies and programmes implemented have constitutional status, and usually relate to basic health, education, housing and food services, among other issues. They are universal in the sense that they are available to the entire child population, without any discrimination. Consequently, they do not require any selection within a category of users, because their universe has been covered.

In articulating or coordinating these universal policies and programmes, it is essential to optimize use of the State's human, material and financial resources, and to ensure fulfilment of the economic, social and cultural rights enshrined in the Convention.

An example of a universal-type policy is Chile's early childhood protection system *Chile Crece Contigo*, in which all children, irrespective of origin, religion or ethnicity, are automatically incorporated into the system at the time of the mother's first pregnancy health checkup (Ministry of Planning, 2007).

(b) *Targeted policies*

Targeted policies pursue equal opportunities for children and adolescents living in situations involving vulnerability, or rights violations, or both. In other words, the beneficiary population of these programmes or provisions are children and adolescents facing impaired opportunities to develop their potential, compensate deficits, or integrate or reintegrate into

[1] Andrade's study lists eight dimensions of social vulnerability. To facilitate the analysis, these have been subsumed in the six mentioned above.

their families, communities, education system or the formal labour market.

Examples of this type of policy in Chile are those implemented by the National Children's Service (SENAME), which attends children who have suffered a rights violation, or are living in situations of risk or social vulnerability as a result of problems of coexistence in their families, conduct problems, or having broken the law.

This article focuses mainly on this type of policy, by seeking to review how coordinated action between the State and civil society in this domain of public policies can —if certain conditions are satisfied—help compensate for the deficits faced by children in situations of vulnerability, and enable them to effectively and actively exercise the universal rights enshrined in the Convention.

III

The approach to public policies on childhood in the framework of interaction between State and civil society in Chile

1. Concept of civil society

The literature generally understands the concept of civil society as an intermediate space located between the State and market, which has come to be generally known as the "third sector". It has the following characteristics: it is independent of the public apparatus; it is non-profit seeking; and it is motivated to intervene in social problems (Serrano 1998; Laurnaga, 1999; De la Maza, 2000).

Serrano (1998) distinguishes three groups that comprise civil society:

(i) non-State organizations (NGOs) and volunteer actions.
(ii) associative and community mechanisms.
(iii) universities and centres of thought.

This article, however, places the emphasis on foundations, corporations, volunteer groups and grassroots organizations, because, historically, it was foundations and other social entities that attended to the needs of vulnerable children in Chile, before the State became involved. In fact, the historical records show that the first action targeting the needs of unprotected children emerged from civil society in the form of the country's first orphanage in 1751 (Anríquez, 1994; Andrade, 2009b).

Nonetheless, the sector started to assume a major role in childhood policy following the structural reforms implemented in the late 1970s (Pilotti, 1994). As a result of this development, which also entailed a downsizing of the public apparatus, various NGOs emerged in the early 1980s, mainly committed to poverty reduction.

This occurred largely for sociopolitical reasons: professionals that had left the public sector as a result of the reforms set up new organizations at that time; and with the assistance of international agencies, these produced an NGO with actions targeted on the social policy areas that the State did not cover. Moreover, for ideological reasons, organizations of this type also arose in response to the policies implemented by the State at that time (Pilotti 1994; Ferrer, Monje and Urzúa, 2005).

According to Pilotti (1994), in many Latin American countries NGOs were "a sort of alternative social policy parallel to the official one, often covering the deficiencies and shortcomings of the latter (Pilotti, 1994, p. 22).

In this context, actions began to address the needs of vulnerable groups, but in some cases from decoupled the State apparatus, thus giving rise to "implicit co-responsibility" between the State and civil society, with the common denominator being reduced to the group targeted rather than the actions that were being articulated and coordinated in pursuit of a common goal.

In the childhood-protection domain, formal relations with the public apparatus started to develop somewhat earlier, involving increasing coordination between private entities and State agencies.

Here it is important to note that although there are precedents for State help in maintaining the first organizations devoted to assisting vulnerable children (in those years referred to as children living in "irregular situations"), it was only in 1967, when Law 16.618 created the National Children's Council (CONAME), that this relationship started to become more formal, and the notion of co-responsibility steadily gained force through close interaction and cooperation between civil society organizations and the State.[2]

This relation developed mainly through two channels: firstly, in the form of economic contributions, known as "institutional maintenance"; and secondly, by recognizing organizations that received funding as "collaborating entities", having previously fulfilled the legal requirements to be considered as such (Anríquez, 1994).

Nowadays, most public-private interaction occurs through the National Children's Service (SENAME), which succeeded CONAME in 1979 and is currently the public organization tasked with "promoting development of the social protection system for children and adolescents through the exercise of rights and the social/family reintegration of children and adolescents who have suffered rights violations, and those that have broken the law, through a network of programmes implemented either directly or by organizations collaborating with the service."[3]

The SENAME mission is important in terms of public-private interaction, since it serves 98% of its target population through subsidies paid to civil society organizations (Andrade, 2009b).

It is important to note here that while there are civil-society organizations that do not receive an operating subsidy from SENAME, studies show that of all childhood programmes present in the different territories, 75% of them receive some type of support from that agency. This supports the hypothesis that the majority of targeted childhood policies are currently defined by this public organization, although there initiatives that receive economic support from the State, other than subsidies, in amounts set by the contestant fund mechanism (Andrade, 2009b).

2. Moments of interaction between State and civil society in public policies

In an article reviewing the public-private nexus in poverty-reduction policies, Ferrer, Monje and Urzúa (2005) systemize the various forms of civil-society participation in the life cycle of a public policy and argue that these depend on the stages of the policy (see table 1).

These authors make an interesting contribution by highlighting, not the participation by private organizations in public-policy design, but the contribution they can make to prioritizing the specific areas to be addressed through policies and programmes.

The authors argue that public policies are defined in a specific economic, social and political context, which may or may not include civil-society organizations. Once approved by the corresponding agencies, these can be implemented by the State through its executive institutions, or else be delegated

[2] See Andrade (2009b).
[3] See the mission of sename in www.sename.cl.

TABLE 1

Interaction in a public policy

Stage	Forms of civil-society participation
1. Diagnostic study	- Identification of basic needs in the policy domain. - Generation of possible solutions to society demands.
2. Programming	- Prioritization of needs and deficits in the policy domain.
3. Implementation and execution	- Contribution of services, activities and resources to manage the policy. - Execution of the policy.
4. Evaluation	- Control of efficiency, effectiveness and transparency in resource use. - Critique of outcomes.

Source: Prepared by the authors on the basis of M. Ferrer, P. Monje and R. Urzúa, *El rol de las ONGs en la reducción de la pobreza en América Latina*, Paris, United Nations Educational, Scientific and Cutural Organization (UNESCO), 2005.

for implementation by civil society organizations (Ferrer, Monje and Urzúa, 2005, pp. 10 and 11).[4]

From the work of these authors, one can therefore conclude that there would be a specific space for the private sector in the productive cycle of public policies, which would mainly be centred on implementation and execution.

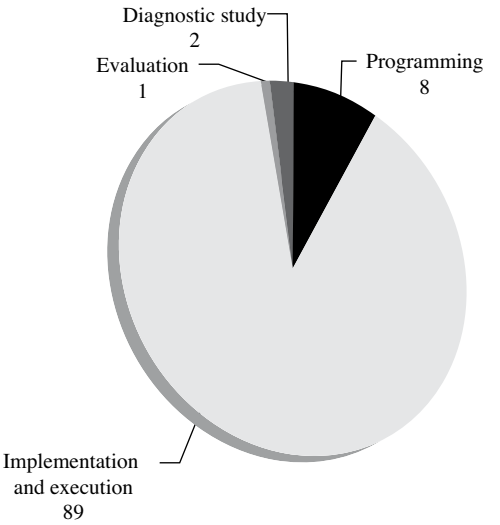
A comparison of the findings of Ferrer, Monje and Urzúa (2005) with a study undertaken by six third-sector organizations in Chile which considers civil-society participation in various public domains, produces interesting information on the most frequent lines of action of social organizations working with children.

Collating the lines of action reported by 108 organizations that serve children with the stages of a public policy, shows that public-private interaction occurs almost a 90% of the time in the policy implementation and execution phase.

This is an important piece of data because it highlights one of the key principles of public-private interaction on childhood policies in Chile.

FIGURE 1

Lines of action/moments of public policy
(Percentages)



Source: Prepared by the authors on the basis of the sample used in FLACSO-Chile/Instituto Libertad y Desarrollo/Asociación Chilena de Organizaciones No Gubernamentales/Corporación Participa/Fundación para la Superación de la Pobreza/Fundación Ideas, *Más voces para la democracia. Los desafíos de la sociedad Civil*, Santiago, Chile, 2004; and M. Ferrer, P. Monje and R. Urzúa, *El rol de las ONGs en la reducción de la pobreza en América Latina*, Paris, United Nations Educational, Scientific and Cutural Organization (UNESCO), 2005.

[4] The authors allude to the idea of NGOs, which in this article are included among civil-society organizations.

IV

Dimensions and components of the interaction between State and civil society

1. Dimensions

The dimensions of the public-private interaction on childhood policies can be grouped as follows:[5]

(a) *Institutional*

The institutional dimension can be understood through the contributions made by North (1993), who argued that institutions are the "humanly devised constraints that structure human interaction" (North, 1993, p. 13). This author recognizes formal and informal institutions; the former include all rules created by human beings, while the latter are those that do not contain in formal instruments, but define codes and dynamics of conduct (North, 1993). He argues that "institutions can be created as if they are political constitutions of States; or else simply evolve through time, as common law evolves" (North, 1993, p. 14).

This approach to childhood policies reveals the institutional change that consolidated after 1989 with the Convention on the Rights of the Child. This not only crystallizes a reference body of doctrine that is

[5] It is assumed that these dimensions are not the only domains of approximation. Nonetheless, to facilitate the analysis, the authors have tried to capture, in these three, the variables mixed up in the interaction in the childhood domain.

binding on States that ratify the Convention, but also serves as a basis for designing and adapting regulatory and legal instruments to guide —and limit— actions undertaken on behalf of children, steering interactions between the State and civil society in this public-policy domain. Following North (1993), the present article views the "institutional dimension" firstly as the framework within which the public-private interaction is generated. It is rooted in the Convention, and encompasses the entire set of formal instruments, both legal and normative, such as laws and public policies that guide actions on behalf of children. Secondly, informal institutions are understood as codes of conduct that promote or limit the "public-private" dialogue on childhood policies.

(b) *Financial*

This dimension will be understood as the instruments through which the State makes transfers to fund targeted childhood policies which are implemented by civil society (Andrade, 2009a).

(c) *Organizational*

To understand this dimension, it is instructive to use the concept of "interface" introduced by De la Maza (2004), which sees the link generated between the initiatives of State action and those of civil society as a combination between different rationales, that produces specific outcomes, depending on the distribution of power resources of the actors that form mutual links" (De la Maza, 2004, p. 108).

This dimension will thus refer to the different capacities that civil society possesses, compared to those of State, and which it puts at the service of childhood policies.

2. Components

Both the specialized literature and expert opinion highlight several components contained in the dimensions of the interaction between State and civil society, which, while not the only elements of the link, have nonetheless been highlighted as the most relevant in relation to children. These are discussed below:

(a) *Institutional dimension - components*

— *Rights Protection Law*

This component refers to a law protecting the rights of the child, which firstly frames and gives orientation to institutional changes on public policies; and, secondly, generates the institutional scenario for the public-private interaction within the rights framework. A draft law on the protection of childhood and adolescent rights has been unable to pass the second constitutional stage in the Senate since 19 January 2005, and is currently classified as "non-urgent".[6]

— *Effective articulation of universal policies*

This component implies universal policies such as education or health that are effectively articulated, so as to strengthen their preventive action in relation to specific rights-violation episodes.

(b) *Financial dimension - components*

— *Subsidies*

This component refers to the transfer modality that SENAME operates in Chile, involving a monthly transfer for each child attended by a SENAME-collaborating organization. The subsidy is accessed by applying through a competitive process (Art. 25, Law No. 20.032, 2005).[7]

— *Contestable funds*

This component refers to a State transfer distinct from the SENAME subsidy. It is paid as a fixed sum to execute a project awarded by public tender. All accredited organizations may apply to receive State funds.

— *Mixed-operations fund*

This component involves a differentiated and progressive State transfer modality. Initially, it would be assigned by public competition for new (not previously trialled) initiatives to provide services to children.

In the second stage, following the accreditation of results, the transfer would be received without the need to compete for the funds, by establishing a cooperation agreement lasting a fixed period, renewable according to the results accreditation.

(c) *Organizational dimension - components*

— *Identity*

This is understood as the set of elements that constitute the differentiated identity of civil society. It includes own capacity to innovate in terms of working methods: for example by making the most of the "informal" or community approach.

[6] It was still in the same situation as of 31 May 2009,.

[7] The aforementioned law establishes the subsidy system for all civil-society organizations that work with SENAME in Chile.

— *Organizational capacity*
This component brings together the good management and administration practices that strengthen civil society in organizational terms. It involves human-resource training in the private domain, development of management systems, and all elements that help strengthen the non-government domain.
— *Interlocution spaces*
These encompass the public-private dialogue mechanisms that legitimize and empower knowledge of the intervention in the private domain, strengthening the organizational capacities of civil society, facilitating policy design and implementation, public-private articulation and coordination, and the retrieval of "know-how" as regards working in the childhood domain both from the State and from civil society.

3. Subcomponents of the organizational dimension

Experts have identified potential strategies (known as subcomponents) from the components of this dimension, to be developed by the State to strengthen the differentiated capacities of civil society. These are framed by the organizational components of the interaction.

(a) *Subcomponents of the identity factor*
— *Minimum "plus" of innovation*
This subcomponents refers to how the State could generate formalized institutional strategies that seek a guaranteed minimum in the results of the intervention for the programmes executed under public-sector interaction rationales, allowing a margin to work with innovative methodologies recognized and empowered through increases in the State transfers.
— *New public policy intervention strategies*
This subcomponent relates to how the State can generate mechanisms in a targeted childhood policy that formally allow for the possibility of developing intervention strategies other than those defined by the public apparatus, and these can also gain access to State transfers.

(b) *Subcomponents of the organizational capacity factor*
— *Civil society management improvement plans*
This subcomponent relates to the strategies the State can develop to strengthen management in the civil society organizations with which it implements targeted childhood policies. It encompasses formal training plans for human resources in private organizations, support for the establishment of management models and monitoring of intervention, among others.
— *Knowledge transfer by assigning a score to the "joint application"*
This subcomponent aims to generate a State system that favours and empowers joint applications between civil society organizations to implement childhood policies and programmes. This would generate positive externalities by strengthening inter-organizational links between childhood institutions, promoting knowledge transfer through the exchange of successful intervention methodologies, and helping to consolidate the identity sphere of private organizations working on childhood issues.

(c) *Subcomponents of the interlocution spaces factor*
— *"Counterpart" organizational figure*
This subcomponent invokes the concept of an organizational figure established within the public agency that implements childhood policies under rationales of interaction with civil society, promoting dialogue on public policies, highlighting the "know-how" of private organizations, and setting guidelines and strategies for support by the public agency who transfer the implementing childhood policy to a civil-society organization. This subcomponent is established and redefines the tasks of the State, assigning it active roles in terms of training, technical assistance, systemization of the intervention and the retrieving of good practices, among other things.
— *Spaces for thematic encounters on public policies*
This component involves the idea of generating meeting spaces between organizations that work on childhood programmes, to promote the exchange of good practices and retrieve joint lessons on services for children, among other things. Unlike the "counterpart" organizational figure, this subcomponent is not seen as an entity established within the public agency that convenes civil society to implement policy in an interaction framework, but instead reflects the

willingness of the public authorities to generate these meetings, but not necessarily established as a formal practice.

4. Hierarchical structure

The dimensions, components and subcomponents, recognized firstly by the literature and secondly by the experts consulted, are brought together in figure 2, which shows the hierarchical structure validated as representative of elements that would promote public-private interaction, putting the best interests of the child at the fore.

Table 2 shows the experts' priorities, for each element of the interaction and which, in their opinion, would aim at putting the best interests of the child first, in the context of public-private interaction. The percentage importance attached to each of these in the framework of their "parent dimensions" is shown in figure 2.

TABLE 2

Global priorities (GP) and local priorities (LP) on the basis of the AHP methodology[a]

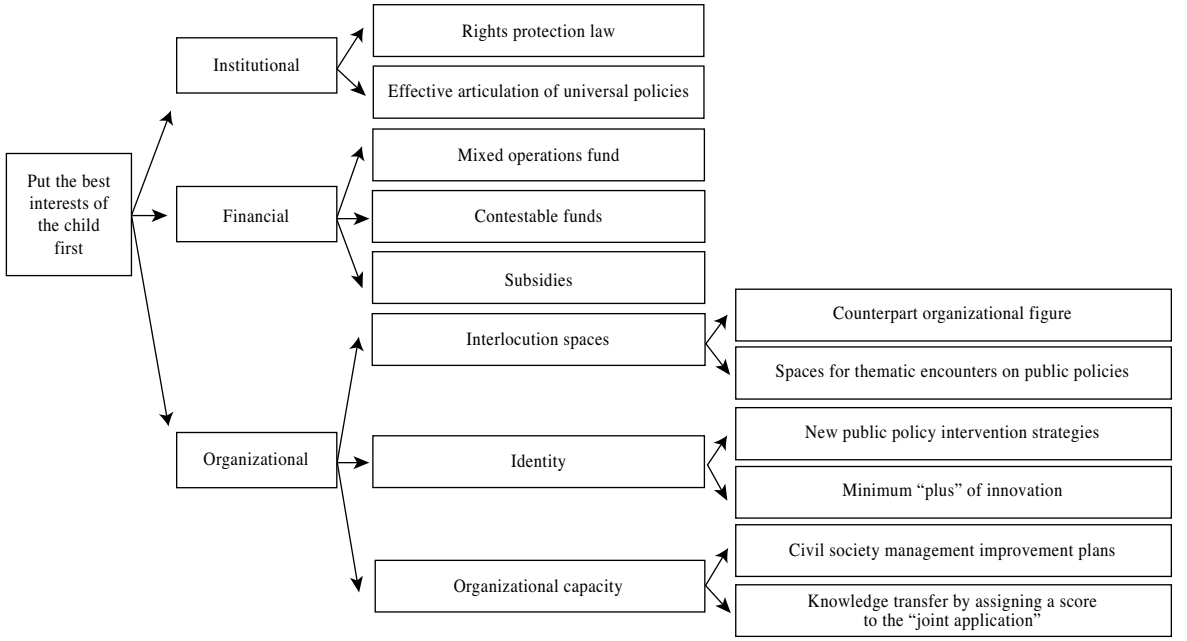
Dimensions	Component	Sub-component
Institutional GP: 0.55 LP: 0.55	Rights protection law GP: 0.38 LP: 0.68 Effective articulation of universal policies GP: 0.18 LP: 0.32	
Financial GP: 0.27 LP: 0.27	Mixed-operations fund GP: 0.18 LP: 0.65 Contestable funds GP: 0.05 LP: 0.19 Subsidies GP: 0.04 LP: 0.16	
	Interlocution spaces GP: 0.09 LP: 0.52	Counterpart organizational figure GP: 0.08 LP: 0.81 Spaces for thematic encounters on public policies GP: 0.02 LP: 0.19
Organizational GP: 0.18 LP: 0.18	Identity GP: 0.05 LP: 0.26	New public policy intervention strategies GP: 0.03 LP: 0.65 Minimum "plus" of innovation GP: 0.02 LP: 0.35
	Organizational capacity GP: 0.04 LP: 0.21	Civil society management improvement plans GP: 0.02 LP: 0.63 Knowledge transfer by assigning a score to the "joint application" GP: 0.01 LP: 0.37

Source: Prepared by the authors.

[a] The unit of measurement is "priorities", expressed in terms of proportions.

FIGURE 2

Hierarchical structure: Elements of the interaction validated by experts



Source: Prepared by the authors.

V

Observations on the public-private interaction in childhood

In the institutional domain, the public-private interaction in Chile occurs in a context of progressive administrative adjustment in which the country has been adapting its legal and regulatory instruments to postulates of the Convention. Nonetheless, a formal institutional deficit remains, since a law protecting rights that relates to the doctrinal framework promoted by the Convention has not yet been passed. This dimension is seen by the experts consulted as the most important area in which the interaction between State and civil society occurs, attaining a 55% priority (see table 2).

With regard to the protection of rights and the notion of co-responsibility, it can be seen that to fulfil the task of protecting and restoring children's rights, it is crucial in the institutional domain to activate and implement this protection law, which relates to the institutional framework promoted by the Convention (priority almost 70%), over and above the component of effective articulation of universal policies (just over 30% priority). At the same time, expert opinions on the idea of co-responsibility show that this involves recognizing shared responsibilities among all social actors in the task of protecting or restoring —as the case may be— the rights of children.[8]

[8] All experts reported that the notion of co-responsibility means that each actor becomes responsible for safeguarding the rights of the child population.

In terms of the characteristics of the interaction, the encounter occurs particularly in the stage of implementation and execution of childhood policies (see figure 1), where the State would be the key actor at the time of design.

With regard to the contributions to the policies made by each domain: firstly, civil society possesses the "know-how" of the intervention, capitalized over centuries since it started to take responsibility for children's needs; a second contribution is its capacity to innovate because it is a more malleable and permeable domain than State, which tends to be more bureaucratic and hierarchical. This enables it to serve as a laboratory for new methodologies in working with the child population. Another contribution would be the fact that it is embedded in localities, which enables it to develop a supply of rights-based services constructed on the basis of close proximity with the subject themselves, namely children.[9] A final contribution is its capacity to promote public policies (legislative or otherwise) on childhood for the State based on what is observed on the ground. The State contribution would mainly involve the definition of guidelines for work on childhood issues; and, secondly, the development of management systems that make it possible to transfer economic resources to civil society to implement and execute the policies.[10]

In the financial domain, there is a need to review how the financing system conditions the way the State and civil society collaborate to address childhood policies. At the macro level, the State defines policies in top-down fashion, involving private actors in the consultation only when the authority recognizes added value in this practice for designing lines of action.[11] The financing system today consists of a public domain that administers resources and delivers them, under contestable tenders, to private entities that execute the policy. According to the consultations made, this means that civil society has few channels for criticizing and commenting on the public policies, which situation may be due to the fact that its very survival depends largely on obtaining these public resources.[12] This is significant in that it probably also affects the supervision of childhood policies "…The suitability of the different mechanisms for monitoring public policies and ensuring that these respect rights depends not only on their institutional characteristics, but also on their appropriation by social organizations and the existence in civil society of actors with the desire and resources to use them." (Abramovich, 2006, p. 47).

Relating this idea to the fact that the financing system would condition the State's response capacity in terms of services for children, makes it possible to envisage a system which, while protecting public resources, firstly ensures the survival of the private sphere; secondly, generates conditions for a critical-constructive horizontal dialogue between the two spheres; and thirdly, delivers institutional resources to enable civil society to play an active role in supervising the public policies developed to serve children.

According to Andrade (2009a), only a small proportion of funding from private organizations comes from private firms or international cooperation, which would put those that depend least on public funding in a better position to criticize and respond to the State-defined actions on childhood issues.[13] At the same time, the financing mode generates negative externalities such as keeping successful methodologies confidential when they could be shared for work on childhood issues.[14] The recognized advantage of the tenders modality is that the private sphere would be permanently improve its intervention product to reapply and again obtain support from a specific fund. In short, there is a clear need to create a new alternative within the system in the form of a mixed-operations fund that creates new forms of financing for policies, without diminishing the private sphere's capacity to criticize the work done on childhood issues (see table 2).

At the organization level, a need felt by experts consists of strengthening dialogue spaces through an organizational "counterpart" figure, formally set up within any public organization that implements

[9] On this point there is agreement between the representatives of academia and the United Nations Children's Fund (UNICEF).

[10] Responses from experts from the public and private spheres.

[11] There is consensus among all actors consulted that it is the State that defines childhood policies.

[12] State and UNICEF experts agree that the capacity to criticize is mediated by resource independency.

[13] Andrade (2009a), shows that in 2004 are only 9.5% of the financing of child and organizations came from the private sector; 25% was provided by international cooperation, while State funding accounted for nearly 50%. The remainder corresponded to self-management resources. These values are averages.

[14] According to a State representative, is impossible to ask a private organization that competes with other organizations for public funds its operation, to also share its working methodologies with them.

childhood policies in conjunction with the private sector (see table 2).[15] In this regard, it is necessary to redefine the roles of the State in providing technical support for the intervention and retrieving knowledge held in the private domain.[16]

In this domain, it is also important to strengthen the identity-component of civil society, to perpetuate those specific characteristics that differentiate it from the State: lower levels of bureaucracy and hierarchy; greater sensitivity to the problems to be addressed, owing to its closer proximity to the population; innovation in ways of working through methodologies that are different from those used by the State: for example the incorporation of community or informal approaches to intervene in education, among other things. For that purpose, the public domain could generate financing instruments that would make it possible to flexibly incorporate new intervention strategies in public policies on childhood, that are different from and complement those defined by the State.[17]

Lastly, the organizational-capacities component is seen as relevant at the time of generating an interaction which, in the "interface" rationale, generates positive impacts on childhood policies. According to State representatives, promoting lines of action from the public domain to improve management capacities in the civil-society organizations with which it implements the policies, should be a formally defined and institutionalized strategy.[18] Such would be the case, for example, of SENAME, because in December 2007 just 2.4% of the child population served was attended through its own organization, while the remaining 98% was attended by civil society organizations (Andrade, 2009b). This is supported by the following data: the development of plans to improve civil society management is rated a 63% priority by the experts consulted (see table 2), compared to the 37% priority given to the knowledge-transfer component through joint application for the various contestable funds put out to tender by the State to provide services to the child population.

VI

Conclusions

In Chile, nearly 20 years after the ratification of the Convention on the Rights of the Child, collaboration between State and civil society to address targeted childhood policies occurs vertically, where the public domain mainly defines the policies to be implemented to meet the needs of the most vulnerable children, leaving private organizations to apply and execute them.

The top-down nature of this relationship is largely explained by the system for financing private organizations to execute the policies, a high percentage of which comes from funds managed by the public sector, thus producing negative externalities in dealing with the State and also between the organizations that implement public childhood policies. In the public-private interaction, these externalities undermine the capacity for criticism that the civil domain could exert with regard to State actions on behalf of children, largely because the civil society organizations depend on these public funds for their survival. Negative externalities also occur within the private domain as a result of competition dynamics whereby public funds are transferred for the implementation and execution of childhood policies.

Competition between private organizations to gain access to funding would generally mean that successful methodologies are kept confidential, when they could be adopted by other organizations to

[15] 81% priority, compared to 19% for spaces for thematic encounters.

[16] The State experts consulted agree that the support of public apparatus is based on financial topics owing to the sensation of "less knowledge" of work in childhood issues, compared to the expertise possessed by civil society.

[17] According to the consultation, the incorporation of new intervention strategies into public policy is of 65% importance as a gravitating factor to maintain the differentiated identity of civil society.

[18] A State expert declared that if there is an organization that serves over 90% of its users through civil society organizations, this should then have a policy and management model defined with regard to work with private agencies..

improve their strategies for providing services to the most vulnerable children. The challenge thus arises of devising a financing system that would make it possible to create conditions for horizontal and constructive critical dialogue on childhood policies —but without undermining civil society's capacity to criticize and supervise State actions for children. While safeguarding public funds, this would make it possible to establish dialogue both within civil society and between it and the State, for the common purpose of putting the best interests of the child before economic resources.

Nonetheless, this requires institutional conditions that are adapted to the postulates of the Convention; and the Chilean State has made significant progress on this, for example, by setting up the *Chile Crece Contigo* early childhood protection system, or through institutional and legal adaptation, passing laws creating the family courts and adolescent criminal responsibility, among other things. Nonetheless, a law still needs to be passed to protect childhood and adolescent rights consistently with the doctrine promoted by the Convention.

In this regard, the Chilean State has a crucial weakness which manifests itself through two channels: firstly, by having to be accountable outside every five years to the United Nations Committee on the Rights of the Child for the specific measures implemented to apply the rights recognized in the Convention (Article 44); and secondly because there is currently no inward-looking legal and formal instrument that makes it possible to demand these rights be upheld.

Strategies to improve the public-private interaction necessarily require a new institutional order of a formal and informal type as the initial condition. At the formal level, the adjustment of legal and public policy instruments to the postulates of the Convention needs to be consolidated. This could be done specifically, for example, by implementing a rights protection law that is consistent with its postulates and guides the spirit of every State measure implemented on behalf of children. Such a law should incorporate mechanisms that require dialogue, so that the public-private approximation is not conditioned merely by the legitimacy that public authorities decide to give to it, but should be a safeguarded and guaranteed practice in rights-based childhood policies.

At the informal level, at least two factors are essential: (i) reconciliation of the wills of political actors, making the benefits of this new institutional order for children visible; (ii) an empowered civil society that actively promotes adjustment to this new institutional order. With this as the initial condition, the challenge is to again identify how the two spheres fulfil their task on behalf of children: on the one hand, the State, giving a new meaning and protagonist role to modes of relating with civil society, stressing tasks such as the retrieval and dissemination of good practices in service, technical support for the intervention and, lastly, the generation of interlocution spaces to jointly discuss and construct childhood policies; on the other hand, a civil society with strengthened organizational capacities, which fully exercises its role as co-responsible for childhood, owing to its proximity and the acquired knowledge regarding the intervention. Until these institutional conditions achieve full development that enables each domain to actively and fully exercise its role on behalf of children, interaction will be vertical rather than total co-responsibility in relation to the child population.

Consequently, achieving this full institutional development means having a civil society that has moved from being essentially a policy executor, to positioning itself as a relevant player in constructing, participating in dialogue and debate on the design, supervising State actions and, ultimately, participating actively in the evaluation of each initiative developed, whether by State or by civil society, with a view to improving living conditions for the most vulnerable children.

ANNEX

Method of analysis

The following section describes the method used to process the information. It sets out both the methodologies and the stages in which this article was produced.

1. Expert opinion from the analysis of content and its integration with quantitative instruments: Analytical hierarchical process (AHP)

The methodological approach to the research questions combined qualitative and quantitative tools, integrating a multi-criterion methodology known as the analytical hierarchy process (AHP) into the analysis of content in the discourse of experts on childhood quantitative tools. The methodological work began using the analysis of content, as this involved technical interpretation of data: transcription of interviews, speeches and other items, making it possible to ascertain certain aspects and phenomena of social life (Andreu Ávela, 2003). When this analysis was integrated with quantitative tools using a multi-criterion methodology, it was possible to visualize the main characteristics of the public-private interaction with regard to vulnerable children, and to sustain public policy proposals to improve this articulation, putting the best interests of the child at the fore.

Data collection and processing was done in four stages: The first consisted of a review of bibliographic sources on social policy, childhood programmes, and the interaction between the public and private domains. Then information in databases made available by the Fundación para la Superación de la Pobreza (Foundation for Overcoming Poverty) and SENAME were systemized and analyzed. This review and systemization made it possible to generate background information for the research and to identify the main dimensions of the public-private interaction on childhood issues: the institutional, financial and organizational dimensions; and secondly, the main components of each case in the light of the review of specialized documents and literature. This identification also made it possible to define the key questions that guided the field work.

The second, qualitative, stage made it possible to identify the general characteristics of the interaction on childhood issues. For that purpose, a group of experts was interviewed from the State, civil society, academia and UNICEF. The sampling method used to select the expert group was non-probabilistic, using "criterion sampling", based on the criterion or opinion of the researcher with the aim of selecting representative sampling units for the purpose of the research (Fernández, 2004).

The key questions that guided the field at the institutional dimension level were: "Is the institutional setup adequate for establishing the public-private interaction within a rights framework?" At the financial level: "Does the financing modality favour the interaction on childhood issues?" In the organizational domain: "What are the main weaknesses and strengths in the public-private approximation process?" And lastly, at the level of prioritizing dimensions and components: "What elements need to be strengthened or generated from the State to improve the public-private interaction, putting the best interests of the child in first place?"

The third stage incorporated the AHP methodology, which made it possible to bring together the dimensions and components identified in the previous stages in a hierarchical structure that was validated as representative; and through its application priorities were assigned to each of its elements, to promote the State-civil society interaction on childhood issues.[19]

Lastly, the main reflections and conclusions of the article have been highlighted and public policy recommendations developed aimed at putting the best interests of the child in first place.

2. Integration of AHP with qualitative tools

Any decision process necessarily entails comparing alternatives, which requires measurements to make it possible to apply comparison criteria and establish preferences between them.

What needs to be done is to measure how much more preferable a given alternative is (in this article, components or dimensions) compared to another one. For this purpose, a common evaluation scale is needed —a scale of priorities— which makes it possible to characterize the elements under the same comparison standard and thus establish relations of preference and intensity between them (Saaty, 1997).

[19] What in this article is referred to as "dimension", in the AHP methodology is seen as a "criterion". A similar situation occurs with the "components" in this article, which in AHP are seen as "sub-criteria". See Saaty (1997).

In general terms, AHP is a method for decomposing complex structures into their components, ordering them in a rankable structure, which AHP refers to as the "hierarchical structure". This methodology also makes it possible to assign numerical values to subjective judgments on the relative importance of each one, and finally synthesizes them to determine which of them has the highest priority (Saaty, 1997).

To identify the best decision, the AHP method needs to define a general objective for the decision process in conjunction with the stakeholders involved, who must be carefully chosen because the representativeness of the models results depends on them.

The problem is organized in a structure that involves all elements of interest (in this article: dimensions, components and subcomponents), to rank the alternatives if there are any.

To build the structure, the following axioms of the methodology need to be taken into account:

Axiom 1: Reciprocity

Given two alternatives A_i and A_j, the intensity of preference for A_i over A_j is inverse to the intensity of preference for A_j over A_i.

Axiom 2: Homogeneity

Homogeneity refers to the fact that the elements to be compared need to be of a similar order of magnitude (to compare elements according to a given criteria a limited scale needs to be available).

Axiom 3: Dependency

This relates to the need to control dependency between the elements of two consecutive levels (external dependency and, within the same level, internal dependency). A hierarchical structure is characterized by the fact that its elements have unidirectional external dependency. In other words: Children depend on their parents and there is no relation between them.

Axiom 4: Expectations

The hierarchical structure is a model that represents all criteria and alternatives, fulfilling the expectations of experts consulted in the process. This axiom relates to the need to aggregate or eliminate alternatives to faithfully represent the perception of the participants in the decision-making process.

Once the hierarchical structure has been built, the process continues by calculating priorities for each of its constituent elements. This is done by comparing pairs of elements with respect to the element immediately above it in the structure, forming matrices using the Saaty scale to enter the judgments of experts relating to the intensity of preference for one element over another, and then make a synthesis to obtain a vector of priorities or the relative importance —or weights— of elements, in addition to the index of consistency to determine the consistency of the judgments.

In calculating the priorities for each level of the hierarchical structure, it should be remembered that there are local and global priorities. The former stem from opinions regarding a single element, obtained in the vector of priorities. The sum of these priorities is 1, if expressed as a proportion, and 100% if expressed as a percentage. An element's global priority is calculated by multiplying its local priority by the global priority of the element immediately above. In other words, global priorities show how an element distributes its weight over the elements that stem from it in the structure.

Subsequently, the judgments are analyzed on an integrated basis by applying geometric means.

This procedure not only makes it possible to assign weights to the different elements of the structure, but also to select, evaluate and prioritize alternatives for projects, actions and products. Methodologically, this article has used part of the tool to structure the dimensions and relevant components of the interaction, to assign the priorities based on exact sciences.

This methodology was chosen, firstly because of the scant information available in databases that record this public-private relation and its effects on childhood issues; and secondly, with the aim of extracting a consistent decision from experts, to rank components and dimensions making it possible to put a best interests of the child in first place.

(Original: Spanish)

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KEYWORDS

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Brazilian municipalities: agglomeration economies and development levels in 1997 and 2007

Eva Yamila da Silva Catela, Flávio Gonçalves and Gabriel Porcile

This article sets out to analyse the relation between agglomeration economies —both the Marshall-Arrow-Romer type (economies of specialization) and the Jacobs-Porter type (economies of diversification)— and the unequal development of Brazilian municipalities as estimated by labour productivity (measured by the average wage). To that end, measures of specialization were constructed for 1997 and 2007, and the data were used to test the relation between the industrial specialization and diversification indices and productivity, using finite-mixture regressions to capture the heterogeneity of the data. The results confirm the duality existing between the north-northeast and south-southeast-centre-west regions of Brazil, which has been widely documented in other research. Nonetheless, this duality needs to be analysed further, because some cities do not reflect the general dynamic of their region.

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I
Introduction

Up to 80% of Brazil's population live in city areas which account for 90% of the country's gross domestic product (GDP) (Da Mata and others, 2007). This concentration of production is very heterogeneous, however, both from the spatial standpoint (in the country, between regions and within states) and with respect to the growth dynamic.

According to the theory of urban systems (Henderson, 1974; Dixit and Stiglitz, 1977; Rivera-Batiz, 1988; Abdel-Rahman and Fujita, 1990; Krugman (1991; Anas and Xiong, 2003), a city can be viewed as the static or dynamic result of a balance between two forces: an agglomeration force, which benefits individuals and firms located close to one another; and a dispersion force, which generates costs from this proximity. The first of these tendencies provides a rationale for the existence of cities, whereas the second limits their size. The optimal city size is the result of the tension that exists between location economies, which act as an amalgamating force, and urban density, which tends to disperse the population.

The literature distinguishes two types of agglomeration that produce positive externalities for the existence of cities: external economies of location, or Marshall-Arrow-Romer externalities (Abdel-Rahman and Anas, 2004), which arise from knowledge transfers within an industry or between complementary ones; and urbanization or Jacobs-Porter externalities, generated by the transfer of knowledge between industries. These models stress the importance of diversity for improving productivity and economic efficiency, and suggest that a country's growth is enhanced by the heterogeneity of its cities. Empirical tests show that efficiency gains are significant (Quigley, 1998).

This article aims to describe some of the characteristics of the process of specialization and diversification in manufacturing industry in Brazil's urban municipalities. To that end, measures of specialization and diversification were constructed, and the selected municipalities were classified in homogeneous groups in terms of their industrialization type. The data were used to empirically test the relation between city productivity (measured by the average wage of its workers) and industrial specialization and diversification economies in the years 1997 and 2007. This analysis makes it possible to identify municipalities which display a similar development pattern, despite belonging to different states, regions or micro-regions.[1, 2] The identification process uses the clusters model, which makes it possible to group homogeneous observations within a heterogeneous dataset. In addition to performing this grouping, finite mixture regressions were estimated. The methodology makes it possible to estimate regressions for differentiated groups, taking explicit account of heterogeneity explicit through discontinuities in the observed relations.

This article is divided into seven sections, including the introduction. Section II considers the theoretical underpinnings of agglomeration economies and their influence on worker productivity, and also refers to a number of empirical tests. Section III presents and describes the data, while section IV establishes the diversification and specialization measures used and briefly characterizes Brazil's urban municipalities in terms of these measures. Section V presents a k-means clustering analysis, and section VI sets out the econometric results of the finite-mixture regression model. Section VII provides conclusions and final comments.

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[1] Brazil is geographically divided into five regions, as defined in 1969 by the Brazilian Institute of Geography and Statistics (IBGE), namely: (i) the centre-west (consisting of the states of Goiás, Mato Grosso, Mato Grosso do Sul and the federal district); (ii) the northeast (Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia); (iii) the north (Acre, Amazonas, Roraima, Rondônia, Pará, Amapá, Tocantins); (iv) the southeast (Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo) and; (v) the south (Paraná, Santa Catarina, Rio Grande do Sul).

[2] Micro-regions are areas that group together municipalities with relatively homogeneous physical, social and economic characteristics, within a given state.

II

Agglomeration externalities, city heterogeneity and economic growth

How do agglomeration economies and a city's size influence productivity, the level of output, and the well-being of its citizens? This section firstly describes the various dimensions of agglomeration economies, to show how they affect the productivity and economic growth of a city.

Rosenthal and Strange (2004) identify three dimensions of agglomeration: geographic, temporal and industrial. The geographic dimension refers to the existence of agglomeration externalities associated with distance. The literature establishes that the geographic scope of location economies is limited —as distance increases, agglomeration economies fade, as confirmed by Henderson (2003 and Rosenthal and Strange (2003). These authors make an analysis of the geographic scope of agglomeration economies, in which a firm's environment is defined by constructing concentric rings according to the postal code of the city in which the firm is located. Some authors specializing in geographical economics argue that space-limited positive externalities may affect the growth of the economy at large. Thus, the spatial distribution of the economy would have a considerable effect on economic activity and the growth of the economy as a whole (Baldwin and Martin, 2004).

The temporal dimension provides a framework for analyzing how an industry's past affects its current growth. The key issue is whether agglomeration economies are dynamic or static. The dynamic effect relates to knowledge spillovers, since knowledge accumulation takes time, and workers' skills increase as time passes. Thus, the temporal scope of the agglomeration can be seen as a historical component. Cities with higher levels of specialization are likely to grow more slowly, which would show that economies of urbanization promote their growth. Henderson, Kuncoro and Turner (1995) argue that a city's characteristics may affect its growth over a period of 20 years or longer. This effect may be direct, or else it may be indirect, through an accumulation of short-run direct effects.

The industrial dimension shows that productive clusters generate increasing returns in a city's industry. What are the nature and sources of the increasing returns produced by these clusters? Marshall (1920) suggests three sources: (i) increases of scale within the firm as production expands; (ii) a parallel labour-market cluster which improves the search for workers with the skills that firms need (integrated labour markets); and (iii) the existence of knowledge spillovers within industries, which generate knowledge externalities for both workers and firms. Other sources recently suggested include local-market effects.

In the first of these sources, economies of scale, or indivisibilities within the firm, encapsulate the basic rationale for the existence of cities: if there were no economies of scale in production, it would be better for economic activities to be dispersed to avoid transport costs. The second factor relates to the sharing of productive inputs. Krugman (1993) explains how the easy availability of specialized workers in metropolitan areas can lower firms' costs. A third reason for the greater economic efficiency of larger cities is their lower transaction costs. From the production standpoint, lower costs stem from a closer matching between workers skills and job requirements, which reduces search costs for workers with differentiated skills and firms with differentiated labour demand. Lower transaction costs in the larger cities also include lower search costs for consumers as a result of retail trade clustering.

The industrial dimension can thus be classified in terms of economies of specialization (agglomeration within individual industrial sectors) and economies of diversification (the clustering of different industrial sectors). In the first case, the agglomeration generates Marshall-Arrow-Romer type externalities, or economies of specialization. Firms benefit from a clustered labour market, which would minimize transaction and communication costs for firms in the same industry. In the second case, the agglomeration of different industrial sectors generates diversity, which also encourages the fertilization of new ideas. The notion that industrial diversity directly contributes to agglomeration economies stems from Jacobs (1969), which are known as Jacobs-Porter type externalities, or economies of diversification.

The effects of agglomeration economies on productivity and economic growth have been the

subject of several empirical studies. Henderson (1986), for example, considers the relative effects of specialization and diversification on productivity in the United States and Brazil, measuring diversification by total employment in the city, and specialization by employment in a specific industry. The results provide considerable evidence of economies of specialization but no evidence at all of diversification economies. In an analysis of the geographic scope of agglomeration economies, Rosenthal and Strange (2003) also find strong evidence for specialization.

By studying the degree of employment specialization in the cities, measured as the share of employment in a specific industry, Henderson, Kuncoro and Turner (1995) analyse the effects of specialization on the growth of eight industries, of which five were classified as mature and three as high-tech. While in the latter group specialization did not have a positive effect on growth, there was an observable positive effect in the mature group.

These authors also analyse the importance of diversity for growth and, in this case, found a positive effect for high-tech industries. Rosenthal and Strange (2003) use a diversity measure based on a Herfindahl-Hirschman index (HHI), which finds that diversity affects the emergence of new enterprises. Wheaton and Lewis (2002) identify a wage premium in relatively more specialized cities and a higher concentration of labour in a given industry. This result reflects the fact that labour displays strong location economies and the existence of sharp increases in specialization.

Galinari and others (2007) investigate the presence of agglomeration economies in urban settings in Brazil, and how these affect the country's urban-industrial wages. They find that these were not sufficient to mitigate wage heterogeneity between Brazil's different regions, despite the far-reaching institutional changes introduced in the 1990s. Higher levels of human capital and industrial concentration had positive and significant effects in explaining the wage level, whereas specialization had a negative and also significant effect. The latter result is treated with caution by the authors, because, in the case of Brazil, a high level of specialization cannot be seen as indicating the existence of competitive and cooperative structures that would help generate economies of specialization.

The repercussions of agglomeration economies are also reflected in both the size and the heterogeneity of cities, as analysed in the models of Abdel-Rahman (1988) and Fujita (1988). As noted above, economies of scale provide the main rationale for the existence of cities. Nonetheless, the economies obtained from shared production and consumption inputs and lower transaction costs are greater when economic activities are more diverse. A larger city will have a larger variety of consumer goods and production inputs. As greater variety increases utility and output, the larger cities are more productive and the welfare of their inhabitants increases with size. This result is holds true both for monopolistic enterprises and those operating under perfect competition (Quigley, 1998).

III

Description of the data

This work is based on the Annual Social Information Report (*Relação Anual de Informações Sociais*) published by the Ministry of Labour and Employment (RAIS/MTE), which covers the entire country and contains data on the employing establishment and employee, based on formal employment contracts signed in a given base year.[3]

The employment data used relate to the number of jobs in the categories breakdown at the municipal level, by type of economic activity —the two-digit level of the National Classification of Economic Activities (CNAE). Data on average wages were related to minimum wages in the cities in question. Data on the real minimum wage in the years studied were obtained from the Inter-Union Department of Statistics and Socioeconomic Research (DIEESE), whereas data on education describe the number of workers with basic, secondary and higher education as a percentage of all workers in the city.

[3] This section is based on *Identificação, mapeamento e caracterização estrutural de arranjos produtivos locais no Brasil* published by the Institute for Applied Economic Research (IPEA), coordinated by Wilson Suzigan (IPEA, 1996).

The main advantage of the RAIS/MTE database is the high level of sector and geographic breakdown of the data, which makes it possible to obtain and directly process disaggregated data down to the municipal level and in sector terms. It is also highly uniform, which makes it possible to compare the distribution of economic activity sectors through time.

Nonetheless, RAIS/MTE also has some defects. The first of these concerns its coverage, because it only includes formalized contractual relations and thus excludes informal workers, thereby generating a significant bias with respect to the real labour market. A second problem stems from the use of self-classification by the firms themselves in primary data collection, since the collecting institution does not check whether the data reported correspond to reality. Self-classification may have considerable effects in cases of firms with than one plant, whose representatives report the volume of employment in a given productive unit, generally the headquarters, and firms with more than one product that are classified only according to activity corresponding to their main product. The final defect stems from the declaratory nature of the RAIS, which may cause distortions in the analysis of small firms or less developed regions where the number of non-declarants is higher.

This article used RAIS/MTE employment data for 1997 and 2007. The universe of analysis was defined on two different levels, according to the work proposal and characteristics of the RAIS database. From the geographic standpoint, urban municipalities or medium-sized and large cities were used, defined as those with over 50,000 inhabitants in the 2000 IBGE Census. This involves 524 cities from all Brazilian states, representing 64% of the population according to the aforementioned census. Economic activities were classified according to the manufacturing industry sectors at the CNAE/95 two-digit level. These sectors correspond to divisions 15-37, as defined in table 1.

Data on GDP per capita and the distance of the various municipalities from the state capital was obtained from the IPEA regional database (Ipeadata), while population data were obtained from the IBGE.[4]

[4] The data are available online at www.ipeadata.gov.br and http://www.ibge.gov.br/home/estatistica/populacao/.

TABLE 1

Brazil: National Classification of Economic Activities (CNAE), divisions 15-37, 1995

Division 15	Manufacture of food products and beverages
Division 16	Manufacture of tobacco products
Division 17	Manufacture of textile products
Division 18	Manufacture of garments and accessories
Division 19	Preparation of leathers and manufacture of leather artefacts and articles
Division 20	Manufacture of wood products
Division 21	Manufacture of wood pulp, paper and paper products
Division 22	Publishing, printing and reproduction of recordings
Division 23	Manufacture of coal, oil refining, manufacture of fuels
Division 24	Manufacture of chemical products
Division 25	Manufacture of rubber and plastic products
Division 26	Manufacture of non-metallic mineral products
Division 27	Basic metallurgy
Division 28	Manufacture of metal products - except machinery and equipment
Division 29	Manufacture of machinery and equipment
Division 30	Manufacture of office machinery and computer hardware
Division 31	Manufacture of electrical machinery, apparatus and materials
Division 32	Manufacture of electronic material and apparatus and communication equipment
Division 33	Manufacture of instrument equipment for medical-hospital uses
Division 34	Manufacture and assembly of automobiles, tow-trucks and chassis
Division 35	Manufacture of other transport equipment
Division 36	Manufacture of furniture and various industries
Division 37	Recycling

Source: Ministry of Labour and Employment (MTE) of Brazil.

IV

Industrial diversity and specialization in Brazil

An analysis of manufacturing-industry specialization and diversity in the cities requires adequate measurement tools. Authors such as Glaeser and others (1992), and Henderson, Kuncoro and Turner (1995) measure industry scope as the share of employment in a given industry. The simplest way to measure a city's specialization in a given sector is to quantify the share of each sector in local employment. If s_{ij} is the share of industry j in city i, the following specialization index (*IE*) can be defined:

$$IE_i = \max_j \left(s_{ij} \right) \quad (1)$$

As some sectors absorb large percentages of local employment, it is better to use a relative measure of specialization, dividing the local index by the sector's percentage share of national employment. The relative specialization index (*IER*) is:

$$IER_i = \max_j \left(s_{ij} / s_j \right) \quad (2)$$

where s_{ij} the share of industry j in national employment.

A common measure of diversity is the inverse Herfindahl-Hirschman index, which is obtained from the ratio between one and the sum of the squares of the sector's share in local employment. The diversification index (ID) is therefore given as:

$$ID_i = 1 \Big/ \sum_j s_{ij}^2 \quad (3)$$

This measure needs to be corrected for differences in the sector employment shares at the national level:

$$IDR_i = 1 \Big/ \sum_j \left| s_{ij} - s_j \right| \quad (4)$$

The relative diversification index (*IDR*) will be higher when the distribution of activities in the city matches the pattern of diversity in≠ the economy nationwide. Measured in this way, specialization and diversification are not really opposites, and a city may be considered specialized in a given sector but diversified in sector-terms generally.

1. Specialization in Brazilian cities

Table 2 lists the most and least specialized cities in Brazil in 2007. In the case of the least specialized, the highest IER among all sectors is shown. In the case of the most specialized cities, those specializing in sectors that depend on natural resources, such as tobacco, coexist with others specializing in sectors that make intensive use of capital goods such as office machinery and computer hardware, oil and other transport equipment.

Another characteristic of specialization is the geographic location of the most highly specialized municipalities: 53 of the 100 most specialized are located in the north and north-eastern regions of Brazil, which in turn contain 35% of the country's urban municipalities. At the other extreme are cities with low *IER*s, where no sector has an employment share greater than 2.3 times the national percentage for that sector. In the three least specialized cities (in the food products and beverages sector) the degree of specialization is high, but relative specialization is low because the specialization pattern is similar to that of the country as a whole (in the case of Viamão, for example, that sector represents 47% of the city's employment).

2. Diversification

The most and least industrially diversified cities are shown below. Six of the 10 most diversified are state capitals. Of the 25 least diversified cities, 20 belong to the north and northeastern regions. The five least diversified are shown in table 3. Only one of these, Angra dos Reis, which is among the most specialized, is also one of the least diversified. The most diversified cities (Belo Horizonte, Cuiabá, Recife, Salvador and Rio de Janeiro) do not have high specialization indices in any of the sectors considered.

One of the features of diversification highlighted in the literature is its relation to city size (Duranton and Puga, 2000): the largest cities tend to be the most diversified. Figure 1 shows the relationship between city size, measured by total employment, and its relative diversification index (*IDR*), as described above. As also noted in literature, this shows that

TABLE 2

Brazil: Most and least specialized cities, 2007

Position	City	Sector	Relative specialization index (IER)
1	Poá (SP)	Textile products	458.70
2	Santa Cruz do Sul (RS)	Tobacco products	168.65
3	Venâncio Aires (RS)	Tobacco products	94.36
4	Angra dos Reis (RJ)	Other transport equipment	72.30
5	Lagarto (SE)	Tobacco products	71.48
6	Ilhéus (BA)	Office machinery and computer hardware	67.15
7	Vitória de Santo Antão (PE)	Coal, oil refining, manufacture of fuels	47.52
8	Piedade (SP)	Office machinery and computer hardware	43.27
9	Niterói (RJ)	Other transport equipment	40.81
10	Patos (PB)	Tobacco products	37.31
.....	.....	.....	...
521	Catanduva (SP)	Machinery and equipment	2.35
522	Guarulhos (SP)	Rubber and plastic products	2.31
523	Viamão (RS)	Food products and beverages	2.27
524	Rondonópolis (MT)	Food products and beverages	2.18
525	Mossoró (RN)	Food products and beverages	1.96

Source: Prepared by the authors on the basis of *Relatório Anual de Informações Sociais* published by the Ministry of Labour and Employment (RAIS/MTE), 2007.
SP: São Paulo. RS: Rio Grande do Sul. RJ: Rio de Janeiro. SE: Sergipe. BA: Bahia. PE: Pernambuco. PB: Paraíba. MT: Mato Grosso. RN: Rio Grande do Norte.

TABLE 3

Brazil: Most and least diversified cities, 2007

Position	City	Relative diversification index (IDR)
1	Belo Horizonte (MG)	2.31
2	Feira de Santana (BA)	2.25
3	Londrina (PR)	2.16
4	Cuiabá (MT)	2.14
5	Recife (PE)	2.10
6	Salvador (BA)	2.01
7	Cascavel (PR)	1.99
8	Rio de Janeiro (RJ)	1.98
9	Campo Grande (MS)	1.89
10	Ribeirão Preto (SP)	1.84
.....	....	.....
521	Santa Cruz do Capibaribe (PE)	0.61
522	Russas (CE)	0.60
523	Paragominas (PA)	0.58
524	Ipirá (BA)	0.55
525	Angra dos Reis (RJ)	0.55

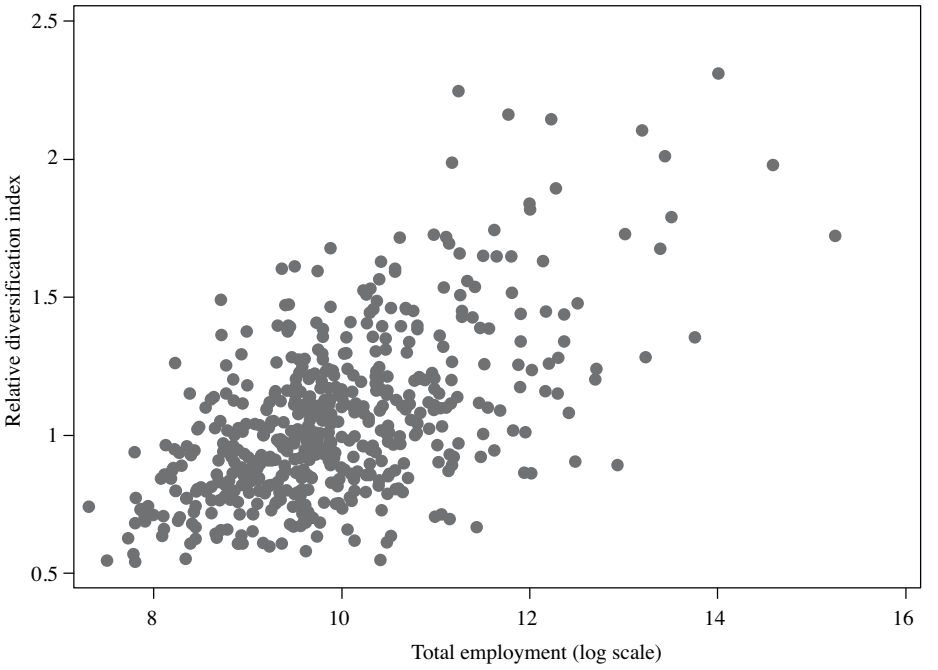
Source: Prepared by the authors on the basis of *Relatório Anual de Informações Sociais* published by the Ministry of Labour and Employment (RAIS/MTE), 2007.
MG: Minas Gerais. BA: Bahia. PR: Paraná. MT: Mato Grosso. PE: Pernanbuco. RJ: Rio de Janeiro. MS: Mato Grosso do Sul. SP: São Paulo. CE: Ceará. PA: Pará.

industrial variety or heterogeneity is a rationale for existence of larger urban areas, which can obtain greater advantages from economies of scale and indivisibilities in production.

Although there is a positive correlation between city size and the *IDR*, it is not very strong (0.58). This may be explained by the fact that a large component of employment in most cities is in activities producing non-tradable goods. Another factor that affects the result is the existence of large cities that are considerably specialized for their size, including Manaus (specialized in the manufacture of electronic material and apparatus and computer hardware and equipment), along with small, highly diversified cities (Itajaí, São José and Palhoça in Santa Catarina). This finding is consistent with other empirical tests showing how cities at the top of the size ranking tend to have a diversified industrial structure, whereas the others are more specialized as size decreases (Abdel-Rahman and Anas, 2004).

FIGURE 1

Brazil (selected cities): relation between size and diversity, 2007



Source: Prepared by the authors on the basis of Relatório *Anual de Informações Sociais* published by the Ministry of Labour and Employment (RAIS/MTE), 2007.

V

Grouping of Brazilian municipalities by size, specialization and diversification

Cluster analysis was used to identify the specific characteristics of homogeneous components within a population of heterogeneous municipalities, and to define groups on the basis of multivariate data, namely indices of specialization, diversification and city size, measured according to the total employment in the city.

The cluster analysis consists of two steps: (i) select the data grouping algorithm; and (ii) decide on a criterion for choosing the optimal number of groups. With respect to the first of these, the k-means method, which consists of a grouping algorithm proposed by MacQueen in 1967, is the best-known and most widely applied. This algorithm requires the data to consist of numerical variables, since part of the process involves calculating means. The k-means method is a non-hierarchical technique for grouping elements through a more flexible process, in the sense that an item assigned initially to a given group can be reassigned several times during the grouping process. Specifically, the k-means algorithm—given a set of n points in d-dimensional real space (R^d) and an integer k— consists of defining the k sets of points in R^d that minimizes the mean-square distance of each point from the centroid of the set closest to it.

This procedure consists of assigning each observation to the group whose centroid is most similar to the vector of observed values. In simplified form, the procedure has three steps: (i) divide the elements into k initial clusters; (ii) assign each element to the

cluster whose centroid is closest and recalculate the centroid of the cluster that received the element and that of the cluster that lost it; and (iii) repeat the second step until no new arrangement of the elements is possible.

In non-hierarchical procedures, it is necessary to specify the initial number of groups and choose the optimal number of groups, using an appropriate criterion. The criterion used is that proposed by Calinski and Harabasz (1974), known as the *CH* index. This procedure assumes the number of groups, k, as given. The database is then divided among the k groups, and an equitable distribution of the points is made at random in each of the groups formed. Following the division into k groups, the group to which each point belongs is verified, on the basis of the distance between the point at the centre of each group. The group with the smallest distance receives that point. When a point changes group, its centre is recalculated. To form the groups, the algorithm groups the elements according to their proximity, based on two premises: maximize the similarity between the elements of the same cluster and maximize dissimilarity between different clusters. To select the most appropriate clusters within the k-means technique based on an object's attributes matrix, the authors propose use the CH index, defined as follows:

$$CH = \frac{B*(n-k)}{W*(k-1)} \qquad (5)$$

where n is the number of points and k is the number of groups. The matrices B and W are obtained using the following formulas:

$$W = \sum_{i=1}^{K}\sum_{j=1}^{n_i}\left(X_{ij} - \bar{X}_i\right)^2$$

where the value of W is the sum of the squares of the distances from the points to the centre of the groups to which they belong, X_{ij} is the jth point of group i, $\bar{X}_i$ is the centre of the group (measured from the points to the centre of the group) and n_i is the number of points in group i.

$$T = \sum_{i=1}^{K}\sum_{j=1}^{n}\left(X_{ij} - \bar{X}\right)^2$$

T is the sum of the squares of the differences from each point of the entire database and the centre of the entire base, represented by $\bar{X}$.

$$B = T - W\sum_{i=1}^{k} n_i\left(\bar{X}_i - \bar{X}\right)^2$$

where the value of B can be obtained from the difference between T and W, which is the sum of the products between the number of points in the entire database and the squares of the differences between the centre of the entire base and the centre of each group.

The Calinski-Harabasz model selection heuristic consists of two steps: (i) calculate the value of the *CH* index for all group solutions from which it is desired to choose; and (ii) select the solution with the highest *CH* index.

Taking account of the three variables indicated, application of the Calinski-Harabasz criterion made it possible to establish an optimal number of two groups (see table 4). With these two clusters, the pseudo-F statistic of this criterion has a maximum value of 407.66.

TABLE 4

Calinski-Harabasz criterion to determine the optimal number of groups

Number of groups	Pseudo-F Calinski-Harabasz
2	407.66
3	369.39
4	363.39
5	332.32

Source: Prepared by the authors on the basis of the results obtained from the k-means cluster analysis.

Table 5 shows the characteristics of the clusters obtained. Cluster 1 has the highest weight, since it contains 355 of the 524 municipalities in the sample. The remaining 169 municipalities correspond to cluster 2. Cluster 1 has the highest *IER* and the lowest *IDR*, and its size with respect to total employment in the city is 10 times less than that of cluster 2. Nonetheless, the characteristics of cluster 2 show that even when there is strong evidence of the existence of a clear and positive relation between diversification, specialization and city size, this is not the case in Brazil owing to the heterogeneity of its cities. This cluster contains the large urban centres of the state of São Paulo and all state capitals, along with smaller cities that have an industrialization pattern that is similar to that of these cities, including Simões Filho (Bahia), Araras (São Paulo), Colombo (Paraná), Pouso Alegre (Minas Gerais), Várzea Grande (Mato Grosso), and other cities

TABLE 5

Characteristics of the clusters

Cluster	Frequency	Weight	Relative diversification index (IDR)	Relative specialization index (IER)	Size
1	355	67.75	0.95	7.57	13 182
2	169	32.25	1.26	5.81	149 266

Source: Prepared by the authors on the basis of the results obtained from the k-means cluster analysis.

which, although relatively larger, display a low-level diversification and a high degree of specialization, such as Chapecó (Santa Catarina).

The cluster analysis thus confirms the existence of heterogeneity, and the fact that this is not explained only by city size —measured by total employment— but also by the industrial characteristics of the city in question. This requires an appropriate methodology to capture the wealth of heterogeneous data. The following section defines and estimates a finite-mixture regression and another that takes account of the quantiles within the distribution, thereby making the heterogeneity identified by the cluster analysis explicit.

VI

Finite-mixtures regression models

This section discusses the problem of estimating a regression model assuming the data are generated from a finite-mixture density function, with different parameter values for each component (or group) within the distribution. As estimation based on the simple probability density hypothesis can generate biased parameters, it is better to model the statistical distribution from a mixture of other distributions, thereby controlling for the heterogeneity of the sample.

The cluster analysis showed that the municipalities were heterogeneous, so the data need special treatment. To strengthen that justification, the Bayesian information criterion was used to identify the model that best fit the data, comparing ordinary least squares (OLS) (one component) with different finite-mixture models (two and three components).[5]

Traditional statistical analyses cannot explain unobserved heterogeneity —in this case, individual differences in the behaviour of municipalities in terms of the average wage in relation to their industrialization pattern. The finite-mixtures model makes it possible to estimate the effect of specialization and diversification on the average wage, encompassing groups of municipalities that respond differently than the average.

How do municipalities react to the type of specialization and diversification they display? Do they react in one way only, or in different ways? If they react differently, how can their behaviour be studied? Can municipalities be classified in groups within which inferences can be made on common behaviour? These questions show that the argument on heterogeneity between municipalities is crucial for understanding the effects of the type of industrialization (specialized/diversified) on the level of the average wage.

The most common way to deal with heterogeneity in panel data is to include dummy variables to control for differences between average wages; but this does not control for differences in the marginal effects of the regressors. An alternative is to find groups of observations for which the process is similar; but this requires choosing average wage levels *a priori*, and even then municipalities with different industrial integration processes can coexist in the same group.

In contrast to these approaches, this article proposes a methodology based on the data to estimate multiple processes of average wage growth. In the models estimated, the municipalities are chosen on the basis of similarities in their distributions conditional on the average wage growth process.

Applications of the finite mixtures model in econometrics include the seminal papers by Heckman and Singer (1984) (on the labour market); Deb and Trivedi (1997); and Bago D'Uva (2006) (on health

[5] If the three-components model is rejected, it is not necessary to analyse models with a larger number of groups.

economics); Alfo, Trovato and Waldman (2008); Deb and others (2009).

In the context of the foregoing discussion, use of the normally distributed finite-mixtures model is a tool that uses the data on industrial specialization and diversification variables, to determine different intensities of response in the endogenous variable (average worker income) without having to separate the groups arbitrarily (for example, large, medium-sized and small municipalities).

The estimation strategy involves evaluating the number of groups that the data can support.[6] In that way, it is verified whether the data fit a one-component regression (OLS) better, or whether it is advisable to apply a finite mixtures regression —in other words if the heterogeneity of the data justifies a differentiated methodology, taking different groups into account. If so, we must also decide how many groups the data support within the finite mixtures regression. The Schwartz information criterion (*BIC*) is used to choose the best number of groups for the data and is obtained as follows:

$$BIC = -2\log(L) + K\log(N) \qquad (6)$$

Where L, K and N are the logarithms of maximum likelihood, number of parameters and number of observations, respectively. The model chosen has the smallest *BIC* value, considering that in some cases the additional components may simply be displaying outlier data points.

The finite-mixtures regression model is defined from a family of parametric density functions, as explained below (Khalili and Chen, 2007). Formally, Y is the response variable of interest; $x = (x_1, x_2, \ldots, x_p)^{\tau}$ is the vector of co-variables affecting Y; $\Omega = \left\{ f(y;\theta,\phi);(\theta,\phi) \in \Theta \times (0,\infty) \right\}$ is a family of parametric density functions of Y in relation to a finite mixture, in which $\Theta \subset \Re$ y f is the dispersion parameter. Accordingly, (x,Y) follows a finite-mixtures regression model of order K if the conditional density function of Y given x has the following form:

$$f(y;x,\Psi) = \sum_{k=1}^{K} \pi_k f(y;0_k(x),\phi_k) \qquad (7)$$

with $0_k(x) = h\,(x^{\tau}\beta_k)$, $k = 1, 2, \ldots, K$ and for $\Psi = (\beta_1, \beta_2, \ldots, \phi, \pi)$ with $\beta_k = (\beta_{k1}, \beta_{k2}, \ldots, \beta_{kP})^{\tau}$, $\phi = (\phi_1, \phi_2, \ldots, \phi_k)^{\tau}$, $\pi = (\pi_1, \pi_2, \ldots, \pi_{K-1})^{\tau}$ such that $\pi_k > 0$ is $\sum_{k=1}^{K} \pi_k = 1$

The density function may take different parametric forms, including the binomial, normal and Poisson distributions, identifiable under certain conditions (Titterington, Smith, Markov, 1985). In this case, the normal function was used.

The finite mixtures regression model to be estimated can be described as follows:

$$\begin{aligned} y_{ik} = {} & \alpha_k + \beta_{1k} ier_{ik} + \beta_{2k} idr_{ik} + \\ & \beta_{3k} dist_{ik} + \beta_{4k} tam_{ik} + \beta_{5k} edu_{ik} + u_{ik} \end{aligned} \qquad (8)$$

where y_{ik} is the average income of a worker in municipality i in component k; α_k is the intercept for component k; ier_{ik} is the logarithm of the relative specialization index for municipality i in component k; ier_{ik} is the logarithm of the relative diversification index for municipality i in component k; $dist_{ik}$ is the logarithm of the distance of the city from the state capital; tam_{ik} is city size, using the logarithm of the population density as a proxy; edu_{ik} is the number of workers with basic, secondary and higher education as a percentage of the total number of workers in the city; u_{ik} is the error term, whose variance σ_{ik}^2 is assumed to be normal and homoscedastic, within the components, but possibly heteroscedastic between components.

Table 6 shows the goodness of fit criterion (*BIC*) for the models: (i) of one component, which corresponds to an OLS estimation (considering robust errors); (ii) two components; and (iii) three components (which corresponds to estimations using a finite mixtures model (FMM)). It should be remembered that the lower the BIC value, the worse the data fit the tested model.

[6] To confirm the heterogeneous nature of relations between agglomeration and productivity economies, a quantile regression model was also estimated. In this technique, apart from not requiring the basic minimum-squares assumption of homoscedastic (or guassian) errors, the information is greater, because it makes it possible to estimate the conditional distribution of the dependent variable through the distribution quantiles. A regression can be obtained for each quantile of interest, compared to ordinary least squares (OLS), which only provides the mean of the distribution. The regression results confirm the heterogeneity of the data. Only the results of the finite samples regression are presented, because this method deals better with the heterogeneity between groups characterized by lack of linearity and not by a continuous process of alterations between the variables of interest.

TABLE 6

Schwartz information criteria (BIC) for regressions with different numbers of components

Model	BIC
Ordinary least squares - one component	755.70
Finite mixtures model - two components	606.13
Finite mixtures model - three components	622.99

Source: Prepared by the authors on the basis of Relatório *Anual de Informações Sociais* published by the Ministry of Labour and Employment (RAIS/MTE), 2007, and Ipeadata of the Institute of Applied Economic Research (IPEA).

As the results in table 6 show, the *BIC* information criterion determines the choice of two components. Another criterion confirming this result is that the third component accounts for just 1% of the municipalities, and, apart from being unrepresentative, it does not change the estimated coefficients. This result also agrees with the number of groups estimated in the cluster analysis using the Calinski-Harabasz criterion.

The results show that municipal heterogeneity is bimodal when using these variables to estimate the regression, which confirms the findings of other studies. For example, Laurini, Andrade and Pereira (2003) find the existence of two income groups among Brazilian municipalities in the period 1970-1996: a low-income group, consisting of municipalities in the north and northeast regions, and a high-income group, consisting of municipalities in the centre-east, south and southeast regions. Chein, Lemos and Assunção (2007) makes progress in the study of unequal development between regions considered to be homogeneous. These authors construct vectors of attributes based on factorial analysis for different territorial units. The results show a high concentration of excluded zones in the north and northeast, and the existence of zones displaying another dynamic within the same space. Territorial spaces in the most developed macro-regions are also not homogeneous, because they also contain less developed regions. The finite-mixtures methodology shows that even within the north and northeast regions, there are some municipalities with differentiated characteristics, while other cities belonging to high-income regions are part of the low-productivity group, as analysed below.

The results shown in table 7 refer to the regression with the real average wage per worker in each municipality as the dependent variable. Economies of diversification and specialization are positive in all cases.

The group defined by the lowest real average wage per worker (group 1) includes cities in the north and northeast regions, whereas Minas Gerais is the state with most cities in this group among the states of the south and southeast regions.

Group 2 corresponds to the higher real wage per worker (1,300 reais, considering the value of the minimum wage in 2007). This group's relative specialization coefficient is higher than its diversification coefficient, and there is also a positive and significant education effect. In the case of group 1, economies of diversification are large and significant, whereas the coefficient for workers with formal education as a percentage of total workers is not significant.

It is interesting to note that the significance of specialization and diversification is reversed in the two groups: diversification is important when incomes are lower, whereas specialization is significant in the higher-income group. This might be explained by the fact that specialization in the lower-income groups probably occurs in activities with little technological content or capacity to generate learning. The incorporation of new activities would thus involve a structural shift towards more skill-intensive activities. In contrast, when incomes are higher, activities are likely to have a larger knowledge content, and the exploitation of higher returns through specialization has greater repercussions.

The bimodality found in other studies is also confirmed, generally linked to the dichotomy between the north-north east and south-south-east regions of Brazil. Nonetheless, this dichotomy breaks down for cities that belong to a poor or wealthy region but do not display the same pattern as the region generally. For example, in the southeastern state of Minas Gerais, there are several cities corresponding in 1 (relatively poorer), while some cities in the north and northeast regions (particularly state capitals and other cities such as Camaçari, Coari and Manacapuru), belong to the relatively wealthier group 2.

City size also has the expected sign. Larger size is associated with higher real wages, because of the exploitation of both types of agglomeration economies, either through more numerous industrial linkages (economies of diversification) or more efficient search and matching in the labour market, since larger scale encourages workers to specialize in certain types of activity (specialization economies).

The education coefficients are different between the two groups. In the first case, the number of formally educated workers (as a percentage of all workers) does

TABLE 7

Brazil: Estimation of finite-mixtures regression for two groups of municipalities, 1997 and 2007

Dependent variable: real average worker incomes (y)	OLS	Group 1	Group 2
Intercept	3.5493[a] (0.0641)	4.4964[a] (0.0964)	3.2651[a] (0.0959)
Relative specialization index (IER)	0.0386[a] (0.0167)	0.0371 (0.0257)	0.0646[a] (0.0264)
Relative diversification index (IDR)	0.2303[a] (0.0483)	0.4730[a] (0.0602)	0.0073 (0.0047)
Distance from the capital	-0.0420[a] (0.0061)	-0.0510[a] (0.0094)	-0.0494[a] (0.0108)
Education	1.8724[a] (0.0651)	0.1145 (0.1094)	2.4574[a] (0.0838)
City size	0.0203[a] (0.0057)	0.0135[b] (0.0075)	0.0184[c] (0.0084)
Proportion of the sample (percentage)	100.00	46.94	53.05
R^2	0.5872		
Mean of y (in reais)	1 150.40	991.80	1 295.80
Number of observations	1 039		1 039

Source: Prepared by the authors on the basis of Relatório *Anual de Informações Sociais* published by the Ministry of Labour and Employment (RAIS/MTE), 2007, and Ipeadata of the Institute of Applied Economic Research (IPEA).
Note: Robust standard errors (in parentheses)

[a] Significant at the 1% level.
[b] Significant at the 10% level.
[c] Significant at the 5% level.
OLS: Ordinary least squares.

not have a significant influence on the wage paid. In contrast, in the second group of relatively better paid workers, the coefficient is highly significant (t = 29.32). This would confirm that investment in education is a way to increase labour productivity, thereby also generating a virtuous circle of higher productivity —higher returns— greater consumption —greater local development— greater national development. Nonetheless, for these investments to take place, physical capital is needed to complement human capital, and thus encourage workers to remain in the municipality after they have been trained. The lack of statistical significance in the first group could reflect a low level of complementarity for higher-skilled workers, which would cause them to migrate to regions offering higher levels of complementarity and, therefore, greater opportunities.

The results of the OLS estimation confirm the findings of Galinari and others (2007), who suggest that cities with high levels of industrial concentration but no clear productive specialization are subject to externalities of scale of urbanization, but their specialization economies are non-existent or very weak. According to these authors, the latter result suggests that the existence of a cluster of firms in the same branch of activity in a given locality is not a sufficient condition to generate external economies. Although this is true for 60% of the municipalities in the sample used in this article, the finite-mixtures estimation finds positive and significant specialization economies in explaining the level of average income of workers and GDP per capita in the other municipalities. Thus, an estimation method that controls for the diversity of the sample could help identify the influences of variables that are not captured by other methods.

The existence of economies of specialization confirms the findings of Wheaton and Lewis (2002), which show that employment displays a sharp gains in specialization. Those authors also find little evidence of economies of diversification, which is the result in our group 2 that corresponds to the higher real average wage per worker. This group contains large metropolis such as São Paulo, Rio de Janeiro, Belo Horizonte, Porto Alegre, Curitiba and other smaller capitals that were growing fast in the period being studied, such as

Palmas (Tocantins) and Rio Branco (Acre), but also medium-sized cities, where strengthening is reflected in the process of de-concentration of production and population in national territory, as shown in the work of IPEA/IBGE/UNICAMP (2002). This group includes the large cities of São Paulo, Florianópolis (Santa Catarina), Maringá (Paraná), Londrina (Paraná), Canoas (Rio Grande do Sul), Caxias do Sul (Rio Grande do Sul) and others. The group also contains oil cities such as Macaé (Rio de Janeiro) and Coari (Amazonas), and others displaying productive integration between industry and agriculture, such as Uberlândia (Minas Gerais), São José do Rio Preto (São Paulo) and Rondonópolis (Mato Grosso).[7]

In short, two different patterns were found in the relation between agglomeration economies and workers' wages, for the 524 municipalities in the sample. The first group corresponds to municipalities with lower average wages, in which specialization economies are not very important. This would suggest the existence of unsophisticated productive clusters and weak linkages, which are compensated by exploiting economies of diversification. These municipalities would fit a developing-country model. The second group consists of municipalities with higher average wages, corresponding to a developed-country model, with positive and significant specialization economies but weak diversification economies. This result can be evaluated in the light of those produced by the Mori and Turrini (2005) model, which shows that, in the location of workers, symmetric configurations may not be stable, and regional inequality is inevitable. Relatively higher-skilled workers tend to gravitate towards places with higher aggregate incomes and skills, whereas the relatively less skilled remain in the other cities. In that way, inequalities between regions are reflected in skill inequalities between individuals.

The low significance level of the relative diversification coefficient in 40% of the municipalities indicates the need to distinguish between diversification economies based on "related variety" and those based on "unrelated variety" (Frenken, Van Oort and Verburg, 2007). If there are complementarities between sectors in terms of shared skills, the externalities will produce indirect knowledge effects and subsequent growth. Such complementarities are captured through the notion of related variety (diversification), whereas no indirect knowledge effects are expected in regions where unrelated variety prevails.

[7] For an analysis of this integration see Lemos and others (2003).

VII
Final comments

The main purpose of this article was to analyse the relation between agglomeration economies of the Marshall-Arrow-Romer type (economies of location or specialization) and the Jacobs-Porter type (economies of urbanization or diversification), and labour productivity in the cities as measured by the average worker wage. To that end, the article firstly described the characteristics of the relative specialization and diversification process in manufacturing industry in 524 urban municipalities in Brazil, constructing specialization and diversification measures for the years 1997 and 2007. As established in the theoretical and empirical literature, the results showed that diversification is related to city size.

Secondly, these municipalities were classified in homogeneous groups in terms of the type of industrial cluster present. For that purpose, a multivariate approach was used, jointly considering these indices and the size of the municipalities based on k-means analysis. Application of the Calinski-Harabasz criterion identified two groups, which justifies the use of a suitable methodology to capture the heterogeneity of Brazilian municipalities.

The relation between the industrial specialization and diversification indices and a productivity measure (average worker wage) was then tested empirically to ascertain the effect of agglomeration economies on development. The use of regressions that control for data heterogeneity and the differentiated influence of the explanatory variables on the dependent variable has a potential advantage compared to traditional methodologies for identifying municipalities which,

while belonging to different states and meso- and micro-regions, display similar features in terms of the agglomeration pattern and the economic consequences thereof. Against this backdrop, regressions were estimated using finite mixtures within the distribution.

The results of the finite-mixtures regression confirm the duality that exists between the north-northeast and south-southeast regions of Brazil, which has been widely studied elsewhere. Nonetheless, this duality needs to be analysed taking account of the fact that some cities do not reflect the dynamic of the region to which they belong. This duality also has another important feature regarding the exploitation of agglomeration economies for development. The results make it possible to distinguish two municipality groups. The first contains municipalities with lower average wages, in which specialization economies are insignificant. This would point to the existence of unsophisticated productive clusters and weak linkages, offset by the exploitation of diversification economies. These municipalities would fit a developing-country model. The second group corresponds to municipalities with high average wages, consistent with a developed-country model, with positive and significant specialization economies but weak or negative diversification economies.

The article shows that policies to promote productive deepening are more important in lower-income cases. When the production structure is more concentrated in activities that are not knowledge intensive, improving that structure is crucial for promoting income growth. The transformation of diversification economies into specialization economies, and the engagement by municipalities in more dynamic development processes entails recognizing local productive possibilities and public policies targeted on these faster growing sectors.

Policies need to be implemented to encourage the emergence of new activities and the creation of upstream and downstream links in the productive chain. The higher-income municipalities would also benefit more from policies that strengthen specialization in already-existing dynamic activities — since they speed up progress along the learning curves. In those cases, policies to create technological and support capacities concentrated in those dynamic activities would have a more important role to play.

Industrial policy has evolved to increasingly include the interaction between variables relating technology supply and demand, stressing the relation between structural change and the role of scientific and technological institutions (both public and private). In the poorer municipalities, there is no point in providing strong support on the supply side without a parallel change in productive activities that redefines the intensity of technological demand. In the higher-income municipalities, in contrast, strengthening supply could be more important, since it would help strengthen specialization, thus overcoming existing capacity constraints in sectors that are naturally more knowledge-intensive.

(Original: Portuguese)

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KEYWORDS

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The footwear industry in Vale do Sinos (Brazil): competitive adjustment in a labour-intensive sector

Achyles Barcelos da Costa

This article analyses the production relocation strategies deployed by firms in the Vale do Sinos footwear cluster in Rio Grande do Sul, in response to competitive pressures from other parts of the world, mainly Asia. The hypothesis proposed here is that, as the sector competes mainly in terms of product price, the factors that most directly influence that variable —such as wages, the exchange rate and tax and financial incentives— have affected the industry's spatial distribution. The study's main conclusions are that, since 1990, footwear production has been migrating to other parts of Brazil and firms have been seeking other sources of competitiveness.

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I
Introduction

Since the mid-1990s, the footwear, furniture and clothing industries, along with other activities in the Brazilian economy, have been facing intense international competition. The competitive features that have the greatest impact on those productive sectors are market globalization; new forms of competition and, of particular importance for the case at hand, the presence of competitors from other regions of the world, particularly Asia, which enjoy more competitive conditions in terms of cost and labour supply. This article will review the productive relocation strategies deployed by firms of the Vale do Sinos footwear cluster, in Rio Grande do Sul, in response to this situation. The hypothesis proposed is that as the sector competes mainly in terms of the price of its footwear products, the factors that most directly affected the price attribute, namely wages, exchange rates, and tax and financial incentives, have influenced the direction of the industry's spatial location. The sector is turning its attention towards other factors of competitiveness, apart from cost-related ones. Nonetheless, the search for regions offering lower production costs remains the basis for business decision-making in the sector, particularly in firms that continue to produce large volumes.

The methodology used in this paper consists of a review of the theoretical literature on the competitive advantages of production in local productive clusters; the empirical literature on the footwear industry, particularly in Vale do Sinos; and official statistics on footwear-industry employment and exports. These data are supplemented by journalistic information on footwear manufacturing firms that have geographically relocated their production units.

Since the mid-1990s, production and employment in the Brazilian footwear industry has fluctuated broadly in line with exchange-rate variations. The stabilization policy implemented in the Brazilian economy as from July 1994 —the Real Plan— which aimed to control inflation through monetary and exchange-rate policy, produced periods of exchange-rate appreciation, for example in 1994-1999 and 2004-2008, that undermined returns in sectors that compete mainly on price. This pressure was intensified by the presence of international competitors, particularly from the Asian continent, which have abundant and cheap labour available. The overall result is competitive pressure that makes it increasingly difficult for Brazilian firms to survive in their markets, if their exclusive source of competitiveness is production costs.

The key argument propounded in this paper is that various segments of the footwear industry in Rio Grande do Sul and other regions of Brazil will find it increasingly hard to compete in foreign markets exclusively through the price of their products, so they will need to develop other attributes of competitiveness. Nonetheless, until the industry develops new capacities, price-based competition is forcing it to relocate its activities to regions offering lower-cost production conditions. Since the mid-1990s, such regions have included the Brazilian north-east and, in the first decade of the twenty-first century, other countries, including those from Asia.

The paper consists of this introduction and three other sections. Section II sets out the concepts and theoretical relations that underpin the subsequent discussion, highlighting two issues: firstly, it presents the concept of local productive cluster, based on the seminal discussion on industrial districts, identifying the structural dimensions that lead to better performance, particularly geographic proximity; and secondly it clarifies the notion of competitiveness in terms of cluster development. Section III considers the evolution of the Vale do Sinos footwear-industry cluster, in terms of its performance and relocation. It first describes the activity in terms of business structure, location in Brazilian territory and its employment and export trends; and it then analyses the steps taken by the cluster to adapt to the new competitive environment arising from Brazilian macroeconomic policy in the presence of lower-cost competitors in its key markets. Section IV summarizes the main results of the study.

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II

Industrial organization and competitiveness

Since the 1970s, there has been a consensus in the economic literature and among policymakers that economic performance does not depend exclusively on large-scale production or standardization, with little importance given to the specifics of the region where the goods are produced. Until then, relatively backward regions attempted to imitate the "best practices" of developed countries through an import-substitution strategy. The crisis of the "Fordist" model and successful experiences in various parts of the world, such as the so-called "Third Italy" (Emilia-Romagna, Veneto, Toscana, Marche, among other localities), which have achieved economic growth based on small geographically neighbouring firms engaging in flexible production of differentiated goods in small batches, have shown that economic growth can also be achieved by exploiting the specific features of local regions and the way their economic activity is organized.

In the theoretical domain, an attempt was made to revive the insights of Alfred Marshall (1842-1924), who argued that industrial organization, with geographically clustered firms, can generating efficiency gains similar to those of the internal economies of the firm. Through a social division-of-labour process, small firms, which benefit from the local labour market and other agglomeration economies, can also engage in efficient economic activity through productive specialization (Marshall, 1982).

In their famous work *The Second Industrial Divide*, Piore and Sabel (1984) claim that the Italian experience is an example of a new form of industrial organization —flexible specialization— which can overcome the constraints on economic expansion faced by the mass-production model. Nonetheless, it was Italian economists (Becattini, 1992; Bagnasco, 1999; and others), who drew most on the Marshallian concept of the industrial district, to include the social dimension in explanations of economic performance.[1] The community/enterprise combination would be a distinctive factor in situations that produce an accidental agglomeration of independent firms acting independently, but linked to the same economic activity (Becattini, 1992 and 1999).

To set up that particular form of industrial organization, the "enterprise population" needs to organize itself to specialize in one or more stages of the production processes of the branch of industry or sector in question. In addition to the main product, the more broadly defined sector encompasses activities that produce machinery and equipment, inputs and materials, among other things, which Marshall referred to as "auxiliary". Linked to the enterprise cluster, there would also be a system of values and ideas relating to ethics, the practice of reciprocity, family and other characteristics of social coexistence, which would become a condition for reproduction of the district; together with a system of institutions, other than the market and the firms themselves, that include school, unions, political parties and cultural associations, among others (Becattini, 1990 and 1992). In this regard, other references for the term "industrial district" can be found, such as local productive cluster.[2]

The analytical benefits of the concept of industrial district, as disseminated by these studies, include that of conceiving the small firm as an entity that is also capable of generating growth.[3] This does not contradict the idea that small size *per se* has limitations; but, as noted by Sengenberger and Pyke (1991), size constraints can be mitigated or overcome when smaller firms coexist in geographic proximity with others, rather than acting in isolation.

The public policy implications were not minor. Policy, generally formulated at the national level, targeted large firms or specific sectors chosen to promote growth; but that changed when the small

[1] Mention should also be made of the seminal work of Granovetter (2001), who introduced the notion of "social embeddedness".

[2] That is the expression used in the literature on the subject, from which other expressions are derived and are often used interchangeably. Apart from the term "industrial districts" as such, the most common include local productive clusters, local production systems, enterprise clusters and networks. Although different words aim to express different meanings, these terms are generally used to refer to groupings of firms that are geographically close to each other, mutually related and connected also with other local stakeholders.

[3] For discussion of different contributions to the topic of enterprise clusters, see Suzigan (2006).

firm became the focus of attention. Nonetheless, the objectives of government actions always took account of small firms, although the instruments targeted the firm as an individual entity. The novelty now is that those policies are targeting enterprise clusters and their productive environment. Thus the industrial-district concept proved useful for dealing with small firms, and has been incorporated into the country's industrial and technology policies.[4]

A key point is that location in a local productive cluster in itself is a positive factor for a firm's competitive performance, particularly in the case of smaller firms. Membership of organizational networks of that type enables small firms to overcome their inherent managerial, financial and technological and other shortcomings, which often make it impossible for them to survive in markets when acting individually and in isolation. The division of labour practised in industrial districts enables entrepreneurs to enter economic activities with little capital, since specialization in specific stages of the production cycle, or specific product components, obviously requires less capital than setting up an integrated plant. In general, such undertakings usually emerge at the initiative of local residents. This involves, as Marshall notes, the existing "industrial atmosphere", which generates the conditions for such adventurers: "The mysteries of the trade become no mysteries; but are as it were in the air (…)" (Marshall, 1982, p. 234).

For Sorenson and Audia (2000), relations forged in the locality and the tacit knowledge of the business, among other factors, explain why industrial sectors remain geographically concentrated through time. The fact that certain activities persist locally —more business start-ups than failures— relates much more to business opportunities that open up for local residents (such as employees who start their own business), which are not easily accessible to outsiders, than to advantages such as the existence of raw materials, production and distribution in certain localities. Local inhabitants have an additional asset in the form of "social capital" (Bourdieu, 1998; Coleman, 1988; Putnam, 1996), which is inherent to the locality and thus makes it hard for outsiders to enter the activity in question.

An issue to note in relation to studies of industrial districts is that this type of productive organization arises from a natural development process and displays elements that reflect the idiosyncrasies of the localities in question. Such elements are not the result of deliberate actions, although actions can be undertaken to promote and consolidate already established structures. The historical nature of the development of industrial districts is the basis for its spatial structural diversity and, conceptually, the basis for controversies over its properties.

Naturally, the concept is more empirical than theoretical (Bianchi, 1998). The same structural and performance dimensions may be present with specific features in various districts, and in those that produce similar products but are located in different regions (Altenburg and Meyer-Stamer, 1999; Paniccia, 1998), which makes the concept somewhat indeterminate (McNaughton, 2000). There are districts in which the productive structure is dominated by small firms, as in the Italian experience (Becattini and Rullani, 1996). In others, large firms serve as attractors for employment and sales to the external market, for example the footwear industry in Vale do Sinos. Then there are districts where competitiveness is based on the availability of abundant resources or cheap labour, while others are characterized by products with local peculiarities, skilled labour and high value-added (Sengenberger and Pyke, 1991). Another point that has been the subject of research is the possibility of reproducing industrial districts. As they are the outcome of historical development, their characteristics will not necessarily be repeated in different geographical spaces or time periods. This is a constraint, even for the implications of public policy, as highlighted by Amin (1994) but minimized by others (Ripoll, 1999).

An important issue that is still open for debate concerns the evolutionary dynamic of those organizational networks, and the development paths of their individual component firms. Changes in the patterns of final demand for the district's output, technological innovations, the availability and price of resources and labour, the pace of capital accumulation by individual firms, and the emergence of new geographic zones offering favourable productive

[4] For example, as happened in Italy with Law 317/91 (Mistri, 1999). In the case of Brazil, the 2004 industrial policy explicitly included the concept of local productive cluster. This concept is also used to guide the actions of institutions working with small firms, such as the Brazilian Microenterprise and Small Business Support Service (SEBRAE). Material printed to disseminate the actions of this service for the leather and footwear sector in Rio Grande do Sul explicitly states that, since 2003, and in accordance with national SEBRAE guidelines, the action of SEBRAE of Rio Grande do Sul moved from an individual-solution approach for its clients to progressively responding to collective needs and opportunities, while respecting regional differences.

conditions, among other factors, mould and modify the configuration of a given enterprise cluster through time.[5] In research undertaken in 24 districts, Paniccia (1998) found various forms of organization and different levels of performance, along with relations between firms that had conflicts of interest. It remains to be decided which factors might limit the expansion of a cluster in a given region and under what conditions those factors would appear.

The notion of the district's natural development stems from the fact that, over a period of time, a product has been created in a specific locality; and the fact that consumers clearly associate the product and its characteristics with the locality rather than a specific firm. These factors provide a degree of autonomy in generating endogenous forces for cluster growth.[6] According to Piore (2001), this gives it a competitive advantage that makes it independent of changes in the relative prices of factors of production, although this author considers that the advantage is more reflective of the social relations established among residents than the physical characteristics of the locality itself.

Nonetheless, not all districts or productive clusters have those characteristics. The historical nature of the district's development means that is not uncommon to find a cluster in which competitiveness stems from the availability of a given abundant and cheap resource, especially in labour-intensive production sectors, such as footwear, furniture and clothing, and located in less developed regions of the world. Moreover, the subordinate way in which the sectors of the footwear industry in those regions enter the external market, makes them more dependent and relatively locked in by that situation, which diminishes their degrees of freedom to implement autonomous strategies for growth and upgrading in the value chain.

Such is the case of the Brazilian footwear industry, particularly its key export segment located in Vale do Sinos, in the south of the country. An understanding of the competitive performance of that industry and its future prospects requires identifying the product attribute on which the cluster depended to remain in the external market, and the type of competition in which it has been participating. These factors shed light on its growth path and the relations of co-operation and competition established between stakeholders in the district and with external agents, in addition to its spatial relocation.

[5] The Vale do Sinos footwear industry cluster, which was craft-based and dominated by small firms at the time of its entry into the external market, has since undergone a number of changes. Its work process began to focus on "Fordist" production, as it began producing for the external market (Costa, Deberofski and Spricigo, 2007); and large firms came to play an key role in cluster dynamics.

[6] There are several examples, including carbonated beverages in France; wines from the Oporto region in Portugal; Italian table cheese; and furniture from Gramado, in Rio Grande do Sul.

III

Evolution and spatial location of footwear production in Brazil

The footwear sector is an important source of jobs and income in the Brazilian economy. According to data from the annual social information report *[Relação Anual de Informações Sociais]* published by the Ministry of Labour and Employment, in 2005, the activity employed 298,659 workers in 9,032 business establishments, of which 94.7% consisted of micro and small enterprises, as shown in table 1. Nonetheless, this type of firm accounted for just one third (33.6%) of employment, owing to the concentration of jobs in the larger firms, which provided 40% of employment in the industry but represented just 1% of the total number of business establishments.

The business structure was not always as shown in table 1, but reflects the outcome of the sector's development process since its incursion into the external market in the late 1960s. Until then, the activity was undertaken by small and medium-sized firms that

TABLE 1

Distribution of business establishments and employment in the Brazilian footwear industry by firm size, 2005

Size	Employment	Percentage	Establishments	Percentage
Microenterprise	32 736	11	7 015	77.7
Small	67 514	22.6	1 534	17
Medium	78 949	26.4	388	4.3
Large	119 460	40	95	1
Total	*298 659*	*100*	*9 032*	*100*

Source: Prepared by the author on the basis of statistics obtained from *Relação Anual de Informações Sociais*, published by the Ministry of Labour and Employment of Brazil.
Microenterprise: 0-19 employees. Small: 20-99 employees. Medium sized: 100-499 employees. Large: 500 employees or more.

were relatively integrated and eminently craft-based.[7] The country's per capita income level was relatively low by international standards, which meant that the quality of the footwear produced was consistent with relatively unsophisticated consumption standards in terms of materials and technology. The lack of entry barriers characteristic of the sector made it possible to satisfy demand growth largely by increasing the number of firms, which were mostly small ones. Population density —Brazil is a country of continental dimensions— allowed for many firms and a large production volume, which to some degree enabled the sector to try to satisfy external demand.

In terms of location, although footwear manufacturing has always been present in the different regions of the country, the industry has for long been concentrated in the states of Rio Grande do Sul and São Paulo. Concentration in those states, as shown in table 2, reflects the industry's historical formation, which was the combined result of settlement by immigrants with skills in the manufacture of leather products and the local availability of that basic raw material. In Rio Grande do Sul, it was assisted by the arrival of German colonists in 1824 and access to leather, a relatively abundant byproduct of corned beef (*charque*) in which the state was then pre-eminent. In São Paulo, the activity took root in the city of Franca, based on Italian immigration dating back to 1875. The rise of certain states in the north-east of the country is more recent, and, as shown below, reflects their policies to attract firms into the region.

As footwear manufacturing is an activity that can be subdivided in time and space, production can be undertaken in business clusters located geographically close to one another. This pattern can be seen in specific regions of several Brazilian states: Vale do Sinos, in Rio Grande do Sul; Franca, in São Paulo and Nova Serrana, in Minas Gerais, among others.[8]

The leading footwear manufacturing cluster in Brazil is located in Vale do Sinos.[9] Footwear production and its productive chains generate thousands of jobs in Rio Grande do Sul. According to information contained in *Relação Anual de Informações Sociais*, published by the Ministry of Labour and Employment in 2005 (see table 3), in Rio Grande do Sul, there are over 15,100 workers in the tannery segment apart from the employees in the footwear industry itself, making a total of 141,945 workers employed directly in the leather-footwear segments of that productive chain. This figure represented 23.5% of total employment in manufacturing industry in Rio Grande do Sul that year, with thousands of families depending on those activities for their economic sustenance.

[7] Until the late 1970s, the work process in the footwear sector was organized around *"caballetes"* —a wooden furniture items shaped similarly to a bookshelf, nearly 1 m high and with four or five shelves roughly 1.5 m long. It has wheels on its base so that it can be moved along the factory floor. Mechanization of the productive process was incipient: a number of manual tools were used and the footwear production cycle was relatively integrated (Costa, Deberofski and Spricigo, 2007).

[8] The exceptions in terms of places where the activity is important, are the states of the north-east: Ceará, Bahia and Paraíba, whose presence in the industry is primarily due to their policies to attract firms from the Brazilian south and south-east, but do not yet have developed footwear industry clusters.

[9] Vale do Sinos, an abbreviation for Vale do Rio dos Sinos, consists of nearly 30 municipalities located around the Sinos river and its tributaries. Footwear is produced in most of those municipalities as a result of the sector's own expansion. Nonetheless, some localities are particularly important: Campo Bom, Dois Irmãos, Igrejinha, Ivoti, Nova Hartz, Novo Hamburgo, Parobé, Sapiranga and Três Coroas, among others. The activity is also pursued in other municipalities of Rio Grande do Sul unrelated to the region, but on a small scale.

TABLE 2

Distribution of employment in the Brazilian footwear industry by selected states, 2005

State	No. of jobs	%	No. of establishments	%
Rio Grande do Sul (RS)	126 784	42.4	3 419	37.8
São Paulo, (SP)	54 570	18.3	2 776	30.7
Ceará (CE)	44 268	14.8	221	2.5
Minas Gerais (MG)	23 515	7.9	1 493	16.5
Bahia (BA)	22 973	7.7	95	1.1
Paraíba (PB)	8 461	2.8	104	1.1
Santa Catarina (SC)	5 696	1.9	321	3.6
Other states	12 392	4.2	603	6.7
Total	*298 659*	*100*	*9 032*	*100*

Source: Prepared by the author on the basis of statistics obtained from *Relação Anual de Informações Sociais* published by the Ministry of Labour and Employment in Brazil.

TABLE 3

Employment in the footwear and leather industries in Rio Grande do Sul by establishment size, 2005

Size	Footwear manufacture		Tanneries		Total	
	Employment	%	Employment	%	Employment	%
Microenterprise	11 044	8.7	656	4.3	11 700	8.2
Small	29 629	23.4	3 026	20	32 655	23
Medium-sized	39 781	31.4	8 571	56.5	48 352	34.1
Large	46 330	36.5	2 908	19.2	49 238	34.7
Total	*126 784*	*100*	*15 161*	*100*	*141 945*	*100*

Source: Prepared by the author on the basis of statistics contained in *Relação Anual de Informações Sociais* published by the Ministry of Labour and Employment.

The trend of production in the footwear industry in Brazil can be divided in two historical phases. In the first, from the start of the activity in the country until the end of the 1960s, production targeted the domestic market. The second phase starts at the end of that decade when the sector begins producing for the external market, taking advantage of the relocation of footwear production from developed countries to regions of the world that have plentiful supply of cheap labour, such as Brazil, the Republic of Korea and Taiwan Province of China.[10]

The first Brazilian footwear exports were shipped in 1968, and they started to expand from 1970 onwards, as shown in Table 4.

As table 4 shows, foreign sales of Brazilian footwear expanded rapidly in the 1970s. The physical volume exported grew by roughly ninefold in just five years from 1970 to 1975, and this performance was maintained until the mid-1990s, albeit at a slower pace.

Nonetheless, the Brazilian footwear sector entered the foreign market in a subordinate role, operating merely with outsourced capacity; and this remains the case today. In other words, footwear design, final sale of the product to consumers, marketing and price setting, have always been controlled by the importer. Exports were mainly sent to the United States market, which from then became the main individual buyer of Brazilian footwear. The products exported were relatively simple —sandals for the women's footwear segment— produced in large batches and with price as the main competitive attribute. Although the quality of the footwear produced in the sector improved

[10] Brazil also implemented tax incentives and a policy of small exchange-rate devaluations, as from 1968 (Costa, 2004).

TABLE 4

Brazilian footwear exports, 1970-2006

Year	Millions of pairs	Dollars F.O.B. (*Millions*)
1970	4	8
1975	35	165
1980	49	387
1985	133	907
1990	143	1 107
1993	201	1 846
1995	138	1 414
1999	137	1 278
2000	163	1 547
2001	171	1 615
2002	164	1 449
2003	189	1 549
2004	212	1 809
2005	189	1 886
2006	180	1 854

Source: Prepared by the author on the basis of statistics obtained from *Sistema de Análise das Informações de Comércio Exterior via Internet* (ALICE-Web) of the Ministry of Development, Industry and Foreign Trade of Brazil (MDIC) [online] http://aliceweb.desenvolvimento.gov.br. and Abicalçados (Brazilian Footwear Industries Association) (2005), *Resenha estatística*, [online] http://www.abicalcados.com.br.

TABLE 5

Footwear-export share of selected Brazilian states by value, 1996-2006

(Percentages)

Year	RS	SP	CE	BA	PB	MG	SC
1996	88.6	9.5	0.6	...	0.2	0.2	0.6
1997	88.1	8.3	2.3	...	0.3	0.2	0.6
1998	86.0	7.4	4.9	0	0.7	0.2	0.4
1999	84.9	7.1	5.6	0.1	1.3	0.3	0.5
2000	83.5	8.7	5.2	0.3	1.1	0.4	0.4
2001	81.5	8.2	6.6	0.5	1.6	0.7	0.4
2002	80.4	8.0	7.6	1.1	1.6	0.3	0.5
2003	74.1	9.4	10.8	1.8	2.0	0.7	0.5
2004	70.3	12.2	10.3	2.8	2.1	0.9	0.5
2005	69.3	12.6	10.8	3.0	1.9	0.9	0.5
2006	67.6	11.3	12.8	3.4	2.3	0.8	0.5

Source: Prepared by the author on the basis of statistics obtained from *Sistema de Análise das Informações de Comércio Exterior via Internet* (ALICE-Web) of the Ministry of Development, Industry and Foreign Trade of Brazil (MDIC) [online] http://aliceweb.desenvolvimento.gov.br.
RS: Rio Grande do Sul. SP: São Paulo. CE: Ceará. BA: Bahia. PB: Paraíba. MG: Minas Gerais. SC: Santa Catarina.

through time, partly as a result of technological dissemination in terms of the machinery, equipment and materials used in the activity internationally, its competitiveness was always based on low production cost.[11] This point is relevant for understanding the spatial movement of the activity not only in Brazil, but also elsewhere in the world.

Brazilian footwear exports were produced by firms in the Vale do Sinos footwear cluster, in Rio Grande do Sul, and their counterparts in Franca, in the state of São Paulo. Table 5 shows the footwear-export shares of selected Brazilian states. Exports of women's shoes quickly became concentrated in the Vale do Sinos cluster, reflecting its specialization pattern, with Franca specializing in men's footwear. Participation by other Brazilian states in exports is relatively recent.

This rapid incursion of Brazilian footwear on the external market had far-reaching economic and social implications in the Vale do Sinos region. When exports began, the "Vale" region, as a footwear producer, involved just a few neighbouring municipalities, such as São Leopoldo, Estância Velha, Campo Bom, Sapiranga and Novo Hamburgo. The latter became the hub of the activity and has been recognized as the "national footwear capital" ever since.

As this is a labour-intensive and relatively unmechanized activity, the rate of growth of orders from abroad called for a major expansion of the sector, with consequent additional demand for labour, raw materials and other inputs. As the labour supply available in those municipalities was insufficient to meet demand from the firms, workers were drawn in from various localities in Rio Grande do Sul, as a result of individual initiatives by workers themselves, and actions promoted by the firms.[12] A recruitment

[11] Obviously, several elements affect final competitive performance. Schmitz (1999 a and b) seeks to explain the competitive path of the footwear sector in Vale do Sinos through what is known as "collective efficiency", in other words apart from the externalities produced by the productive cluster, there is the joint action of entities and firms in developing the local activity. This is not the place to discuss this point, but merely to observe, for example, that the exchange rate arising from the macroeconomic environment has played a key role in the competitive difficulties faced by the sector, as will be seen below.

[12] These workers, most of them from the countryside, but also from other productive activities, seldom had any training in footwear production tasks. Some of them even found it hard to adapt to factory discipline. That labour force profile, linked to the need to meet high-volumes footwear orders of a single model and with one or two colours, led to the introduction of the conveyor belt and "Taylorist-Fordist" models of work organization which, according to Costa, Deberofski and Spricigo (2007), occurred at the start of the 1970s.

scheme used at the time involved dispatching buses to other municipalities in Rio Grande do Sul, which would circulate through the cities to "pick up" workers. The company representative on board the bus would use a megaphone to advise local inhabitants of job vacancies in the industry.[13]

Obviously this required an expansion of urban infrastructure in terms of housing, transport and schools, which also was supported by the municipal authorities. The growing population density not only raised the cost of reproducing the labour force but also spawned the social disadvantages associated with greater agglomeration, which led the firms to change their labour recruitment strategy. Instead of making workers travel to the municipalities in which the company's headquarters were situated, the latter started to set up additional plants in the municipalities where the workers lived, with a twin purpose: to reduce the pressure on urban infrastructure and to avoid higher labour costs. Employees working in their home neighbourhood could be paid less than those working at headquarters, because those living in agricultural areas would have access to horticultural and farm products, as well as the opportunity to participate in a subsistence activity of some kind (Costa and Fligenspan, 1997).

The geographical boundaries of the Vale do Sinos footwear industry cluster thus started to spread beyond its original municipalities. In research on the migration of footwear firms from Vale do Sinos to the Brazilian north-east, which considered 42 medium-sized and large firms, Costa and Fligenspan (1997) found that some had plants in other municipalities of Rio Grande do Sul, in addition to that of their main headquarters; and a total of almost 30 localities were detected where there was another production unit.

The expansion conditions for Vale do Sinos firms both in the region and elsewhere in Rio Grande do Sul lasted until the mid-1990s, when the sector was confronted by a new competitive environment. The changes in the basis of competition in the sector relate to two main types of factors. One of them stems from the macroeconomic policy implemented by the Brazilian government following the launch of the Real Plan in July 1994, which attempted to stabilize the economy through monetary and exchange-rate policy. By pegging the exchange rate between the real and the United States dollar, an exchange-rate appreciation was generated which, while effective for keeping domestic prices in check, made export products such as footwear less competitive.[14]

The second set of factors concerns the presence on international markets of footwear made by competitors operating under a much more favourable productive conditions than their Brazilian counterparts, including Asian producers particularly from China and Vietnam. Drawing on the supply of abundant labour earning much lower wages than those paid in other footwear-producing countries, the Chinese started to attract demand from customers that previously purchased from Brazilian, Italian, Mexican, Taiwanese and other firms.[15] For the Brazilian footwear industry in particular, which competes on price, the exchange-rate appreciation and competitors with lower production costs had a drastic impact on its export performance.

Foreign markets were lost because, as from the mid-1990s, firms operating as intermediaries between footwear importers and Brazilian manufacturers whose business units were located in Vale do Sinos, started to move to the city of Dongguan in the Guangdong region of southern China, in pursuit of lower-priced footwear. In an interview with the newspaper *Folha de São Paulo* (20 November 2008, p. B7), the owner of one of those firms, Paramont Asia, the largest exporter of women's shoes from China, cited competitive difficulties faced by local producers making cheap footwear from synthetic material, compared to those produced in Asia stated as the reason for leaving Brazil. The firms also took experienced Brazilian

[13] This brief undocumented "history" was recounted to the author by a manager of the firm located in Campo Bom during the research undertaken by Costa and Fligenspan (1997).

[14] The nominal exchange rate fell from R$ 0.94 to R$ 0.84 per dollar between July and December 1994; and Guimarães (1995, cited in Costa and Fligenspan, 1997) estimates the appreciation of the Brazilian currency at 10.6% in real terms, comparing its average 1994 dollar value with its value in December 1996. Moreover, if the comparison is made between that month and earlier periods, using the average values for 1991 and 1992, the appreciation amounts to 30.2%. Exchange-rate policy remained relatively rigid until January 1999, when the Government changed the currency regime and put the real into a free float; whereupon it depreciated from R$ 1.21 per dollar on 12 January 1999 to R$ 1.98 on 29 January 1999 —a 63.3% rise in the nominal exchange rate in under a month (www.ipeadata.gov.br consulted on 8 December 2006). From 2004 onwards, the real appreciated once again: having reached a level of R$ 3.95 per dollar in October 2002, its nominal exchange rate was fluctuating around R$ 1.80 per dollar in late 2009 and early 2008.

[15] The dissertation by Machado (1997) shows, for example, that the average monthly wage in the sports footwear segment was US$ 100 in Vietnam, US$ 120 in China, US$165 in Indonesia, US$ 188 in Thailand and US$190 in Taiwan Province of China, compared to US$ 295 in Brazil.

workers with them to China, to supervise and provide quality control for production in Chinese factories that received footwear orders. There is currently a Brazilian community in that region, most of which originally came from Vale do Sinos.

As shown in table 6, Brazilian footwear exports to the United States have stalled in absolute terms, although that country is the main individual purchaser of footwear on the international market; this trend represented a fall in market share from 9.2% in 1990 to 4.7% in 2004. The Chinese, on the other hand, who until the mid-1980s had a very small presence in the United States statistics, contributing just 1.9% of that country's footwear imports in 1981 (Santos and others, 2002), gradually began to gain market share and by 2004 were making 83.5% of the shoes imported by the United States.

The effect of this competitive pressure on the Brazilian footwear industry provoked a major crisis in the sector, with a nominal export values dropping from a total of US$ 1.85 billion in 1993 to US$ 1.28 billion in 1999, with concomitant job losses. According to data contained in *Relação Anual de Informações Sociais* published by the Ministry of Labour and Employment, the number of workers in the footwear industry nationwide fell by about 56,000, from 240,600 in 1994 to 184,700 in 1998. The Rio Grande do Sul footwear sector shed over 33,000 workers in that process, with the number of employees falling from 128,900 in 1994 to 95,500 in 1998.

Responding to the competitive pressure required support from the Government, together with defensive actions such as the business closure, job losses, and capacity downsizing. A rise in tariff barriers and the granting of credit lines for productive modernization of the sector were the first public-policy measures adopted at that time. In the business domain, especially in the case of large firms, proactive measures were adopted such as the relocation of productive units, this time not to other localities of Rio Grande do Sul but to regions of the country that offered production conditions capable of allowing the sector to face the competition in domestic and external markets, particularly from China, while maintaining some production activities in Vale do Sinos. This migration was assisted by the fact that some Brazilian states, especially Ceará and Bahia, offered a set of tax, financial and labour-hiring incentives to attract investment and create jobs.

The north-eastern states focused mostly on labour-intensive sectors such as footwear (Costa and Fligenspan, 1997; Santos and others, 2002). That practice, which would become widespread in the mid-1990s within the framework of the "tax war", arose because of the lack of national public policies to coordinate and promote industrial investment.

TABLE 6

United States footwear imports by country of origin: 1990-2004

Country	1990		1995		2000		2004	
	Thousands of pairs	Percentage	Thousands of pairs	Percentage	Thousands of pairs	Percentage	Thousands of pairs	Percentage
China	395 719	35.3	949 419	67.4	1 368 344	77.5	1 772 464	83.5
Brazil	103 428	9.2	97 042	6.9	98 540	5.6	98 834	4.7
Indonesia	33 911	6.6	93 177	6.6	76 145	4.3	46 728	2.2
Vietnam	0	0	325	0	7 319	0.4	43 707	2.1
Italy	46 109	4.1	45 680	3.2	52 287	3.0	35 264	1.7
Thailand	34 636	3.1	30 910	2.2	27 571	1.5	25 305	1.2
Hong Kong Special Administrative Region	19 195	1.7	15 469	1.1	10 577	0.6	19 058	0.9
Mexico	26 178	2.3	33 015	2.4	34 748	2.0	15 722	0.7
Taiwan Province of China	188 841	16.9	25 924	1.8	13 740	0.8	13 139	0.6
India	3 992	0.4	6 958	0.5	7 096	0.4	8 037	0.4
Rest of the world	268 653	24	111 313	7.9	68 533	3.9	45 503	2.1
Total	*1 120 662*	*100*	*1 409 232*	*100.0*	*1 764 900*	*100.0*	*2 123 761*	*100*

Source: (Alessandro Ramos Carloni and others, *Setor de calçados: competitividade, mudança tecnológica e organizacional, vol. 1*, Brasilia, SENAI/DN, 2007, table 9).

From the mid-1990s onwards, large numbers of footwear firms from the Vale do Sinos and Franca clusters, especially the former, set up business in the north-east. A scan of national newspapers for reports on the opening of footwear manufacturing plants in the north-east shows that, since 1997, there has been a migration towards several cities in those states, particularly Bahia, as shown in table 7.[16]

Once established in the north-east, some firms started to expand their production capacity in the region by adding new productive units. Examples include Calçados Azaléia, Dakota Calçados and Calçados Paquetá, among others. The relocation of production gave those states an increasing share of sector exports and employment. Data on the percentage distribution of footwear exports by Brazilian states shown in table 4 illustrate the shift of the origin of external sales towards the north-eastern region of the country. The states of Ceará, Bahia and Paraíba, which had less than 1% of footwear exports in 1996, were accounting for 18.5% of such exports 10 years later. Table 8 reports the corresponding shares of employment in the sector.

As from 1997, jobs in the Brazilian footwear industry tended to migrate towards the states of the north-east, particularly Bahia and Ceará, and away from Rio Grande do Sul and São Paulo. In 1996, those two north-eastern states accounted for 5% of employment, but by 2006 they accounted for 24.5% of workers employed in the sector nationwide. In contrast, the share of the states of Rio Grande do Sul and São Paulo declined in that period by about 20 percentage points, from 77.6% to 57%.

Nonetheless, the removal of firms to the north-east was not just a way to respond to importers' orders. For some firms, the production undertaken there also aims to supply the domestic market. For example, the Grendene firm, originally from the municipality of Farroupilha in Rio Grande do Sul, transferred its production of footwear using plastic materials to the north-east, setting up several plants in the state of Ceará; but it kept its product development activities in Farroupilha. According to the firm (newspaper *Valor*, 16 August 2008, p. A4), 85% of its production was for the domestic market in 2007.

[16] The first column of the table only lists firms that relocated their productive units to the north-east. The listing is illustrative rather than exhaustive, because more firms are known to have migrated to that region. The other two columns identify the municipalities in the states of Bahia and Ceará where these firms set up business. Some of them have establishments in more than one municipality, but the author is not interested in listing each firm with the municipality in which it set up, since that would make the table unduly large and add little analytical content to the text. Nonetheless, including a spread of the municipalities reveals that the firms, by migrating, did not expect to consolidate or benefit from an already developed cluster of footwear producers in the region.

TABLE 7

Footwear firms from Rio Grande do Sul which set up production units in the state of Bahia, Ceará or both

Firms from Rio Grande do Sul	Localities in Bahia	Localities in Ceará
Calçados Belpasso, Calçados Bibi, Calçados Cariri, Calçados Jacob, Calçados Orquídea, Daiby, Dakota Calçados,	Alagoinhas, Amargosa, Castro Alves, Conceição do Coité, Conceição do Jacuípe,	Baturité, Canindé, Crato, Iguatu, Itapajé, Maranguape, Pentecoste,
Dal Ponte, Dilly, Gredene, Heinrich, J W Calçados, Killing Tintas e Adesivos, Leve, Luigi Calçados, Maide, Paquetá Calçados, Ramarim, Trevo, Via Uno, Vulcabrás, West Coast	Coração de Maria, Cruz das Almas, Feira de Santana, Ipiaú, Ipirá, Irará, Itaberaba, Itabuna, Itapetinga, Jequié,	Quixadá, Russas, Sobral, Umirim, Uruburetama
	Santo Amero da Purificação, Santo Antonio de Jesus, Santo Estevão, São Francisco do Conde, Serrinha, Teixeira de Freitas, Terra Nova, Valente, Vitória da Conquista	

Source: Prepared by the author on the basis of news items obtained from national newspapers in several periods, and from other sources.
Note: Three firms on the list belonged to footwear auxiliary segments.

TABLE 8

Share of employment in Brazilian footwear industry, selected states 1994-2006

Year	Brazil	RS	Percentage	SP	Percentage	BA	Percentage	CE	Percentage	PB	Percentage	Other	Percentage	Total
1994	240 655	128 882	53.6	63 836	26.5	264	0.1	5 081	2.1	5 497	2.3	37 095	15.4	100
1995	196 462	113 692	57.9	41 839	21.3	229	0.1	6 339	3.2	5 688	2.9	28 675	14.6	100
1996	202 768	116 602	57.5	40 752	20.1	153	0.1	9 968	4.9	7 261	3.6	28 032	13.8	100
1997	182 687	101 814	55.7	35 743	19.6	237	0.1	14 449	7.9	6 398	3.5	24 046	13.2	100
1998	184 725	95 526	51.7	34 478	18.7	1 626	0.9	20 243	11	7 297	3.9	2 555	13.8	100
1999	211 582	108 026	51.1	41 452	19.6	4 967	2.3	22 880	10.8	7 758	3.7	26 499	12.5	100
2000	240 392	120 596	50.2	46 613	19.4	8 350	3.5	27 287	11.3	8 359	3.5	29 187	12.1	100
2001	248 829	129 591	52.1	45 609	18.3	10 431	4.2	27 353	11	7 883	3.2	27 962	11.2	100
2002	262 537	130 510	49.7	46 586	17.7	11 856	4.5	36 770	14	6 700	2.6	30 115	11.5	100
2003	272 124	129 311	47.5	48 009	17.6	15 418	5.7	41 454	15.2	6 185	2.3	31 747	11.7	100
2004	312 579	143 022	45.8	56 993	18.2	19 781	6.3	45 982	14.7	7 192	2.3	39 609	12.7	100
2005	298 659	126 784	42.5	54 570	18.3	22 973	7.7	44 268	14.8	8 461	2.8	41 603	13.9	100
2006	295 222	116 524	39.5	51 681	17.5	24 282	8.2	48 309	16.3	11 692	4	42 734	14.5	100

Source: Prepared by the author on the basis of statistics contained in *Relação Anual de Informações Sociais*, published by the Ministry of Labour and Employment of Brazil

RS: Rio Grande do Sul. SP: São Paulo. CE: Ceará. BA: Bahia. PB: Paraíba.

The exchange rate has played a key role in the trend of total employment in the Brazilian footwear sector, through the decline in exports. As noted above, employment declined when the local currency appreciated in real terms between 1994 and 1998 (see table 8), but then rebounded when the exchange rate returned to more competitive levels in 1999-2004. From 2004 to 2008, when the real appreciated once again, exports declined and employment in the sector fell back, although to a lesser extent owing to demand from the domestic market. The trend of employment in the sector is thus closely related to its export capacity, as shown above in table 5.[17] These adverse effects on activity caused the Government to provide assistance to the sector once again. In April 2007, it imposed tariff restrictions on imported footwear, by raising the import quota (common external tariff) from 20% to 35%, the maximum allowed by the rules of the World Trade Organization (WTO).

In additional support, the Government promoted a credit line for firms through the National Economic and Social Development Bank (BNDES), drawing on resources held in the Worker Protection Fund (FAT), to offer conditions for sector modernization. Nonetheless, as regards the effectiveness of this incentive, it should be noted that the sector's competitive difficulties do not stem from obsolescence in the productive apparatus, but from the exchange rate and labour costs relative to those of Asian countries. The technological upgrading process had already taken place, following the first crisis that began in 1994 (Costa and Fligenspan, 1997). Firms continued to move their productive units to the states of the Brazilian north-east for no other reason.

The sector's effort to remain price-competitive in the market had a major effect on the labour market, causing deteriorating job quality. As shown in table 9, wage ranges narrowed throughout the period 1995-2006, which led to an increase in the number of workers receiving lower pay. In 1995, just 18% of workers employed in the sector earned up to 1½ times the minimum wage, whereas in 2006, 62% of employed workers were in that pay bracket. Higher paid workers (above five times the minimum wage) accounted for 9.9% of the total in 1995, but just 3.4% by 2006.

The adjustment in that most recent phase is a new departure: firms from Vale do Sinos are also starting to set up production units outside the country: Calçados Paquetá is inaugurating a plant in Argentina.[18] Calçados Azaléia has marketing units in Colombia and has opened an office in China from which it outsources footwear production to supply its customers in the United States; and West Coast is outsourcing its production in Argentina, India and Guatemala (*Valor*, 6 and July 2007, p. B6). Another line of action is the effort made by firms to diversify

[17] Exports represent about 30% of total sector production.

[18] In the case of this firm, the decision was taken to avoid the trade restrictions on Brazilian footwear imposed by that country.

TABLE 9

Number of workers in the Brazilian footwear industry by average income level (relative to the minimum wage), 1995-2006

Income bracket	1995	Percentage	2000	Percentage	2003	Percentage	2006	Percentage
Up to 1.5 times the minimum wage	35 367	18	83 563	34.8	129 900	47.7	182 949	62
1.5 to 3 times the minimum wage	110 134	56.1	122 033	50.8	114 929	42.2	91 435	30.9
3 to 5 times the minimum wage	31 524	16	20 825	8.6	15 441	5.7	10 857	3.7
5 to 15 times the minimum wage	15 159	7.7	11 221	4.7	9 869	3.6	6 827	2.3
+ 15 times the minimum wage	2 067	1.1	1 713	0.7	1 546	0.6	799	0.3
Not classifiable	2 211	1.1	1 037	0.4	439	0.2	2 355	0.8
Total	*196 462*	*100*	*240 392*	*100*	*272 124*	*100*	*295 222*	*100*

Source: Prepared by the author on the basis of statistics contained in *Relação Anual de Informações Sociais* published by the Ministry of Labour and Employment of Brazil.
Note: The category "not classifiable" corresponds to the number of workers who did not provide information or provided erroneous information.

markets, and operate more independentlyin terms of marketing their footwear internationally. Selling directly to the final importers is a trade policy which large firms in particular are pursuing by setting up distribution centres abroad, and selling to the importer, while using the latter's brands. Another type of action involves selling abroad through franchises. The pursuit of other attributes to enable firms to compete and operate in different market niches leads them to develop their own brands, by setting up internal departments or sectors to develop fashion products, either working on design themselves or hiring professional services with that specific skill. Those initiatives have attracted attention from large and small firms alike (Schuh, 2006), and also from institutions working in the sector (Costa, 2007). In terms of institutional partnerships, projects in the sector between the Brazilian Footwear Industries Association (Abicalçados), the Brazilian Association of Companies of Components for Leather, Footwear and Accessories (ASSINTECAL), and others, and the Brazilian Trade and Investment Promotion Agency (APEX) have made it possible to increase the number of countries to which the sector supplies footwear products. The mechanisms used in such case are business roadshows, trade missions and assistance to enable firms to participate in international trade fairs.

Meanwhile, the search for other attributes of competitiveness calls for structural changes at the enterprise and sector levels to make those initiatives viable; and these take time to mature. For example, the positioning of a footwear brand requires sustained financial investment over time. Moreover, the transition from price competition to competition based on some other product characteristic is slow and costly. Generally, own-brand and design footwear is manufactured in small batches and workgroups. This in turn requires changes in the layout of production and workers with skills other than those required for more standardized volume production. Nonetheless, volume orders are not expected to disappear, at least in the foreseeable future; so firms, particularly the large ones, will continue to seek to respond to those demands. Ultimately, the search for regions offering competitive conditions with lower production costs will remain the basis for strategic decision-making by the sectors' firms.

IV
Final thoughts

The Brazilian footwear industry, particularly the Vale do Sinos productive cluster, is undergoing major changes of direction in response to a new competitive environment defined by two key factors: the frequent periods of exchange-rate appreciation since 1994, and the presence of competitors on international markets with more favourable production conditions.

Footwear manufacture is one of the founding sectors of Brazil's national industry. Production on Brazilian soil, although present in various states, has from the outset been concentrated in Rio Grande do Sul and São Paulo —in the first of these states, in the Vale do Sinos region; and in the second, in the city of Franca.

Until the late 1960s, the sector consisted of small and medium-sized firms, producing for the domestic market and using craft-based work processes. By the end of that decade, the industry —particularly the Vale do Sinos segment— was entering the international market, taking advantage of the shift of footwear production from developed countries to regions offering better productive conditions in terms of labour supply and low wages. This incursion happened in a subordinate way, with the importer deciding on the outsourced production, the model and the price paid to the manufacturer, as well as marketing to the final consumer. Owing to the size of orders coming from abroad, which involved production runs of hundreds of thousands or more, and little variety, satisfying that demand allowed for rapid and extensive growth and led to far reaching structural changes in the sector.

In terms of working practices, production for the external market led to the introduction of "Taylorist-Fordist" organization methods to make footwear in large volumes in just one or two colours. As a direct-labour-intensive activity, large-volume footwear manufacturer required huge numbers of workers on the factory floor; and this attracted large numbers of workers from other cities in Rio Grande do Sul to the export-pioneering municipalities, such as Novo Hamburgo, São Leopoldo, Campo Bom y Sapiranga. It also caused footwear firms to transfer their production units to other locations in the state. This relocation caused a geographic expansion of the "Vale", which raised the productive profile of other municipalities.

Until the mid-1990s, the geographical expansion of Vale do Sinos footwear production was confined to the state of Rio Grande do Sul. From then on, however, firms in that productive cluster started to relocate their production units in other Brazilian states, particularly Bahia and Ceará, as tax, financial and labour-hiring incentives drew production and employment to the north-eastern region. In 1996, those two states were responsible for just 5% of sector employment nationwide, but 10 years later this had risen to 24.5%. In terms of exports, these two states hardly participated at all in the external market in 1996; but by 2006, along with the state of Paraíba, they accounted 18.5% of Brazilian footwear exports by value. As a counterpart to this, the share of sector employment accounted for by Rio Grande do Sul and São Paulo fell by 20.6 percentage points in the same period. In terms of export value, as the migration of firms to the north-east basically took place from Vale do Sinos, the effect was mainly felt in the state of Rio Grande do Sul, whose share of sector exports dropped from 88.6% in 1996 to 67.6% in 2006. On the labour market, apart from the geographical move, the quality of employment declined throughout the 1995-2006 period, as jobs increasingly slipped into lower pay brackets.

In these first few years of the twenty-first century, footwear firms have also started to move their production out of the country. The pursuit of more competitive conditions in terms of production costs took them to Asia and Latin America, where they have outsourced footwear production lines and set up their own shops, franchises and distribution centres.

Nonetheless, for the sector as a whole, competition based on production cost is increasingly hard to maintain, given the better conditions available to the sector's Asian competitors. One way to overcome this situation is for firms to operate with their own design and brand, sell directly to the final importer, meet smaller orders and ensure swift delivery. But that is a relatively slow course to follow, and it has only just begun.

On a theoretical level, the behaviour of firms belonging to the Vale do Sinos footwear industry cluster raises questions about the evolution of that form of industrial organization. If belonging to a local

productive cluster is a factor of competitiveness, why do firms stop expanding within such arrangements after a certain time, and try to grow outwards, even in localities in which the organizational characteristics of that industry are not fully developed? And, lastly, what are the limits of that form of industrial organization?

As discussed in the theoretical section of this article, this concept requires empirical observation, and each specific industrial district has its own peculiarities. In the case studied here, although footwear production in Vale do Sinos takes place within the structural characteristics of a cluster, its competitiveness is more related to labour costs and the exchange rate than to any specific property of the cluster itself. Since entering the external market, the sector's development shows that its competitiveness was restricted by the prevailing pattern of competition, namely price. Thus, as long as conditions were favourable for competing on price, the sector expanded. When those conditions were adverse, or faltered, the sector started to face growth difficulties. That is the key to understanding the sector's performance through time.

(Original: Portuguese)

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KEYWORDS

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Growth and concentration among the leading business groups in Mexico

Germán Alarco and Patricia del Hierro

This article discusses various hypotheses relating to the origin and operation of business groups in Mexico, and it proposes a model to explain the sources of their total asset growth. It highlights their growing contribution to Mexican GDP, but notes that their shares of employment and profits are smaller. Over time, sales and assets have clearly tended to become more concentrated in the largest groups. The paper concludes that the main financing sources for asset growth between 2005 and 2007 were firstly debt and secondly capital contributions from shareholders. It also finds that the leading groups invest discretely over time and tend to "overinvest" to block the entry of other competitors.

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I
Introduction

The presence of business groups has been a longstanding and important source of debate because they account for a large share of production, investment and employment in some countries; and they have been the protagonists of industrialization processes in many cases. The recent return to more specialized and less diversified business structures has not diminished their preponderance internationally. This view of business groups coexists with others that see them as reflecting market distortions or failures with the potential to impair competitive processes.

The study of enterprises and business groups in Mexico is not recent. Basave and Hernández (2007, pp. 94-119) review its evolution, starting with the pioneering work of Cossío Villegas and Ceceña in the 1970s, which focused on industrialization and monopolies. Subsequently, in the import-substitution strategy and closed-economy phase, the focus was turned towards concentration in the different sectors and branches of the economy, and on the role of foreign direct investment (FDI). In the 1980s, industrial development tended to be explained in terms of the influence of financial capital (before and after the 1982 crisis); and, more recently, the approach has sought to explain trans-nationalization and the export dynamic of large Mexican firms.

In the real world, Latin American business groups, including Mexican ones, have arisen mainly in three periods (Mortimore and Peres, 2001, p. 51). During the country's first industrialization wave at end of the nineteenth century, business groups created large manufacturing factories that were not formally integrated, and set up banks to finance them. In the second industrialization wave starting in the 1930s, a network of firms emerged that were held together through holding companies (Chavarín, 2006, pp. 195-196). In the third wave, new business groups were formed as part of the neoliberal productive restructuring —characterized by privatization, deregulation and globalization— which began in the 1980s (Fernández, 2000, p. 97). Among the 10 leading Mexican groups, three large groups stand out: Slim, Zambrano-Cementos Mexicanos (Cemex) and Salinas Pliego-Elektra.

The universe of large firms located in Mexico includes transnational enterprises, the strengthening and modernization of traditional groups and the emergence of new and very powerful conglomerates formed since the 1980s. Domestic firms grew rapidly in size and developed into a medium-sized transnational structure, as a result of goods and capital exports, while ownership maintained the traditional profiles (Garrido, 1997, pp. 8-9). In response to trade liberalization and the North American Free Trade Agreement, firms targeting the domestic market entered strategic partnerships with foreign firms, raised entry barriers (through preventive investments), and deployed a combination of market power and political relations (Garrido, 2001, pp. 2-3).

This article has several aims. Firstly, it will briefly review explanations of the origin and maintenance of business groups, and propose a model to explain the sources of total asset growth. Secondly, it will present and process statistical data to assess the importance of the leading groups in the Mexican economy in terms of gross domestic product (GDP), employment and profits. Thirdly, it will explore the growth dynamic of Mexican business groups between 2004 and 2007, based on the model developed in the first part and on a cross-section equation.

The article consists of three sections and final thoughts. The first part reviews and evaluates the concepts of diversification, synergy, networks, various hypotheses on the emergence and operation of business groups, and a simple model to explain the sources of asset growth among those groups. The second part discusses the importance of these groups in the Mexican economy and the levels of asset, liability and capital concentration within them. The third section explores the growth sources of these groups during the period under analysis. Lastly, two annexes set out the data used in the regression analysis.

This article does not analyse the transnational firms or medium- and small- scale enterprises with which the most important Mexican business groups coexist. The leading Mexican enterprises are assumed

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to act under the business-group modality. The paper also does not review the history of large Mexican business groups and their relations with the State, nor does it analyse the specific behavior of any of them in times of boom (Garrido, 2002; Castañeda, 2004) or crisis (Garrido, 2001).

II

Diversification, contribution and growth possibilities of business groups

The fundamental issue for defining business groups is diversification. While this concept and how to measure it do get discussed, the most traditional approach is to define the business group in terms of active participation in various different business areas that may or may not be related (Huerta and Navas, 2007, pp. 134-135). The next issue to consider is the relation between diversification and business results. Here, the same authors claim that the link between diversification and results remains inconclusive, despite numerous studies. Nonetheless, they infer, firstly, that diversified firms achieve better results than single-business enterprises, *ceteris paribus*; and firms that are diversified within related areas perform better than those whose diversification is unrelated (ibid., pp. 138 and 141).

The synergy and network concepts are fundamental for understanding business groupings. In the case of synergy, Huerta and Navas (2007, pp. 137-138) state that related resources between businesses generate synergies (the whole is greater than the sum of the parts) that enhance overall corporate value; whereas formal and informal networks provide a way to reduce transaction costs in the market by choosing less expensive resources. Such networks can also be viewed from the social standpoint, prioritizing personal contacts as a key tool for obtaining the desired results (Levanti, 2001, p. 1,046).

The term "business group" should be understood as a form of business network that arises from a specific combination of organizational architecture and corporate governance, in which a group of firms is controlled by a small number of large shareholders, usually members of an extended family or a closed circle of associates with mutual social ties. Transactions between the firms in a group are usually sustained over the long term and respond to institutional shortcomings, such as the functioning or formation of certain markets (credit, for example), the availability of certain workers or inputs, the presence of market failures; or else they are explained in economic-policy, sociological, culturalist or other terms (Chavarín, 2006, pp. 194 and 195).

The market-failure or imperfections approach claims that business groups overcome difficulties in obtaining capital, specialized labour, raw materials, components and technology in emerging economies (Guillén, 2000, p. 363). Along the same lines, Rendón (1997, p. 5) argues that groups emerge in response to the uncertainty of guaranteeing quality and timely delivery of the inputs they need for production and sales.

The second approach, favoured by sociologist-economists, argues that firms replicate the surrounding social structure, such that patterns of vertical, horizontal and reciprocal authority affect business organization and relations between firms. These patterns of authority are assumed to be relatively stable through time and resistant to external pressures. Key examples can be found in the Republic of Korea (vertical structure), Taiwan Province of China (horizontal), and Japan (reciprocal). In the third approach, the growth of business groups in newly industrialized countries is associated with policies to promote economic development implemented by the Government or banks, or both, in which the Government prefers to deal with few enterprises as agents of the private sector (Guillén, 2000, pp. 363 and 364).

Another way of visualizing theories that explain the emergence of business groups has been proposed by Tarziján and Paredes (2006, pp. 56-58), who argue that the structure of business groups originally reflected the economic incentives prevailing in the region at the time; and that this organizational structure is now less useful and has varied, as a result of changes in the institutions that gave rise to those incentives. Moreover, the hypothesis propounded by these authors is that business groups form and consolidate to generate a

structure and network of influences that affords them access to political power and, thereby, enhances their economic capacity and action.

Khanna and Yafeh (2007, pp. 333, 336-341) set forth and analyse six hypotheses to explain the formation of business groups, the persistence of such groups in different settings, and some of their welfare implications. The first hypothesis claims that diversified business groups are more common in economies that have less developed market institutions. Following an extensive bibliographic review, they conclude that capital-market under-development is not a decisive factor in forming a business group. Apparently, other types of institutions and situations are more important, such as vague labour laws, low skill levels among workers and managers, or a desire to reduce the tax burden. There is also no clear linear correlation between greater diversification and higher profits. In general, the results are ambiguous, for example in the Chilean case —with well developed capital markets and more or less clear labour laws— the formation of groups with diversification aims has intensified.

The second hypothesis developed by Khanna and Yafeh (2007, pp. 341-343) argues that the formation of business groups, through vertical integration and the volume of intragroup exchange, tends to be greater when legal and judicial institutions are poorly developed, implying higher contracting costs. The evidence does not support this hypothesis, however, and vertical integration would seem to be more reflective of a firm's desire to increase its monopoly power. The third hypothesis claims that the formation of pyramid-type groups (controlled by a few shareholders) is common in countries where the law provides weak protection for investors. This in turn forces investors to seek a discount when they buy shares in a firm belonging to an business group.

No evidence has been found to support this hypothesis. Pyramid groups tend to form in cases where the State has implemented laws to support or protect industries, for example the Chaebol of the Republic of Korea. Group formation in such cases has more to do with stabilizing earnings rather than maximizing them. Moreover, these groups seek to spread the support and subsidies they receive from the State among their members. Group structures also enable firms to overinvest for the purpose of erecting defences or barriers against other domestic or external competitors.

The fourth hypothesis states that family control of business groups is more common in countries where laws are inadequate and transactions with third parties are costly. Such groups also continue to exist for societal reasons going beyond family ties. The family presence tends to be greater in countries that have poorly developed institutions and markets. For example, in Singapore and Malaysia, nine out of 10 and 35 out of 50 groups had managers drawn from the respective controlling families. Similarly, there are social, cultural, institutional and other factors extending beyond the purely economic rationale, which determine and influence the creation, preservation and operation of business groups (Khanna and Yafeh, 2007, pp. 348-351).

The fifth hypothesis argues that while the creation, expansion and diversification of business groups occurs as a result of government support, their profitability depends on the skills and opportunities they succeed in harnessing. Thus, evidence shows that business groups in many countries were formed thanks to deliberate support from the Government. Nonetheless, while it was possible to confirm that such support is very important to the formation of business groups, in other countries, groups have also arisen with little or no government help. The general pattern, however, is that the vast majority of business groups initially consist of families with very close links to the Government of the day.

Under their own dynamic, business groups accumulate both economic and political influence and power. This causes their relation with the State domain to be fluctuating, ambiguous, and changing, which sometimes elicits a reaction by the State to try to reduce their influence. As a result, their representatives have to lobby intensively to avoid falling out of favour with the authorities. In some circumstances, groups also confront the State, for example in attempts to resist anti-trust and other similar regulations. Khanna and Yafeh (2007, pp. 352-361) find a fruitful relation between the State and business groups, which also has its setbacks since it involves a game between the two parties, and the games are typically complex. Although they cohabit, their coexistence is not easy.

The final hypothesis proposed by Khanna and Yafeh (2007, pp. 361-362) focuses on the fact that business groups engage in a number of uncompetitive practices that tend to increase market power; and this monopoly power is reflected in high rates of profit —especially when they can establish trade barriers and the regulatory framework promoting competition is weak. On this point, it is not entirely clear whether increasing the degree of monopoly

increases profits. In such variable environments, it impossible to create stable conditions to guarantee a given level of monopoly and abundant profits; and perhaps this explains why business groups are forever trying to influence government decisions.

Following this bibliographic review, we now design a model to explain the sources of expansion of business groups, based on a breakdown between domestic financing (retained profits) and external financing. The starting point is the balance sheet of these groups, where the year-on-year change in total assets (*A*) in a given year, compared to the previous one, is equal to the sum of year-on-year variations of liabilities (*L*) and capital (*E*). Total assets include financial assets (including investments), fixed and other assets, reflecting the fact that a group can expand through different channels. Equation (2) shows these changes in discrete terms, where the asset growth may be financed through debt (liabilities) or equity.

$$A_t - A_{t-1} = \left(L_t - L_{t-1}\right) + \left(E_t - E_{t-1}\right) \tag{1}$$

$$\Delta A = \Delta L + \Delta E \tag{2}$$

This article will not discuss the constraints on external financing, but it is clear that this is possible provided certain proportions are maintained in relation to equity growth. Normally, no group will borrow in excess of the standards of the activity in question, which traditionally are related to a given proportion of the capital contributions made by the partners in the business group. Capital growth occurs as a result of profits earned in the fiscal year (*P*) and capital expansions, either direct or through the stock market (*NS*). The group's external debt is defined as a proportion of the increase in equity, considering two ratios linked to the total of liabilities with respect to total assets (α) and assets in relation to capital (β) of equations (3) and (4), which are substituted in equation (2) to obtain (5).

$$\frac{L}{A} = \alpha \tag{3}$$

$$\frac{A}{E} = \beta \tag{4}$$

$$\Delta A = \left(1 + \alpha\beta\right)\left(NS + P\right) \tag{5}$$

Profits can be explained by various traditional variables, such as the product of return on equity (*roe*) and capital in equation (6); or the return on sales (*ros*) multiplied by total sales (*S*) , the latter being the product of the business group's share of the total sales of the activity (χ), the activity's share in GDP (δ), and GDP itself, as shown in equation (7). No distinction is made here between profits and retained profits after dividend distribution.

$$\Delta A = \left(1 + \alpha\beta\right)(NS + roeE) \tag{6}$$

$$\Delta A = \left(1 + \alpha\beta\right)\left[NS + ros\left(\chi\delta Y\right)\right] \tag{7}$$

The total-asset growth of any business group is explained directly by the growth of output;[1] the possibilities of increasing capital with the same partners, new partners (or both); or through the stock market. Asset growth is also affected directly by the ratios liabilities/total assets, total assets/capital, and return on sales of the business group, and by share of the firm and activity in the economy.

[1] For simplicity, the analysis excludes external sales, which would depend on the dynamic of the product or service internationally and its external competitiveness.

III

Participation by business groups in the Mexican economy

The available statistical information on national business groups comes from the journal *Expansión*, which publishes a report on the 100 largest firms in Mexico every year between late April and June. This publication provides information on domestic enterprises and the firms under their control ranked in descending order. For the purposes of this article, information has been selected from the last four years (2004-2007), published between 2005 and 2008, since it is more homogeneous.[2] These 100 leading enterprises, which engage in various economic activities, do not generally operate in isolation, but form large organizations that function as business groups (Rendón and Morales, 2008b, p. 1,184).

The report presents the following information for each business group: sales, stockmarket capitalization, volume traded on the Mexican stock market, number of workers, net profit, return on equity (*roe*), the ratio between the share price and earnings per share at the end of December each year, and the asset/debt ratio. To supplement this information, it also shows market share and the index of economic power calculated by *Expansión*. In the first year only (2004), the report also contains records on total assets and equity.

We used partial the information provided by *Expansión* for 2004, 2005, 2006 and 2007 to estimate total assets, liabilities and capital for each and every group. Equity (E) was estimated on the basis of knowledge of net profit for the fiscal year (P) and the rate of return on equity (*roe*) shown in equation (8). Total liabilities (L) were determined from the accounting identity which states that total assets are equal to liabilities plus equity, as shown in equation (9). Dividing each side of this expression by (L) gives the ratio between total assets and liabilities, as shown in equation (10).

$$roe = \frac{P}{E} \tag{8}$$

$$A = L + E \tag{9}$$

$$\frac{A}{L} = 1 + \frac{E}{L} \tag{10}$$

The results thus obtained revealed a number of inconsistencies in the information. In some enterprises, the value of total assets, liabilities and equity were sharply different between 2006 and 2007. It was found that the inconsistencies occurred when returns on equity changed significantly without any relation to what was happening with net profits. The case of the first Mexican group (Slim) is illustrative, since return on equity (*roe*) fell from 26.4% to 12.6% between 2006 and 2007, while profits rose from 77,450 million pesos to 122,370 million pesos, and the ratio total assets/liabilities remained constant at 1.6.

To correct this problem, various alternatives were evaluated, considering ranges in the variation in sales, in *roe*, in net profit, and in the total assets/debt ratio. These were evaluated conceptually and then applied to the database. Nonetheless, a new criterion was ultimately adopted whereby the *roe* for 2007 would be equal to that of the previous year (2006), multiplied by the profits of 2007 and divided by the profits of 2006. This made it possible to avoid sharp variations in capital, and hence in liabilities and in total assets. Moreover, to guarantee data consistency, it was decided to eliminate all information from the enterprise or business group for a given year if data were missing on total assets, liabilities or equity. Maintaining that enterprise would have meant affecting the balance of the sum of balance sheets (or the financial situation statement).

For the 100 largest enterprises in Mexico, table 1 shows their GDP, wage-earning employment, the employed population and operating profits for the years under analysis. To analyse the degree of concentration or dispersion, information is also presented for the first five groups (6 - 10) and for groups 11-20, 21-30, 31-40, 41-50 and 51-100.

The total sales of the 100 enterprises with respect to GDP grew between 2005 and 2007, reaching the equivalent of 22.9% of GDP in the latter year.

[2] The information contained in *Expansión* on the 100 Mexican enterprises goes back further, but unfortunately it is not comparable over time.

TABLE 1

Contribution of Mexican business groups to GDP, employment, and operating profits
(Percentages)

Groups	Year	Gross domestic product	Employment		Operating profit
			Wage- earners	Employed population	
Groups 1 - 5	2004	11.87	2.05	1.17	2.12
	2005	9.60	1.70	1.00	2.03
	2006	10.09	1.68	1.01	2.08
	2007	10.65	1.78	1.08	...
Groups 6 - 10	2004	3.47	0.68	0.39	0.50
	2005	2.77	0.95	0.56	0.47
	2006	2.51	0.73	0.44	0.44
	2007	3.48	0.97	0.59	...
Groups 1 - 10	2004	15.34	2.73	1.56	2.62
	2005	12.37	2.66	1.56	2.50
	2006	12.59	2.42	1.45	2.51
	2007	14.13	2.75	1.66	...
Groups 11 - 20	2004	3.32	0.97	0.55	0.44
	2005	3.08	0.89	0.52	0.47
	2006	4.09	1.24	0.75	0.52
	2007	3.36	1.16	0.70	...
Groups 21 - 30	2004	1.57	0.64	0.37	0.08
	2005	2.10	0.66	0.39	0.20
	2006	2.03	0.68	0.41	0.19
	2007	2.17	0.72	0.44	...
Groups 31 - 40	2004	1.21	0.38	0.22	0.09
	2005	1.57	0.46	0.27	0.12
	2006	0.99	0.35	0.21	0.11
	2007	1.27	0.36	0.22	...
Groups 41 - 50	2004	1.18	0.29	0.17	0.07
	2005	0.40	0.20	0.12	0.08
	2006	0.78	0.33	0.20	0.07
	2007	0.51	0.21	0.13	...
Groups 51 - 100	2004	1.51	0.47	0.27	0.03
	2005	1.49	0.51	0.30	0.12
	2006	1.58	0.53	0.32	0.11
	2007	1.49	0.61	0.37	...
Total	*2004*	*24.13*	*5.48*	*3.14*	*3.32*
	2005	*21.01*	*5.39*	*3.16*	*3.49*
	2006	*22.06*	*5.54*	*3.33*	*3.51*
	2007	*22.91*	*5.81*	*3.51*	...

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

Nonetheless, this was a smaller share than in 2004. The first five groups alone account for 10.7% of GDP; while the first 10 produced 14.1% of GDP in 2007, groups 11-20 contributed 3.4%; groups 21-30 contributed 2.2%; groups 31-40 contributed 1.3%; groups 41-50 contributed 0.5%; and groups 51-100 contributed 1.5% of GDP. Between 2005 and 2007, there is a greater concentration of national output in domestic groups generally, although less among the first 10 groups.

Is worth noting that GDP grew between 3% and 3.5% per year in the period under analysis, quite close to the long-term historical average, despite the fact that oil prices were rising. Inflation rates fluctuated between 5.2% and 3.3% per year, while the exchange rate against the dollar remained broadly stable. The purchasing power of wage earners, the external sector, the financial sector and public finance all maintained their trends of previous years.

The 100 largest enterprises provided just over 1.5 million permanent jobs in 2007, representing an insignificant 5.8% of total wage-earners (persons receiving wages and salaries) and just 3.5% of the employed population nationwide.

Employment is less concentrated than total sales in relation to GDP, since the 10 leading groups provided just 2.8% of national wage-earning employment in 2007, and 1.7% of the total employed population. The first five groups accounted for 1.8% of wage-earning employment, and 1.1% of the total employed population. Groups 11 to 20 accounted for 1.2% and 0.7%, respectively, while groups 21 to 30 employed 0.7% and 0.4% of the total, in that year.

The share of operating profit is measured by the ratio between the sum of net total profits earned by the selected firms and the total operating profits reported in the national accounts. There is currently no information available on profits for 2007. Nonetheless, between 2004 and 2006, the share of these firms in operating profits nationwide rose from 3.3% to 3.5%. In the latter case, while the top 10 groups contributed 2.5% of national profits, in 2004 their share was 2.6%.

With regard to other information sources, Rendón and Morales (2008b, pp. 1,178 and 1,180-1,181) argue that concentration in favour of the larger firms and business groups clearly increased. Between 1993 and 2003, large firms employed 21.1% and 28.4% respectively of all persons employed in the economy. The 5,000 largest Mexican firms reported by *Expansión* had net sales equivalent to 18.2% of GDP in 1990, 50% in 2000, and as much as 73.5% in 2004. In the latter year, 5.4% of these firms were State-owned, 57.8% were domestic private-sector firms, and 36.8% were foreign.

Table 2 shows a number of financial ratios applied to the 100 business groups, and also to a selection of those groups by decile. The chosen ratios include the asset turnover rate, defined as total sales divided by the value of total assets. The second ratio measures average output per employed worker, calculated the quotient between total sales and the number of workers, in millions of pesos at current prices. The third ratio, subject to stock-market fluctuations, is the quotient between the groups' market value (stock market capitalization) and total assets. Leveraging ratios are then presented —total liabilities in relation to total assets, and total liabilities in relation to equity. Lastly, the table shows the ratio of net profits to equity as a percentage.

Taking the 100 enterprises as a whole, asset turnover increased between 2004 and 2007, which implies better exploitation of total assets. Groups 11-50 make better use of total assets than the first 10 groups, where turnover is lower. Asset turnover is highest among groups 31-50. The lower turnover of total assets displayed by the top 10 business groups reflects the existence of greater idle installed capacity, stemming from "overinvestment" aimed at erecting entry barriers against competitors, by raising equipment standards. These firms overinvest to raise barriers and would have the capacity to respond more quickly to unforeseen changes in demand. This defensive strategy has also been reported by Mortimore and Peres (2001, p. 54).

The average output per worker for all enterprises analysed has also increased, but only from 2005 to 2007, having fallen between 2004 and 2005. By decile, the highest value corresponds to the 10 leading enterprises, followed by groups 31-40. The ratio of market capitalization to total assets has also increased between 2004 and 2007, reflecting the better performance of the price index and prices quoted on the Mexican stock exchange. This ratio is also higher in the case of the 10 leading business groups, and among those in positions 31-50.

Leveraging indicators for the period 2004-2007 do not display a clear trend and are less variable in the case of total liabilities/total assets. The other ratio of total liabilities with respect to capital fluctuates more. Both ratios rose between 2006 and 2007. Total liabilities grew to 60% of total assets, and 148% of equity set of enterprises as a whole. The 10 leading groups have slightly higher ratios, equivalent to 62% and 161%, respectively, in 2007.

The last ratio is the quotient between net profit and equity, which rose from 14% to 24% between 2004 and 2007. The top 10 groups have the highest rates of return in all years, whereas the other deciles display lower rates. The larger the size, the higher the absolute and relative returns.

Figure 1 shows concentration levels among total assets, total liabilities and equity, for the 100 largest enterprise groups in Mexico. The 10 largest domestic groups have been increasing their share of total assets: 60.8% in 2005, 62.9% in 2006 and 66.8% in 2007. The top 10 groups had 59.1% of total liabilities in 2005, 63.7% in 2006, and 69% in 2007. Equity shows no clear trend, however, with the share in those years fluctuating between 63.1% in 2005, 61.8% in 2006, and 63.5% in 2007.

These high concentrations are ratified through the Herfindahl-Hirschmann index (HHI), for the various deciles of the 100 leading business groups in Mexico. In this case, the index is defined as the sum of the squares of the shares of total assets of each

TABLE 2

Financial ratios of Mexican business groups, 2004-2007

Groups	Year	Sales/total assets	Sales/workers[a]	Stockmarket capitalization/ total assets	Liabilities/total assets	Liabilities/ equity	Net profit/ equity (%)
Groups 1 to 10	2004	0.58	2.08	0.71	0.61	1.54	15.41
	2005	0.66	1.80	1.07	0.56	1.28	18.41
	2006	0.81	2.12	1.58	0.55	1.22	22.04
	2007	0.82	2.21	1.69	0.62	1.61	28.86
Groups 11 to 20	2004	0.97	1.27	0.83	0.49	0.98	15.49
	2005	0.68	1.33	0.41	0.65	1.86	17.75
	2006	1.07	1.34	0.75	0.54	1.15	17.96
	2007	1.12	1.25	1.13	0.57	1.30	16.70
Groups 21 to 30	2004	0.81	0.90	0.62	0.58	1.38	5.87
	2005	0.95	1.23	1.01	0.46	0.86	9.89
	2006	1.19	1.22	1.13	0.57	1.33	15.85
	2007	1.41	1.29	1.04	0.57	1.32	18.74
Groups 31 to 40	2004	0.82	1.17	0.62	0.50	1.00	7.07
	2005	0.91	1.31	0.43	0.61	1.54	10.32
	2006	0.77	1.15	0.76	0.55	1.20	11.83
	2007	1.27	1.50	1.17	0.55	1.24	8.88
Groups 41 to 50	2004	1.45	1.49	0.59	0.55	1.22	11.11
	2005	0.43	0.77	0.33	0.68	2.16	16.40
	2006	0.98	0.95	0.88	0.55	1.22	11.55
	2007	0.64	1.02	1.31	0.43	0.75	17.29
Groups 51 to 100	2004	0.70	1.18	0.40	0.62	1.64	2.27
	2005	0.57	1.13	0.28	0.60	1.53	6.93
	2006	0.98	1.22	0.44	0.45	0.83	7.64
	2007	0.65	1.06	0.46	0.58	1.40	8.77
Total	*2004*	*0.67*	*1.62*	*0.69*	*0.59*	*1.44*	*13.65*
	2005	*0.68*	*1.51*	*0.84*	*0.58*	*1.36*	*16.16*
	2006	*0.89*	*1.62*	*1.28*	*0.54*	*1.19*	*19.02*
	2007	*0.88*	*1.70*	*1.45*	*0.60*	*1.48*	*23.52*

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

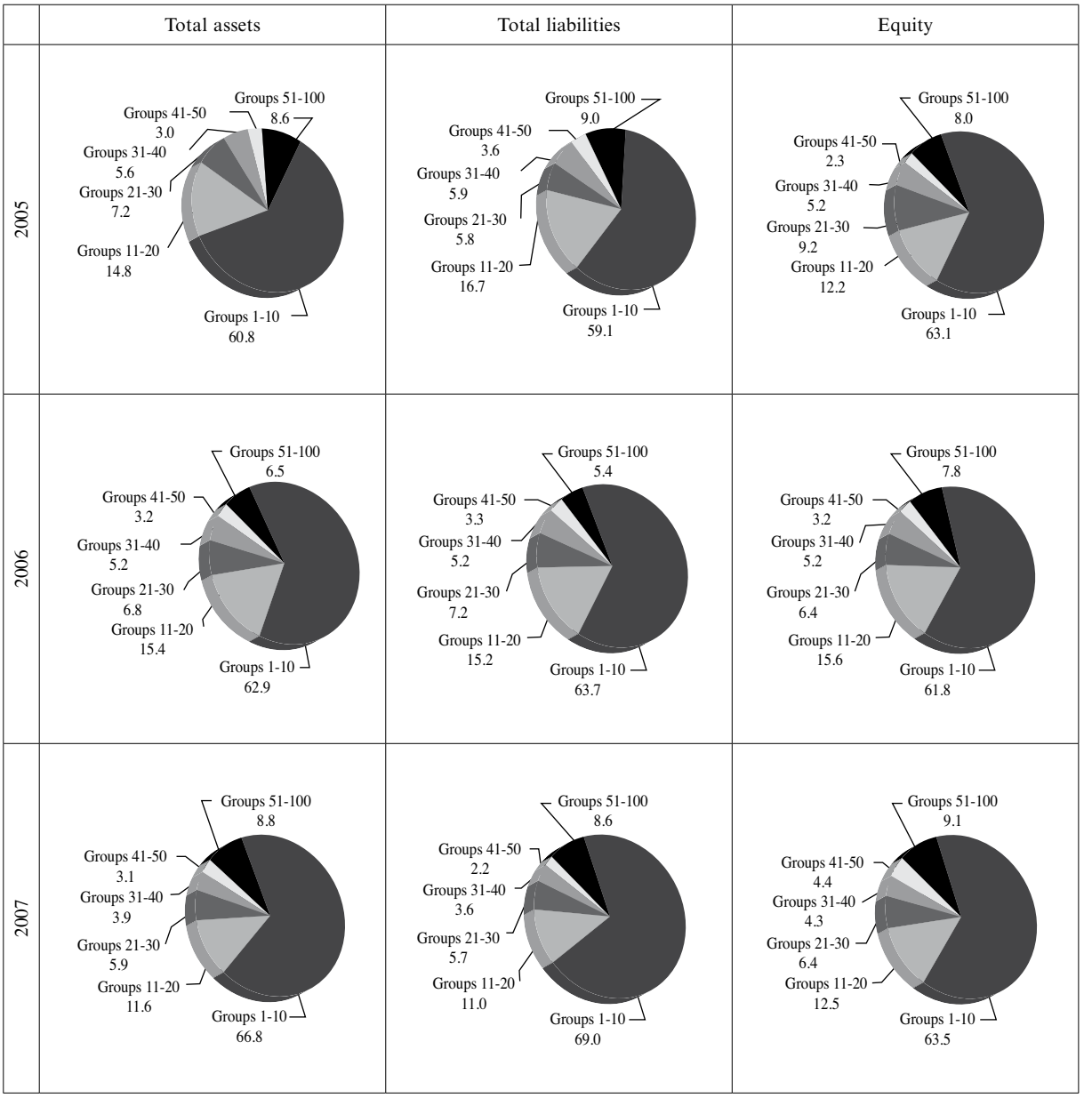
[a] Millions of pesos per worker at current prices.

decile in the total of the 100 groups.[3] The maximum HHI value is therefore 10,000 when a decile accounts for 100% of total assets (maximum concentration). A decile can be classified as deconcentrated (HHI<1,000), moderately concentrated (1,000< HHI <1,800) or highly concentrated (HHI >1,800). The available information shows that asset concentration is clearly very high and increasing through time, since the HHI for 2005 was 4,506.4, compared to 4,672.5 in 2006, and 5,208.7 in 2007.

[3] $IHH = \sum_{i=1}^{n} S_i^2$, where S_i is each group's share in the total.

FIGURE 1

Distribution of assets, liabilities and equity among Mexican business groups, 2005-2007
(Percentages)



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

IV

Growth and dynamic of the business groups, 2004-2007

Table 3 provides data on the key accounting categories for all Mexican firms in 2004 through 2007, in millions of pesos at current prices, including total assets, total liabilities, equity, total sales and net profits. The table includes information not only for the total, but also the first five deciles (positions 1-10, 11-20, 21-30, 31-40, 41-50), along with the subtotal of values for firms located in positions 51 to 100.

An initial aspect to stress is that local sales decreased between 2004 and 2005, along with the total assets, liabilities and the equity of all enterprises. Only net profits grew in that period. There are several possible explanations for this. Firstly, it may reflect the presence of adjustments in accounting criteria ordered by the government authorities, relating to the consolidation of firms in a single business group. Secondly, it may stem from the combination of the accounting criteria mentioned above, with the sale of assets or equity by national groups to foreign owners, although the FDI data for those years do not report a significant increase in assets held by foreigners.

Lastly, it is important to note that the changes that occurred between 2004 and 2005 in some of the top 10 Mexican groups (Slim, Larrea, Fernández,

TABLE 3

Values of the main accounting categories of Mexican business groups, 2004-2007
(Millions of pesos at current prices)

Group	Year	Total assets	Total liabilities	Total equity	Sales	Net profits
Groups 1 - 10	2004	2 265 072.0	1 374 430.0	890 642.0	1 314 944.0	137 250.0
	2005	1 722 874.9	966 419.7	756 455.3	1 141 545.5	139 267.8
	2006	1 615 730.7	888 420.5	727 310.3	1 302 136.5	160 293.4
	2007	1 934 035.2	1 192 394.4	741 640.7	1 579 250.8	214 041.2
Groups 11 - 20	2004	291 554.0	143 978.0	147 576.0	284 168.0	22 857.0
	2005	419 231.0	272 472.1	146 758.8	283 991.4	26 053.7
	2006	395 449.6	211 700.8	183 748.8	423 366.5	32 995.3
	2007	335 344.7	189 553.9	145 790.9	375 056.5	24 341.3
Groups 21 - 30	2004	167 222.0	96 864.0	70 358.0	134 669.0	4 128.0
	2005	205 516.2	94 855.3	110 660.8	194 277.1	10 948.0
	2006	175 905.6	100 453.0	75 452.6	209 954.2	11 956.9
	2007	172 219.9	97 955.0	74 264.9	242 440.5	13 920.8
Groups 31 - 40	2004	126 921.0	63 579.0	63 342.0	103 838.0	4 481.0
	2005	159 153.1	96 442.0	62 711.0	144 607.1	6 471.5
	2006	133 482.0	72 909.0	60 573.1	102 255.7	7 164.3
	2007	111 558.2	61 808.5	49 749.7	141 402.5	4 417.6
Groups 41 - 50	2004	70 022.0	38 544.0	31 478.0	101 312.0	3 496.0
	2005	85 849.4	58 681.8	27 167.6	36 942.6	4 456.6
	2006	82 866.0	45 510.7	37 355.3	80 883.5	4 314.3
	2007	88 971.3	38 078.4	50 893.0	56 676.4	8 801.8
Groups - to 100	2004	184 840.0	114 764.0	70 076.0	129 632.0	1 591.0
	2005	242 684.5	146 697.8	95 986.7	137 580.6	6 647.1
	2006	167 056.0	75 553.1	91 502.8	163 248.5	6 995.0
	2007	253 811.9	147 997.0	105 814.9	166 019.6	9 283.2
Total	*2004*	*3 105 631.0*	*1 832 159.0*	*1 273 472.0*	*2 068 563.0*	*173 803.0*
	2005	*2 835 309.1*	*1 635 568.8*	*1 199 740.3*	*1 938 944.3*	*193 844.7*
	2006	*2 570 489.9*	*1 394 547.1*	*1 175 942.8*	*2 281 844.9*	*223 719.2*
	2007	*2 895 941.2*	*1 727 787.2*	*1 168 154.0*	*2 560 846.3*	*274 805.9*

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

Garza Medina and Salinas Pliego) explain most of the amounts observed for the 100 leading business groups. The higher level of total assets, liabilities and equity in 2004 compared to the 2005 figures, can also be seen in the deciles containing the smaller business groups, apart from those located in positions 41-50.

The total sales of the 100 leading domestic enterprises increased between 2005 and 2007, while total assets retreated 2005-2006, before recovering between 2006 and 2007. Total liabilities moved in a similar way, contracting again in 2005 and 2006, before rising from 2006 to 2007. In the case of equity, there has been a slight long-term declining trend despite profits expanding from year to year.

Table 4 shows the annual financial flows of total assets, which are explained by the variation in total liabilities and equity for all of the 100 large Mexican enterprises (presented by decile). Only information for the period 2005-2006 and 2006-2007 is shown, because the period 2004-2005 involves the methodological elements referred to above. As information from just two years in particular is used, it is not considered necessary to transform from millions of current pesos to constant prices basis.

An initial comment on the available information is that the higher sales levels are not supported by changes in total assets: financial, fixed or intangible. These levels, reflecting higher domestic or external demand, stem from higher turnover in relation to total assets and the investment decisions taken discontinuously through time. Given the scant information available, it is impossible to establish other hypotheses on this. From 2005 to 2006, total assets declined, matched by a larger reduction in total liabilities with respect to equity. This phenomenon is general and could be explained by accounting or other reasons.

Between 2006 and 2007, there was significant growth in total assets among the 100 enterprises analysed. Nonetheless, the behaviour is different, because most of the increase is explained by what happened in the top 10 groups, and among the smallest, located in positions 41-100. There is a sharp drop in the value of assets and liabilities among groups 11-40. The other relevant observation, when working with the set of firms as a whole, is that the main adjustment variable are liabilities, with equity fluctuating by less.

As a whole, the 100 largest firms are financed overwhelmingly by third-party capital (liabilities), supported by small equity capital injections. The situation is clear in the case of the 10 leading business groups, whose total asset expansion is financed with liabilities, and to a lesser extent through an equity expansion. In contrast, the latter is more important as a financing mechanism among groups in positions 41-100, especially those ranked 41-50, whose total

TABLE 4

Financial flows of Mexican groups, 2005-2007[a]

(Millions of pesos at current prices)

Groups	Year	Variation in total assets	Variation in total liabilities	Variation in equity
Groups 1 - 10	2005-2006	-107 144.2	-77 999.2	-29 145.0
	2006-2007	318 304.5	303 974.0	14 330.5
Groups 11 - 20	2005-2006	-23 781.4	-60 771.3	36 989.9
	2006-2007	-60 104.9	-22 147.0	-37 957.9
Groups 21 - 30	2005-2006	-29 610.6	5 597.7	-35 208.3
	2006-2007	-3 685.7	-2 498.0	-1 187.7
Groups 31 - 40	2005-2006	-25 671.0	-23 533.1	-2 138.0
	2006-2007	-21 923.9	-11 100.5	-10 823.4
Groups 41 - 50	2005-2006	-2 983.4	-13 171.1	10 187.7
	2006-2007	6 105.3	-7 432.4	13 537.6
Groups 51 - 100	2005-2006	-75 628.6	-71 144.7	-4 483.9
	2006-2007	86 755.9	72 443.9	14 312.0
Total = US$100	*2005-2006*	*-264 819.2*	*-241 021.7*	*-23 797.5*
	2006-2007	*325 451.2*	*333 240.1*	*-7 788.8*

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

[a] Firms listed as ranked by *Expansión* 2008 for 2007.

asset expansion is explained by an increase in equity and a reduction in total liabilities.

Corporate financing through liabilities includes funding through the domestic banking and international banking systems, the issuance of debt securities floated on local and international markets, among the main financial instruments. For reference purposes only, it is interesting to note that between 2006 and 2007, the expansion of liabilities among the 100 leading Mexican business groups accounted for 76.2% of the increase in lending by the financial system to the private sector, according to data reported in *International Financial Statistics* published by the International Monetary Fund (IMF, 2009).

Table 5 shows the results of cross-section regressions that aim to explain the growth in sales and total assets between 2005 and 2007, of the groups and businesses reported by *Expansión*. It is claimed that sales growth depends directly on the fixed-asset turnover ratio and growth of total assets, while the latter would be explained more by growth and liabilities than by contributions made by shareholders (equity). Annexes 1 and 2 provide the basic information used for these regressions, converted into percentage variations to improve the goodness of fit of the regressions.

The results show that the first regression does not reject the hypothesis that the percentage change in sales growth depends positively on the percentage change in the ratio between total sales and total assets, and the percentage change in total assets. The second equation is also unable to reject the hypothesis that the percentage change in total assets depends firstly on the percentage change in liabilities and secondly on equity. There is no direct link with the percentage change in net profits for the fiscal year.

The two equations display a goodness of fit of over and 60% and 90%, respectively, which are high values for cross-section regressions using percentage variations. The parameters reflect the logic of the hypothesis, since they have the correct signs and are significantly different from zero according to the t-test. Overall, they are also different from zero according to the F-test. Both cases considered data for firms with complete information for the period 2005-2007: 69 in all. Neither regression detected problems of autocorrelation, heteroscedasticity or multicollinearity.

No detailed analysis will be made of the sources of total-asset growth among the leading business groups or enterprises in Mexico, because

TABLE 5

Main results of sales growth regressions

Independent variables	Dependent variables	
	Percentage change in sales, 2005-2007	Percentage change in assets, 2005-2007
Constant	24.3097 (-3.0426)	-3.0039 (-1.8231)
Percentage change in the ratio of sales/assets, 2005-2007	0.2794 (10.1443)	
Percentage change in total assets, 2005-2007	0.8348 (4.4317)	
Percentage change in total liabilities, 2005-2007		0.5563 (19.3295)
Percentage change in equity, 2005-2007		0.4618 (7.4837)
Percentage change in profits, 2005-2007		-0.0002 (-0.1210)
R^2	0.6093	0.9092
Adjusted R^2	0.5974	0.9050
F -test	51.4541	216.9358
Durbin-Watson test	1.8482	1.9499

Source: Prepared by the authors on the basis of data obtained from the journal *Expansión* and from the National Institute of Statistics, Geography and Information (INEGI).
Note: t-test values shown under the respective parameters.

the secondary information is still fragmented. Nonetheless, it may be interesting to note that from 2006 to 2007, four of the 10 leading domestic groups increased their levels of debt in relative to assets (Zambrano-Cemex, Garza Medina-Alfa, Fernández González-Modelo and González Barrera-Maseca), while three maintained them (Slim, Bailléres-Bal and Salinas Pliego-Elektra) and three reduced them (Larrea-Grupo México, Fernández Carbajal-Femsa and Servitje-Bimbo).

Lastly, unlike other countries, Mexican business groups do not generally have financial institutions either under their control or forming part of the group itself. In 2007, only 12 of the 100 leading Mexican enterprises had associated financial institutions or enterprises for which financial services were the core of their activities. In the top 10 national groups, only Slim-Grupo Financiero (GF) Inbursa and González Barrera-GF Banorte have direct financial links; in groups 11 to 20, there are just two: Salinas Pliego-Banco Elektra and Del Valle Ruiz-GF Ve por Más and in positions 31 - 40, there are just GF Ixe and GF Invex. Positions 51 to 100 include genuine financial groups, but of small national scope: Banco del Bajío, GF Banregio, GF Interacciones, GF Afirme, GF Mifel and GF Monex.

V

Final thoughts

The formation of business groups in Mexico replicates the dynamic that has unfolded in most Latin American countries. Groups arose mainly during the early industrialization period in the late nineteenth and early twentieth centuries, then during the import substitution process between the 1950s and 1970s, and again following the neoliberal productive restructuring of the 1980s. New groups emerge over time, while some maintain their presence, and others fade away.

Various hypotheses have been put forward to explain the origin and functioning of business groups. An extensive review of the literature shows that many issues are still under discussion and conclusive evidence is scarce. The main arguments claim that groups emerge as a result of failings or shortcomings in various markets, but other explanations also seem to be valid, which posit linkages between these groups and the State. Business groups maintain a complex relation of mutual support with the State (depending on the government); but distancing occurs in some circumstances.

The financial statements of any business group or firm can be used to identify the sources of expansion of total assets (financial, fixed and intangible) as a counterpart to changes in liabilities and equity. The sources of liability growth are domestic and international bank financing, the issuance of national and international debt, and other liabilities. Capital growth occurs through retained profits and new share issues. The proportions between liabilities and capital are determined in accordance with domestic and international sector parameters, and the specific evaluation of the financial or business group in question.

Based on available information, it is clear that Mexican business groups are making a growing contribution to GDP, reflecting a process of concentration and centralization of sales, total assets, liabilities and equity in the hands of just a few groups. The contribution of these groups to employment and operating profits is less, however; but this reflects higher levels of productivity than in other firms in the economy. No evaluation has been made of transnational firms and other smaller domestic enterprises.

There is a concentration phenomenon in favour of the 10 leading Mexican business groups, to the detriment of other groups and businesses registered by *Expansión*. The 10 leading groups account for over 60% of total assets, liabilities and equity. Between 2005 and 2007, the share of total assets and liabilities has been growing, reflecting increasing concentration; and this seems to be positively correlated with earnings, since return on equity (*roe*) has also been rising during the period under analysis.

Sales growth among business groups is explained by increases in the fixed asset turnover ratio (total sales/total assets) and the growth of total assets, as can be inferred from a direct analysis of financial information and cross-section regressions. Moreover, the different business groups do not invest continuously through time, but in discrete jumps (sporadically), to exploit specific advantages that may be related

to the real exchange rate, interest rates, tariffs, and other variables.

Although most Mexican business groups do not have very close relations with firms in the financial sector, as previously was a characteristic feature, in the period under analysis from 2005 to 2007, the main source for financing total asset growth was third-party capital (debt) and a proportionately smaller equity expansion. The leading business groups, particularly the top 10, exploit their position to gain more third-party capital through a higher leveraging than the average among Mexican business groups and enterprises.

Of the 15 largest business groups, three stand out: Slim, González Barrera and Salinas Pliego, which have performed very dynamically since the 1980s and have their own financial institutions. In contrast, the smaller business groups located in positions 41-100 need to draw on equity more than third-party capital to finance their asset growth. Those located in positions 41-50 self-financed the expansion of their total assets in the period under analysis.

The lower asset turnover rate among the 10 leading business groups reflects a feature commented on by other authors, namely that as part of their defensive strategies these firms tend to overinvest, generating entry barriers for competitors. Lower turnover would mean less productive use of their assets; but these firms are willing to accept the opportunity cost of underuse to guarantee growth spaces for their groups. Similarly, it should not be forgotten that these larger groups probably face lower financial costs than other smaller groups and enterprises.

Lastly, an important finding in relation to Mexican business groups is that business networks may be large and more or less complex, and have both offensive and defensive strategies; but the capital structure remains highly traditional, with clear presence and control by a family group in particular. It is also clear that none of the large Mexican groups occupies a significant place in high technology sectors (Salas-Porras, 2006a, p. 6).

(Original: Spanish)

ANNEX 1

Basic statistics for the econometric regressions, 2005-2007
(Millions of pesos at current prices)

Business groups/enterprises	Sales		Total assets		Total liabilities	
	2005	2007	2005	2007	2005	2007
Grupo Carso, América Móvil, Imbursa (Carlos Slim Helú & Sons)	495 434.1	618 238.6	669 234.49	782 354.99	371 796.94	488 971.87
Cemex (Lorenzo Zambrano Treviño)	162 708.6	236 669.0	293 138.56	370 126.53	183 211.60	231 329.08
Grupo México (Germán Larrea Mota Velasco)	58 101.8	80 950.2	99 512.20	81 865.12	41 463.41	29 237.54
Fomento Económico Mexicano (José Antonio Fernández Carbajal)	105 581.7	147 556.1	127 642.28	99 505.10	60 782.04	45 229.59
Grupo Alfa (Dionisio Garza Medina)	69 334.8	106 832.7	61 966.70	74 323.26	29 507.95	41 290.70
Grupo Modelo (Carlos Fernández González)	49 550.5	72 894.6	80 311.38	71 325.47	12 168.39	12 736.69
Gruma y Banorte (Roberto González Barrera)	63 856.4	97 308.6	240 468.45	224 355.33	200 390.37	186 962.78
Grupo Bimbo (Daniel Servitje Montull)	56 102.2	72 293.6	36 270.51	36 797.82	16 486.60	13 628.82
Grupo Bal (Alberto Bailléres González)	57 278.4	85 127.4	76 248.60	104 607.88	54 463.29	74 719.92
Grupo Salinas Elektra (Ricardo Salinas Pliego)	47 075.9	61 380.0	70 101.08	88 773.67	58 417.57	68 287.44
Organización Soriana (Ricargo Martín Bringas)	48 394.4	65 190.7	35 798.32	54 005.17	14 915.97	30 002.87
Grupo Televisa (Emilio Azcárraga Jean)	32 481.0	41 561.5	78 532.05	85 121.11	35 696.39	50 071.24
Mexichem (Antonio del Valle Ruiz)	8 677.4	24 236.9	91 030.97	16 104.43	56 894.35	11 503.16
Grupo Coppel (Enrique Coppel Luken)	19 607.5	34 752.7	18 733.54	33 933.85	10 407.52	22 622.57
Empresas ICA (Bernardo Quintana Isaac)	18 404.9	22 447.8	31 241.39	18 372.94	18 377.29	8 749.02
Comercial Mexicana (Guillermo González Nova and Carlos González Zabalegui)	40 308.9	50 409.2	30 453.33	34 886.57	13 842.42	15 857.53
Liverpool (Max David Michel and Max Michel Souberville)	32 055.2	42 976.3	36 910.44	42 109.51	17 576.40	19 140.69
Axtel y Avantel (Tomás Milmo Santos)	4 966.8	12 190.6	10 872.34	16 789.51	3 749.08	9 327.51
Grupo Xignux (Eugenio Garza Herrera)	21 983.1	39 142.7	15 352.04	12 737.86	9 030.61	7 076.59
Homex (Eustaquio Tomás de Nicolás Gutiérrez)	8 571.4	16 166.1	14 143.73	17 598.52	8 319.84	10 352.07
Bachoco (Francisco Robinson Bours-Castelo)	14 437.4	18 208.8	15 286.38	17 068.65	2 779.34	3 555.97
Grupo Acerero del Norte (Xavier Autrey Maza and Alonso Ancira Elizondo)	22 718.0	27 379.0	40 265.28	36 682.58	28 760.92	24 455.05
Casas Geo (Luis Orvañanos Lascurain)	10 091.3	14 975.6	13 495.70	14 883.51	8 434.81	8 268.62
Arca (Manuel Barragán Morales and Miguel Fernández Iturriza)	14 647.0	18 572.7	14 178.57	15 602.39	3 832.05	4 216.86
Kimberly-Clark (Claudio X. González Laporte and Pablo González Guajardo)	21 983.1	21 480.2	25 247.33	22 765.19	13 288.07	13 391.29
Fragua (Javier Arroyo Chávez)	9 832.2	14 575.2	3 811.36	4 594.67	1 732.44	1 997.68
Grupo Posadas (Gastón Azcárraga Andrade)	5 126.8	25 948.9	11 865.63	17 941.06	6 592.01	13 800.81
Grupo Simec (Rufino Vigil González)	16 219.0	27 640.1	19 314.24	19 489.57	6 230.40	4 753.55
Urbi (Cuauhtémoc Peréz Román Urbi)	8 194.3	12 779.4	12 376.05	16 218.86	5 625.48	7 723.27
Grupo Kuo (Fernando Senderos Mestre)	24 577.4	22 722.8	24 460.23	20 343.34	11 647.73	11 301.86
Corporación Durango (Miguel Rincón Arredondo)	8 150.4	15 430.0	14 400.00	14 653.13	9 600.00	9 768.75
Quálitas Compañía de Seguros (Joaquín Brockman Lozano)	4 450.3	8 593.4	4 955.84	11 031.07	4 129.87	10 028.25
Alsea (Cosme Alberto Torrado Martínez)	4 318.3	7 047.3	3 039.07	4 369.28	1 266.28	1 820.53
Grupo Lamosa (Federico Toussaint Elosúa)	3 782.0	6 817.3	5 494.06	11 423.86	2 616.22	8 159.90
Grupo Continental (Cynthia Helena Grossman)	10 623.8	12 283.3	8 900.13	9 394.08	1 934.81	1 957.10
Interacciones (Carlos Hank Rhon)	1 773.3	11 055.1	9 412.80	3 098.05	7 844.00	1 032.68
Grupo Embotelladoras Unidas (Juan Gallardo Thurlow)	6 304.3	7 713.6	4 664.87	3 841.39	2 028.21	1 670.17
Consorcio ARA (Gemán Ahumada Russek)	6 772.7	9 257.3	9 685.22	11 543.01	2 934.92	4 439.62
Minera Autlán (José Antonio Rivero Larrea)	2 097.9	2 461.7	2 667.11	2 917.99	919.69	1 080.74
Grupo Cementos de Chihuahua (Federico Terrazas Torres)	4 722.9	8 453.2	11 159.42	15 641.39	3 985.51	7 109.72
Grupo Aeroportuario del Sureste (Fernando Chico Pardo)	2 063.8	2 785.9	14 114.58	15 967.29	1 037.84	2 073.67
Ixe Grupo Financiero (Enrique Luis Castillo Sánchez Mejorada)	2 261.7	6 460.0	22 641.67	15 410.96	20 583.33	12 842.47
Grupo Gigante (Ángel Losada Moreno)	32 524.6	27 115.3	28 514.10	27 583.94	12 397.44	11 493.31
Promotora Ambiental (Alberto Garza Santos)	2 096.5	3 004.5	2 477.71	2 843.04	952.96	1 292.29
Verzatec (Eugenio Clariond Reyes)	39 182.1	7 148.4	35 469.47	33 221.82	15 421.51	10 381.82
Promotora y Operación de Infraestructura (David Peñalosa Sandoval)	2 645.8	2 715.5	6 450.18	10 620.09	5 863.80	9 654.63
Corporación Interamericana de Entretenimiento (Alejandro Soberón Kuri)	8 658.9	10 187.9	15 672.84	9 786.37	9 795.52	6 116.48
SANLUIS Rassini (Antonio Madero Bracho)	6 841.0	7 999.7	8 190.48	3 200.63	5 119.05	2 133.75
Grupo Transportación Marítima Mexicana (José Francisco Serrano Segovia)	3 260.5	3 306.8	8 631.50	12 156.15	7 192.91	10 130.12
Grupo Martí (Alfredo Harp Helú)	2 322.7	3 282.0	2 969.70	3 442.50	1 414.14	1 912.50
Internacional de Cerámica (Óscar Almeida Chabre)	4 462.0	5 503.4	4 465.51	4 629.50	2 480.84	2 571.94
Corporacion Mexicana de Restaurantes (Joaquín Vargas Guajardo)	1 137.4	1 643.7	1 092.86	1 366.47	242.86	440.80
Mifiel Grupo Financiero (Daniel Becker Feldman)	1 248.7	2 597.1	4 877.78	14 532.45	4 064.81	13 211.31

(*continues overleaf*)

(continued)

Business groups/enterprises	Sales		Total assets		Total liabilities	
	2005	2007	2005	2007	2005	2007
Invex Grupo Financiero (Juan Guichard Michel)	889.7	3 976.9	9 137.36	11 682.19	7 028.74	8, 986.30
Grupo Mexicano de Desarrollo (Jorge Ballesteros Franco)	1 080.1	1 517.9	3 866.10	3 734.13	1 431.89	1 383.01
Grupo Collado (Guillermo Vogel Hinojosa)	4 954.2	5 883.2	3 371.43	4 330.19	2 107.14	3 092.99
Médica Sur (Misael Uribe Esquivel y Manuel Martínez López)	1 069.4	1 397.2	1 566.65	1 742.52	540.23	528.04
Monex Grupo Financiero (Héctor Lagos Cué and Héctor Lagos Dondé)	1 335.0	2 232.0	2 399.51	1 975.28	1 090.69	1 097.38
Grupo Industrial Saltillo (Ernesto López de Nigris and Juan Carlos López Villarreal)	9 518.2	8 823.7	12 366.67	10 480.18	6 183.33	4 556.60
Grupo Famsa (Humberto Garza González)	10 611.3	14 181.2	10 968.49	14 029.05	7 312.33	8 252.38
Grupo Casa Saba (Isaac Saba Raffoul)	21 829.3	25 126.5	10 008.28	11 157.17	5 267.52	5 872.20
Grupo Bafar (Óscar Eugenio Baeza Farés)	3 407.6	4 318.7	2 741.74	3 330.13	1 096.70	1 189.33
Sare (Dionisio Sánchez Carbajal)	3 370.7	4 899.2	4 926.07	5 364.84	1 894.64	2 554.69
Grupo la Moderna (Eduardo Monroy Cárdenas)	3 676.1	4 651.8	4 216.38	4 035.01	795.54	733.64
Grupo Ruba (Enrique Terrazas Torres)	2 557.0	4 567.6	2 511.22	3 587.37	1 141.47	1 559.72
Copamex (Juan Bosco Maldonado Quiroga)	4 724.7	5 562.5	6 800.00	7 287.80	3 400.00	3 643.90
Grupo Minsa (Raymundo, Armando, Alfonso and Guillermo Gómez Flores)	2 214.2	3 033.1	2 085.12	2 604.64	347.52	685.43
Grupo Accel (Eloy Vallina Lagüera)	1 537.3	1 726.1	1 713.13	1 628.85	535.35	542.95

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

ANNEX 2

Basic statistics for the econometric regressions, 2005-2007

(Millions of pesos at current prices)

Business groups/enterprises	Equity		Net profit		Ratio sales/assets	
	2005	2007	2005	2007	2005	2007
Grupo Carso, América Móvil, Imbursa (Carlos Slim Helú & Sons)	297 437.55	293 383.12	70 492.7	122 370.1	0.74	0.79
Cemex (Lorenzo Zambrano Treviño)	109 926.96	138 797.45	22 425.1	26 107.8	0.56	0.64
Grupo México (Germán Larrea Mota Velasco)	58 048.78	52 627.58	7 140.0	18 356.5	0.58	0.99
Fomento Económico Mexicano (José Antonio Fernández Carbajal)	66 860.24	54 275.51	5 549.4	8 510.4	0.83	1.48
Grupo Alfa (Dionisio Garza Medina)	32 458.75	33 032.56	7 790.1	3 551.0	1.12	1.44
Grupo Modelo (Carlos Fernánez González)	68 142.99	58 588.78	7 291.3	9 503.1	0.62	1.02
Gruma y Banorte (Roberto González Barrera)	40 078.07	37 392.56	7 494.6	9 744.5	0.27	0.43
Grupo Bimbo (Daniel Servitje Montull)	19 783.92	23 169.00	2 829.1	3 811.3	1.55	1.96
Grupo Bal (Alberto Bailléres González)	21 785.31	29 887.97	3 115.3	5 762.4	0.75	0.81
Grupo Salinas Elektra (Ricardo Salinas Pliego)	11 683.51	20 486.23	5 386.1	6 324.1	0.67	0.69
Organización Soriana (Ricargo Martín Bringas)	20 882.35	24 002.30	2 130.0	3 134.7	1.35	1.21
Grupo Televisa (Emilio Azcárraga Jean)	42 835.66	35 049.87	6 125.5	8 082.5	0.41	0.49
Mexichem (Antonio del Valle Ruiz)	34 136.61	4 601.27	6 247.0	2 108.3	0.10	1.50
Grupo Coppel (Enrique Coppel Luken)	8 326.02	11 311.28	1 024.1	2 616.3	1.05	1.02
Empresas ICA (Bernardo Quintana Isaac)	12 864.10	9 623.92	501.7	-893.1	0.59	1.22
Comercial Mexicana (Guillermo González Nova and Carlos González Zabalegui)	16 610.91	19 029.04	1 827.2	2 555.6	1.32	1.44
Liverpool (Max David Michel and Max Michel Souberville)	19 334.04	22 968.82	2 726.1	3 831.2	0.87	1.02
Axtel y Avantel (Tomás Milmo Santos)	7 123.26	7 462.01	306.3	491.0	0.46	0.73
Grupo Xignux (Eugenio Garza Herrera)	6 321.43	5 661.27	531.0	1 049.6	1.43	3.07
Homex (Eustaquio Tomás de Nicolás Gutiérrez)	5 823.89	7 246.45	1 048.3	2 193.5	0.61	0.92
Bachoco (Francisco Robinson Bours-Castelo)	12 507.04	13 512.68	1 776.0	1 278.3	0.94	1.07
Grupo Acerero del Norte (Xavier Autrey Maza and Alonso Ancira Elizondo)	11 504.37	12 227.53	2 634.5	1 972.3	0.56	0.75
Casas Geo (Luis Orvañanos Lascurain)	5 060.89	6 614.89	1 138.7	1 448.0	0.75	1.01
Arca (Manuel Barragán Morales and Miguel Fernández Iturriza)	10 346.52	11 385.53	1 934.8	2 501.4	1.03	1.19
Kimberly-Clark (Claudio X. González Laporte and Pablo González Guajardo)	11 959.26	9 373.90	2 906.1	3 728.0	0.87	0.94
Fragua (Javier Arroyo Chávez)	2 078.92	2 596.99	463.6	672.1	2.58	3.17
Grupo Posadas (Gastón Azcárraga Andrade)	5 273.61	4 140.24	379.7	135.8	0.43	1.45

(*continues overleaf*)

(continued)

Business groups/enterprises	Equity		Net profit		Ratio sales/assets	
	2005	2007	2005	2007	2005	2007
Grupo Simec (Rufino Vigil González)	13 083.84	14 736.02	1 295.3	1 791.9	0.84	1.42
Urbi (Cuauhtémoc Peréz Román Urbi)	6 750.57	8 495.60	1 174.6	1 832.5	0.66	0.79
Grupo Kuo (Fernando Senderos Mestre)	12 812.50	9 041.48	307.5	-828.2	1.00	1.12
Corporación Durango (Miguel Rincón Arredondo)	4 800.00	4 884.38	52.8	-312.6	0.57	1.05
Quálitas Compañía de Seguros (Joaquín Brockman Lozano)	825.97	1 002.82	- 63.6	35.5	0.90	0.78
Alsea (Cosme Alberto Torrado Martínez)	1 772.79	2 548.75	2 60.6	478.4	1.42	1.61
Grupo Lamosa (Federico Toussaint Elosúa)	2 877.84	3 263.96	5 06.5	900.2	0.69	0.60
Grupo Continental (Cynthia Helena Grossman)	6 965.32	7 436.98	1 2 05.0	1 604.9	1.19	1.31
Interacciones (Carlos Hank Rhon)	1 568.80	2 065.37	1 96.1	603.5	0.19	3.57
Grupo Embotelladoras Unidas (Juan Gallardo Thurlow)	2 636.67	2 171.22	1 58.2	294.2	1.35	2.01
Consorcio ARA (Gemán Ahumada Russek)	6 750.31	7 103.39	1 1 00.3	1 339.7	0.70	0.80
Minera Autlán (José Antonio Rivero Larrea)	1 747.41	1 837.25	2 02.7	296.9	0.79	0.84
Grupo Cementos de Chihuahua (Federico Terrazas Torres)	7 173.91	8 531.66	990.0	1 670.5	0.42	0.54
Grupo Aeroportuario del Sureste (Fernando Chico Pardo)	13 076.74	13 893.62	5 62.3	522.4	0.15	0.17
Ixe Grupo Financiero (Enrique Luis Castillo Sánchez Mejorada)	2 058.33	2 568.49	1 23.5	-75.0	0.10	0.42
Grupo Gigante (Ángel Losada Moreno)	16 116.67	16 090.63	- 96.7	4 722.6	1.14	0.98
Promotora Ambiental (Alberto Garza Santos)	1 524.74	1 550.75	1 47.9	93.2	0.85	1.06
Verzatec (Eugenio Clariond Reyes)	20 047.96	22 840.00	1 9 64.7	285.5	1.10	0.22
Promotora y Operación de Infraestructura (David Peñalosa Sandoval)	586.38	965.46	1 63.6	547.9	0.41	0.26
Corporación Interamericana de Entretenimiento (Alejandro Soberón Kuri)	5 877.31	3 669.89	-1 2 69.5	-569.2	0.55	1.04
SANLUIS Rassini (Antonio Madero Bracho)	3 071.43	1 066.88	- 21.5	-982.7	0.84	2.50
Grupo Transportación Marítima Mexicana (José Francisco Serrano Segovia)	1 438.58	2 026.02	1 8 27.0	-731.8	0.38	0.27
Grupo Martí (Alfredo Harp Helú)	1 555.56	1 530.00	1 12.0	76.5	0.78	0.95
Internacional de Cerámica (Óscar Almeida Chabre)	1 984.67	2 057.55	2 71.9	28.6	1.00	1.19
Corporacion Mexicana de Restaurantes (Joaquín Vargas Guajardo)	850.00	925.68	47.6	82.2	1.04	1.20
Mifiel Grupo Financiero (Daniel Becker Feldman)	812.96	1 321.13	87.8	79.4	0.26	0.18
Cydsa (Tomás González Sada)	4 402.67	4 205.02	-330.2	100.5	0.66	0.91
Invex Grupo Financiero (Juan Guichard Michel)	2 108.62	2 695.89	122.3	196.8	0.10	0.34
Grupo Mexicano de Desarrollo (Jorge Ballesteros Franco)	2 434.21	2 351.12	185.0	136.6	0.28	0.41
Grupo Collado (Guillermo Vogel Hinojosa)	1 264.29	1 237.20	53.1	-45.9	1.47	1.36
Médica Sur (Misael Uribe Esquivel and Manuel Martínez López)	1 026.43	1 214.49	143.7	216.3	0.68	0.80
Monex Grupo Financiero (Héctor Lagos Cué y Héctor Lagos Dondé)	1 308.82	877.90	267.0	370.3	0.56	1.13
Grupo Industrial Saltillo (Ernesto López de Nigris and Juan Carlos López Villarreal)	6 183.33	5 923.58	74.2	364.3	0.77	0.84
Grupo Famsa (Humberto Garza González)	3 656.16	5 776.67	266.9	519.9	0.97	1.01
Grupo Casa Saba (Isaac Saba Raffoul)	4 740.76	5 284.98	744.3	921.7	2.18	2.25
Grupo Bafar (Óscar Eugenio Baeza Farés)	1 645.05	2 140.80	365.2	193.1	1.24	1.30
Sare (Dionisio Sánchez Carbajal)	3 031.43	2 810.16	318.3	487.0	0.68	0.91
Grupo la Moderna (Eduardo Monroy Cárdenas)	3 420.83	3 301.37	328.4	361.5	0.87	1.15
Grupo Ruba (Enrique Terrazas Torres)	1 369.76	2 027.64	339.7	579.5	1.02	1.27
Copamex (Juan Bosco Maldonado Quiroga)	3 400.00	3 643.90	17.0	74.7	0.69	0.76
Grupo Minsa (Raymundo, Armando, Alfonso and Guillermo Gómez Flores)	1 737.60	1 919.21	420.5	125.9	1.06	1.16
Grupo Accel (Eloy Vallina Lagüera)	1 177.78	1 085.90	21.2	49.3	0.90	1.06

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

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