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ECLAC



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**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.

*Essay based on the keynote address delivered at the Economic Commission for Latin America and the Caribbean (ECLAC) in Santiago, Chile, on 29 April 2014 as part of the thirteenth Raúl Prebisch Lecture.*

# Development then and now: Idea and utopia

*Rolando Cordera Campos*

**ABSTRACT**

The crisis of globalization has given renewed topicality to the idea of development as a complex process involving social and institutional changes as well as a variety of democratic learning processes. Placed at the margin of the international academic and political debate, the political economy of development can come back into its own if academics and politicians responsible for the economy are forced to think for the long term. The political economy of development needs to be twinned with politics so that what we understand by the general interest can be reconfigured in pursuit of freedom, justice and democracy. These can be the keys to turning globalization, whose essence is openness and interdependence, into an active agent in the development of national density, something that is indispensable if we are to think critically about reality and, as Prebisch taught and practised, set history on a future-creating course.

**KEYWORDS** Economic development, globalization, Raúl Prebisch, development models, equality, human rights, democracy, social welfare, right to development, Latin America

**JEL CLASSIFICATION** B15, B31, O10, O54

**AUTHOR** Rolando Cordera Campos is professor emeritus at the Faculty of Economics of the National Autonomous University of Mexico (UNAM), Mexico City. cordera@unam.mx

*The ills besetting the Latin American economy are not determined by circumstantial or transient factors. They are an expression of the critical state of affairs in our time and of the incapacity of the economic system —owing to structural defects that it has been beyond our ability or our power to remedy— to achieve and maintain a rate of development consonant with the growth of the population and with its demands for a speedy improvement in its standards.*

Raúl Prebisch
(1963)

# I
# Introduction[1]

The purpose of this essay is to take an unconstrained look at the idea of development, now and formerly. Headquartered in this beautiful and endearing country of poets, educators and fighters for democracy and social justice, ECLAC continues to strive to give rigour and soundness to the thinking of Latin Americans committed to collective progress and the constant, ever-renewed affirmation of Latin America in the world as a group of States and nations linked by the idea of sovereignty, but also joined in an innate project of human cooperation to sustain and give meaning to the discourse of *changing production patterns with social equity, citizenship and democracy* that now includes, as a consistent rider, a bold call to make this the *time for equality*.

In Prebisch's teaching, these substantive prerequisites for the continent's political evolution are organized around the idea, the theory and the practice of development. Feeding into them are a complex set of economic transformations, new and changing roles in the turbulent environment of the global economy, social movements and long-term commitments to instil power structures with a progressive outlook and constrain them to exercise the necessary care and respect for human rights in an expanding horizon of citizenship.

This historic agenda has never been completed, because that is one of the conditions for preventing the American utopia Alfonso Reyes spoke of from descending into futile illusions and for ensuring that what are pursued are realistic and achievable goals of civic improvement and fair and effective social progress.

An ambitious and consistent innovator, Prebisch dwelt on the need for the legionaries of Latin American development —economists, sociologists, political scientists, and now biologists and environmentalists— to equip and enrich themselves with the exercise of a critically informed intellectual autonomy. His unceasing commitment to finding ways around blockages and labyrinths engaged him in a tireless labour of institution-building. Raúl Prebisch was a man of action when it came to the design and discussion of economic policy, a patient explorer —as well as a bold and restless one— in quest of an authentic and robust Latin American development. He never indulged in ephemeral self-satisfaction, but was always ready to imagine and venture along his own paths of invention and adaptation, not, as Alfonso Reyes would have put it, of "extra-logical" and uncritical adoption or imitation.

His vision still has a contemporary, modern character: the polarity and tension in the centre-periphery global system; the crucial centrality of technical progress and thence of knowledge and culture; dynamic, creative links between external trade and production growth; foreign investment, import substitution, virtuous interdependence; commodity terms of trade as an opportunity, but also a nightmare. The very first requirement, as we have been told time and again in these lectures, is to think critically about reality, do away with self-styled hegemonic thinking, and put history to transformative, future-creating use.

I have drawn heavily upon the reflections of those who have preceded me on this splendid platform, and I am only sorry that I cannot do them the justice they deserve. All occupied and preoccupied by the imperious challenge of development, aware that this can only be achieved by drawing on a public ethos that can give historical as well as practical meaning to democracy, the constitutional State, human rights and justice. Celso Furtado, Joseph Stiglitz, Fernando Henrique Cardoso, Rubens Ricupero,

[1] I am very excited to be here. My thanks to everyone who had a hand in this generous distinction; my affectionate gratitude to Alicia Bárcena and my warm respect for those whose intellectual endeavour and keen dedication to development research and thinking have contributed to the great educational and transformative effort called for by Raúl Prebisch, *the great heretic*, as Furtado would call him, and the *members of the ECLAC order* of development.

Dani Rodrik, Enrique Iglesias, Tulio Halperín-Donghi, Fernando Savater, Aldo Ferrer, José Antonio Ocampo, Danilo Astori, Luiz Gonzaga Belluzzo, enrolled as of right in the legion founded by Raúl Prebisch and those around him in search of Latin America's and the world's best platforms of social and political thought.

When trying to think past the fog brought down by this first great global crisis, it has not been and will not be easy to identify a new forge in which economics and politics, in fusion, can lead us to the outline of new strategies for a development that has gone astray and democracies that are under strain: the keynote ideas or paradigms that have inspired or justified, as the case may be, the different projects for transforming the State and production systems in pursuit of social and economic change have never been neutral.

As Rosanvallon (1989) pointed out in his study of the development of Keynesianism in France, economic ideas, unlike theories in the physical and natural sciences, are not addressed on a homogeneous plane of knowledge. Some political and ideological filter is always present, and it is never innocuous; nor are the presence and action of State bureaucracies, particularly financial ones; social interests and agents; those deriving de facto power from wealth; and influential media conglomerates with a global reach.

Common sense, constructed *in* and *from* the media and in the dominant centres of thought and opinion, is not likely to encourage the emergence of new ideas about the governance of the State and the economy. Rather, it acts as a powerful yet ill-defined barrier against them and their conversion into alternative paradigms.

It also serves to support cosmetic revisions or renewals of the predominant schools of thought, which are reproduced not in a linear fashion but through the institutional and ideological enclaves where social conflict and political confrontation are never-ending.

The political and intellectual developments that have accompanied the current crisis, or that it has brought to prominence, provide lessons of particular interest to those of us who work in the privileged global and regional observatory that is ECLAC, especially if what has brought us here is a belief in the pressing need to construct a vision that, without evading or mythologizing the vast structural and mental shifts brought about by globalization, explicitly sets out to build strategies guided by aims of cultural renewal, social redistribution, enlarged democracy and strict yet creative stewardship of the environment.

We are faced with new milestones, complex and tense interactions between politics and democracy, the State and the market, the economy and society. Initially, financial disaster made yesterday's dogma anathema (global self-regulation and market efficiency), while the powers of time and the world seemed intent on giving a new relevance to what had been seen as an anachronism (the active role of States). The world did not set out from there, though, to use the crisis as a platform for conquering a different future. Rather, those same powers and their offshoots in academia and the media seemed to opt for a new return to the past.

For this and many other reasons, we have and will continue to have a great deal to review and rethink, and we need to do this now, without haste but without delay. We need to recognize that we represent a discipline "shamed" by its helplessness in the face of the Great Recession, as Lord Skidelsky, the great biographer of Keynes, has put it, and then go on to recover, and quickly, a common sense that only the cultivation of history and engagement with criticism can provide.

In Prebisch's words, "a new rationality must be sought, but (…) one not merely based on economic and social objectives but on eminently ethical ones" (Dosman, 2011). This affirmation can be extended to the establishment of a public ethos (Cortina, 2013) that reasserts solidarity as a modern value, as well as the acceptance of a good dose of humility in our exercise of historical and conceptual review and modernization. As Ocampo (2001) has put it: "The idea that 'we already know what must be done' is nothing more than a sign of arrogance on the part of the economics profession (…) the unsatisfactory results of reforms and the existing level of social discontent should —and is— leading many experts to rethink the development agenda."

The political economy of development that we want should show that it is willing to join forces with politics to reconfigure the meaning of the general interest or common good in pursuit of freedom, justice and democracy. Only thus will we be able to return to long-term visions centred on sustained economic growth, the centrality of equity to social equality and the creation of a sustainable democratic citizenship. These can be the keys to turning globalization, whose essence is openness and interdependence, into an active agent in the development of the national density that Ferrer (2010) considers indispensable for resolving the great dilemma of development in a globalized world.

Coupling democracy and economics with globalization has not been and will not be an easy road to travel; what it ultimately comes down to, though, is re-embarking upon the adventure of social change, as in the past, when it was believed that appropriating the

future to reinvent it through development and planning was not just an "organized fantasy", as Celso Furtado called it, but a realistic utopia.

As he put it: "What characterizes development is the underlying social project. Growth is founded on the preservation of the privileges of the elites, who satisfy their zeal for modernization. When the social project gives priority to the effective improvement of the living conditions of the majority of the population, growth is metamorphosed into development. But this metamorphosis is not spontaneous. It is the fruit of the expression of a political will" (Furtado, 2004).

Schematically, section II of this document deals with some issues considered critical, the aim being to review, update and put into perspective the idea of development cultivated by ECLAC and its thinkers. These issues have to do with the tension between crises, democracy and inequality in the light of the urgent need to restore development as a central concept and process, as discussed in section III. Section IV addresses what is held to be the great modern tripod: rights and the demand for development and justice with a view to emerging from the current global crisis to what is regarded as the great institutional commitment giving substance to the idea of development: the welfare State, which is discussed in section V. Section VI adds an overview, at once critical and constructive, of structural change undertaken in Mexico with the aim of accelerating the globalization of its economy. Lastly, section VII sets forth the main conclusions of the essay.

# II

## Crisis, democracy, inequality: going back to basics

The current crisis has called into question the globalization that accelerated in the late twentieth century. Whether or not we are on the brink of deeper changes in a global order that could not be constituted as such at the close of the Cold War; whether or not its essential mechanisms and fabrics can be restored on a basis of free trade or capital mobility; whether national economies are capable of dealing positively and productively with the great issue of migration: these are some of the dilemmas surrounding the old tension between economics and politics, democracy, the market and development.

Social conflict, heightened by the crisis, is overshadowing the potential for economic recovery and, as inequality increases, threatens to lead not only to a new discontent in the culture, in this case in democracy, but in what UNDP (2004) warned of a few years ago for Latin America: a disconnect between economics and politics, exacerbated by a heightening of the social question, which is spreading in the form of discontent not only *in* but *with* the region's restored democracy.

Because of this, it needs to be appreciated that the relationship between democracy and inequality encompasses a dimension that transcends the economic sphere and belongs, by reason of its importance, to the field of what we might call "State policy"; and implementing or even proposing this means asking questions about the organizational, institutional and fiscal, political and ideological capabilities of States that went through the traumatic shifts of the neoliberal model and are now struggling to turn back into constitutional democratic States worthy of the name.

In these circumstances, reform of the State takes on a structural cast that cannot be dealt with by reductionist expedients, such as minimizing it, or indeed merely enlarging the public-sector apparatus. What is urgent is to rethink the centrality of the State as an institutional whole, as an interface with the rest of the transnational system of States and as a complex relationship between society and power and the ways in which this is constituted and exercised.

The issue of hierarchies and of the constitution, exercise and renewal of power is inseparable from the other two key aspects of any political economy: the division of labour and the distribution of the fruits of the social effort involved in production. Social coordination ultimately depends on how the unfolding of this central triangle of societies, markets and States is dynamically approached. The relationship is always in tension, on the verge of instability, and this has been heightened by the advance of globalization, economic and otherwise.

For now, what we can say is that we still have politics and the pacts that can be forged through it to seek means and mechanisms whereby these tensions can be prevented from turning into insoluble contradictions

and national formations from dissolving into the global maelstrom. Having invoked politics in this way, we may add that an expressly equality-oriented politics needs to be cemented in a civic culture and a public ethics consistent with its aims and motivations, if it aspires to be stable and lasting. The crisis of equality is an all-encompassing social fact and not just a matter of incomes, access or opportunities.

How, then, are we to build societies that are more democratic, egalitarian and supportive? Can democracy endure in conditions of acute inequality and poverty? How far is it possible to speak of democracy when economic and social inequity is being maintained and reproduced? How can we achieve substantive changes that help to reduce levels of inequality and exclusion and ensure universal access to and exercise of social rights?

Asking these questions is not a mere intellectual exercise. Latin American social and political thought is entangled in them. After years of democratic recovery and almost two decades of economic growth, inadequate at first and then fairly high and in some cases steady, albeit without significant changes in income distribution, the problems posed to democracy by inequality are still being evaded.

It could be said that inequality is becoming a culture, not the culture of poverty that anthropologists studied, but one of concentrated wealth, or indeed satisfaction, as Galbraith (2011) would say. Apart from complicating modern political designs, this represents a head-on challenge to the ethical and political standards and forms that ought to flow from democratic development.

This could yield a first response to our questions: social cohesion is the fruit of societies' democratic development, but it has also become a precondition for Governments to renew their legitimacy and for democracy to engage the participation and support of citizens. Cohesion, a primary condition for a promising role in a globalized world, is suddenly coming under the crossfire of the democratic call for redistribution and the demand for balances and incentives to accumulation and dynamic forms of competitiveness to hold and win ground in the global marketplace. From these tensions it is just a step to subjecting sovereignty, without prior warning, to new and exorbitant requirements against which, on the face of it, there is no appeal.

This is why the relationship between democracy and inequality needs to be viewed as an equation that has to be resolved positively in favour of equality, and as a prerequisite for politics to produce governance based on legitimacy. Whence it is that in modern societies, or societies seeking to be modern, the dialogue between development and equality ceases to be a product of chance or natural laws and becomes a political issue. This is a severe test for the categorical imperative of democracy that Fernando Henrique Cardoso spoke of.

In the face of these dilemmas, the economy has to evolve into a political economy of development inspired by the current, modern, global equivalent of the moral sentiments of Adam Smith, so that development can be restored.

# III

## The topicality of development

As a process of social, political and economic change, development requires properly functioning institutions, but it also entails a basic restructuring of values and attitudes. Again, the structural hindrances to such change can only be dealt with by an active platform of designs and strategies that disrupt the stability those hindrances create, so that the end result is political and institutional configurations capable of channelling the energies released by economic and social change —and none of this can be guaranteed in advance.

Modern development, and particularly that which began after the end of the Second World War, quickly unfolded into a complex and diverse institutional and political process that is now inseparable from the aspiration to create a universal rights regime. This idea, in turn, draws upon the concept of comprehensive fairness, because if the equality held out by democracy is confined to laws or the polls, it is wholly inadequate to the task of securing and extending social justice. Development envisaged as the creation and expansion of rights; rights understood as justice and freedom; politics conceived as action and an unfailing commitment to the democratic code: these are the cornerstones of a new agenda and a reformed macroeconomy for development and equality.

At ECLAC, there has rightly been discussion of the different connections between macroeconomics and development economics. These relationships are at the historic core of ECLAC thinking. It is not redundant, however, to recall what Ros (2013) warned of: that development economics, like the economics of growth, "was born macro", and economic growth itself should be seen as a "process of structural change rather than of mere factor accumulation cum technical change."

What the crisis makes imperative, then, is for us to adopt a macroeconomic policy for development and not just for financial or price stabilization, as has been pointed out by Moreno Brid (2013), among others. By focusing on variables such as sustained economic growth and employment, this macroeconomics will have to induce larger strategies and specific, broad-spectrum policies explicitly aimed at promoting social redistribution and restoring the aspirations to equality that inspired the construction of social States.

As ECLAC (2012) pointed out in its second approach to the subject of equality, and as Ocampo (2011) has explained, an unavoidable condition is the implementation of new production patterns that drive structural diversification and open the way to a dynamic performance capable of sustaining and being combined with objectives of equity, universal rights and expanded citizenship.

Amartya Sen (2003), for his part, has stressed that the concept of development cannot be confined to rising gross domestic product (GDP) or personal income, industrialization, technological progress or social modernization. These are important and often crucial attainments, but their value needs to be gauged by the effect they have on the lives and freedoms of the people who experience them. The development as freedom proposed by the Indian Nobel laureate needs to be extended to development as equality —a complex and even capricious continuum that must not be subjected, however, to arbitrary interruptions dictated by poorly perceived and worse understood economic or financial contingencies, or by concentrated, unconcealed and brazenly asserted class and power interests.

# IV

## The modern tripod: development, rights and justice

The "right to development" predates the current wave of human rights universalization. It is increasingly clear, however, that modern development is inseparable from the aspiration to create a universal rights regime. Only in this way, according to the United Nations, can civilization give real effect to the old dreams of the Enlightenment and the commitments of today's democracy.

The idea of development as progress, as being "up with" what is deemed most advanced, is as old as modernity itself; it forms part not only of classical social science thinking but of the international political experience of the last two centuries. It is no chance that in 1776 Adam Smith, the founding father of economics, gave his most famous work the title *Inquiry into the Nature and Causes of the Wealth of Nations*.

Concern with this core process of modernity did not become universal and strategic, however, until the second half of the twentieth century. Before that, it only formed part of the arsenal of statesmen in the "closed circle" of powerful nations. It might be said that what was at work was an ethnocentrism without solid foundations, but with an effective rhetoric that encouraged unrestrained pride and selective cosmopolitanism: the "white man's burden" that Kipling spoke of. These configurations of exclusion underwent their first major reverse with the First World War and its aftermath of economic crises and democratic upsets, being overwhelmed in several places by variants of fascism and other totalitarian tendencies.

With the Second World War, the world experienced a great historic turning point: although the conflict was tremendously destructive, it also proved to be a giant "blender" of human cultures and experiences. In more than one sense, it was the first great mass experience of globalization that brought people from everywhere into contact, taking them through territories hitherto unknown to the average citizen, and introduced whole populations from less developed regions into what we would now call modernity.

True, this took place by way of the most violent destruction imaginable, but its lessons were assimilated by emerging or developing elites and were quickly given substance in demands for decolonization, material

improvement, national independence and social progress. The right to development began to be asserted as a universal demand, and the autonomy of States and the sovereignty of nations as indissoluble components of the new order, whence the importance of the 1955 Bandung Conference, as it was the first time the notion of a "third world" spread around the planet as a leading idea.

Combatants from the advanced world and their families, whose memory of the interwar crises had been sharpened and enhanced by the painful experience of the conflagration, began to regard social protection and the active presence of the State as a collective and individual right that not only had been acquired, but was enforceable. Thus, starting with the centres of the new international system that arose from the war, there was a rational and political (re)discovery of the centrality of development which, to be that, would have to be accompanied by social equity and welfare.

In Latin America, under different conditions and with different perspectives, the dream of development also began to be lived out: State-directed industrialization and import substitution; urbanization, emerging middle classes and mass demands for inclusion; new ways of engaging with a global economy that was being reshaped: all these were part of the arsenal of policies and visions promoted by Raúl Prebisch and his colleagues at ECLAC, whose arguments sought to combine economic rationality with historical necessity via politics and State action, tasks whose crucial importance to economic evolution is now being reaffirmed.

Without being politically and socially centre stage as it is now, democracy was viewed as the institutional and social participation platform that could productively forge a dynamic interdependence between a State with new demands and a society that was changing and seeking new forms of sovereign affirmation vis-à-vis the rest of the world.

Thus, the whole planet gave itself over to the explicit quest for economic growth, as this was considered an indispensable factor in social well-being and the consolidation of democracies. With the triumph of the Chinese Revolution and the independence of India, it seemed that a substantial portion of the world's population would be able to realize these expectations, not only in terms of material progress for all, but by harnessing national capabilities to map out innovative historical paths, including some that were radically different from those hitherto acknowledged as successful.

The ability of the Soviet Union to take a "leap forward" amidst the great depression of the 1930s and withstand the Nazi invasion helped to turn development into the leading idea of the world that was emerging. A cornerstone of this effort was planning, which, when taken up in pursuit of development and post-war reconstruction, lost its centralizing rigidity and began to be seen as a feasible way of pursuing new combinations between State and market and implementing a creative and sustainable mixed economy.

In these circumstances, "Prebisch called for 'an intelligent regime,' or 'smart State.' While the State must support industrialization, the economy as a whole must remain private sector-led in order to prosper" (Dosman, 2001). Excessive State intervention was therefore as damaging as a naive acceptance of the doctrine of comparative advantage. "Don't stifle the private sector," Prebisch warned. A healthy private sector and investment climate were essential for economic success and a wise investment strategy.

When the Cold War made ideology a determining factor in global politics, development too began to be seen as a strategic variable in the bipolar confrontation, being presented as an alternative to revolution and a more effective and gradual way to achieve a redistribution of income and wealth. Paradoxically, it was in the heat of this conflict that many countries experimented with routes towards economic and social progress that aimed to reap the best of two experiences presented at the time as incompatible alternatives.

The "third ways" of those years were not very effective, but the idea of using and exploring traditions and idiosyncrasies as platforms and starting conditions for economic development stuck in the historical and institutional memory. Now, amidst the storms of globalization and its crisis, it demands a central place in the inventory of development institutions and policy options. This was descried, furthermore, by Prebisch, the social reformer and tireless pioneer of planning and the mixed economy (Halperin, 2008).

For decades, the world developed in a frenzied equilibrium of mutual destruction. The reigning paradigm was full employment and social protection, and in the developing world, sustained economic growth and industrialization were seen as the paths towards platforms of progress embodied in welfare States. Regular State interventions in economic processes and decision-making; heavy use of external assistance, lending or investment funding; protection and even creation of fragile local industries: all this and more was brought into play during those years under the banners of growth and a rapid move towards activities with the highest possible value added.

The accumulation of physical capital and productive investment, together with the wider industrialization of

economies and rapid urbanization of societies, were the main drivers of the great transformation in the second half of the twentieth century. Political effectiveness and sustained material creation were placed above what we would now call sound policy. The mission was expansion, while the distribution of the fruits of growth and economic efficiency (micro or macro) were seen as side-effects of the overall process.

The outcome of this development effort does not fit the bleak myth that would later be propagated. There were mistakes and excesses but, essentially, these were times of rising production and social change; and while the predominance of corporatist forms of social control and participation squeezed democracy and opened the way to all kinds of abuses, corruption and concentration of wealth and power, it is also true that the scope for expanding the spheres of social reproduction increased and was able to bear fruit in the form of goods and institutions.

Years later, with the upheavals of the late twentieth century, which can be summarized as the implosion of Soviet communism and the globalization of finance and, to a lesser extent, of production and trade, a radical paradigm shift occurred. Instead of full employment and social protection, the priorities were the fight against inflation, financial stability and the reduction of State commitments to social welfare and justice. All this was presented as the price of entry to the new globalized world of the unified global market and representative democracy: over time, the new order promised by President Bush after the first Gulf War was to become more of a working hypothesis than an actual development path for international society.

In a number of countries, the ideas of adjustment, external debt payment and the review and rolling back of the State were set in stone as immutable criteria and policies, consistently with what would later be called the Washington Consensus. There thus occurred a profound, and to a large degree passive, economic counter-reform of the State that would significantly affect the economic policy core of the State itself.

Rather than a development that was "elusive", to use the term employed by Wolfe (1976), or erratic and declining like that experienced in the 1970s with its fluctuations, hiatuses and "stagflation", what the world began to experience in the last decades of the twentieth century was a loss of direction, in terms not just of growth rates or macroeconomic stability, but of those values and criteria that drove the great vision of a development understood as expanded rights and social change.

Thus, with its catalogue of recommendations for "getting back to basics", which in this logic is the centrality of the market, the Washington Consensus sought to redesign the profile of the world and introduce a new global order. Its prescription was underpinned by the vision of an untrammelled, and purportedly universal and rational, market economy that reduced the State to a minimum, to the point of turning it into a purely instrumental entity.

This effort to "correct" what were held to be excesses and waste in the State and the tasks it performed was carried so far, as was the revision of ideas and projects, that it even encompassed the removal of the idea of development itself from the map of international priorities. However it may have been understood in the centres of international power and ideas, development always means change and disequilibria, whereas the prevailing terms of reference were those of equilibria, or at best of comparative statics.

In 1986, however, in what can only be called a cruel irony of world history, in the very eye of the hurricane of the financial crises heralding the arrival of the globalizing whirlwind, the right to development was successfully adopted by the United Nations as one of the inalienable human rights. Development, it was affirmed, was the realization of all the civil, economic, social and cultural rights contained in the Universal Declaration of Human Rights. This was followed in 1993 by the proclamation of the right and duty of States to formulate national development policies aimed at constantly improving the welfare of the whole population, ensure equal opportunities for all in access to basic resources, education, health services, food, housing and employment, and bring about fair income distribution.

The discords triggered by the great global change that was beginning clashed with the logic of development, with its mission of identifying and giving political expression to the most heartfelt demands of planetary majorities that the other great disintegration unleashed by the Second World War had set in motion. Bobbio (1991), the great thinker of Turin, spoke and thought about this with remarkable foresight and proverbial acumen. He held that acknowledgement and protection of the rights of human beings are the foundations of modern democratic constitutions. Peace, in turn, is necessary for the recognition and protection of human rights, both within States and in the international system. At the same time, democratization of the international system, which is the only way to realize the ideal of "perpetual peace" in the Kantian sense of the term, cannot advance without a gradual extension of recognition and protection of human rights over and above States.

According to Bobbio (1991), "Human rights, democracy and peace are three essential stages of the same historical movement. If human rights are not recognized and protected, there is no democracy, and without democracy, the minimum conditions for a peaceful resolution of conflicts do not exist." It might be said that the right to development is underpinned by economic, social, cultural and environmental rights, which, notwithstanding the difficulties of fixing them in time and space, should be seen as rights that answer to the "global" values of equality, solidarity and non-discrimination. Furthermore, as argued by the United Nations, they should be understood as universal, indivisible and progressive, as well as interdependent with civil and political rights. These socioeconomic, cultural and environmental rights refer to goals and aims whose fulfilment depends on the respective capabilities of economies and States to give them not only reality, but sustainability, whence the insistence, in certain circles and power groupings, on seeing them primarily as "programmatic rights" whose fulfilment depends on financial viability or the economic situation.

However, their value lies rather in the fact that they define a legal and institutional system that helps to entrench ethical attitudes which are increasingly integrated into collective purposes and thence into economic and political decisions intended to meet needs, reduce inequalities and protect the environment.

Recognizing economic, social, cultural and environmental rights as an indissoluble part of the demands of legal and political citizenship, claimed by the West as a triumphant agenda, raises the issue of the "third" citizenship, the social one, studied by Bottomore and Marshall (2005). Its realization depends not only on the generation of adequate material and institutional resources, but on the way these are distributed, and also on this indivisibility of rights becoming established as an essential reflex of States and societies.

This is the essence of the social density democracies can achieve, and on it depends their quality and duration as a fundamental political order. Thus, the evolution of citizenship in and with globalization could shift from the elementary demand for democratic and civic rights and freedoms towards social participation in the construction of political economies organized for equity and equality, not just by their level and rate of growth, but by the political and ethical framework of demands that could be constructed around their centrality. The right to development would then turn into real development of rights.

Yet globalization, incomplete in scope and content, and now in crisis, is far from having yielded the hoped-for results. "Despite the efforts made by the countries of the region, the results of the new development patterns have been unsatisfactory in economic and especially in social and environmental terms. For a large part of the population, this situation is compounded by the fact that people are often unable to exercise their rights as citizens. At the legal and political level, this is manifested in a fundamental inequality in terms of access to the justice system and in the population's lack of involvement in political decision-making. In the economic and social spheres, it takes the form of inequality of opportunity, job instability, low incomes, barriers to social mobility (particularly for women), a disregard for ethnic and cultural diversity and a lack of protection in the face of misfortune" (ECLAC, 2000).

If the right to development is inseparable from social justice, it can also be seen as a fundamental citizen right and its realization is (or ought to be) a priority for States, which is why autonomy and the ability to decide on their own patterns of economic development and social distribution need to be recognized as a universal right of nations, as do the ways they choose to participate in the global market and economy.

Equality, its extension to unfamiliar ways of life and expressions of culture, its link to democracy and broader social participation constitute the great extension of development, the outlook and ethical mandate that ECLAC has offered us. This is also, or should be, the future of States reformed in pursuit of the general welfare.

# V

## Welfare States: the great historical commitment

The ominous circumstances of the present should lead to a reappraisal of the terms of the strategy that led to the crisis. Financial innovation conceived of as a "big bang," the culture of greed and the enthronement of the most extreme possessive individualism are some of the things whose excesses now drive the rediscovered need for their regulation. Together with this, the requirement for strong, dynamic fiscal States is unavoidable:

only thus will the effort to recast the combination of economic growth and social stability be possible of attainment.

Now, in the face of the disruptions of globalization, which have become a far-reaching crisis since 2008, the role and character of the State in economies is being (re)discovered, as is the urgent need to establish new and more effective forms of connection between the economy and society, with an eye to the way globalizing structural change and its crisis have brought the social question to a head. This is the contention of recent publications by ECLAC (2010 and 2012), arguing and recommending that "the State has to be provided with more capabilities to redistribute resources and promote equality. We are talking about a welfare State, not a subsidiary State, which can advance towards a tax structure and transference system that privileges social solidarity." This is a reaffirmation of the centrality of politics and the State in forging social covenants that are both wide-ranging and deep and in reforming the State and endowing it with effective social promotion and coordination capabilities for the purpose of politics.

The return of the State via its own reform and the expansion of democratic politics will certainly remain subject to the constraints resulting from global and national history and from the specific, idiosyncratic experiences of national formations. A dialectic arises: in the face of "too much State," the libertarian demand for affirmation of individuality and autonomy; in the face of an excessive concentration of politics in parties and parliaments, the new political, ideological and, in a broad sense, cultural conceptions thrown up by globalization and the end of bipolarity: civil society, human rights as a universal mandate, democratic cosmopolitanism, global citizenship.

On the other hand, though, the warning issued by the great Polanyi (1992) in his analysis of the collapse of the first phase of globalization still holds true: if the market sets out to subordinate society, it will end up destroying its own foundations. "Our thesis is that the idea of a self-adjusting market implied a stark Utopia. Such an institution could not exist for any length of time without annihilating the human and natural substance of society."

The role of a social State capable of generating technological and institutional externalities without reneging on its historical commitments is fundamental and non-contingent in this whole process of restoring growth and recentralizing development. The new State reform agenda has nothing to do with ideas of a *tabula rasa* or an impossible return to the past. It is meant to be the outcome of a recapitulation of concepts and experiences, a renovation in which history illuminates a new course that leads to a project of social inclusion and democratic consolidation.

The reform of the State that the age requires if it is to embark upon a fundamental shift needs to pivot on social reform of the State itself. This cannot be reduced to meeting specific demands for changes in the use of resources or institutional configurations; to be a component and catalyst in an effective and radical "reform of the reforms," the State needs to concentrate on rebuilding basic social fabrics and processes, and this in turn implies a redistribution of power and a radical readjustment of relationships and weights between spheres of the economy and their command over the allocation of resources and the distribution of income and wealth, as well, no doubt, as in the sphere of political and administrative power and in the division of labour within the State itself.

Consequently, there is an unavoidable need for strong, dynamic fiscal States. Only thus can the delicate and fickle combination of economic dynamism with social and macroeconomic redistribution and stability be attempted. As ECLAC (2010) has put it: "Equality of rights provides the normative framework and the basis for social covenants creating more opportunities for those who have less. The equality agenda requires that covenants should be rethought in order to create institutional policy consolidating a democratic and participatory order (…) This agenda includes the construction of a far-reaching economic and social agreement whose ultimate expression is the fiscal covenant. This requires a tax structure and a tax burden that strengthen the redistributive role of the State and of public policy in order to guarantee thresholds of well-being."

From this perspective, the structural change implemented in the late twentieth century needs to be revised with a view to reappraising economic policy and a number of the immovable certainties on which its discourses have been based. In the face of the dictatorship of financial adjustment and fiscal balance, interpreted unequivocally as "zero deficit", it is possible to imagine new ways of structuring national States, other combinations between external opening and induced domestic development that, without giving up on external trade and interdependence, bring to the fore the functional but transcendental notion of development as freedom and equality.

Going against the orthodoxy, Fernando Fajnzylber (1992) argued that Latin America required an internationally competitive industrial system, but in a context of equity.

In the face of the ongoing crisis and the difficult recovery now in progress, normality needs to be revisited in the light of the harsh experience of these years, although returning to normality means more than restoring growth rates and bringing the production system out of its recession; it means going back to a different "normality" (Anguiano, 2012).

Experience allows and requires us to look further than this. The need today is to make the social question the starting point when reconfiguring goals and visions for the macroeconomy and development. This new inversion of functions may not only prove useful for political stability, but become a renewable source of renovation and enhancement of democratic legitimacy and the State. Conceiving of social policy as an indispensable rather than residual component of democratic development could thus become a civilizing mission.

"Social justice, let it be said again, is inseparable from the right to development," argued Carpizo (2012), a splendid dean of the National Autonomous University of Mexico (UNAM); "the idea of social justice has not become a dead letter (…) The special strength of the concept of social justice lies in the fact that, besides its legal and constitutional meaning, it is impregnated with a sociological character and, in particular, with a sense of equity." It is a citizen right and its realization should be a priority for States, in and beyond the crisis.

To spell it out, the opportunity to place democracy among development objectives seems to be the surest way, albeit perhaps the most arduous one, to render feasible the aspiration (reinvigorated by the changes in the world) of economic progress with greater democratization and social equity with a view to equality. This being so, it is worth reiterating the vital need for a renewed acceptance and appreciation of national dimensions in order to engage with, not exorcize, global ones.

As the Spanish philosopher Adela Cortina (2007) has put it: "The democratic state, an ethical economy, and active citizenship form the tripod on which a developed society is sustained. The philosopher's stone of the new times lies in structuring the endeavours of these three powers —political, economic, and civic."

Conflict with the State has also been a persistent feature of the tradition of thought founded by Prebisch. From the very conception of the modern State to the evaluation of its different forms of intervention, the State is never the last resort for ECLAC, but nor is it the only one, whence the conceptual and practical difficulty of struggling with it, since ultimately it is the relationship between society and power. The saga is a long one: from proto-developmentalism to the mixed economy and innovative planning; from the great project of transformation, development and integration to the constricted State and a relationship cut short by the sheer violence of dictatorship. This provided the impetus for the grotesque ambition of a radical, "revolutionary" reform of the State to remake the present via a misleading rewriting of history: the golden age of a minimal State and an economy of perfect competition that would leap to participate in an illusory unified global market: a false dawn.

Now we are going to find out what lessons have been learnt from decades of conflict, penury and adversity; the difficulty, meaning a linearity the State has to get over, needs to be left behind so that the complexity which is inseparable from globalization, as well as the complexity which is an unavoidable feature of a plural, diverse society that has made democracy the lingua franca of politics, can be fully accepted. Politics, in turn, needs to incorporate into its semantics the dilemmas and constraints issuing from globalization and its "perplexities," as Fajnzylber liked to call them.

This complexity is extended and compounded when it comes up against and is recognized in a structural heterogeneity that globalizing change has been unable to modulate. What it is managing to do is create new hordes of the excluded, together with angry demands for inclusion that are centred increasingly on cities and less on the countryside, directly challenging the purportedly democratic State and calling for representativeness and participation consistent with an egalitarian message that does not end at the polling booth, one of a State refounded by the creation of universal welfare systems, whence the stand-off that encapsulates the current challenge: awkward States and democracies, in a complex and motley social context, torn apart by inequality.

What is needed is a fresh approach to the State that accepts the need for it and for power in general, while recognizing the idiosyncratic stamp of histories, social structures and State configurations that give meaning and character to the two hundred year-old adventure of Latin America, where the idea of development is once again becoming the restless development of ideas. A great deal remains to be done to give substance to the change that now, under the labels of democracy and equality, can be claimed as indispensable. In the first place, it is essential to have a system of decisions and

priorities, sequences and coalitions that serve to govern it and give it an explicit redistributive stance.

Furthermore, a process like the one outlined calls for effective mechanisms to detect errors, shortcomings and inadequacies and correct them in time, accepting that leadership can be fallible and that a plethora of contingencies always accompany economic and social change. What is at stake is not so much avoiding failure as failing and then trying again in order, as Beckett put it, to "fail better."

"The attempt to influence the forces of development," asserted Prebisch (1963), "involves a design that is far-reaching in terms both of time and of scope. It requires not only changed structures, but also changes in outlook, approach and form of action. But are such changes feasible in our countries? When this question arises the response is often a feeling of scepticism that discourages action. But it has to be done, because there is no other way out."

The aim, then, must be to create new economic, institutional and intellectual capabilities, new powers of historical and sociological imagination, in order to adapt global technology and make openness work for us; to *nationalize* globalization, in other words, something that we in Mexico have put off, leaving the task for some undefined future.

# VI

## A point of view

To end, perhaps I may be allowed to venture a brief summary of recent Mexican experience. A frontier country, Mexico may be seen as the "far north" of this far West of ours, as the learned French ambassador Alain Rouquié saw us. The country committed itself heavily to a vertiginous structural change that would carry it rapidly into the new worlds promised by the globalization of the late twentieth century. Mexico's story of its "great transformation" into an open, market-based economy suggests many lessons to be learnt and much to be amended, and in some cases mended, and little to boast about, except society's remarkable willingness to live prudently under the storm of change and give further proof not so much of resignation as of its ability to overcome adversity and seek to affirm the idea of development as a national endeavour.

After almost 30 years in which the State and important and powerful groups in society have looked for a different way of growing and developing, Mexico's political economy is suffering from a crisis of vision that distils the results of poor economic performance and social implications that are discouraging and damaging to that bare level of cohesion required for stability and development. This crisis, in turn, has been feeding into and upon the various social and political failings that have accompanied the structural changes dating from the closing years of the last century and are now viewed as a fearsome combination of anomy and unrestrained criminality.

A review of the strategy followed is urgent and necessary and needs to start by questioning the economic policy adopted, whose results hitherto have been very slow growth in economic activity, progressive loss of economy-wide potential, with half the population in poverty and jobs that are not only insecure but ill-paid, falling far short of what is needed by the large and growing number of young people and young adults who embody the country's social and demographic change of recent years. Again, consideration of the democratic structure in operation since the late twentieth century raises the question of whether the forms of representation and government of the State that have been put in place are what is needed to channel the redistributive and developmentalist demands that are looming.

The reforms altered customary practices and the formats and routines of economic calculation, but the dislocations they triggered were not internalized by the emerging social and productive fabric, and they resulted in a greater weakening of the State, whose failings, apparent or invented, served to justify economic reform at any cost and then political reform in which nothing but votes counted. There was a State-led acceleration of social and economic change, but too little was done to modulate it, temper its inevitable dislocations and protect the weakest sectors, regions and social groups.

The achievements of this change are not to be gainsaid: in less than 20 years, Mexico became a major

exporter of heavy and medium-heavy manufactures, with a powerful industrial base for automotive and electronics production and export. The country's total sales abroad quintupled, and it left behind its virtually complete dependence on a single export product, crude oil.

During these rapid shifts in its trade structure, Mexico attracted considerable amounts of foreign direct investment. The country very quickly became one of the top three trading partners of the United States and came on to the world trade scene as a new and attractive major league player.

It can also be taken as read that, slow as it was, political reform ultimately yielded substantial benefits. The chambers of Congress diversified their political and ideological content, reproduced plurality and gave a new face and hue to the political system that resulted in an active and activist multi-party system. Furthermore, the constraints on a federal system that had always been trammelled and distorted by the central authority were lifted, and the country embarked upon a still unfinished phase of breakneck, almost savage regionalization and decentralization that despite everything has become a source of plural political power exercising a decisive influence within the current national State.

As against this, the question must now be asked as to whether a country of Mexico's economic size, with all the wealth that has been generated and accumulated, with institutions and knowledge so laboriously built up, can afford the luxury of undergoing and reproducing a "stabilizing stagnation" like the one that has become established, along with the levels of inequality and poverty that characterize it. Beneath these discords, there has been a persistent inability to productively link a transformed demography, now dominated by young people and young adults in urban areas of an age to work and study, with a likewise transformed, open and diversified economy, but one that for more than three decades has been unable to generate the jobs and education opportunities needed to absorb the population productively.

The Mexican journey has included excesses and mistakes, both economically and socially, and in ideas about change and the best ways to govern it and secure a good outcome. The main barriers to the necessary transformation, in Mexico and elsewhere, have come from the fundamentalisms imposed in the management of economic policy, which infected important power groupings as well as sections of public opinion. The dogma of maintaining supposed macroeconomic equilibria at all costs, with the elementary external and internal constraints this imposed, led the political and economic elites to support policies and actions driven wholly by the orthodox versions of how these equilibria should be met and maintained.

It needs to be stressed that poor long-term economic performance is not only or mainly the effect of imbalances in international markets. It should rather be understood as an outcome of political and economic decisions that have ignored other "fundamentals," such as the need for sustained physical investment in pursuit of long-term growth, an industrial policy aimed at diversification and the creation of new production chains to appropriate external revenues, and anti-poverty measures and consistent reduction of inequality as core areas of State concern and action.

What must be at the top of the agenda for Mexican economic development is to reconfigure its basic functions and make employment a central, unifying goal of a strategy for growth *with* and *for* equality. The relative historical stagnation affecting the country of revolutions and nation-building against the grain of the supposedly universal mandates of history can only be overcome by setting a new course in which means and objectives are recombined and consideration is given to the vital need for new forms of social and political participation in State deliberations and decision-making. Reaching higher platforms of cooperation between social forces, economic groupings and regions that combine democracy with collective mobilization will make it possible to redefine the boundaries between the public and the private, without sacrificing or indefinitely postponing the time for equality, and will create the conditions, this time within the terms of the democratic constraint, for a virtuous dialogue between accumulation and redistribution, of the kind that President Lázaro Cárdenas ventured to attempt at the head of the popular coalition which covered the country and its revolution with glory.

What we need to do, if we are to exit this hybrid labyrinth of "open solitude" which we are currently in (but which is a baroque continuation of the one sketched out for us by Octavio Paz), where modernity has become confused with the most ingenuous and insubstantial of cosmopolitanisms, is, if I may paraphrase Alfonso Reyes, to join in delineating, "as a possible field in which to achieve a more equal justice, a better understood freedom (…) the dreamed-of Republic, a Utopia" (Martínez, 2012).

# VII
## Conclusions

The discords emerging from globalization and exacerbated by the crisis between external opening, State and national sovereignty, and democracy need to be addressed as a matter of urgency. These strains are acting in complex social contexts rent by inequality; in the face of all this, it is indispensable to restore development as a core, all-encompassing process. These are structural, value-related and ideological constraints that the planet needs to deal with to make way for evolved configurations in the economic and political order that create the right conditions for the search for new ideas and utopias organized around (and underpinned by) development.

All the institutional evolution and reforms required for a restored development entail an explicit acceptance of this as a complex political and social process, as well as an economic one. Whatever idea of development may come out of this dialectic cannot ignore the preponderant role to be played by policy and the State in its implementation, which is why the idea of social change and the imperative need to take democratic learning and teaching on board as irreplaceable features of the whole process need to be central to a historical and contemporary idea of development.

This is the context in which strategies and policies will have to be settled upon, as well as the different options for engaging in the global economy that arise, or should do, for nations striving to appropriate the idea of development as a reality and as a utopia.

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# Latin America's competitive position in knowledge-intensive services trade

*Andrés López, Andrés Niembro and Daniela Ramos*

**ABSTRACT**

This study presents a dynamic analysis of Latin America's competitiveness in trade in knowledge-intensive services. The methodology used to undertake this analysis is based on the TradeCAN approach developed by the Economic Commission for Latin America and the Caribbean (ECLAC), which provides a means of assessing different countries' competitiveness by looking at their exports to the fastest-growing markets. (In the past, it has usually been applied primarily to exports of goods.) The results suggest that, although some Latin American countries have made inroads in knowledge-intensive service segments and have comparative advantages in them, the percentage of "rising stars" (dynamic sectors in which a country or region is gaining in market share) is still low, while there is a high percentage of "missed opportunities" (dynamic sectors in which a country or region is losing market share). This points up the existence of areas in which the region's competitive position is weak and in which policies are needed to leverage its competitive advantages and remove the obstacles that are holding it back from establishing a more advantageous position in knowledge-intensive service markets.

**KEYWORDS**

Competitiveness, services trade, knowledge-based economy, international trade, exports, trade statistics, Latin America

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E01, F14, L80

**AUTHORS**

Andrés López is a researcher at the Research Centre for Industrial Transformation (CENIT/UNTREF), Argentina. anlopez@fund-cenit.org.ar

Andrés Niembro is a researcher at the Interdisciplinary Territorial, Economic and Societal Research Centre (CIETES), Universidad Nacional de Río Negro (Andean campus), Argentina, and a doctoral fellow with the National Council for Scientific and Technological Research (CONICET), Argentina. aniembro@unrn.edu.ar

Daniela Ramos is a researcher with the Research Centre for Industrial Transformation (CENIT/UNTREF), Argentina. danielaramos@fund-cenit.org.ar

# I
# Introduction

Services have been a dominant sector in the global economy for some time now, as they account for the largest portion of gross domestic product (GDP) and employment in developed economies and in a sizeable part of the developing world as well.

Until recently, however, services were viewed as a low-productivity sector in which there was very little innovation and —with the exception of a limited number of activities such as transport and tourism— very few tradables. Nonetheless, in recent decades the world has witnessed a sea change that has given rise to an entirely new paradigm in service production and trade. As a result, service activities now play an entirely different role in national economies than they did in the past.

Two key factors underlie this transformation. The first is the growing importance of what have come to be known as "knowledge-intensive services". This sector includes a wide range of activities, such as accounting and legal services, audiovisuals, design, advertising, software and information services, research and development (R&D), health care and education.[1] What all these activities have in common is that they make intensive use of highly skilled human capital and that information and knowledge are both their inputs and their outputs.

The second major factor is that, while a number of these services were mainly traded in countries' domestic markets until not long ago, now they can be exported. The available statistics do not fully capture this process because of the intangible nature of trade in services and the resulting difficulties in recording service transactions. However, even though the available figures are known to be an underestimate of the true value of trade in services, approximately 20% of total (goods plus services) world exports are made up of service activities. Even more interestingly, recent estimates based on the use of input-output tables suggest that when trade is measured in terms of value added, the share of the services sector verges on 50% and outweighs trade in manufactures (Escaith, 2008).

The growth of this sector has been led by knowledge-intensive services (see figure 1). Global exports of such services now amount to nearly US$ 1.6 trillion[2] (data for 2012 compiled by the United Nations Conference on Trade and Development (UNCTAD)), which is 3.7 times higher than the corresponding figure for 2000. Trade in these services in 2012 outpaced trade in foodstuffs (including raw materials and processed goods), minerals, steel, textiles and clothing, electronics and motor vehicles, to cite only a few examples.

The growth of trade in knowledge-intensive services has gone hand in hand with the deployment of information and communications technologies (ITCs), which have made the generation, processing and transmission of information much less expensive and much faster and have even made it possible to digitize certain types of goods and thus convert them into intangibles. These same ITCs have also made it possible to provide certain types of services remotely that, until recently, could be traded only via direct contact between the service provider and user.

ITCs provide the infrastructure needed for the dispersion of production on a global scale, which has led to the formation of global value chains. Within these chains, production processes are divided up into portions of value added that is generated in different locations. This means that what is important is no longer what is produced where, but rather what processes are carried out where and how much value added they generate (Baldwin, 2011). Transnational corporations play a leading role in organizing most of these global value chains and in offshoring the production of goods and services to locations where costs are competitive and skilled resources can be accessed.

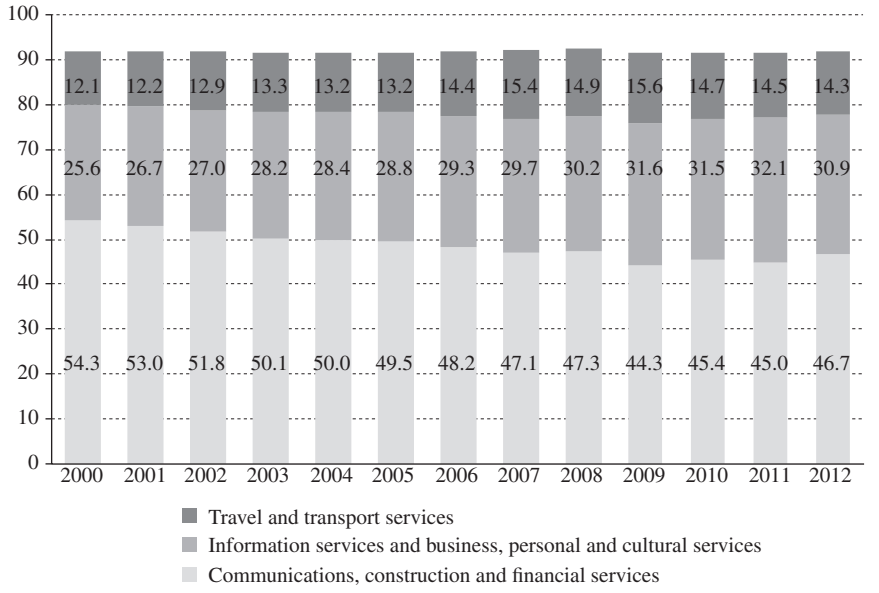
China and India have become world-class magnets for knowledge-intensive services because of their vast reserves of university-trained human resources. Data compiled by UNCTAD indicate that these two countries export over US$ 90 billion worth of knowledge-intensive

[1] Because the focus of this study is competitiveness, the information on knowledge-intensive services is based on the available data on trade in the following segments: business and professional services, software and information services, and audiovisual, cultural and personal services. While these data do not provide full coverage of the knowledge-intensive services sector, they do afford an approximation that is sufficient for the purposes of this study.

[2] If insurance and financial services, communications, and royalties and licences are factored in, then the figure climbs to US$ 2.35 trillion for 2012.

FIGURE 1

**Composition of international services trade, 2000-2012**
(*Percentages of the total*)




*Source:* prepared by the authors on the basis of figures from the United Nations Conference on Trade and Development (UNCTAD).

Note: the figures do not add up to 100% because the categories "royalties and licences" and "government services" have not been included.

services. There are many developing countries that have also positioned themselves in these markets, however, such as Malaysia, the Philippines and Thailand, in Asia, and Poland, the Czech Republic and Hungary, in Eastern Europe, as well as developed-country pioneers such as Ireland.

Latin America has also begun to play an active part in this new area of global trade, and a number of countries in the region (notably Argentina, Brazil, Colombia, Costa Rica, Chile and Uruguay)[3] have been exporting more and more knowledge-intensive services.

Moving beyond the information provided by trade statistics, the question to be answered is how competitive the region is in knowledge-intensive service markets. The concept of "international competitiveness" involves many different factors and has been the object of a wide range of different conceptualizations and approaches. Given the difficulties involved in arriving at a single, agreed definition, for the purposes of this study the concept of competitiveness can be, generally speaking, seen as corresponding to the (relative) performance of a given firm, sector or country in the international economy. A number of indicators have been developed on this basis as a means of comparing the relative performance of different countries/firms in world markets.

Although it is becoming more and more common to view international competitiveness as part of a structurally, systemically and otherwise complex, dynamic process that entails an interaction of micro-, meso- and macroeconomic factors, most of the studies that have been done to date on the competitiveness of different countries in international services trade have focused on the "revealed comparative advantages" indicator (see, for example, Langhammer, 2004; Díaz de la Guardia, Molero and Valadez, 2005; Bobirca and Miclaus, 2007; Seyoum, 2007; Zhang, Wei and Miao, 2010; Jiang, 2011). This type of methodological approach entails an ex post calculation (for a given point in time) of an economy's degree of specialization in world trade and is based on an essentially static view of comparative advantages (Ferraz, Kupfer and Haguenauer, 1996). As noted by

[3] Mexico does not compile statistics on exports of knowledge-intensive services other than audiovisual services. For this reason, it is not included in a number of the statistical tables presented in this study.

Chudnovsky and Porta (1990, pp. 13-15), this traditional concept of static comparative advantages is not very useful, however, when the objective is to determine the areas in which action might be taken to create dynamic advantages[4] or to derive greater benefit from international trade.

This study takes an alternative approach to the analysis of Latin America's competitive position in international markets for knowledge-intensive services based on an ex post examination of outcomes. The focus is on determining how effective the region's patterns of specialization are in enabling it to take advantage of the opportunities that open up in world markets. An effort is also made to delve into the factors underlying the observable trends in this area.

The following discussion is organized as follows. Section II presents a brief analysis of trends in world exports and, more specifically, in Latin American exports of knowledge-intensive services over the past decade. Section III, which is the core component of this study, focuses on the region's competitive position in trade in knowledge-intensive services based on the TradeCAN methodology. Section IV briefly reviews the main ex ante determinants of competitiveness in knowledge-intensive service sectors and highlights certain aspects of the region's position in those markets. The fifth and final section presents the study's findings.

[4] For a more in-depth analysis, see, for example, Ffrench-Davis (1990).

# II

## The role of Latin America in knowledge-intensive services trade

Before taking a brief look at trends in world and Latin American trade in services in recent years, a few comments regarding trade statistics are in order. It is well known that the statistics on trade in these kinds of services do not provide an accurate picture of the volumes that are actually involved. Some of the reasons for this are: (i) many of these services are new types of activities, and there is as yet no consensus as to how they should be measured; (ii) many of these exports are intangible, which makes it hard to keep records on them; and (iii) international trade in services occurs in various ways that are not always captured fully or in any standardized manner in official statistics (López, Ramos and Torre, 2009). These difficulties are heightened by the fact that a large part of services trade is made up of intra-firm transactions that are conducted on the basis of transfer prices and that are sometimes not recorded at all because of taxation, accounting or other types of considerations. The available statistics are also not sufficiently disaggregated to serve as a basis for a detailed analysis of trade in knowledge-intensive services.

These difficulties notwithstanding, there is still enough information at hand to undertake an analysis of this type and to arrive at useful findings regarding Latin America's position in knowledge-intensive services and its levels of competitiveness.[5]

Since the General Agreement on Trade in Services (GATS) was signed in the mid-1990s, international trade in services has been divided into four categories: mode 1, cross-border supply (often linked to ICT transactions); mode 2, consumption abroad (i.e. when clients travel to the country of origin to obtain the service, as when people travel to other locations in order to receive medical treatment); mode 3, commercial presence, which entails the supplier's presence on foreign soil, usually via foreign direct investment (FDI); and mode 4, presence of a natural person, which involves the movement of people (i.e. the service providers) to the country where the destination market is located. One example of this is what has come

[5] The different countries of the region have made very uneven progress in the collection of information on services trade, and their statistics differ significantly in terms of their level of disaggregation and their coverage. UNCTAD statistics have therefore been used in this study, as they provide a more homogenous basis for cross-country comparisons. A more in-depth analysis of data at the country level for more specific segments of the knowledge-intensive services sector will thus remain a subject for future studies.

to be known as "body shopping", which is the way that the Indian software industry initially made its way into international markets.

Most of the transactions in most types of services that are registered in balance-of-payments statistics are almost entirely mode-1 transactions. Mode-2 and mode-4 transactions are often (erroneously, in many cases) lumped into a single category under the heading of "travel" (which includes tourism income and expenditure). In other words, the second and fourth modes are generally not accurately reflected in official figures because many of these activities are not recorded directly or are misreported because of the inaccurate classification of the movements of the persons concerned (as in the case, for example, of medical tourism or of educational services provided to foreign nationals in the country that is compiling the statistics). The other category of transactions —"commercial presence"— is linked to FDI flows and stocks.[6] In addition, there are many services (engineering, design, marketing and others) that are embedded in physical goods and are thus registered in the sales of those products.

This study focuses on mode-1 service transactions, which climbed from US$ 1.5 trillion in 2000 to US$ 4.4 trillion in 2012, with US$ 1.6 trillion of that sum being accounted for by knowledge-intensive services (according to data compiled by UNCTAD). While the cumulative annual growth rate for trade in services for 2000-2011 was only slightly higher than the rate for goods (9.3% versus 9.1%), the growth rate for knowledge-intensive services trade was far higher (11.6%). During the international financial crisis, services directly linked to trade in goods (transport and financial services) and tourism were the ones that witnessed the steepest declines, whereas business, professional and technical services expanded even during the crisis (Borchert and Mattoo, 2010). Along the same lines, data compiled by consultancies and international organizations indicate that trade in the information technology outsourcing (ITO) and business process outsourcing (BPO) segments —the two largest categories, by volume, of knowledge-intensive services— continued to grow during this period of international turbulence (Gereffi and Fernández-Stark, 2010b; Muthal, 2011).

What is the situation in Latin America? The region (and this includes the Caribbean) has no more than a small share of the global market for knowledge-intensive services (2.9% in 2012), although that share has grown slightly since 2000 (when it was 2.3%). This is a far cry from the share of developing Asian countries (27% en 2012)[7] (figures from the UNCTAD database). In addition, the region's service exports are largely made up of traditional services (transport and travel), although the relative share of knowledge-intensive services has been growing over the past decade. The greatest differences in absolute terms between the region's averages and world averages are in the categories of royalties and licences (the region is not a technology exporter) and financial services (see table 1), which are not included in the category of knowledge-intensive services as defined for the purposes of this study. Using this definition, knowledge-intensive services made up 26.6% of Latin American service exports in 2010, while the world average is 29.3%.

Table 2 shows the ranking of the main exporting countries in some of the segments of interest here (it also includes all the Latin American countries for which data are available). India leads the list of developing countries for exports of computer services (and is, in fact, the world's top exporter in this category), while China is the leader in other business services (which include BPO, the biggest global offshore services market). China is ranked as the sixth-largest exporter for computer services while India is in twelfth place for exports of business services. In Latin America, Brazil is a major exporter of business services (it is in eighteenth place in the international ranking). Argentina is ranked as the twenty-fourth-largest exporter of computer services (and tops the Latin American list) and the thirty-fourth-largest exporter of business services. Chile, Costa Rica, Colombia and Uruguay are further down in the rankings (with differing positions and significant differences in sales levels). For personal, cultural and recreational services (including health care, education, audiovisuals and other services), Hungary and Turkey are in the top 10. In this case too, Argentina is the largest Latin American exporter (in nineteenth place in the world ranking).

[6] Foreign affiliates statistics (FATS) can be used to measure mode-3 services trade.

[7] The gap is even wider in the case of industrial exports, in which the share of Latin America and the Caribbean in the global market amounts to 4.3% while developing Asia's comes to 37.1% (UNCTAD database).

TABLE 1

**World and Latin American service exports, 2000-2010**

*(Composition and cumulative annual growth rate (CAGR), in percentages)*

| Category | World exports | | | | Latin American exports | | | |
|---|---|---|---|---|---|---|---|---|
| | Percentage of total | | | CAGR (2000-2010) | Percentage of total | | | CAGR (2000-2010) |
| | 2000 | 2005 | 2010 | | 2000 | 2005 | 2010 | |
| Transport | 22.6 | 22.3 | 20.7 | 8.7 | 19.8 | 22.7 | 21.2 | 8.8 |
| Travel | 31.6 | 27.2 | 24.9 | 7.1 | 47.0 | 46.7 | 40.1 | 6.4 |
| Communications | 2.1 | 2.2 | 2.4 | 11.1 | 5.4 | 3.5 | 2.9 | 1.6 |
| Financial services and insurance | 7.9 | 8.6 | 9.2 | 11.3 | 6.7 | 4.5 | 5.5 | 6.0 |
| Construction | 1.9 | 2.1 | 2.3 | 12 | 0.5 | 0.1 | 0.1 | -6.9 |
| Computer and information services | 2.8 | 3.3 | 4.4 | 14.7 | **0.6** | **1.2** | **2.8** | **25.5** |
| Royalties and licences | 6.0 | 6.2 | 6.5 | 10.6 | 0.9 | 0.6 | 0.9 | 7.9 |
| Other business services | 21.0 | 21.9 | 24.1 | 11.2 | **14.6** | **16.3** | **23.0** | **13.1** |
| Personal, cultural and recreational services | 0.9 | 0.8 | 0.7 | 7.3 | 1.0 | 1.2 | 0.7 | 5.2 |
| Government services (+ residual) | 3.2 | 5.4 | 4.8 | 14.3 | 3.5 | 3.2 | 2.8 | 5.8 |

*Source:* prepared by the authors on the basis of figures from the United Nations Conference on Trade and Development (UNCTAD).

TABLE 2

**Major exporters of knowledge-intensive services, 2010**

*(Millions of dollars)*

| Computer and information sciences | | | Other business services | | | Personal, cultural and recreational services | | |
|---|---|---|---|---|---|---|---|---|
| 1 | India | 56 701.2 | 1 | United States | 100 476.0 | 1 | United States | 14 563.9 |
| 2 | Ireland | 37 250.8 | 2 | Germany | 74 399.5 | 2 | United Kingdom | 4 080.6 |
| 3 | Germany | 16 305.0 | 3 | United Kingdom | 73 416.8 | 3 | Canada | 2 198.3 |
| 4 | United States | 13 830.2 | 4 | China | 61 241.6 | 4 | France | 1 965.4 |
| 5 | United Kingdom | 11 518.5 | 5 | Singapore | 43 851.3 | 5 | Spain | 1 774.7 |
| 6 | China | 9 256.3 | 6 | Japan | 42 547.4 | 6 | Malta | 1 382.7 |
| 7 | Israel | 7 699.5 | 7 | Switzerland | 38 879.6 | 7 | Luxembourg | 1 352.2 |
| 8 | Sweden | 6 660.5 | 8 | Netherlands | 32 947.8 | 8 | Hungary | 1 259.5 |
| 9 | Spain | 6 407.6 | 9 | France | 32 603.4 | 9 | Germany | 1 074.1 |
| 10 | Netherlands | 6 155.1 | 10 | Ireland | 29 705.5 | 10 | Turkey | 912.0 |
| 21 | France | 1 398.6 | 12 | India | 28 984.6 | 19 | Argentina | 355.8 |
| 24 | Argentina | 1 248.5 | 18 | Brazil | 15 776.5 | 21 | India | 334.6 |
| 26 | Costa Rica | 1 070.7 | 34 | Argentina | 3 910.0 | 32 | China | 122.9 |
| 43 | Brazil | 209.8 | 41 | Chile | 1 865.4 | 34 | Brazil | 108.3 |
| 46 | Uruguay | 179.8 | 52 | Costa Rica | 688.5 | 38 | Chile | 86.8 |
| 53 | Chile | 90.7 | 55 | Colombia | 612.1 | 39 | Colombia | 84.2 |
| 57 | Colombia | 45.9 | 58 | Paraguay | 544.2 | 41 | Mexico | 80.0 |
| 66 | Panama | 24.8 | 66 | Peru | 333.3 | 61 | Paraguay | 14.0 |
| 67 | Peru | 20.9 | 76 | Panama | 202.6 | 64 | Honduras | 11.7 |
| 69 | Guatemala | 11.7 | 79 | Uruguay | 180.4 | 68 | Venezuela (Bolivarian Republic of) | 6.0 |
| 72 | Venezuela (Bolivarian Republic of) | 9.0 | 81 | Venezuela (Bolivarian Republic of) | 155.0 | 71 | Peru | 3.9 |
| 77 | Honduras | 4.5 | 90 | Guatemala | 69.6 | 75 | Bolivia (Plurinational State of) | 1.7 |
| 78 | Paraguay | 4.4 | 100 | El Salvador | 29.6 | 82 | Uruguay | 0.4 |
| 86 | El Salvador | 0.7 | 106 | Bolivia (Plurinational State of) | 16.6 | 84 | Costa Rica | 0.1 |
| 87 | Bolivia (Plurinational State of) | 0.7 | 111 | Honduras | 10.3 | 86 | El Salvador | 0.01 |

*Source:* prepared by the authors, on the basis of figures from the United Nations Conference on Trade and Development (UNCTAD).

# III

## The competitiveness of knowledge-intensive services exports in Latin America

As noted earlier, the objective of this study is to evaluate Latin America's competitive position in the international market for knowledge-intensive services and to provide new evidence regarding its pattern of trade specialization and (dynamic) comparative advantages in these activities.

One approach that is frequently used when making sectoral comparisons (and policy decisions) is to focus on the services that generate the greatest value added. While a number of contributions have been made to this area of research —including, for example, the ranking proposed by Gereffi and Fernández-Stark (2010a and 2010b) based on the intensity of the value added by different service activities and the use of that information to graph the situation in Argentina by López, Niembro and Ramos (2011), or its dynamic application (for four countries) by Fernández-Stark, Bamber and Gereffi (2011)— the fact remains that, given the scarcity of information and, in particular, the high level of aggregation of the available data, there is not a sufficient basis, at this stage, to make the jump from case studies to more generally applicable comparisons. Accordingly, the above-mentioned studies draw upon research done in the field and analyses of the literature and other secondary sources on the situation in each country or sector.

Studies have also been conducted that provide a comparative analysis of the situation in knowledge-intensive service sectors in different countries of the region (López, Ramos and Torre, 2009; López and Ramos, 2010), while others draw upon the available evidence in the theoretical and empirical literature to assess the position occupied by Latin America in the various areas that have an impact on its competitiveness in those sectors (López and Ramos, 2013).

Another approach is to examine trade statistics and some of the indicators that are commonly used in the literature. The revealed comparative advantage index[8] is one of the main indicators of this type which, despite its limitations, can serve as a point of departure for an examination of the specialization patterns of major exporters (see table 3).[9]

As is to be expected, India, Ireland and Israel (the "three I's", as they are known in the literature on this industry) are the leaders in computer services, while a number of developing countries —especially in Asia— are the top-ranked exporters of business services. Developing countries, including transition economies, are even more prominent in personal, cultural and recreational services. In Latin America, Costa Rica, Argentina and Uruguay are leaders in software, while Brazil is in the number-one spot in other business services and Argentina is in fifth place for personal, cultural and recreational services. This indicates that some of the Latin American countries do have comparative advantages in the markets for knowledge-intensive services, even though, for various reasons (especially the size of their economies), they do not rank among the world's top exporters in those segments.

In short, although the Latin American countries have no more than a small share of world trade in services overall, there are a number of success stories in which countries have managed to consolidate their comparative advantages and gain entry into dynamic knowledge-intensive service markets.

As mentioned earlier, the revealed comparative advantages indicator has various limitations, including

[8] This is a variant of an export indicator; others are based on trade balances.

[9] This index is computed on the basis of the following formula:

$$VCR_{ij} = \frac{X_{ij} \Big/ \sum_i X_{ij}}{\sum_j X_{ij} \Big/ \sum_i \sum_j X_{ij}}$$

where $X_{ij}$ represents service exports $i$ from country $j$. The numerator thus represents a given sector's share of a country's total service exports, while the denominator reflects that sector's share of world service exports. When $VCR_{ij}$ is greater than unity, then country $i$ has comparative advantages in service $j$. If $VCR_{ij}$ is between 1 and 2, then the country is said to have a weak comparative advantage; if it is between 2 and 3, it is said to have a strong comparative advantage; and if it is greater than 3, then its comparative advantage is classified as being very strong.

TABLE 3

**Revealed comparative advantages in knowledge-intensive services exports, 2010**

| Computer and information services | | | Other business services | | | Personal, cultural and recreational services | | |
|---|---|---|---|---|---|---|---|---|
| 1 | India | 7.9 | 1 | Brazil | 2.1 | 1 | Malta | 32.9 |
| 2 | Ireland | 6.6 | 2 | Philippines | 2.0 | 2 | Hungary | 6.3 |
| 3 | Israel | 5.4 | 3 | Taiwan Province of China | 2.0 | 3 | Serbia | 4.8 |
| 4 | Costa Rica | 4.4 | 4 | Switzerland | 1.9 | 4 | Canada | 3.0 |
| 5 | Finland | 4.2 | 5 | Sweden | 1.7 | 5 | Argentina | 2.6 |
| 6 | Philippines | 2.8 | 6 | Singapore | 1.6 | 6 | United States | 2.5 |
| 7 | Sri Lanka | 1.9 | 7 | Paraguay | 1.5 | 7 | Turkey | 2.5 |
| 8 | Romania | 1.8 | 8 | Bermuda | 1.5 | 8 | New Zealand | 2.4 |
| 9 | Sweden | 1.8 | 9 | China | 1.5 | 9 | Azerbaijan | 2.2 |
| 10 | Argentina | 1.6 | 10 | Belgium | 1.5 | 10 | Luxembourg | 1.9 |
| 11 | Uruguay | 1.2 | 22 | Argentina | 1.2 | 11 | Colombia | 1.8 |
| 51 | Colombia | 0.2 | 46 | Chile | 0.7 | 21 | Honduras | 1.1 |
| 55 | Chile | 0.1 | 52 | Costa Rica | 0.7 | 25 | Paraguay | 0.9 |
| 59 | Brazil | 0.1 | 55 | Colombia | 0.6 | 30 | Chile | 0.8 |
| 62 | Peru | 0.1 | 68 | Venezuela (Bolivarian Republic of) | 0.4 | 42 | Mexico | 0.5 |
| 63 | Guatemala | 0.1 | 69 | Peru | 0.4 | 51 | Venezuela (Bolivarian Republic of) | 0.3 |
| 64 | Venezuela (Bolivarian Republic of) | 0.1 | 74 | Uruguay | 0.3 | 52 | Brazil | 0.3 |
| 67 | Honduras | 0.1 | | | | 63 | Peru | 0.1 |

*Source:* prepared by the authors, on the basis of figures from the United Nations Conference on Trade and Development (UNCTAD).

the fact that it provides a basis only for a static analysis of competitiveness. One way of getting around this limitation is to differentiate trade patterns on the basis of the dynamism of the international markets concerned. As pointed out by Porta (2005, pp. 12-13), bringing (upward, stagnant or downward) trends in world demand into the equation opens up the possibility of taking another look at certain aspects of production and marketing specialization, whereupon it becomes possible to take into account the fact that some shortcomings in terms of international competitiveness could be the result of a country's weak or unsuitable patterns of trade specialization. Bianco (2007) notes that an economy's increasing involvement in sectors or activities (or both) that have expanding external markets constitutes an indicator of structural competitiveness gains.

An approach to the analysis of international competitiveness that fits in with the objectives of this study (and that, as will be shown, can accommodate the types of statistics that are available) is the TradeCAN (Trade Competitive Analysis of Nations) methodology, which was developed in 1990 by the Economic Commission for Latin America and the Caribbean (ECLAC), mainly for use in analysing countries' competitiveness in merchandise trade.[10] This methodology can be used to obtain a dynamic picture of countries' competitive positions by gauging the extent to which a country manages (or fails) to increase its market share in sectors that are attracting an increasing level of international demand. These patterns can be divided into four categories: (i) "rising stars": dynamic sectors (their share in total world imports is expanding) in which a country's market share is growing; (ii) "declining stars": stagnant or declining sectors (their percentage share of world imports is shrinking) in which a country's market share is expanding; (iii) "missed opportunities": dynamic sectors in which a country's market share is shrinking; and (iv) "retreats": stagnant or declining sectors in which a country's market share is also declining.

This classification thus reflects both the growth of the various sectors and the increase or decrease in a country's market share between 2000 and 2009 based on the data compiled by UNCTAD on imports and exports

[10] It should be pointed out that analyses based on the TradeCAN methodology do not provide information on the reasons why countries may have gained or lost international market shares.

in the main segments of the services sector.[11] In terms of the first of these two dimensions, the sectors that were on the decline during this period (as measured by the percentage of total world imports that they account for) were: transport, travel, and personal, cultural and recreational services. The sectors that came to account for a larger share of total international trade were: communications, construction, insurance, financial services, computer and information services, royalties and licences, and other business services.

Clearly, the data used in this exercise are highly aggregated, and it is quite possible that different subcategories of the main segments have trended in different ways. If this is the case, then some segments could be dynamic while others could be on the decline, so the aggregate figures would not provide an accurate reflection of the status of its components. This issue will be discussed further later on in this study.

The aforementioned reservations notwithstanding, figure 2(a) shows what percentage of the TradeCAN categories of service exports came from Latin American countries in 2009. Even today, the bulk of the region's exports are concentrated in stagnant or declining sectors of global trade (declining stars and retreats), while the number of rising stars (dynamic sectors in which a country or region is gaining in market share) is, in most cases, quite limited, except in the cases of Brazil, Argentina and Costa Rica, where this category accounts for at least 40% of service exports. In a number of countries in the region, a considerable share of exports fall into the missed opportunities category, i.e. dynamic segments in the international economy in which the countries' market share is shrinking.

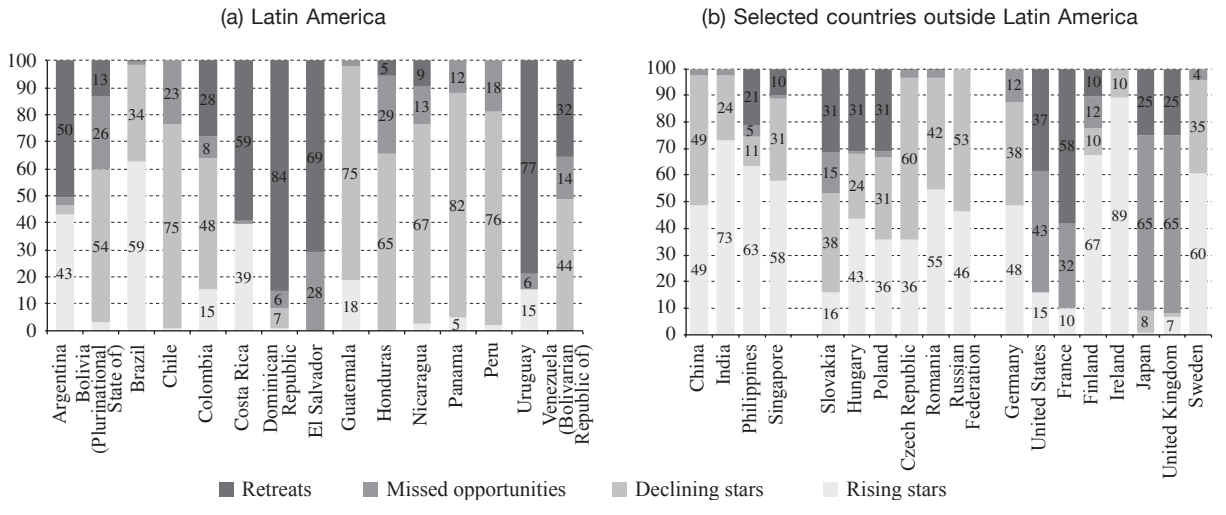
The pattern for Latin America is thus at odds with the patterns for other developing and emerging regions that have succeeded in taking greater advantage of the growth of world trade in services and of opportunities for offshoring services and have thus managed to become a part of these global value chains. As shown in figure 2(b), Asian countries and, to a lesser extent, those of Eastern Europe have a higher percentage of rising-star exports and a fairly small share of missed-opportunity exports. The situation is much the same in the case of developed countries such as Ireland, Finland, Sweden and Germany. Other developed countries such as the United States, the United Kingdom, France and Japan have a higher percentage of missed-opportunity exports, which shows that, although a large part of their exports are still in dynamic world service segments, during the 2000s their market shares in those sectors have been shrinking as these activities are offshored to other countries. The other side of the coin is reflected in the developing and some developed countries' rising stars.

As mentioned earlier, the various subcategories of services may exhibit differing trends that could be

[11] The available data are subject to the same flaws in terms of the compilation of statistics that were mentioned earlier (including the failure of certain categories of activities to report their figures in some countries).

FIGURE 2

**Service exports in 2009, by TradeCAN categories for 2000-2009**
(*Percentages of the total*)




*Source:* prepared by the authors, on the basis of data from the United Nations Conference on Trade and Development (UNCTAD).

masked or obscured by the overall trends in the major categories for which figures are being given. Table 4 provides a basis for an at least partial analysis of the trends in the various service subsegments by showing how the share of services in total imports has varied in selected major import markets.[12] This approach brings out some interesting issues.

[12] This is referred to as a "partial analysis" because, in contrast to the preceding discussion, the available data on these activities do not provide a full picture of the world market. Another factor to be taken into account is that the data used in the comparison are for different years because the periods for which data have been compiled by the various sources do not coincide.

First of all, although in earlier sections of this study the category of "personal, cultural and recreational services" was classified as a sector with a shrinking share of the total market, it turns out that this is not necessarily true of all the subcategories and markets included under this heading. For example, the United States is a highly dynamic market for exports of audiovisual and related services (and the relative level of these imports has also been on the rise in the United Kingdom). In addition, the share of total service imports represented by other personal, cultural and recreational services has climbed for the European Union as a whole (and this is especially true for Portugal).

TABLE 4

**Service imports in selected markets, by category and subcategory, 2004-2008**
(*Percentage variation*)

| Category | Percentage variation, 2004-2008 | | | | |
|---|---|---|---|---|---|
| | EU27 | Spain | Portugal | United Kingdom | United States |
| 1. Transport | 0.3 | -7.9 | -0.9 | -22.1 | -15.6 |
| 2. Travel | -14.1 | -6.2 | -8.9 | -10.3 | -13.1 |
| 2.1. Business trips | -13.9 | … | … | -6.9 | -9.9 |
| 2.2. Personal trips | -14.2 | … | … | -10.8 | -13.1 |
| 2.2.1. Health-related expenditures | … | | … | 14.0 | … |
| 2.2.2. Education-related expenditures | … | | … | 18.9 | 3.5 |
| 2.2.3. Other | … | | … | -11.0 | -14.0 |
| 3. Communication services | 8.9 | 18.2 | 19.1 | 8.5 | 7.8 |
| 3.1. Postal and mail services | -18.0 | … | -49.4 | 0.5 | -24.7 |
| 3.2. Telecommunications services | 16.7 | … | 30.1 | 10.3 | 11.8 |
| 4. Construction services | 7.7 | 98.2 | -14.5 | 473.5 | 131.9 |
| 5. Insurance | -13.6 | 1.7 | … | -0.7 | 36.7 |
| 6. Financial services | 17.0 | 46.1 | … | 42.1 | 160.4 |
| 7. Computer and information services | 20.9 | -5.7 | … | 39.8 | 454.7 |
| 7.1. Computer services | 22.1 | … | 44.3 | 51.0 | 501.1 |
| 7.2. Information services | 8.1 | … | 18.0 | 0.4 | 154.0 |
| 8. Royalties and licences | 12.2 | -38.3 | -18.2 | -14.6 | -21.4 |
| 9. Other business services | 0.7 | 9.8 | … | 29.9 | 1.4 |
| 9.1. Merchanting and other trade-related services | -15.6 | -14.6 | … | -54.0 | … |
| 9.2. Leasing services | -1.6 | -44.8 | … | -10.4 | … |
| 9.3. Business, professional and technical services | 4.3 | 16.7 | … | 40.2 | 1.4 |
| 9.3.1. Legal, accounting, management consulting and public relations services | 7.0 | … | -12.3 | 34.1 | … |
| 9.3.1.1. Legal services | … | … | … | 17.8 | … |
| 9.3.1.2. Accounting, auditing and tax consulting services | … | … | … | -1.1 | … |
| 9.3.1.3. Business and management consulting and public relations services | | … | … | 41.9 | … |
| 9.3.2. Advertising, market research and public opinion polling services | 8.3 | … | 37.9 | 74.0 | … |
| 9.3.3. Research and development | 4.6 | … | 50.5 | 53.4 | … |
| 9.3.4. Architecture, engineering and other technical services | -5.0 | … | 33.1 | -18.3 | … |
| 9.3.5. Agricultural, mining and other processing services | 56.7 | … | -9.8 | 155.0 | … |
| 9.3.6. Other business services | -4.2 | … | 169.3 | 49.4 | 299.0 |
| 9.3.7. Services between affiliated enterprises (n.i.e.) | 9.9 | … | 14.2 | 62.2 | … |
| 10. Personal, cultural and recreational services | -11.7 | -23.3 | -2.1 | -8.0 | 218.2 |
| 10.1. Audiovisual and related services | -16.5 | -34.1 | -10.3 | 2.9 | 218.2 |
| 10.2. Other personal, cultural and recreational services | 3.6 | -1.4 | 3.5 | -43.1 | … |
| 10.2.1. Education services | … | … | … | -60.3 | … |
| 10.2.2. Health services | … | … | … | 773.9 | … |
| 10.2.3. Other | … | … | … | -58.8 | … |

*Source:* prepared by the authors, on the basis of United Nations Service Trade.

EU-27: the 27 economies that form part of the European Union.
n.i.e: data that are not included elsewhere.

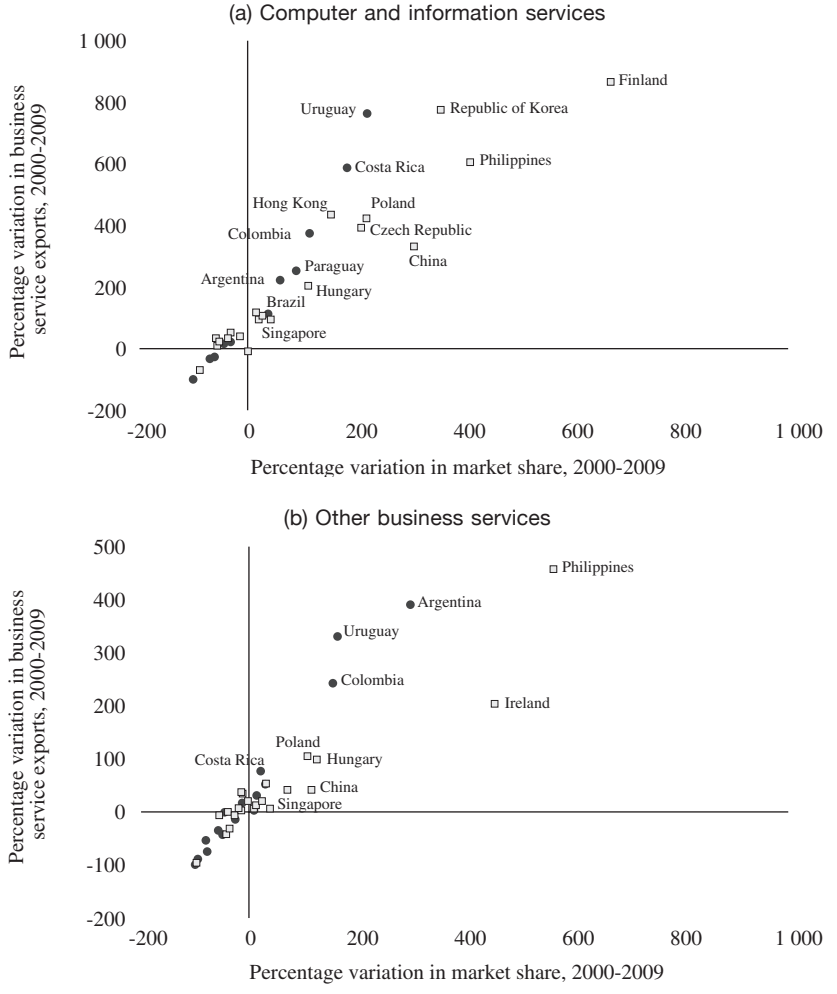
Second, there are also significant differences between some components of the category "other business services". For example, while advertising, market research, and research and development (R&D) are buoyant markets, imports in the subsegment of architecture, engineering and technical services are on the decline in the European Union and the United Kingdom.

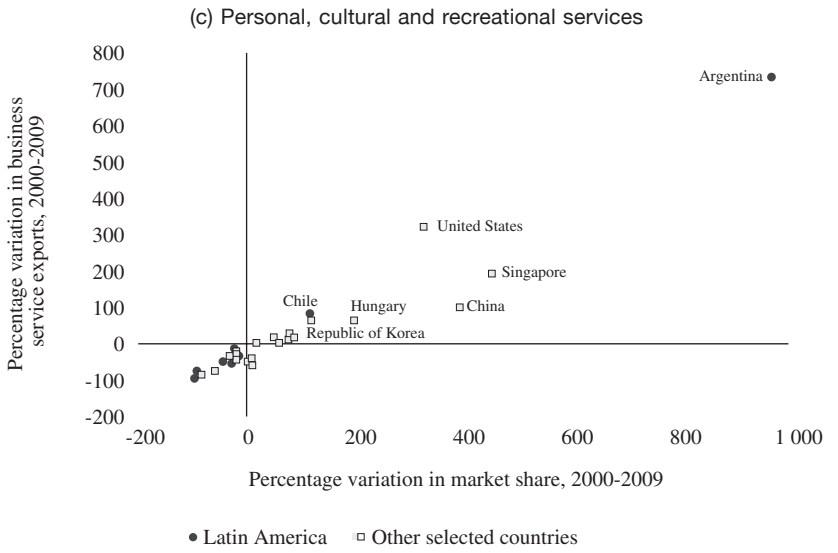
Third, there are some destinations that are particularly strong for certain types of service exports: the United States is such a destination for computer and information services and, as mentioned earlier, for audiovisual services, while the United Kingdom is an especially important market for construction and health services (a portion of health services is also linked to the category of travel). This reading of the data should be used for purposes of illustration only, however, since information at this level of details is not available for many destinations/sectors. For example, disaggregated data on health service exports is unavailable for the United States, even though it is known that the United States is a key market for such exports (López and others, 2010).

Figure 3 shows a different way of analysing the figures that affords a new perspective on some of the results of the preceding TradeCAN exercise that had cast the region in an unfavourable light. This approach makes it possible to differentiate among certain types of services and to identify countries that not only expanded their share of total world exports in those markets, but also increased those segments' share in the corresponding country's total service exports for 2000-2009.

FIGURE 3

**Market share of knowledge-intensive services exports for Latin America and selected countries, 2000-2009**
(*Percentage variation*)






*Source:* prepared by the authors, on the basis of data from the United Nations Conference on Trade and Development (UNCTAD).

As can be seen from the figure, a number of Latin American countries became increasingly specialized in exports of knowledge-intensive services during the 2000s and increased their share in the world market for those segments, with an overall positive trend being exhibited in both dimensions. In many cases, this trend has matched up with trends in other developed- and developing-country competitors.

Reference can also be made to gains in competitiveness, disaggregated by the various markets for Latin American service exports. These data have been generated by an analysis based on the TradeCAN methodology,[13] but with the difference that the most dynamic importing countries/markets for "other commercial services" are singled out[14] (i.e. those in which the share of total service imports represented by this category of imports expanded between 2006 and 2008); the data are also broken down by the extent of changes in the different Latin American countries' market share in the destination countries/markets (also for 2006-2008).

The data used in this analysis are primarily drawn from the import statistics by country of origin compiled in *United Nations Service Trade*, which are reported only for the Organization for Economic Cooperation and Development (OECD) countries, plus a few other specific cases (e.g. Slovenia and Slovakia). A first limiting factor in this connection is, clearly, that not all destination markets for Latin American exports are represented in these figures, since they include information only on sales to developed countries and some emerging East European countries. However, even though trade in services within the region is significant in the case of Latin America (as is illustrated by the 2009 IDC study on Chile), in order for the region to expand its exports of services, it will have to target developed markets, since they are the world's main importers. Accordingly, despite the limited geographical coverage of the information provided in figure 4, it nonetheless provides meaningful inputs for this study.[15]

As may be seen from figure 4, the four Latin American countries for which data are provided increased

[13] The four quadrants shown in this figure correspond to those used in the more conventional TradeCAN structure

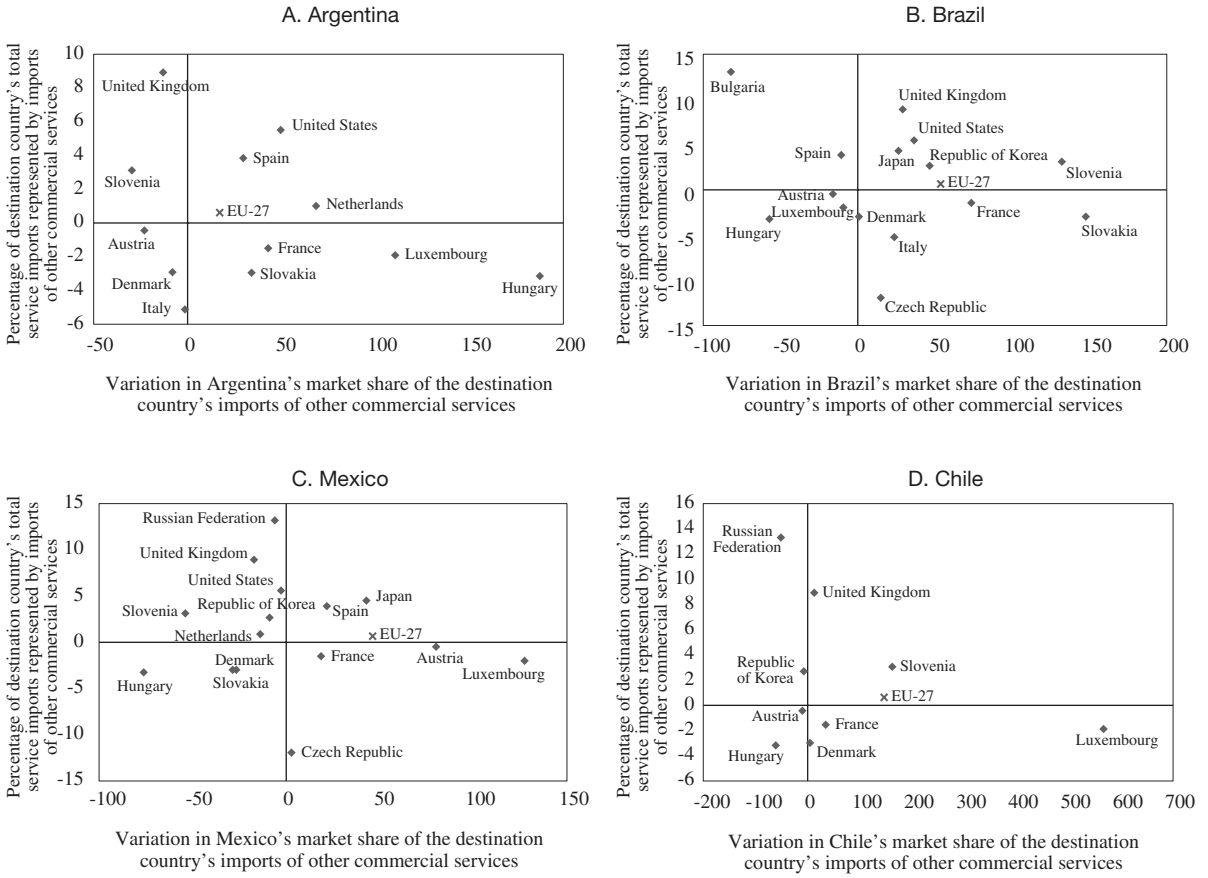
| | |
|---|---|
| MISSED OPPORTUNITIES | RISING STARS |
| RETREATS | DECLINING STARS |

[14] Given the gaps in the available statistics for the categories used to report import flows by country of origin, in order to attain the broadest coverage possible, it was necessary to limit the analysis to 2006-2008 and to the category "other commercial services" (total service imports minus imports in the "travel" and "transport" categories), which include knowledge-intensive exports but also include other types of external sales.

[15] Another factor to be taken into account is that the ways in which firms report the origins and destinations of service exports are subject to the influence of tax and other considerations which can, in part, complicate the interpretation of the data, as it is possible, for example, that a firm may declare exports as being directed to a certain country where a billing office is located while the services are actually exported to another location. However, for the purposes of our analysis, this type of distortion does not alter our findings in any significant way.

FIGURE 4

**TradeCAN analysis of destination markets for Latin American exports of other commercial services, 2006-2008**
(*Percentage variation*)




*Source:* prepared by the authors, on the basis of data from the United Nations Service Trade and the United Nations Conference on Trade and Development (UNCTAD).

EU-27: the economies of the 27 countries of the European Union.

their share in the burgeoning European Union market overall (Argentina and Mexico, in particular, exhibited the same upward trend in the Spanish market). The United States represents a rising star for Argentina and Brazil, but somewhat of a missed opportunity for Mexico. The United Kingdom is a rising star for Brazil and Chile but a missed opportunity for Argentina and Mexico, while Japan figures as a rising star for Brazil and Mexico. In sum, then, the data indicate that, in recent years, although Latin America still lags behind in terms of competitiveness in various areas, a number of Latin American countries have succeeded in gaining ground in major markets for knowledge-intensive service imports.

It has been noted in earlier studies, however, that the region's position in knowledge-intensive services sectors is, for the most part, confined to low-technology or intermediate-technology segments or to segments that are not strategically positioned in the global activities of the corporations that dominate these value chains. This is true of clinical research, engineering and construction, software and outsourcing, all of which exhibit much the same pattern (López, Ramos and Torre, 2009; López, Niembro and Ramos, 2011 and 2012). This situation poses additional challenges for the Latin American countries, which need to climb their way up the global value chains in these sectors.

# IV

## Determinants of competitiveness in knowledge-intensive services and of Latin America's market position

Given the findings presented in section III, the next step is to explore the factors that may underlie the region's relatively poor performance in knowledge-intensive services markets. This may point up useful policy lessons that can be drawn upon to help Latin America achieve a larger and stronger position in these sectors.

Reports from major international consulting firms and the findings of a number of different academic studies (Doh, Bunyaratavej and Hahn, 2008; Ramasamy and Yeung, 2010; Capik and Drahokoupil, 2011; Liu, Feils and Scholnick, 2011; Kim, Yoon and Lee, 2012) indicate that costs (especially labour costs) are a decisive factor in decision-making about the outsourcing of services and in export competitiveness. Along these same lines, Eichengreen and Gupta (2012) show that the exchange rate is a key explanatory factor for exports of knowledge-intensive services and that this effect is even greater in the case of goods exports.

The supply of human capital is another decisive factor in decision-making about outsourcing and related FDI (Liu, Feils and Scholnick, 2011; Doh, Bunyaratavej and Hahn, 2008), as well as service exports (Guerrieri and Meliciani, 2005; Nyahoho, 2010; Arora and Bagde, 2011). Goswami and others (2012) find that an ample supply of qualified human capital has a positive impact on service exports and that the return on investment in education is higher in developing countries. It is to be expected that the importance of human capital increases in step with the complexity of offshored economic activities (see Py and Hatem, 2009; Jensen and Pedersen, 2012).

Case studies on determinants of FDI in services also reflect the predominance of the English language (Ceglowski, 2006; Walsh, 2006; Doh, Bunyaratavej and Hahn, 2008; Capik and Drahokoupil, 2011; Goswami and others, 2012; Kim, Yoon and Lee, 2012), while other studies have highlighted the importance of cultural proximity (Bunyaratavej, Hahn and Doh, 2007; Castellacci, 2010; Nefussi and Schwellnus, 2010). The data on the influence of geographical (and time zone) proximity are not as clear cut, since, for some activities, being in the same time zone is an important consideration, whereas, for others (in which, for example, 24-hour per day, 7 days per week, coverage is an asset), locations in different time zones are a plus.

R&D is also an influential factor in determining the competitiveness of service exports (Popescu and Tachiciu, 2006; Nyahoho, 2010; Seo, Lee and Kim, 2012), as is the availability of suitable ICT infrastructure (Guerrieri and Meliciani, 2005; Doh, Bunyaratavej and Hahn, 2008; Ramasamy and Yeung, 2010; Walsh and Yu, 2010).

Institutional and legal considerations also play a key role in decision-making about outsourcing since, given the intangible and unstandardized nature of certain services, trade in those services often involves information asymmetries (Kimura and Lee, 2006; Kolstad and Villanger, 2007; Kandilov and Grennes, 2010; Liu, Feils and Scholnick, 2011). As a result, less routine, more complex services that have to be personalized or customized are generally offshored to countries with more advanced institutional structures. Information asymmetries can, at least in part, be mitigated by certification arrangements[16] or by a firm's decision to partner with prestigious local and/or international networks (Conti, Turco and Maggioni, 2010).

How are the Latin American countries positioned in terms of the various factors that contribute to competitiveness in these sectors? One approach to answering this question is to refer to the competitiveness rankings that consultants have developed when surveying potential locations for knowledge-intensive service exports. Table 5 provides an overview of the available information for the countries of the region, including the A.T. Kearney Global Services Location Index (the leader in the field), which indicates that all the countries are badly placed in terms of educational level. This is also the case (except in the case of Chile) for the business environment, which is assessed on the basis of a range

[16] These arrangements include, for example, the Capability Maturity Model Integration (CMMI) quality assessment system for software and information services, the eSourcing Capability Model for Service Providers (eSCM-SP) for business process outsourcing (BPO) and the accreditation awarded by the Joint Commission International for medical tourism.

TABLE 5

**Latin American countries' rankings in the A.T. Kearney Index, 2011**
(*Rankings in various categories*)

| | Argentina | Brazil | Chile | Colombia | Costa Rica | Mexico | Panama | Uruguay |
|---|---|---|---|---|---|---|---|---|
| Global index | 30 | 12 | 10 | 43 | 19 | 6 | 34 | 41 |
| 1. Business environment | 46 | 30 | 18 | 40 | 25 | 28 | 26 | 29 |
| 1.1. Country risk | 44 | 28 | 6 | 43 | 22 | 25 | 26 | 32 |
| 1.2. Infrastructure | 34 | 33 | 14 | 28 | 29 | 44 | 20 | 27 |
| 1.3. Cultural exposure | 45 | 48 | 44 | 40 | 32 | 33 | 39 | 27 |
| 1.4. Intellectual property protection | 48 | 22 | 27 | 29 | 34 | 26 | 38 | 37 |
| 2. Labour supply and capacity | 15 | 8 | 24 | 26 | 36 | 14 | 49 | 41 |
| 2.1. Relevant experience | 13 | 9 | 19 | 21 | 34 | 14 | 45 | 38 |
| 2.2. Size and availability of the labour force | 18 | 4 | 28 | 20 | 41 | 8 | 46 | 42 |
| 2.3. Education | 40 | 39 | 29 | 44 | 30 | 34 | 47 | 31 |
| 2.4. Language | 12 | 31 | 35 | 36 | 16 | 32 | 38 | 17 |
| 3. Financial advantages | 26 | 37 | 27 | 31 | 14 | 20 | 19 | 28 |
| 3.1. Labour costs | 23 | 34 | 26 | 29 | 17 | 21 | 15 | 30 |
| 3.2. Infrastructure costs | 31 | 50 | 49 | 45 | 12 | 26 | 28 | 37 |
| 3.3. Taxes and regulatory costs | 44 | 35 | 6 | 40 | 16 | 25 | 43 | 9 |

*Source:* prepared by the authors on the basis of A.T. Kearney, *Offshoring Opportunities amid Economic Turbulence. The A.T. Kearney Global Services Location Index, 2011*, A.T. Kearney, Inc., 2011.

of factors such as intellectual property and cultural level. The countries of the region turn in a better showing for labour supply and workforce skills. On the rating for languages, only Argentina, Costa Rica and Uruguay are higher up in the ranking. In terms of financial (cost) factors, Costa Rica is in the lead, but Chile and Uruguay make up for their higher labour and infrastructure costs by having lower taxes and less onerous regulations. Upgrades are also needed in ICT infrastructure (quality and cost) in most of the countries of the region. On the other hand, the fact that they are all in the same time zone as parts of the United States makes them prime nearshoring sites for businesses in that country.

The most conspicuous shortcomings appear to have to do with the countries' education systems, since there are a number of areas in which Latin American countries could boost their export capacity if they had more people with the required skills.[17] As is shown in table 6, Latin America lags behind other regions, and the percentages of the population with a university education vary a great deal within Latin America as well. There are sharp contrasts in terms of scale or volume (Mexico and Brazil, on the one hand, as compared to Costa Rica and Uruguay, at the other extreme, for example), but there are also differences in the percentages of students who choose scientific or technical disciplines and in the percentages who succeed in completing their university studies. For example, Colombia's and Argentina's populations are similar in size, but Colombia has more science and engineering graduates than Argentina does, and Chile has nearly as many as Argentina even though its population is much smaller. Overall, however, the percentage of science and engineering graduates in the region is quite low, which is one of the reasons why it can be so difficult to overcome or redress shortages of skilled workers in certain segments of the knowledge-intensive service sector.

There is also a gap in terms of the quality of education in Latin America, as is demonstrated by the test scores recorded by the OECD Programme for International Student Assessment (PISA). For the 2009 examination, the 8 Latin American countries that took part ranked in the bottom 20 out of the 65 countries that participated in PISA in the mathematics and sciences segments (with the exception of Chile in the latter case).

Finally, as is well known, the region's innovations systems are in difficulty, as is indicated, for example, by the poor performance reflected in such indicators as R&D expenditure and patents.

While problems in relation to human capital and the shortcomings of the region's innovations systems are broader in nature and have a widespread impact on the structure of the regional economy, the preceding discussion clearly shows that these problems are a particularly serious obstacles to Latin America's progressive entry into knowledge-intensive value chains and especially into the more sophisticated segments of those chains.

[17] For an in-depth case study of this issue in Argentina, see López, Niembro and Ramos (2013).

TABLE 6

**University students and graduates in selected disciplines, around 2005 and around 2010**

*(Thousands and percentages of the total)*

| | Around 2005 | | | | | | | | Around 2010 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Students | | | | Graduates | | | | Students | | | | Graduates | | | |
| | Social sciences, business and law | | Science, engineering, production and construction | | Social sciences, business and law | | Sciences, engineering, production and construction | | Social sciences, business and law | | Science, engineering, production and construction | | Social sciences, business and law | | Science, engineering, production and construction | |
| Central and Eastern Europe | | | | | | | | | | | | | | | | |
| Russian Federation | | | | | 845 | 47% | 421 | 23% | | | | | 946 | 46% | 580 | 28% |
| Ukraine | 1 096 | 42% | 691 | 27% | 197 | 42% | 114 | 24% | 1 046 | 40% | 730 | 28% | 288 | 44% | 171 | 26% |
| Poland | 844 | 40% | 423 | 20% | 231 | 46% | 71 | 14% | 853 | 40% | 456 | 21% | 266 | 43% | 98 | 16% |
| Romania | 348 | 47% | 185 | 25% | 72 | 46% | 35 | 23% | 549 | 55% | 227 | 23% | 183 | 60% | 52 | 17% |
| Belarus | 205 | 39% | 145 | 27% | 37 | 37% | 26 | 25% | 214 | 38% | 162 | 28% | 47 | 39% | 32 | 27% |
| Czech Republic | 94 | 28% | 98 | 29% | 18 | 33% | 13 | 24% | 146 | 33% | 110 | 25% | 35 | 34% | 24 | 23% |
| Slovakia | 50 | 28% | 48 | 26% | 10 | 29% | 9 | 26% | 72 | 31% | 55 | 23% | 24 | 32% | 16 | 21% |
| Hungary | 186 | 43% | 78 | 18% | 33 | 45% | 8 | 11% | 157 | 40% | 82 | 21% | 28 | 40% | 11 | 16% |
| Eastern Asia and Asia and the Pacific | | | | | | | | | | | | | | | | |
| Japan | 1 158 | 29% | 787 | 19% | 267 | 25% | 226 | 21% | 1 117 | 29% | 699 | 18% | 258 | 27% | 198 | 21% |
| Republic of Korea | 685 | 21% | 1 238 | 39% | 119 | 20% | 224 | 37% | 737 | 23% | 1 149 | 35% | 129 | 21% | 195 | 32% |
| Indonesia | | | | | | | | | 2 722 | 51% | 1 297 | 24% | 316 | 39% | 185 | 23% |
| Philippines | 678 | 28% | 663 | 27% | 134 | 33% | 98 | 24% | | | | | | | | |
| Malaysia | 189 | 27% | 263 | 38% | | | | | 359 | 34% | 363 | 34% | 69 | 30% | 83 | 37% |
| Bangladesh | 309 | 34% | 187 | 20% | | | | | 969 | 48% | 334 | 17% | 130 | 43% | 47 | 16% |
| Thailand | | | | | | | | | 1 337 | 54% | 454 | 18% | | | | |
| Latin America | | | | | | | | | | | | | | | | |
| Mexico | 961 | 40% | 747 | 31% | 165 | 44% | 104 | 27% | 1 093 | 38% | 903 | 32% | 218 | 47% | 118 | 25% |
| Brazil | 1 852 | 41% | 723 | 16% | 278 | 37% | 93 | 12% | 2 644 | 40% | 1 047 | 16% | 412 | 40% | 115 | 11% |
| Colombia | 523 | 43% | 403 | 33% | 63 | 48% | 34 | 25% | 770 | 46% | 339 | 20% | 93 | 49% | 53 | 22% |
| Argentina | 824 | 40% | 377 | 18% | 70 | 32% | 30 | 14% | 939 | 37% | 472 | 19% | 71 | 34% | 28 | 14% |
| Chile | 182 | 27% | 187 | 28% | 23 | 31% | 18 | 24% | 257 | 26% | 240 | 24% | 34 | 28% | 24 | 20% |
| Ecuador | | | | | | | | | 247 | 46% | 111 | 21% | 34 | 48% | 9 | 13% |
| El Salvador | 59 | 48% | 29 | 23% | 6 | 44% | 3 | 22% | 61 | 41% | 38 | 25% | 6 | 35% | 5 | 26% |
| Costa Rica | 28 | 26% | 25 | 23% | | | | | | | | | 15 | 40% | 4 | 11% |
| Panama | 49 | 39% | 26 | 20% | 6 | 36% | 3 | 19% | 58 | 42% | 26 | 19% | 8 | 38% | 4 | 19% |
| Uruguay | | | | | 3 | 33% | 1 | 12% | 65 | 41% | 35 | 22% | 3 | 41% | 1 | 16% |
| Venezuela (Bolivarian Republic of) | | | | | | | | | 650 | 31% | 532 | 25% | | | | |
| North America and Western Europe | | | | | | | | | | | | | | | | |
| United States | | | | | 983 | 38% | 430 | 17% | 5 656 | 28% | 3 225 | 16% | 1 139 | 38% | 464 | 15% |
| France | 760 | 35% | 523 | 24% | 268 | 42% | 166 | 26% | 836 | 37% | 573 | 26% | 273 | 42% | 168 | 26% |
| United Kingdom | 614 | 27% | 510 | 22% | 194 | 31% | 140 | 22% | 683 | 28% | 541 | 22% | 220 | 31% | 159 | 22% |
| Germany | | | | | 83 | 24% | 93 | 27% | 710 | 26% | 886 | 32% | 128 | 26% | 147 | 30% |
| Italy | 739 | 37% | 476 | 24% | 134 | 35% | 83 | 22% | 685 | 35% | 507 | 26% | 124 | 32% | 84 | 22% |
| Spain | 582 | 32% | 540 | 30% | 84 | 29% | 79 | 27% | 591 | 31% | 497 | 26% | 89 | 27% | 83 | 25% |
| Portugal | 119 | 31% | 112 | 29% | 21 | 30% | 19 | 27% | 122 | 32% | 113 | 29% | 23 | 29% | 20 | 25% |
| Ireland | | | | | 18 | 30% | 17 | 28% | 51 | 26% | 51 | 26% | 18 | 31% | 14 | 23% |

*Source:* prepared by the authors, on the basis of data from the UNESCO Institute for Statistics.

# V
# Concluding observations

The objective of this analysis has been to supplement earlier studies, most of which have focused primarily on an analysis of revealed (static) comparative advantages by providing inputs for a dynamic approach to building the region's competitiveness in the international market for knowledge-intensive services as a means of.

In recent years, some Latin American countries have managed to gain ground in world trade in knowledge-intensive services by expanding their market shares and gaining entry into major import markets for these services. In addition, the relative share of knowledge-intensive services has been on the rise as they gradually displace a portion of the region's more traditional service exports.

Nevertheless, the share of total sales of services represented by knowledge-intensive services still tends to be significantly smaller than is the case for other developing countries (such as those of Asia or Eastern Europe), as is indicated by the fairly small percentage of rising stars identified in the TradeCAN-based study presented here. This is partly due to the fact that the pattern of the region's services exports still reflects a high degree of reliance on the more traditional sectors (transport and especially travel, which are segments of world trade that are on the decline). It is also probable that —unlike other nations that began to offshore services earlier on— a number of Latin American countries are still in the early learning stages, as they are just beginning to enter these new markets. If this is the case, then it may be that, while this trend is deepening throughout the region, this will not become readily apparent until a few more years have passed. In order for this to occur, however, certain basic conditions that underpin the competitiveness of these sectors must be maintained. Be this as it may, the fact remains that the business services category figures prominently among the missed opportunities of some Latin American countries; this is a worrisome development, since business services are the biggest market, by volume, at the global level.

The region's prospects for the future appear to be bright. All the available projections indicate that knowledge-intensive service markets are going to continue to grow at a rapid pace (see, for example, Muthal, 2011 and Volek, 2012), and Latin America has a series of advantages that put it in a good position to expand its share of international trade in knowledge-intensive services: (i) lower costs than the developed countries in terms of wages, real property and infrastructure; (ii) a supply of skilled human resources that, while it does not compare in quantity or quality to that of some Asian or Easter European countries, is nonetheless sufficient for the development of many of the activities involved in the knowledge-intensive service sectors; and (iii) geographic proximity (and shared time zones) with the United States and a greater cultural proximity to North America and Europe than its Asian competitors. The region can use these general attributes to leverage its export specialization in these sectors.

Nevertheless, Latin America —and, in particular, the countries that have made the most headway in these sectors— is now faced with the challenge of holding on to the positions it has won and then strengthening them further by developing certain assets that will help it to scale the various global value chains and begin to gain ground in the more technologically sophisticated and knowledge-intensive segments, where the region's presence is still quite limited.

Making inroads into the more sophisticated links in the services chain (while gradually moving out of the commoditized activities, which include most of the ones in the BPO category) is a formidable challenge. To do so, the region will have to expand and upgrade its supply of human capital so that it can consolidate other types of advantages, above and beyond those based on low costs. These new advantages will need to be based on specific assets, talents and capacities that will enable the region to take up differentiated positions in these sectors. While there are a few cases in which this is already happening, they are as yet only scattered examples and are far from becoming a consolidated trend. This comes as no surprise, given the complexity of the task and the long time involved.

It is therefore important to bear in mind that, if integration into global value chains and the services trade hinges on the existence of low labour costs, then the countries' efforts to gain entry into those chains could, if successful, soon create obstacles to their continued progress. In other words, as the export of services drives up the per capita income of the exporting country (or as that export activity generates bottlenecks in the supply of human resources for the most dynamic services sectors), wages will have to rise, and this rise in costs will have to be matched by commensurate productivity gains if

the exporting country is to maintain its competitive position in the international economy. However, since much the same types of technologies are used in the production of many knowledge-intensive services around the world (basically ICTs and easily transferable organizational routines), it does not seem plausible that cross-country productivity differentials could be so large as to enable countries with high or rising labour costs to remain competitive in offshored services. Clearly, this is all much less likely if competition is based on other differentiating factors that are not easily replicated by competitor countries. The search for a dynamic, sustainable pattern of service export activity for Latin American countries should therefore be focused on bolstering these sorts of factors and finding appropriate niche markets.

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# Wage share and economic growth in Latin America, 1950-2011

*Germán Alarco Tosoni*

**ABSTRACT**

This article builds series of wage shares in gross domestic product (GDP) for 15 Latin American economies individually and as a group for the period 1950-2010. Using different methodologies, it is established that wage share is non-linear and has undergone two major cycles. The article discusses various authors, especially classic and post-Keynesian thinkers, who have explored the relationship between wage share in GDP and economic activity. It is also shown that the post-Keynesian approach is relevant in explaining that the main variables determining real GDP variations include wage share, gross capital formation and exports of goods and services. However, the contribution of wage share to real output growth has declined from the 1980s onwards.

**KEYWORDS** Wages, gross domestic product, economic growth, econometric models, Latin America

**JEL CLASSIFICATION** E01, E12, E25, N16, N36

**AUTHOR** Germán Alarco Tosoni is a research professor at the School of Postgraduate Studies of Universidad del Pacífico, Peru. g.alarcotosoni@up.edu.pe

# I
# Introduction

The link between the factor distribution of income and activity levels and economic growth is an old one reaching back to classical economists and examined in detail by the post-Keynesian school. In recent times, in most Latin American economies, efforts have focused on the analysis of personal income distribution at the household level. In standard macroeconomics, position in the production process (wage earners, own-account workers, owners of the means of production and financiers) is not considered in the diagnosis or in specific recommendations. Moreover, the statistics available on this position have deteriorated. The first challenge of redeeming theories that treat functional income distribution as relevant is thus the need to rebuild the data.

This statistical work is preceded by that of Lindenboim (2008), who uses information on wage share in output for a group of developed countries from the 1950s onwards, and for some in the region starting in 1980. The conclusion is clear for the developed economies, where the wage share rose up to the 1960s, then stood still or fell amid the crisis of "Fordism", except in Denmark. In the case of Latin America, there is simply a downtrend with the occasional fluctuation in individual economies. Only Chile and Colombia show sustained growth in certain periods.

Along the same lines, Neira Barría (2010) rebuilt the information on wage participation in GDP at factor cost for 14 countries and the weighted aggregate for Latin America, with output at purchasing power parity in constant dollars at 1970 prices for 1950-2000 and wage shares based on census information, including the wages of own-account or self-employed workers.[1] In the aggregate, and using unprocessed basic information, Neira Barría found an upward phase until the mid-1970s, thereafter falling to a trough around 1983. The wage share in output then entered a recovery, which peaked around the mid-1990s. This was followed by another downward period. Neira Barría found sharp variations between and within countries, however.

The International Labour Organization (ILO, 2012) has also engaged in this statistical and analytical effort, although with information from selected countries starting in the 1980s. A comparative analysis of productivity and wage share in different subregions in Latin America between 2000 and 2010 is available in ECLAC/ILO (2012). Other works encompass longer periods, dating back to the nineteenth century for certain countries (Argentina, Brazil and Mexico (Frankema, 2009), with a trough found around the time of the First World War), and for the countries of the Southern Cone, where inequality was found to rise between 1870 and 1920 (Bértola and others, 2008).

This article uses reconstructed statistical information to review the evolution of wage share in GDP in Latin America, comparing this variable to the evolution of real GDP to assess the extent to which real GDP is explained by wage share and other components of aggregate demand under a post-Keynesian approach. The main questions are: How has wage share evolved? How does that share relate to changes in real GDP? What theoretical approaches relate wage share to level of activity and economy growth? How does the post-Keynesian approach evaluate the link between these variables? Is this approach useful for analysing the evolution of growth in Latin America?

This article has seven sections, including the introduction, conclusions and methodological annex. The second section provides basic information on wage share in the different Latin American economies, finding that it is uneven in terms of starting and ending dates. The third section reviews some of the main theoretical contributions regarding the variables analysed. This review touches, first, on some classical economists, with the macroeconomic approaches of Keynes, Kalecki and some post-Keynesians. The fourth section presents the basic model in the post-Keynesian rationale, which treats wage share as relevant in explaining real output level. The fifth section conducts an empirical analysis of causal links between wage share, GDP and output growth share. The sixth section sets forth the conclusions of the study and the seventh contains the methodological annex.

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[1] These workers are traditionally included in the operating surplus. For independent workers Neira Barría assumes the same average pay as for wage workers, not including unpaid family workers and other unpaid workers.

The scope and limitations of this study are such that it does not offer a detailed analysis of every economy considered. The analysis is conducted at the macroeconomic level and does not touch upon structural and sociopolitical specificities of each economy. It does not examine the issues of urban and rural independent workers whose situation could be similar in practice to that of wage workers. It does not enter into issues of value theory, or its link with prices and income distribution. Neither does it undertake theoretical discussion or statistical evaluation of the Kuznets curve, which looks at the link between personal income inequality and economic growth. Lastly, it does not look specifically at whether the demand regime is wage-led or profit-led.

# II
# Basic statistics

The main variable of analysis is the wage share in GDP at current prices, which is obtained from the quotient between nominal information from each country for each year, and the corresponding output. Statistical information is included for 15 countries in the region between 1950 and 2011, although the period is not evenly covered in all cases, since information is lacking for the 1950s. The analysis includes Argentina (1950-2011), Bolivarian Republic of Venezuela (1957-2011), Brazil (1950-2011), Chile (1950-2010), Colombia (1950-2010), Costa Rica (1953-2011), Ecuador (1953-2011), El Salvador (1960-2011), Honduras (1950-2011), Mexico (1950-2011), Panama (1950-2011), Paraguay (1962-2010), Peru (1950-2011), Uruguay (1955-2010) and Plurinational State of Bolivia (1960-2011). It does not include Guatemala, Nicaragua or the Dominican Republic, because the information for these countries is too fragmented.

The first source of information is the *Statistical Yearbook for Latin America and the Caribbean* for various years, published by the Economic Commission for Latin America and the Caribbean (ECLAC), as well as electronic statistics (ECLAC, 2013) from 1988 on. Where this information was insufficient, International Labour Organization (ILO) data were used, considering that presented by national sources in each case (first the official data, failing which, third party data prepared on the basis of the official data). Only in extreme case in which primary or secondary local information was not available, was the procedure retrieved by which wage share ($w$) was generated for specific years on the basis of average real wages ($W_t$), the waged population ($L_t$)[2] and real GDP ($Y_t$). In all cases, particular care was taken with the linking of the various statistical series, always using the most recent source. Accordingly, equation (1) gives the calculation of wage share in GDP.

$$w_t = \frac{(W_t L_t)}{Y_t} \tag{1}$$

Applying differences between year $t$ and $t$-1 and dividing by $w_{t-1}$, the growth rate of wage share in GDP[3] is shown in equation (2), where $\gamma_{xt}$ is the growth rate of variable $x$ in year $t$. This expression thus gives an idea of what happened in years for which no information in available, based on the value for the preceding year. Particulars of the information by country are shown in the annex to this article.

$$\frac{\Delta w_t}{w_{t-1}} = \frac{\left(1+\gamma_{w_t}\right)\left(1+\gamma_{L_t}\right)}{1+\gamma_{Y_t}} - 1 \tag{2}$$

Table 1 shows some variables for the series of wage share in GDP for different countries in Latin America and for the region for the period 1950-2010.[4] First, the number of observations, the mean, the standard deviation and the coefficient of variation.[5] Next, the maximum and minimum values are shown, along with

[2] Exceptionally, employed population was used when there was no information on the waged population.

[3] On the premise that average wages are representative of the respective country's wage structure and that the GDP deflator is similar to the price index used to convert nominal wages into real wages.

[4] This is the case of Argentina, Brazil, Chile, Colombia, Honduras, México, Panama and Peru, which represent between 80% of regional output for the 15 countries selected in 1960 and 92% in 1994.

[5] As is known, the coefficient of variation is the ratio of the standard deviation to the mean, during the period examined. It is acknowledged that the coefficient of variation can vary from one economy to another and over time, but a detailed analysis of this is beyond the scope of this study.

their dates of occurrence. Finally, table 1 shows the moving trend indicator[6] and the number of complete cycles after a Hodrick-Prescott filter is applied to calculate non-linear trends.

The highest averages for wage share are found in Panama, Costa Rica, Honduras, Brazil, Argentina, Uruguay and Chile; the lowest occur in Ecuador, El Salvador and Peru. The Bolivarian Republic of Venezuela, Colombia, Mexico, Paraguay and the Plurinational State of Bolivia, are in intermediate positions. However, Panama, Ecuador, El Salvador, Peru, Argentina, Uruguay and the Bolivarian Republic of Venezuela show a higher standard deviation than Costa Rica and Brazil, which show the lowest standard deviations. The most stable coefficients of variation were found in Costa Rica, Brazil and Paraguay, and the most unstable in Ecuador, Panama, El Salvador and Peru. The dates at which the various countries achieve the highest wage share in GDP vary.

The minimum values tend to occur after the debt crisis of the 1980s. In Honduras and El Salvador, they occur at the end of the 1950s and early 1960s. The maximum values arise both at times of intensive import-substitution industrialization —Bolivarian Republic of Venezuela, 1960; Brazil, 1957; Peru, 1958; and Uruguay, 1963— and at certain sociopolitical junctures that were favourable to workers: Argentina, 1974; Chile, 1972; Colombia, 1993; Costa Rica, 1990; Ecuador, 2007; El Salvador, 1981; Honduras, 1986; Mexico, 1976; Panama, 1969; Paraguay, 2000; and the Plurinational State of Bolivia, 1984.

On the basis of the techniques described, economies were identified whose long-term trend is more or less consistent over time, those that showed an upward trend and those that showed a downward trend over the long term. Of the entire group, only Honduras showed an upward trend over time; Ecuador and El Salvador report a high value for the indicator, but it is extremely cyclical. The countries in which the trend is more or less constant over time are Brazil, Chile, Colombia, Costa Rica and, to a lesser extent, Mexico and Paraguay. The last group consists of those countries showing a downward trend, with the most negative evolution in Panama and Peru, followed by Argentina, Bolivarian Republic of Venezuela, and Plurinational State of Bolivia. Notwithstanding, in

[6] The results of the moving trend indicator $\varnothing = \frac{\sum_{n-9}^{n} X_i}{\sum_{1}^{10} X_i}$ give the ratio between the last result of the moving average (10) and the first. A ratio of around 1 indicates a constant trend; a ratio of more than 1 indicates a rising trend; and a ratio of less than 1 indicates a falling trend.

TABLE 1

**Main characteristics of wage share in GDP in Latin America**

| Country | Coverage | No. of observations | $\overline{X}$ | $\overline{\sigma}$ | $\frac{\overline{\sigma}}{\overline{X}}$ | Maximum value | Date of maximum value | Minimum value | Date of minimum value | Average moving indicator (t=10) | Cycles |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Argentina | 1950-2011 | 62 | 39.51 | 5.46 | 0.14 | 48.79 | 1974 | 28.06 | 1989 | 0.79 | 2 |
| Bolivia (Plurinational State of) | 1960-2011 | 52 | 33.98 | 3.88 | 0.11 | 43.12 | 1984 | 24.13 | 1986 | 0.79 | 1 |
| Brazil | 1950-2011 | 62 | 43.11 | 2.46 | 0.06 | 48.27 | 1957 | 39.31 | 2004 | 0.92 | 2 |
| Chile | 1950-2010 | 61 | 38.17 | 3.79 | 0.10 | 52.19 | 1972 | 30.88 | 1988 | 1.02 | 2 |
| Colombia | 1950-2010 | 61 | 36.82 | 3.35 | 0.09 | 44.07 | 1993 | 31.67 | 2008 | 0.95 | 1 |
| Costa Rica | 1953-2010 | 58 | 46.95 | 1.96 | 0.04 | 50.57 | 1990 | 39.10 | 1982 | 1.02 | 1 |
| Ecuador | 1953-2011 | 60 | 26.15 | 7.19 | 0.28 | 37.95 | 2007 | 11.51 | 1999 | 1.08 | 1 |
| El Salvador | 1960-2011 | 52 | 30.67 | 6.81 | 0.22 | 41.91 | 1981 | 15.80 | 1960 | 1.47 | 1 |
| Honduras | 1950-2011 | 62 | 43.31 | 3.52 | 0.08 | 50.36 | 1986 | 35.04 | 1953 | 1.15 | 1 |
| Mexico | 1950-2011 | 62 | 32.58 | 3.57 | 0.11 | 40.26 | 1976 | 26.84 | 1987 | 0.96 | 2 |
| Panama | 1950-2011 | 62 | 50.76 | 11.48 | 0.23 | 67.41 | 1969 | 30.15 | 2011 | 0.53 | 2 |
| Paraguay | 1962-2010 | 49 | 33.70 | 3.03 | 0.09 | 38.73 | 2000 | 24.34 | 1990 | 0.94 | 1 |
| Peru | 1950-2011 | 62 | 31.60 | 6.62 | 0.21 | 41.15 | 1958 | 20.91 | 2008 | 0.61 | 1 |
| Uruguay | 1955-2011 | 57 | 39.37 | 5.68 | 0.14 | 50.43 | 1963 | 27.75 | 1984 | 0.76 | 2 |
| Venezuela (Bolivarian Republic of) | 1957-2010 | 54 | 37.40 | 5.43 | 0.15 | 46.90 | 1960 | 25.52 | 1996 | 0.72 | 2 |
| Latin America | 1950-2010 | 61 | 38.76 | 2.02 | 0.052 | 41.70 | 1967 | 33.69 | 2004 | 0.88 | 2 |

*Source:* prepared by the author on the basis of data from the World Bank, the Economic Commission for Latin America and the Caribbean (ECLAC), the International Labour Organization (ILO) and institutions of the respective countries.

GDP: gross domestic product.

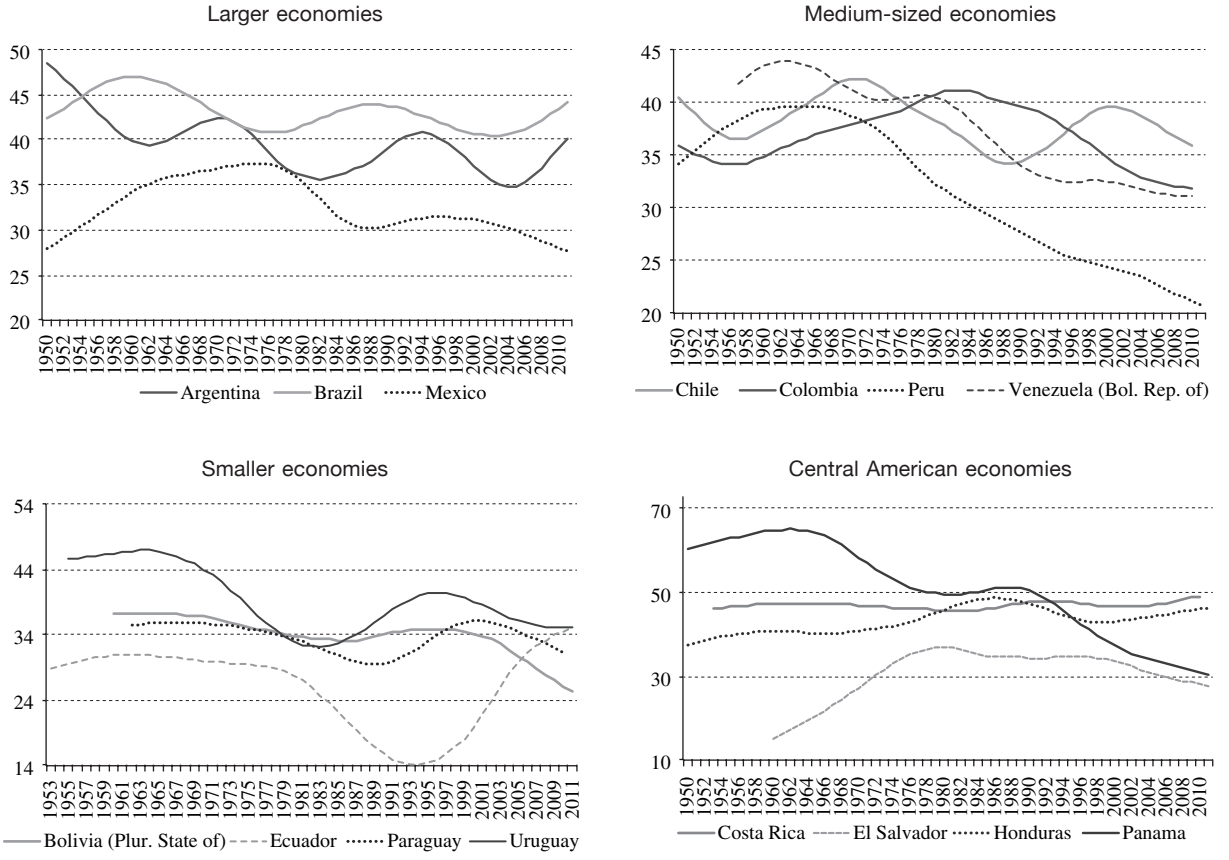
many of the economies there were one or two complete cycles during the period under analysis. Two cycles were observed in Argentina, the Bolivarian Republic of Venezuela, Brazil, Chile, Mexico, Panama and Uruguay, while the other countries showed only one cycle or a pattern that is less clear-cut.

Figure 1 shows wage share in GDP for the 15 economies analysed on the basis of the original information corrected by the Hodrick-Prescott filter, which serves to determine the non-linear trend of statistical series. The figure shows the results by country groupings: larger economies, medium-sized economies, smaller economies, and the Central American economies. A first, obvious observation is that levels and fluctuations vary between countries, reflecting the complexity of the structural factors associated with the economic, social, political and accumulative models that shape shares in GDP, although the maximum and minimum values noted earlier were observed in the group overall. In Argentina the cycles are more pronounced than in Brazil, which is different again from the cycle in Mexico. The second group of economies is notable for the downtrend from the 1970s peak in Peru, the cyclical pattern in Chile, and the cases of Colombia and Bolivarian Republic of Venezuela, with peaks in the 1980s and the 1960s, respectively. Of the smaller Latin American economies, variability is notably low in the Plurinational State of Bolivia, but sharper in Ecuador according to the official information. Lastly, among the Central American economies, the trend is least cyclical in Costa Rica,

FIGURE 1

**Wage share in GDP corrected by Hodrick-Prescott filter, 1950-2010**

*(Percentages of GDP)*




*Source:* prepared by the authors, on the basis of data from the World Bank, the Economic Commission for Latin America and the Caribbean (ECLAC), the International Labour Organization (ILO) and institutions of the respective countries.

GDP: gross domestic product.

followed by Honduras. The information is more variable for Panama and El Salvador, and is for a shorter period of time.

The series for Latin America for 1950-2010, weighted by nominal GDP in current dollars,[7] shows wage participation averaging 38.8%, with a small standard deviation only slightly higher than that of Costa Rica. The coefficient of variability is small, with a peak of 41.7% in 1967, a time when several of the region's economies were engaged in import-substitution industrialization. The low in the coefficient of variability was 33.7% in 2004, down eight percentage points from the 1967 peak. Two full cycles were identified for the 61-year series, along with a negative trend shown by a moving trend indicator of less than 1.

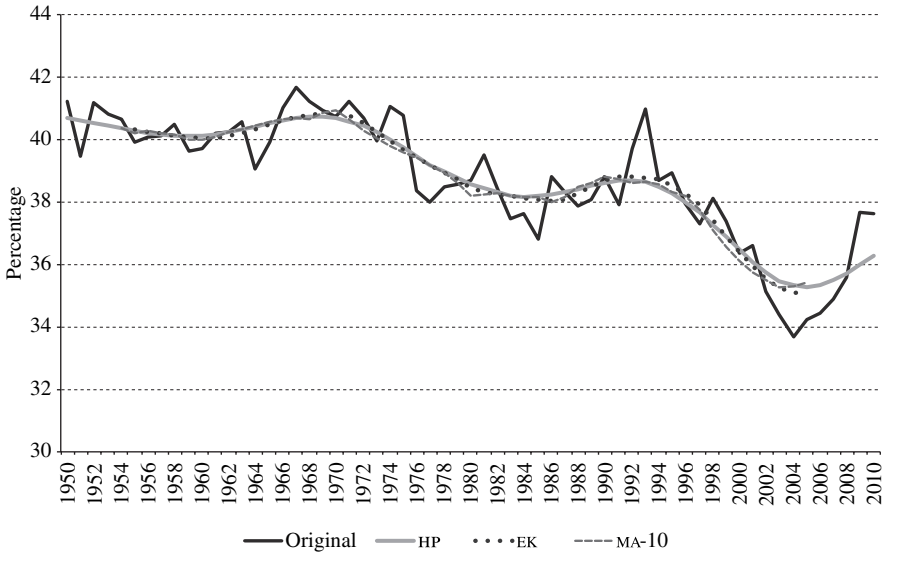
Figure 2 shows the original series for wage share in GDP and the various results as a non-linear trend calculated using the Hodrick-Prescott filter, the Epanechnikov kernel indicator[8] and the 10-year moving average. The largest wage shares were found to have occurred in the late 1960s and early 1970s and the mid-1990s, with higher values for the first cycle than the second. By contrast, the periods with smaller wage shares correspond to the debt crisis of the 1980s and the middle of the first five-year period of the twenty-first century, owing to the impact of the Argentine crisis. Wage share in GDP then begins to rise in the second five-year period of this century, owing to the larger contribution made by Argentina and Brazil. The rest of the countries make a minimal contribution to this rise (Colombia and Honduras) or even a negative one (Chile, Mexico, Panama and Peru). Over the long term, Argentina and Brazil are the economies pushing up the wage share in Latin America. Chile is at the average, whereas Colombia, Mexico, Panama and Peru tend to pull the average down.

[7] With the World Bank series starting in 1960 and the ECLAC series for 1950-1960.

[8] In this case, an 11-point moving average whose weighting factors come from a probability distribution which is symmetric with respect to the number of points. The series of coefficients is as follows: {0.04; 0.07; 0.09; 0.11; 0.12; 0.13; 0.12; 0.11; 0.09; 0.07, and 0.04}.

FIGURE 2

**Wage share in GDP in Latin America, 1950-2010**




*Source:* prepared by the author on the basis of data from the World Bank, the Economic Commission for Latin America and the Caribbean (ECLAC), the International Labour Organization (ILO) and institutions of the respective countries.

GDP: gross domestic product.
HP: Hodrick-Prescott.
EK: Epanechnikov kernel
MA-10: 10-year moving average.

# III

## Theoretical contributions over time

Smith (1776), a champion of better living conditions for the lowest earners —the majority in every society— argued that: "No society can surely be flourishing and happy, of which the far greater part of the members are poor and miserable. It is but equity, besides, that they who feed, clothe and lodge the whole body of the people, should have such a share of the produce of their own labour as to be themselves tolerably well fed, clothed and lodged". In the same chapter on the wages of labour, he noted that a moderate abundance (high wages) over the usual will likely lead workers to work harder, as they will feel more encouraged. Smith also notes that when rising wages impact on the prices of products and thus slow their domestic and external consumption, they are generally accompanied by rising capital endowments, which increases manufacturing productivity and spreads to society and the economy overall. Thus, many of these goods are produced with less labour than before, so that the rise in prices is offset by the fall in the number of workers needed (Smith, 1776).

Unlike Smith, Ricardo (1959) considers economic growth to be essentially the work of capitalists —the productive class in society— who consume a small part of what they obtain and devote their returns to capital accumulation. The idea, then, is to prevent profits from decreasing to zero, because at that point the capitalist can accumulate no more, growth stops and the system grinds to a halt (Pasinetti, 1978). The profit rate cannot rise unless wages are reduced through technical progress and foreign trade (i.e. through imports), that lower the prices of essential goods (Ricardo, 1959, p. 101). Both Malthus and Ricardo opposed the Poor Laws, on the basis that wages should be left to free market competition and never controlled or influenced through legislation. They argued that the Poor Laws did not enrich the poor, but impoverished the rich, since the funds needed for the maintenance of the poor would grow to absorb the country's entire net revenue (Ricardo, 1959, pp. 80-81).

Marshall (1957) did not resolve the paradox that had swept aside the entire issue analysed by the neoclassical school up to the 1930s crisis. He acknowledged that raising the living standards of the population at large would increase both efficiency and national well-being (p. 566), but also that it could render the population more unfortunate than before (p. 567). Starting with Marshall, all association between wage share and level of economic activity was lost, as a result, first, of emphasis on microeconomic analysis and, later, of the division between consumer theory and producer theory. Say's Law and, later, Walras's Law would minimize the effects of this evident delinking.

The link between wage share and economic growth surfaces again with Keynes (1943), although only implicitly though the marginal propensity to consume and the multiplier,[9] becoming more explicit in Keynes' economic policy recommendations. Wages are the main component of income and determine propensity to consume, which —in turn— determines the spending multiplier. Consumption propensity is not constant for all levels of employment, however, or for all degrees of foreign trade openness, or for different labour shares in public investment. It also depends on the financial behaviour of firms. Moreover, it varies with changes in the proportion of total income accruing to business-owners, who tend to show a lower individual consumption propensity than the average for the community (p. 113). In chapter 24, Keynes signals more clearly that "it is, of course, true that a fiscal policy of heavy death duties[10] has the effect of increasing the community's propensity to consume" (Keynes, 1943, p. 329), which contributes to capital accumulation. Abstinence by the rich, however, slows the accumulation of wealth.

Kalecki (1954) refers explicitly to the income distribution relationship, in particular the wage burden vis-à-vis income, on the basis of supply side pricing processes and their involvement in determining demand and production levels. In the first case, the wage share in income depends on the degree of monopoly of the particular industry, the ratio between wages and spending on raw materials in that industry and the industry structure (p. 31). The share of wages in income or in output thus depends inversely on elements such as product differentiation (sales promotion through advertising), processes of concentration and involvement in tacit agreements or cartels; and directly on the strength of the unions and how variations in overheads with respect to primary costs influence the degree of monopoly.

[9] This is shown by Kaldor (1955).

[10] Income taxes and death duties tend to redistribute the income from rich to poor ones, raising the average propensity to consume in society and increasing the spending multiplier.

Kalecki determines the level of demand and economic activity on the basis of the explanatory factors of profits, derived from the principle of effective demand by social class: capitalists earn what they spend, whereas wage earners spend what they earn. Gross earnings are thus determined by levels of consumption (which depend on the level of earnings), investment, the export surplus (exports minus imports) and the budget deficit.[11] Assuming that the wage burden depends on output level, output depends on the earnings determined by a multiplier which takes into account the share of the wage burden in output. In sum, when private investment increases, the export surplus and the budget deficit push up output, depending on the multipliers linked to capitalists' propensity to consume and the wage share in output. Output increases faster if these multipliers rise, but more slowly if they fall.

Kaldor (1955), taking a post-Keynesian approach, analyses the links between earnings, investment and level of economic activity, noting that the wage share in output depends on the level of investment in relation to output and the various propensities to save of wage earners and capitalists.[12] In the extreme case in which wage earners save nothing at all, earnings depend solely on the level of investment adjusted inversely for capitalists' propensity to save, which will be equivalent to the traditional spending multiplier. In this respect, Kaldor holds that his finding is similar to that of Kalecki, and becomes more sensitive when workers save part of their wages. Later, Pasinetti (1979) makes a small correction, to the effect that an individual who saves part of their income then owns it. Workers who have saved will thus receive a portion of the total profits. What is interesting about this correction is that it gives similar results to those of Kaldor, but without assuming that wage earners' propensity to save is equal to zero. Workers' propensity to save, then, does not influence the distribution of income between profits and wages, nor does it influence the rate of profit (Pasinetti, 1979, p. 94).

Ros (2004) gives an account of the economic and sociopolitical mechanisms through which inequality affects economic growth. The economic mechanisms include the negative impacts of inequality on the market size of industries with increasing returns to scale or on aggregate demand, with severe impacts on investment, and other indirect effects which link inequality to slower population growth and birth rates. The sociopolitical impacts include degree of political stability and social conflict triggered by inequality and the polarization that undermines agreement on economic policy —which in turn makes it difficult to manage external shocks if there is no consensus on the distribution of the adjustment burden.

More recently, post-Keynesian models have proposed different growth regimes. At one extreme is the wage-led regime, under which a rise in the wage share pushes up aggregate demand and GDP via the impact on investment levels of higher private consumption. However, this regime could lead to a reduction in export competitiveness and lower investment. At the other extreme, under a demand-led regime an increase in the wage share would lead to lower aggregate demand, if investment were highly susceptible to a reduction in profit margins. In this rationale, high profitability can encourage firms to expand their capacity and increase investment. Lower wage levels would also contribute to export growth (Stockhammer, 2011).

[11] Insofar as the private sector of the economy receives more in the form of government spending than it pays in tax. Strictly speaking, gross savings by capitalists and workers should be deducted from gross profits.

[12] Which should be understood as $1\text{-}C_i$, where $C_i$ are the different propensities to consume of wage earners and capitalists.

# IV
## Basic model

Kalecki (1954) models the level of economic activity on the basis of the balance between supply and aggregate demand. This model is reprised by authors such as Ocampo (1988), who notes that, on the income side, income can be broken down into profits after tax ($G_a$), wages ($S$), imports and taxes ($I$). On the demand side, the variables are equivalent to consumption by owners ($CP$), consumption by wage earners ($CA$), gross fixed capital formation ($F$), exports ($E$) and public spending ($G$). To bring the model closer to reality it is assumed that imports can be consumption goods ($IC$), intermediate goods ($II$) and capital goods ($IBK$) as shown in equation (3). In equations (4), (5) and (6), owners consume a proportion ($\theta_0$) of their profits, capital goods

imports are a proportion of total investment ($\theta_1$) and saving by wage earners (*As*) is the difference between their wages and consumption. Removing profits from (3) and incorporating the other formulas gives (7).

$$Y = Ga + S + II + IC + IBK + I = CA + CP + F + E + G \quad (3)$$

$$CP = \theta_0 Ga \quad (4)$$

$$IBK = \theta_1 F \quad (5)$$

$$S - CA = As... \quad (6)$$

$$Ga\left(1-\theta_0\right) = F\left(1-\theta_1\right) + \left(G-I\right) + \left(E-II-IC\right) - As \quad (7)$$

Equation (8) establishes that wages maintain a proportion of private sector gross income (wY) which is also equivalent to the gross income of the private sector minus profits.[13] Next, equation (9) establishes that imports of intermediate goods are a proportion of gross national output ($\theta_2$). Equation (10) is obtained from equations (8) and (9) in (7). Output would then be determined by the exogenous components of demand included in the numerator: net exports, gross capital formation in national goods and the difference between public spending and taxes. The denominator includes wage share in GDP, owners' propensity to consume and the propensity to import intermediate goods which are part of the spending multiplier.

Equation (11) estimates the contribution of wage share to output. A higher wage share in output will give a higher output, unless the value of the exogenous demand components included in the numerator is negative. This is unlikely, however, because the national component of gross capital formation should be neutralized by the fiscal surplus, the presence of negative net exports and a high rate of savings by wage earners.

$$S = Y - Ga = wY \quad (8)$$

$$II = \theta_2 Y... \quad (9)$$

$$Y = \frac{F\left(1-\theta_1\right) + \left(G-I\right) + \left(E-IC-As\right)}{\left[\left(1-w\right)\left(1-\theta_0\right) + \theta_2\right]} \quad (10)$$

$$\frac{\partial Y}{\partial w} = \frac{\left(1-\theta_0\right)\left[F\left(1-\theta_1\right) + \left(G-I\right) + \left(E-IC-As\right)\right]}{\left[\left(1-w\right)\left(1-\theta_0\right) + \theta_2\right]^2} \quad (11)$$

[13] For simplicity's sake, a constant was not included as a parameter in the equations for consumption by owners, in imports of intermediate goods or in fluctuations of wage share in output.

# V
# Empirical evaluation

As a first assessment, a Granger causality test is performed for wage share and the evolution of real GDP for the different Latin American economies and the regional average calculated on the basis of information from eight countries. The information on real GDP is expressed in constant dollars at 2000 prices. This information is taken from the World Bank and complemented by ECLAC.[14] The Granger causality test is a statistical test to assess causal primacy between two groups of variables, i.e. whether wage share determines GDP, or GDP determines wage share. The model in section IV shows that causality runs from wage share to output more than the reverse (GDP causes wage share in Granger terms) when wage share is small or the economy's strongest drivers are government sources (consumption and public investment), private investment or the external sector (exports and openness to imports). However, it should be recalled that the Granger test analyses information-based —not intuitive or factual— causality.

Table 2 shows the results of the Granger test on wage share in GDP and the evolution of real GDP by country and for the region for the entire period of analysis. The exercise was performed using information obtained by applying a Hodrick-Prescott filter to determine the non-linear trends for both series. This criterion was used rather

[14] The World Bank now presents information from 1960, whereas the ECLAC data cover the earlier period and are also useful for recent years in the case of Argentina. In all cases, the splicing was performed using a simple rule of three.

than the observed data, because of the latter's variability in response to short-term and other structural factors not explored in this work. In any case, in the second section of the article it is shown that the result obtained from applying the Hodrick-Prescott filter is similar to that obtained from applying the moving averages and the Epanechnikov kernel indicator.

In 8 of the 15 Latin American economies examined, the relationship envisaged in the theory was borne out: in all the tests performed, causality runs from wage share to GDP more than the reverse. In another five cases, the dominant relation is the reverse, but it cannot be ruled out that wage share determines GDP. Only in one case can causal primacy of GDP over wage share be established. With a 95% confidence level, the hypothesis that GDP causes wage share was rejected for Argentina, the Bolivarian Republic of Venezuela, Chile (with the highest level of rejection), Costa Rica, Ecuador, El Salvador, Peru and the Plurinational State of Bolivia. GDP causing wage share is not rejected in Brazil, Colombia, Honduras, México, Panama and Paraguay. The wage share causality of GDP is rejected only in the case of Uruguay. For Latin America overall, in which Brazil and Mexico weigh heavily, GDP causality of wage share is not rejected at 95% confidence, but neither is wage share causality of GDP rejected at 90% confidence.

TABLE 2

**Granger causality tests between wage share and real GDP for economies in Latin America**
*(Hodrick-Prescott filter: 3 lags)*

| Null hypothesis | No. of observations | F-statistic | Log-odds |
|---|---|---|---|
| Real GDP in Argentina does not cause wage share | 59 | 1.41 | 0.25 |
| Wage share in Argentina does not cause real GDP | 59 | 4.98 | 0.00 |
| Real GDP in Bolivia (Plurinational State of) does not cause wage share | 49 | 3.49 | 0.02 |
| Wage share in Bolivia (Plurinational State of) does not cause real GDP | 49 | 11.73 | 0.00 |
| Real GDP in Brazil does not cause wage share | 59 | 3.19 | 0.03 |
| Wage share in Brazil does not cause real GDP | 59 | 1.37 | 0.26 |
| Real GDP in Chile does not cause wage share | 58 | 1.37 | 0.26 |
| Wage share in Chile does not cause real GDP | 58 | 13.11 | 0.00 |
| Real GDP in Colombia does not cause wage share | 58 | 8.57 | 0.00 |
| Wage share in Colombia does not cause real GDP | 58 | 6.35 | 0.00 |
| Real GDP in Costa Rica does not cause wage share | 55 | 2.85 | 0.05 |
| Wage share in Costa Rica does not cause real GDP | 55 | 8.85 | 0.00 |
| Real GDP in Ecuador does not cause wage share | 56 | 5.91 | 0.00 |
| Wage share in Ecuador does not cause real GDP | 56 | 8.77 | 0.00 |
| Real GDP in El Salvador does not cause wage share | 49 | 6.46 | 0.00 |
| Wage share in El Salvador does not cause real GDP | 49 | 11.47 | 0.00 |
| Real GDP in Honduras does not cause wage share | 59 | 11.34 | 0.00 |
| Wage share in Honduras does not cause real GDP | 59 | 9.06 | 0.00 |
| Real GDP in Mexico does not cause wage share | 59 | 11.61 | 0.00 |
| Wage share in Mexico does not cause real GDP | 59 | 7.79 | 0.00 |
| Real GDP in Panama does not cause wage share | 59 | 9.35 | 0.00 |
| Wage share in Panama does not cause real GDP | 59 | 5.54 | 0.00 |
| Real GDP in Paraguay does not cause wage share | 46 | 42.27 | 0.00 |
| Wage share in Paraguay does not cause real GDP | 46 | 24.62 | 0.00 |
| Real GDP in Peru does not cause wage share | 59 | 3.73 | 0.02 |
| Wage share in Peru does not cause real GDP | 59 | 6.27 | 0.00 |
| Real GDP in Uruguay does not cause wage share | 54 | 4.30 | 0.01 |
| Wage share in Uruguay does not cause real GDP | 54 | 0.30 | 0.82 |
| Real GDP in Venezuela (Bolivarian Republic of) does not cause wage share | 51 | 6.98 | 0.00 |
| Wage share in Venezuela (Bolivarian Republic of) does not cause real GDP | 51 | 9.25 | 0.00 |
| Real GDP in Latin America does not cause wage share | 58 | 3.69 | 0.02 |
| Wage share in Latin America does not cause real GDP | 58 | 2.13 | 0.11 |

*Source:* prepared by the author, on the basis of data from the World Bank, the Economic Commission for Latin America and the Caribbean (ECLAC), the International Labour Organization (ILO) and institutions of the respective countries.

GDP: gross domestic product.

Table 3 shows the results of the Granger causality tests for Latin America overall, with the period 1950-2011 divided into two subperiods, 1950-1985 and 1986-2011, on the premise that a structural shift occurred in the region after the debt crisis of the 1980s, whereby the inward-looking production pattern —in which a higher wage share was central to the model— gave way to an outward-looking pattern in which wage share was less important. Like table 2, table 3 assesses the dominant causality between the information obtained on wage share from the application of the Hodrick-Prescott filter, and real GDP. It also looks at the wage share causality of percentage variation in real GDP, and at wage share percentage variation causality of percentage variation in real GDP. For the subperiods 1950-1985 and 1986-2011, the null hypothesis that wage participation does not cause real GDP is rejected for both percentage variations. Regarding the relationship between wage share and real GDP, and that between wage share and percentage variation both for 1950-2011 and for 1986-2011, it cannot be rejected in the first instance that real GDP causes wage share; neither can it be rejected that wage share causes real GDP.

TABLE 3

**Granger causality tests between wage share and real GDP for Latin America: 1950-1985 (3 lags) and 1986-2011 (2 lags)**

| Null hypothesis | No. of observations | F-statistic | Log-odds |
|---|---|---|---|
| Real GDP of Latin America 1950-1985 does not cause wage share | 33 | 11.23 | 0.00 |
| Wage share of Latin America does not cause real GDP | | 3.70 | 0.02 |
| Δln (real GDP of Latin America) 1950-1985 does not cause wage share | 32 | 10.35 | 0.00 |
| Wage share of Latin America does not cause Δln (real GDP of Latin America) | | 5.36 | 0.01 |
| Δln (real GDP of Latin America) 1950-1985 does not cause Δln (wage share) | 32 | 4.74 | 0.01 |
| Δln (wage share of Latin America) does not cause Δln (real GDP) | | 7.30 | 0.00 |
| Real GDP of Latin America 1986-2011 does not cause wage share | 23 | 170.98 | 0.00 |
| Wage share of Latin America does not cause real GDP | | 16.71 | 0.00 |
| Δln (real GDP of Latin America) 1986-2011 does not cause wage share | 22 | 17.65 | 0.00 |
| Wage share of Latin America does not cause Δln (real GDP of Latin America) | | 60.87 | 0.00 |
| Δln (real GDP of Latin America) 1986-2011 does not cause Δln (wage share) | 22 | 1.22 | 0.32 |
| Δln (wage share of Latin America) does not cause Δln (real GDP) | | 9.53 | 0.00 |

*Source:* prepared by the author, on the basis of data from the World Bank, the Economic Commission for Latin America and the Caribbean (ECLAC), the International Labour Organization (ILO) and institutions of the respective countries.

GDP: gross domestic product.
Δln: natural log differences.

Figure 3 shows the relationship between the non-linear trend of wage share and output (left scale) and percentage variations in the trend of real GDP (right scale), both calculated after applying a Hodrick-Prescott filter. Three clear stages may be observed in the relationship between the two variables. In the first, lasting until the early 1980s, the two variables are very closely associated. After the 1980s and into the 1990s, the relation still appears to be direct, but weaker. Lastly, since the early twenty-first century wage participation and real GDP percentage variation have been moving in opposite directions. Figure 4 shows how the percentage variation in wage share has evolved in relation to the percentage variation in real GDP for the same period of analysis. As in figure 3, there is a direct relation between the variables in the 1950s, 1960s and 1970s, but they move in opposite directions in the 1980s and 1990s. Since the year 2000 there has been a direct relation between the percentage variations, but a weak one.

Table 4 shows selected regressions of the percentage variation of real GDP in Latin America in relation to wage share, which is part of the spending multiplier and the other exogenous components of demand, under the post-Keynesian model presented in their third section. The table shows four of the selected regressions, where the percentage variation of real GDP is a lagged function of wage share in the same period, the sum of gross capital formation, exports of goods and services and a dummy variable for Latin America as a region. Unfortunately, there is no information on public finances, propensity to consume and other variables included in the theoretical model for the period under analysis. The contribution of imports to the percentage variation of real GDP

FIGURE 3

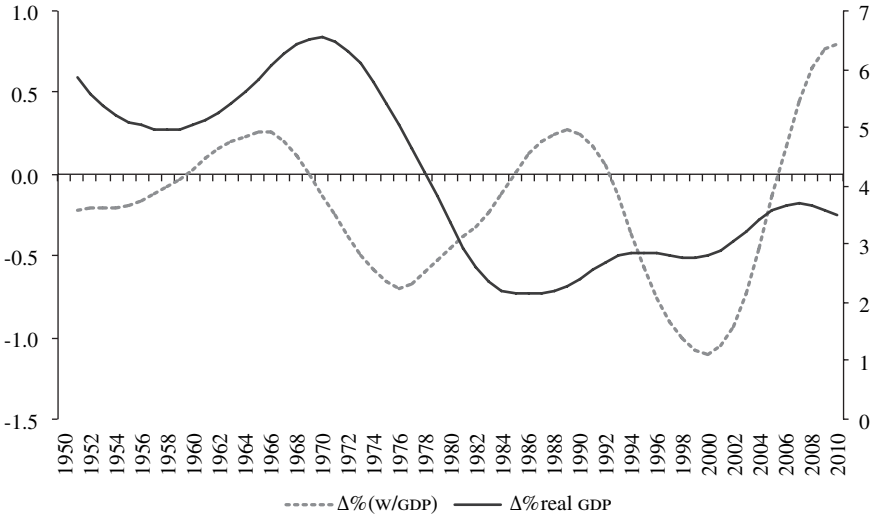
**Wage share and real GDP growth in Latin America, 1950-2010**
*(On the basis of data with Hodrick-Prescott filtering)*


*Source:* prepared by the author, on the basis of data from the World Bank, the Economic Commission for Latin America and the Caribbean (ECLAC), the International Labour Organization (ILO) and institutions of the respective countries.

GDP: gross domestic product.
W/GDP: wage share in GDP.
Δ%real GDP: percentage variation in trend real GDP.

FIGURE 4

**Percentage variations in wage share and in real GDP growth in Latin America, 1950-2010**
*(On the basis of data with Hodrick-Prescott filtering)*




*Source:* prepared by the author, on the basis of data from the World Bank, the Economic Commission for Latin America and the Caribbean (ECLAC), the International Labour Organization (ILO) and institutions of the respective countries.

GDP: gross domestic product.
Δ% real GDP: percentage variation in trend real GDP.
Δ%(W/GDP): percentage variation inwage share.

was negative as expected, but this parameter was not significantly different from zero.

The results are shown with and without intercept, where all the variables (including wage share) have the expected sign, with parameters significantly different from zero. The regressions satisfy the various statistical tests and have an explanatory capacity of between 68% and 76%. A dummy variable for wage share is included in equations 2 and 4, with a value of 1 between 1980 and 2000 and value 0 for the rest of the period. This variable is included to reflect the existence of other policies such as income policy, which —since the debt crisis and the 1990s— led to lags in adjustment to the minimum wage and government salaries, which in turn reduced the contribution of wage share to real GDP growth. These dummy variables improved the fit of the models, by providing an element of the reality of adjustment policies in Latin America. It also warrants mention that information on real wages is not available for the whole of the period under analysis. In all cases, it was concluded that wage share and the growth rate of gross capital formation and exports could not be rejected as explanatory variables for real output growth in Latin America.

TABLE 4

**Main regressions of percentage variation in real GDP and wage share**

| Independent variables | Dependent variable: ΔLn (RGDP) | | | |
|---|---|---|---|---|
| | Equation 1 | Equation 2 | Equation 3 | Equation 4 |
| Constant | -0.059151 | -0.045571 | -0.061211 | -0.046985 |
| | (-1.474413) | (-1.27295) | (-1.613072) | (-1.38286) |
| Wage share | 0.000776 | 0.000691 | - | - |
| | (2.083441) | (2.08416) | | |
| Wage share (-1) | - | - | 0.000803 | 0.000709 |
| | | | (2.257673) | (2.234324) |
| ΔLn (gross capital formation) | 0.269483 | 0.237249 | 0.269758 | 0.237493 |
| | (9.875241) | (9.286399) | (10.06362) | (9.423314) |
| ΔLn (exports of goods and services) | 0.078918 | 0.117782 | 0.063889 | 0.10445 |
| | (1.787322) | (2.914614) | (1.498404) | (2.657407) |
| Dummy variable*wage share | - | -0.000153 | - | - |
| | | (-3.995833) | | |
| Dummy variable*wage share (-1) | - | - | - | -0.00015 |
| | | | | (-3.986638) |
| $R^2$ | 0.682682 | 0.754075 | 0.68645 | 0.755766 |
| $\overline{R^2}$ | 0.665682 | 0.736189 | 0.669947 | 0.73832 |
| F | 40.15965 | 42.16127 | 41.59639 | 43.32202 |
| Durbin Watson | 1.683911 | 2.154472 | 1.653169 | 2.108096 |
| No. of observations | 60 | 60 | 61 | 61 |

*Source:* prepared by the authors, on the basis of data from the World Bank, the Economic Commission for Latin America and the Caribbean (ECLAC), the International Labour Organization (ILO) and institutions of the respective countries.

Note: the number shown in brackets is the value of the student's t-test.
GDP: gross domestic product.
ΔLn (RGDP): logarithms of real GDP.

# VI
## Conclusions

This work complemented and built on previous studies on wage share in 15 of the economies in Latin America and for the region as a whole, for the period 1950-2010. The process of building the statistics was notably arduous, since, in most of the economies, the issue of functional income distribution has been neglected and displaced by individual distribution. Mainstream macroeconomic thinking unfortunately treats wage share in output,

the evolution of real wages and employment levels as residual variables in explaining levels of activity and economic growth.

A brief review was conducted of the approach to the link between wage share and activity levels and economic growth since the work of Smith, who treated the two as positively correlated. The analysis of this relationship was later diluted in the work of Ricardo and Marshall; they initiated the neoclassical school of economics, which disregards this link. It reemerges implicitly in the work of Keynes, and more explicitly with post-Keynesian authors such as Kalecki, Kaldor, Pasinetti and Ros. Modern macroeconomics continues in the neoclassical tradition, with the exception of authors such as Krugman (2012) and Stiglitz (2012), who redeem income distribution for explaining the evolution of particular economies and the global economy.

In the tradition of Kalecki, a model was developed to explain activity levels and economic growth as functions of the spending multiplier and exogenous components of demand. The presence of wage share in output is central in the spending multiplier. It is also clear that a positive variation in the multiplier will lead to a rise in the level of real GDP. It must be emphasized, however, that the final result in terms of output also depends on the values of the exogenous components of demand.

Although clear findings were obtained for the non-linear trend of wage share in Latin America between 1950 and 2010, different results were observed for the various countries in the region. In sum, two cycles are evident, with a higher wage share in the late 1960s and early 1970s, a low in the 1980s, another (smaller) rise in the 1990s and further drop until 2005, followed by a fresh uptrend. The levels and fluctuations of wage share in each economy are explained by a set of structural factors associated with the model of accumulation, and with developments over time in economic, social and political factors, the analysis of which exceeds the scope of this study.

Causal primacy runs from wage share to activity levels and economic growth, although causality in the other direction cannot be rejected for some countries. The causality of wage share on growth is stronger when the percentage variation in wage share is used than when the variables are analysed in absolute terms. At the regional level, there is a strong correlation between wage shares in GDP and percentage variation in GDP until the 1980s; thereafter, the links are weaker. The same occurs when percentage variation in wage share is analysed with respect to variations in GDP, although this association recovers slightly after the year 2000. When the regression analysis is performed under the post-Keynesian approach, the hypothesis that wage share in real output plays a part in explaining real GDP fluctuations in Latin America in the period under analysis cannot be rejected. However, its contribution is found to be smaller after the 1980s. These results may reflect a transition from a wage-led to a profit-led demand regime. However, the analysis of this question is beyond the scope of this article.

# VII

## Methodological annex

In the case of Argentina, methodology and information is available from Graña (2007) up to 2005, in addition to official information from INDEC (2013) up to 2007. However, the author, a member of the Research Centre on Population, Employment and Development (CEPED) of the University of Buenos Aires, kindly provided the complete series up to 2011, which coincides with the official information up to 2007. In the case of Bolivia (Plurinational State of), the periods 1969-1982 and 1984-1986 are from ECLAC (1979, 1981 and 1990), and 1988-2008 is from ECLAC (2013), preceded for the period 1960-1968 by information from ILO (1970). For 2009-2011 data from the National Institute of Statistics of the Plurinational State of Bolivia were used directly. For the years 1983 and 1987 equation (2) from the second section of the article was applied. The data on real average wages used correspond to ECLAC (2013), those on the general level of employment are from ILO (1988) and those on real GDP from the World Development Indicators (World Bank, 2013). In the case of Brazil, the information from 1990-2009 came from ECLAC (2013), and that for 1950 to 1989 was obtained from Medialdea (2012). For the years 2010 and 2011 the methodology described earlier was used, with information on average real wages from ECLAC (2013), on employment from ILO (2012), and on GDP from the World Bank (2013).

Information on Chile for the period 1960-2010 comes from ECLAC (2013) and for the period 1950-1959 rates of wage share growth were based on the work of Rodríguez (2012), since these are expressed in terms of national income and not GDP. For the period 1965-1969, in the case of Colombia, information used was from ECLAC (1976) and for 1970-2010 from ECLAC (2013). For the period 1950-1964, the source was ILO (1955, 1960, 1965 and 1970). In the case of Costa Rica, ECLAC (1976, 1999) and ECLAC (2013) was used as a source between 1961 and 1998; the period 1999-2011 was completed with data from the Central Bank of Costa Rica (2013). The period 1953-1960 was completed on the basis of ILO (1960, 1965 and 1970). In the case of Ecuador, the period 1990-1996 was based on ECLAC (1999), and 1970-1989 on ECLAC (2013). For the period 1997-2011 information was taken from the Survey of Employment, Unemployment and Underemployment for 1996-2012 (INDEC, 2013). Lastly, information on the period 1953-1969 is from Neira Barría (2010).

The data on El Salvador for the period 1960-2011 are from Durán and others (2010), which contains information on current wages and salaries on the basis of information provided by the Salvadoran Social Security Institute and the Multi-Purpose Household Survey. In the case of Honduras, all the information for the period 1950-2011 comes from ECLAC (2013). The information on the period 1970-2011 for Mexico corresponds to data from ECLAC (2013). Information from Hernández Laos (2000) was used for 1950-1969, and was spliced with the later period using growth rates. In the case of Panama, the information on the period 1960-2011 was obtained from ECLAC (2013), and that for the period 1950-1959 was completed using wage share growth rates provided by the National Bank of Panama (2013). In the case of Paraguay, information for 1962-1969 came from ECLAC (1976), and for 1970-2007 from ECLAC (2013). The period 2008-2010 was completed with information from the primary income account prepared by the Central Bank of Paraguay (2013).

In the case of Peru, the data from the period 1965-2010 come from ECLAC (2013) and the data for 1950-1964 come from information processed by Alarco and Del Hierro (1989), on the basis of national accounts prepared by the Central Reserve Bank of Peru. The data for 2011 are from the National Institute of Statistics and Informatics (INEI, 2013). With regard to Uruguay, information for the period 1955-1996 was obtained from the United Nations Development Programme (UNDP, 2008). Data for the period 1997-2005 came from the Central Bank of Uruguay (2013). For 2006-2011, the method described earlier was used, taking ECLAC (2013) as a source for real wages, ILO (2013a) for employment levels, and World Bank (2013) for real GDP. Finally, in the case of the Bolivarian Republic of Venezuela, the sources of information were ECLAC (2013) for the period 1970-2010 and the Central Bank of Venezuela (2013) for 1957-1969.

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# Patterns of technical progress in the Brazilian economy, 1952-2008

*Adalmir Marquetti and Melody de Campos Soares Porsse*

**ABSTRACT**

This article analyses the pattern of technical change in the Brazilian economy between 1952 and 2008. A Marx-biased pattern of labour-saving and capital-using change predominated in the period under study. Three phases in the dynamism of technical change can be distinguished, however. The first, from 1952 to 1973, was highly dynamic. In the second, from 1973 to 1991, this dynamism lessened. Lastly, between 1991 and 2008, the dynamism of technical change recovered slightly. The wage share held fairly steady throughout the period. The rate of profit dropped between 1952 and 1991 before rising slightly from 1991 to 2008. The net capital accumulation rate contracted after 1975 because of the decline in the rates of profit and investment. Between 2004 and 2008, the net capital accumulation rate increased.

**KEYWORDS** Economic growth, productivity, industrial development, capital, capital formation, income, wages, Brazil

**JEL CLASSIFICATION** B14, O33, O40

**AUTHORS** Adalmir Marquetti is a professor with the Economics Department of the Pontifical Catholic University of Rio Grande do Sul, Brazil. aam@pucrs.br

Melody de Campos Soares Porsse is an adjunct professor at the Department of General and Applied Administration of the Federal University of Paraná, Brazil. msporsse@gmail.com

# I
# Introduction

Brazil has gone through two wholly distinct phases of economic growth in the past 60 years. Between 1952 and 1980, the country had one of the world's most dynamic economies, with a gross domestic product (GDP) growth rate of over 7% a year. Between the end of the Second World War and 1980, growth was driven by the industrial sector in a framework of State-led import substitution industrialization. This industrialization process began to erode in 1973, when the "golden age" of the Brazilian economy started to enter into crisis because of the progressive deterioration of profitability and capital accumulation conditions.

In the second phase, from 1980 to 2003, growth dropped to 2%, a decline of some 5 percentage points. Thus, the Brazilian economy was extremely weak in the 1980s, the so-called lost decade, and the 1990s. Corrected for the economic cycle, Brazilian GDP growth was 2.2% a year between 1980 and 1990 and 2.3% between 1990 and 2003. This contrasts with the major political shifts (redemocratization and the enactment of the federal Constitution in 1988) and economic changes that took place over the period. Economically, the most important changes were trade and financial opening, the control of inflation under the 1994 Real Plan, privatization and a reduction of the State's role in economic activity, and the adoption of the inflation targeting programme in 1999. The economic changes of the early 1990s put an end to import substitution industrialization in the country.

The international economy also underwent large institutional and technological changes after 1980. Institutional reforms aimed to make the market the primary mechanism for resource allocation once again, thus reducing the role of the State in this process, while the technology pattern was altered by new information and communication technologies (ICTs) that increased labour and capital productivity, especially when combined with organizational changes within firms. Globalization, meanwhile, meant an increasing flow of goods and capital between countries.

Technical progress is the main factor in a country's growth. The classical authors, Smith and Ricardo, together with Marx, pioneered research into the incorporation of technical progress into an economy and the long-term evolution of productivity. Smith studied the effects of the division of labour on productivity. Ricardo, in his chapter on machinery, analysed the income distribution and employment effects of replacing labour with capital. Marx associated analysis of capitalist development with the pattern of technical change. In Marx's view, production methods are being constantly altered in capitalism by the introduction of technical innovations to obtain a super-profit. Marx thought that the struggle between capitalists and workers over value added created a systematic incentive for a labour-saving and capital-using bias in technical change.

According to Marx's analysis, mechanization is the typical form taken by technical change in capitalist economies, and increases in labour productivity are achieved by reducing capital productivity, with the resultant fall in the rate of profit if income distribution holds steady. Foley and Michl (1999) use the term "Marx-biased technical progress" for labour-saving, capital-using technical change. This contrasts with Harrod-neutral technical change, which is labour-saving but neither capital-using nor capital-saving. Marx-biased technical change also differs from Solow-neutral technical progress, which is neither labour-using nor labour-saving but is capital-saving, and from Hicks-neutral technical progress, which is both labour- and capital-saving.

The present study investigates patterns of technical change in the Brazilian economy between 1952 and 2008 and the relationship between these patterns and the country's growth. Patterns of technical change are analysed using the growth-distribution schedule, a straight line that shows labour productivity at the intersection with the Y-axis and capital productivity at the intersection with the X-axis. The growth-distribution schedule is based on the Sraffa (1960) wage-profit curve and can be used to identify patterns of technical change over time.

The paper is organized as follows. After this Introduction, section II presents a system for studying technical change. Section III addresses technical change in the Brazilian economy from 1952 to 2008. Section IV discusses profitability, distribution and technical change. Section V focuses on capital accumulation and technical change. Lastly, section VI offers some final considerations.

# II

## A system for studying and representing technical change

For the purposes of studying technical change, the economy is treated as producing just one good using capital and labour. The production technique is represented by the growth-distribution schedule. Among the studies employing this schedule to analyse the simultaneous behaviour of labour and capital productivity are Foley and Michl (1999), Foley and Marquetti (1997 and 1999), Marquetti (2002), Ferretti (2008) and Felipe, Laviña and Fan (2008).

For a given year, $X$ is GDP, $K$ is the net stock of non-residential fixed assets measured in the same unit as GDP, $C$ is aggregate consumption including all income other than gross investment, $I$ is gross investment, $D$ is depreciation, $N$ is the number of workers employed, $W$ is total worker compensation, $Z = X - W$ is gross profit and $R = Z - D$ net profit, and $Y = X - D$ is net output.

When countries' performance over time is being studied, it is preferable to express absolute measures in terms of ratios. Thus, $x = X / N$ is GDP per worker or labour productivity, $k = K / N$ is capital per worker or capital intensity, $w = W / N$ is the average real wage, $c = C / N$ is social consumption per worker and $i = I / N$ is investment per worker. Other variables are expressed in terms of capital stock: $p = X / K = x / k$ is output per unit of capital or capital productivity, $v = Z / K = z / k$ is the gross rate of profit and $r = v - d$ the net rate of profit, $g_K + d = I / K$ is the rate of capital accumulation, i.e., the ratio between gross investment and the capital stock, and $d = D / K$ is the depreciation rate. The growth rate of any variable, e.g., labour productivity, is denominated $g_x = \Delta x / x$, while $g_p$ is the capital productivity growth rate. The profit share of national income is $\pi = z / x$ and the wage share is $1 - \pi = w / x$.

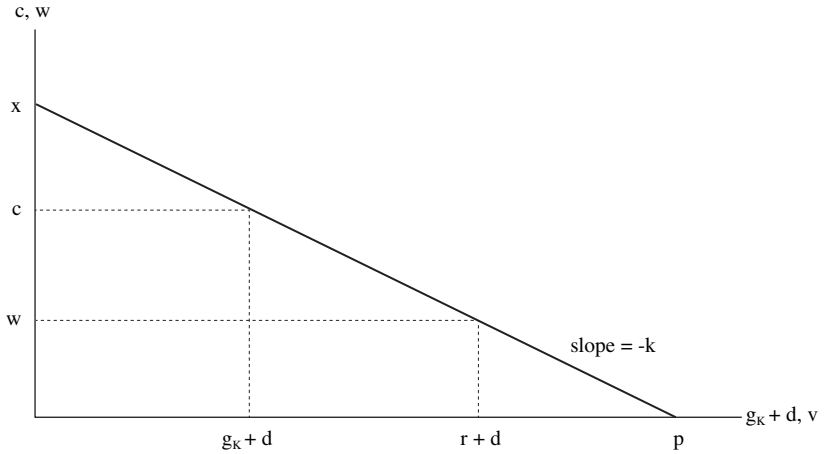
The growth-distribution schedule (see figure 1) is a way of representing national accounts components for a given period. For expenditure, the point ($g_K + d$, $c$) shows the allocation of labour productivity between investment and consumption, $x = c + i = c + g_k k + dk = c + (g_K + d)$ k. When the totality of output is invested, the capital accumulation rate takes the highest possible value, which is equal to capital productivity. Again, social consumption per worker is equal to labour productivity when the totality of output is consumed. As for income, the point ($r + d$, $w$) shows the allocation of labour productivity between profits and wages, $x = w + z = w + rk + dk = w + (r + d)k$. The maximum rate of profit, when all output takes the form of profit, is equal to capital productivity. In turn, the maximum wage, when the totality of output takes the form of wages, equals labour productivity.

Technology consists of all known production techniques. Each production technique is described in terms of labour productivity, capital productivity and the rate of depreciation. The pattern of technical change is analysed with reference to the combination of changes in labour and capital productivity. Technical change is labour-saving if it increases labour productivity and labour-using if it decreases it. Technical change is capital-saving if it increases capital productivity and capital-using if it decreases it. Consequently, it is possible to analyse the different types of technical progress over a given period by observing the movements in the growth-distribution schedule.

The literature distinguishes three types of technical progress. Harrod-neutral or pure labour-saving technical progress occurs when labour productivity rises while capital productivity remains unchanged. This pattern is represented by a shift in the growth-distribution schedule from technique B to technique C in figure 2. Solow-neutral or pure capital-saving technical progress occurs when capital productivity rises while labour productivity remains unchanged, and is represented by a shift in the growth-distribution schedule from technique A to technique B. Hicks-neutral technical progress, which is both capital- and labour-saving, occurs when labour productivity grows at the same speed as capital productivity. This pattern is represented by a parallel shift in the growth-distribution schedule from technique A to technique C, with the ratio between capital and labour remaining unchanged.

FIGURE 1

**The growth-distribution schedule**

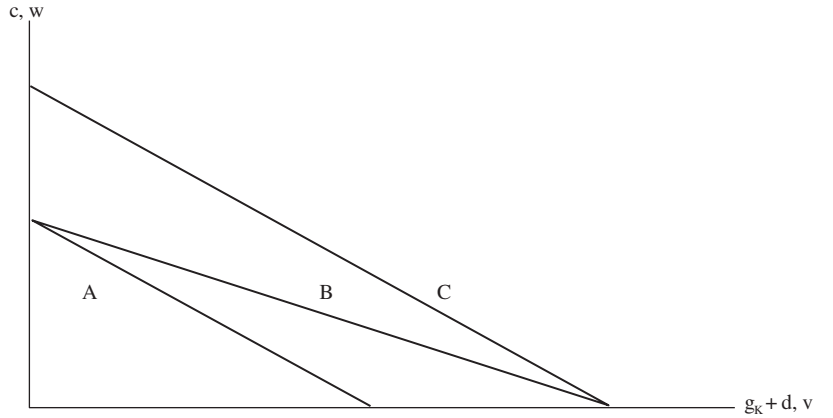



*Source:* D. Foley and T. Michl, *Growth and Distribution*, Cambridge, Massachusetts, Harvard University Press, 1999.

Note: $x$ is labour productivity, $k$ is capital intensity, $w$ is the average real wage, $c$ is social consumption per worker, $p$ is capital productivity, $v$ is the gross rate of profit, $r$ is the net rate of profit, $g_k + d$ is the rate of capital accumulation and $d$ is the rate of depreciation.

FIGURE 2

**Conceptions of neutral technical change and movements in the growth-distribution schedule**



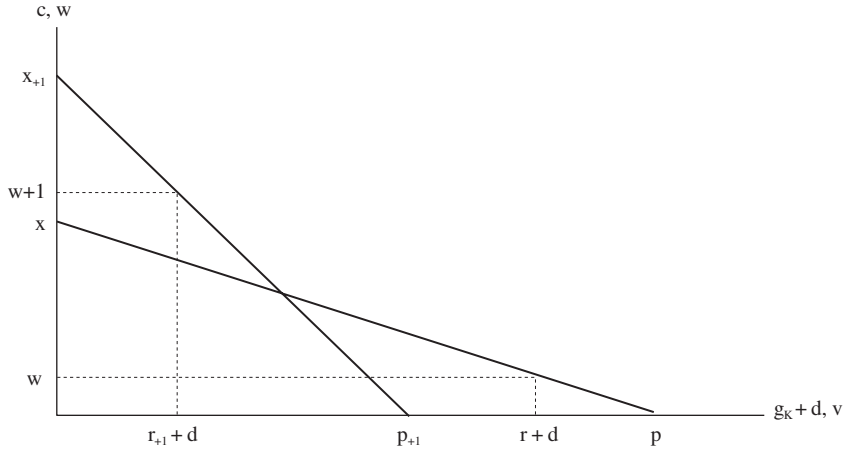

*Source:* A. Marquetti, "Progresso técnico, distribuição e crescimento na economia brasileira: 1955-1998", *Estudos econômicos*, vol. 32, No. 1, São Paulo, University of São Paulo, 2002.

Note: w is the average real wage, c is social consumption per worker and v is the gross rate of profit. Harrod-neutral technical progress is represented by a shift in the growth-distribution schedule from technique A to technique B. Solow-neutral technical progress is indicated by a shift from technique B to technique C. Hicks-neutral technical progress is represented by a shift from technique A to technique C, with the ratio between capital and labour remaining unchanged.

In turn, Marx-biased technical progress entails rising labour productivity and declining capital productivity, as shown in figure 3. According to Marx, the struggle between capitalists and workers over value added creates a powerful incentive for technical change to follow a labour-saving and capital-using pattern where growing use of machinery and equipment replaces the labour of human beings. On this view, mechanization is the pattern of technical change in a capitalist economy, with rising labour productivity and falling capital productivity. Foley and Michl (1999) call this type of technical change Marx-biased technical change. Assuming a constant functional income distribution, the rate of profit falls if technical progress is Marx-biased, and as a result the capital accumulation and economic growth rates decline as well.

FIGURE 3

**Marx-biased technical change and the growth-distribution schedule**




*Source:* A. Marquetti, "Progresso técnico, distribuição e crescimento na economia brasileira: 1955-1998", *Estudos econômicos*, vol. 32, No. 1, São Paulo, University of São Paulo, 2002.

Note: $x$ is labour productivity, $w$ is the average real wage, $c$ is social consumption per worker, $p$ is capital productivity, $v$ is the gross rate of profit, $r$ is the net rate of profit and $d$ is the rate of depreciation.

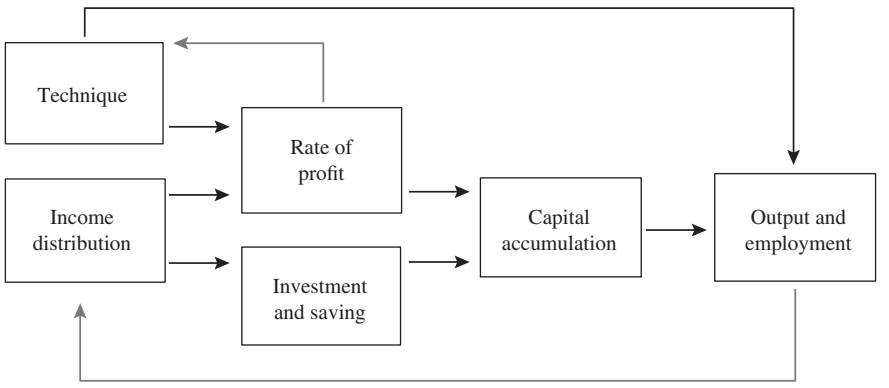
With the Marx-biased pattern of technical progress, accordingly, the following long-run trends are predicted:

(i) rising labour productivity, falling capital productivity and increasing capital intensity;
(ii) decline in the rate of profit, with the wage share holding fairly steady;
(iii) rising real wages;
(iv) reduction in the rate of capital accumulation;
(v) higher output and employment.

As Duménil and Lévy (2003) point out, the historical trends are clearly interrelated and involve different aspects of economic theory. Figure 4 provides a very simplified illustration of the main relationships between the variables. The technique used and the distribution of income determine the rate of profit. The distribution of income also affects capitalists' saving and investment decisions. The rate of profit, assuming that some portion of profit is saved and invested, determines capital accumulation. The rate of profit also influences the choice of technique. A new technique will be adopted if the expected profitability, calculated on current wages, is higher than the existing rate of profit. Depending on the technique of production employed, capital accumulation gives rise to a given output and employment growth rate. In turn, growth affects the distribution of income between profits and wages. The various patterns of technical change display different long-run trends.

FIGURE 4

**Relationships of determination in a growth model**




*Source:* prepared by the authors on the basis of G. Duménil and D. Lévy, "Technology and distribution: historical trajectories a la Marx", *Journal of Economic Behavior & Organization*, vol. 52, No. 2, Amsterdam, Elsevier, 2003.

# III

## Technical change in the Brazilian economy between 1952 and 2008

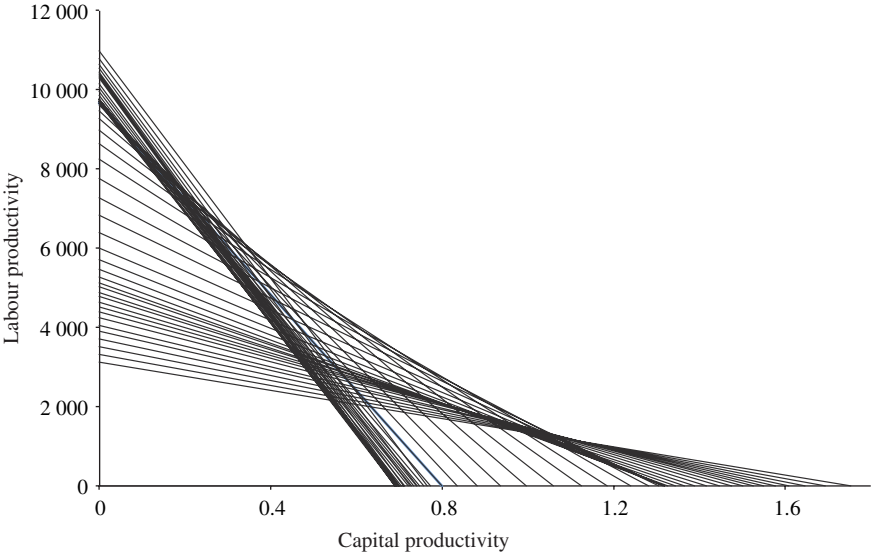
Figure 5 shows growth-distribution schedules in the Brazilian economy between 1952 and 2008. Labour and capital productivity were corrected for the business cycle using a local regression, a non-parametric method that applies smoothing to estimate curves and surfaces (Loader, 1999). The annex provides information on the sources of the database and the methodology employed to calculate the variables used in this article. A rise in labour productivity and a decline in capital productivity can be observed over the period studied. The pattern of technical progress was Marx-biased, as labour productivity grew by 2.25% a year between 1952 and 2008, while capital productivity fell by 1.48% a year.

Nonetheless, there were three phases in the dynamism of technical progress in the Brazilian economy (see figure 6). The first was the period from 1952 to 1975, when labour productivity growth was 4.45% and capital productivity declined by 1.93% a year. This phase was the "golden age" of capitalist development, with the Brazilian economy expanding at a rate of over 7% a year. During this period, economic growth was led by the industrial sector via import substitution industrialization. The GDP share of industry at factor cost rose from 25% in 1952 to 43.3% in 1975.

During the second phase, between 1975 and 1991, labour productivity grew by 0.71% a year and capital productivity fell by 2.99% a year. Brazil suffered the consequences of the ending of the "golden age" and the productivity decline experienced by a number of developed countries in the 1970s and 1980s. The economic growth rate remained high between 1975 and 1980, owing to the second National Development Plan. This plan was a response to the international crisis and was designed to stimulate the production of basic inputs, capital goods and

FIGURE 5

**Brazil: growth-distribution schedule, 1952-2008**
*(1995 reais per worker)*

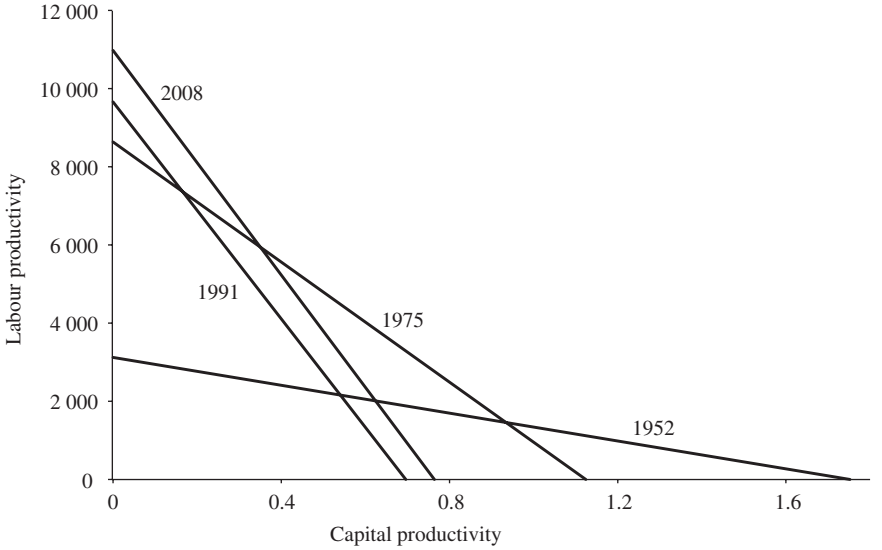



*Source:* Brazilian Geographical and Statistical Institute (IBGE), *Sistema de Contas Nacionais – Brasil 2004/2008*, Rio de Janeiro, CD-ROM, 2010; *Estatísticas do século XX*, Rio de Janeiro, CD-ROM, 2003; and *Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1988*, Rio de Janeiro, Brazilian Geographical and Statistical Institute Foundation, 1990; A. Heston, R. Summers and B. Aten, "Penn World Table Version 6.2", Center for International Comparisons of Production, Income and Prices, 2006 [online] http://pwt.econ.upenn.edu8; A. Marquetti, "Estimativa do estoque de riqueza tangível no Brasil, 1950-1998", *Nova Economia*, vol. 10, No. 2, Belo Horizonte, Federal University of Minas Gerais, 2000.

FIGURE 6

**Brazil: growth-distribution schedule and phases of technical change: 1952-1975, 1975-1991 and 1991-2008**

*(1995 reais per worker)*




*Source:* Brazilian Geographical and Statistical Institute (IBGE), *Sistema de Contas Nacionais – Brasil 2004/2008*, Rio de Janeiro, CD-ROM, 2010; *Estatísticas do século XX*, Rio de Janeiro, CD-ROM, 2003; and *Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1988*, Rio de Janeiro, Brazilian Geographical and Statistical Institute Foundation, 1990; A. Heston, R. Summers and B. Aten, "Penn World Table Version 6.2", Center for International Comparisons of Production, Income and Prices, 2006 [online] http://pwt.econ.upenn.edu8; A. Marquetti, "Estimativa do estoque de riqueza tangível no Brasil, 1950-1998", *Nova Economia*, vol. 10, No. 2, Belo Horizonte, Federal University of Minas Gerais, 2000.

energy. Its inability to sustain the dynamism of technical progress in the Brazilian economy was at the root of the crisis in the import substitution industrialization model. Annual growth dropped to 2% in the 1980s. The industry share of GDP at factor cost peaked in 1985 and fell back to 36.6% in 1991. The deindustrialization of the Brazilian economy began during this phase.

Lastly, during the third phase, which began in 1991 and ended in 2008, labour and capital productivity grew by 0.75% and 0.55% a year, respectively. There was a significant change in the trajectory of capital productivity, which rose as a result of the adoption of new ICTs. This phase represented a new pattern of technical progress, termed input-saving technical change, where labour productivity growth is higher than capital productivity growth and the ratio of capital to labour increases.

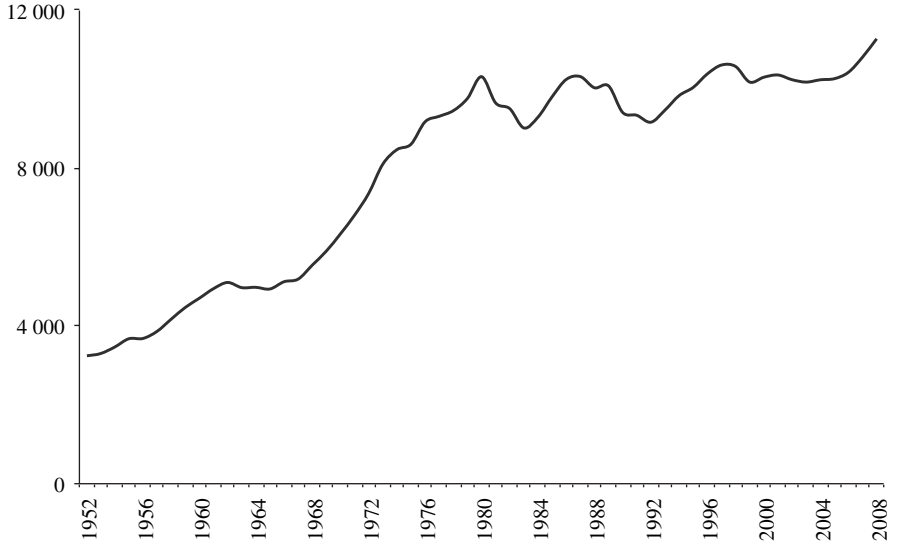
In the late 1980s and early 1990s, import substitution industrialization was replaced by a new model, following the Washington Consensus (Williamson, 1992). The reforms carried out included the adoption of a new form of international integration involving trade and financial liberalization and the start of privatization. In consequence, Brazil began to receive a new flow of external resources that made it possible to launch the Real Plan in 1994. The Real Plan tied the real to the dollar and was very successful in reducing inflation, which dropped from 1,996% in 1993 to 8.3% in 1997, in values measured by the GDP deflator. The Brazilian economy grew by 2.7% a year from 1991 to 2003 and by 4.5% a year from 2003 to 2008. Meanwhile, the industry share of GDP at basic prices fell to 27.9%.

The three phases in the dynamism of technical change can also be seen in figure 7, which presents the evolution of labour productivity in the Brazilian economy between 1952 and 2008. Figure 7 shows rapid labour productivity growth up to the mid-1970s followed by stagnation until the 1990s, when labour productivity began rising again, albeit at lower rates than in the first phase. After 2004, with higher economic growth, labour productivity grew rapidly, although more data are needed to determine how much of this acceleration was due to a new phase of dynamism in technical change and how much to the business cycle.

Two significant aspects of the findings on the evolution of technical change in the Brazilian economy should be highlighted. First, there is a correspondence

FIGURE 7

**Brazil: labour productivity, 1952-2008**
*(1995 reais)*




*Source:* Brazilian Geographical and Statistical Institute (IBGE), *Sistema de Contas Nacionais – Brasil 2004/2008*, Rio de Janeiro, CD-ROM, 2010; *Estatísticas do século XX*, Rio de Janeiro, CD-ROM, 2003; and *Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1988*, Rio de Janeiro, Brazilian Geographical and Statistical Institute Foundation, 1990; A. Heston, R. Summers and B. Aten, "Penn World Table Version 6.2", Center for International Comparisons of Production, Income and Prices, 2006 [online] http://pwt.econ.upenn.edu8; A. Marquetti, "Estimativa do estoque de riqueza tangível no Brasil, 1950-1998", *Nova Economia*, vol. 10, No. 2, Belo Horizonte, Federal University of Minas Gerais, 2000.

between the different phases of technical change and the performance of the Brazilian economy. The Marx-biased pattern of technical progress arose during import substitution industrialization. The literature states that this is the typical pattern in less developed countries that have succeeded in catching up with the leading countries (Foley and Michl, 1999; Marquetti, 2003). Second, the last two phases of technical change in the Brazilian economy were similar to those in the United States (Duménil and Lévy, 2010). Technical change is due to a historical process whereby a country is able to invent new production methods or benefit from the transfer of techniques developed in other countries. Late-industrializing countries usually adopt techniques developed in the central country. The new techniques are not a public good, and therefore involve an acquisition cost and delays in implementation in less developed countries. They also require access to machinery and equipment, workforce education and a period of learning by firms and workers. However, using techniques developed in the leading country is easier and faster than discovering new ones.

# IV

## Profitability, distribution and technical progress

According to the classical-Marxian approach, the main driver of technical change is profitability. On this view, individual capitalists would adopt technical changes that reduced production costs at current prices and wages to obtain an above-average rate of profit by selling their products at prices set by less technically efficient competitors. However, it is the struggle between capital and labour over the distribution of value added that determines the form taken by technical change in capitalist society. Mechanization replaces human labour

with machinery and equipment in the production process, increasing labour productivity. Okishio (1961) showed that, if real wages remained unchanged, the rate of profit tended to rise even if technical progress was Marx-biased.

The rate of profit is measured by the ratio between the total profits generated in a period and the fixed capital invested in the production process. It should be recalled that only a portion of total profits is appropriated by the capitalists. Other portions of the value added are appropriated by unproductive workers, the State and international value transfer. Duménil and Lévy (1993) have analysed the different ways of calculating the rate of profit.

In the present study, the rate of profit has been calculated as follows:

$$v = Z / K = (Z / X) / (K / X) = \pi\, p = (1 - w / x)\, p$$

where $\pi$ is the profit share, p is capital productivity, w is the average real wage and x is labour productivity. The average real wage is deflated by the GDP deflator and represents the cost of a worker from the capitalist's point of view. The evolution of the rate of profit depends on two factors: functional income distribution and capital productivity. In turn, functional income distribution is determined by the evolution of the average real wage relative to labour productivity. The profits portion rises, as therefore does the rate of profit, when labour productivity grows by more than the average wage.

Figure 8 shows the path of the net rate of profit at current prices and at constant 1995 prices in the Brazilian economy during the period of study. A downward trend in both measures can be observed between 1952 and the early 1990s, when profitability increased slightly. The 1952-1990 period can be divided into two stages. In the first, from 1952 to 1973, there was rapid industrialization in the 1950s, followed by political struggles in the early 1960s that culminated in the 1964 military coup. The political and economic changes that took place under the military dictatorship account for some of the increase in the rate of profit from the mid-1960s to 1973. In the second stage, from 1973 to 1990, this rate dropped sharply, and falling profitability was one of the determinants of the structural crisis in the Brazilian economy. This period was characterized by the second National Development Plan, which presented a high level of capital accumulation and a rapid build-up of foreign debt that culminated in the debt crisis, high inflation and low growth of the 1980s.

The rate of profit increased slightly between 1990 and 2008. This phase corresponds to the period of neoliberalism in the Brazilian economy between 1990 and 2003, followed by a period in which international conditions favourable to the country combined with the restoration of the State's role in the formulation and implementation of development policy between 2003 and 2008.

Movements in the rate of profit are explained by alterations in functional income distribution or capital productivity. Figure 9.A shows that the profits portion held fairly steady throughout the period studied, averaging 57.8% of GDP. Functional income distribution favoured workers in the periods of greatest political agitation, such as the late 1950s and early 1960s, as well as during the political liberalization of the second half of the 1970s and early 1980s and in the years of highest inflation, especially the late 1980s and early 1990s.

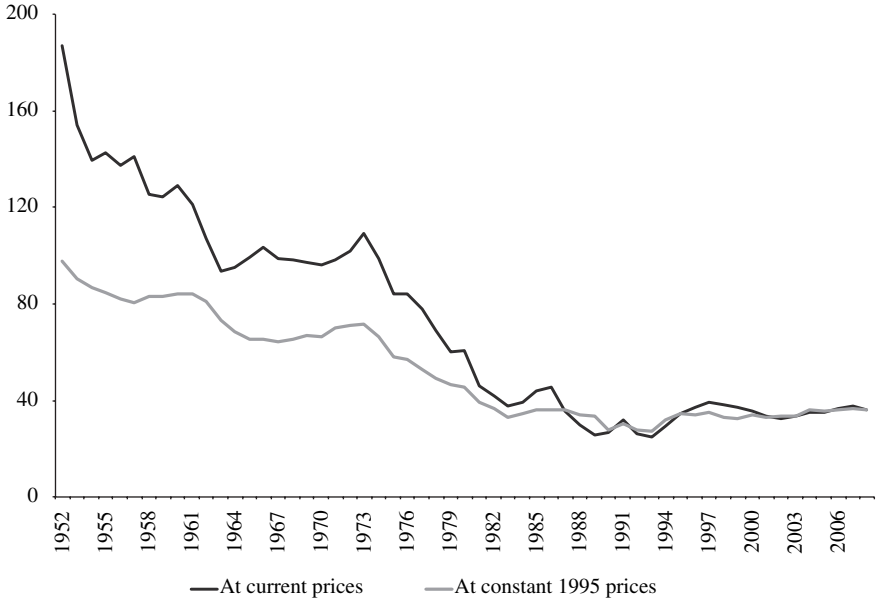
On the other hand, the profit share increased from the start of the military dictatorship in 1964 until the so-called Brazilian miracle of 1968-1973. After bottoming out at 50.5% of GDP in 1993, its lowest observed value, the profit share rose rapidly, peaking at 60.7% in 2004. This change was apparently connected with the effects of neoliberal reforms and macroeconomic policies relating to employment and wages, which strengthened the political power of the capitalist class. Figure 9.B reveals that the average real wage tracked labour productivity, except during the 1991-2004 period.

Figure 10 presents the evolution of capital productivity, measured at constant 1995 prices and current prices. Much as with the rate of profit, there were three phases in the path of capital productivity: a phase of slight decline from 1952 to 1973, followed by a rapid drop between 1973 and 1990 and a moderate rise between 1990 and 2008. However, capital productivity stood at much the same level in 2008 as in the early 1980s. The third phase represents a long-term shift in the evolution of capital productivity in Brazil, which could reflect the adoption of ICT-linked innovations. It can be seen that the long-run evolution of the rate of profit has been determined mainly by the evolution of capital productivity, which is a technological factor.

The difference between the net rate of profit as measured at current and at constant prices is due to the rise in the capital goods price deflator relative to the GDP price deflator, as shown in figure 11. A rise in this index during the 1950s and early 1960s was followed by a period of stability until the late 1970s, when the relative prices of capital goods climbed again, peaking in the late 1980s. The relative price of capital goods in the Brazilian economy then stabilized from the early 1990s until 2008.

FIGURE 8

**Brazil: net rate of profit, 1952-2008**
*(Percentages)*

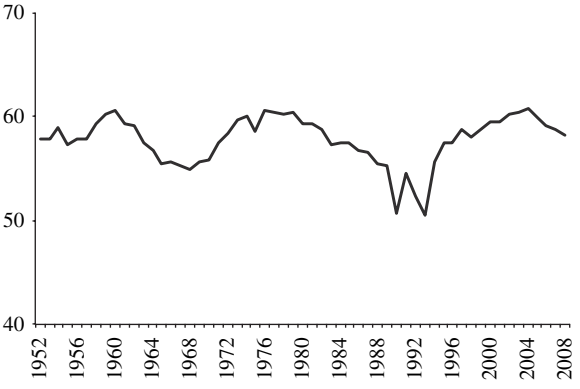



*Source:* Brazilian Geographical and Statistical Institute (IBGE), *Sistema de Contas Nacionais – Brasil 2004/2008*, Rio de Janeiro, CD-ROM, 2010; *Estatísticas do século XX*, Rio de Janeiro, CD-ROM, 2003; and *Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1988*, Rio de Janeiro, Brazilian Geographical and Statistical Institute Foundation, 1990; A. Marquetti, "Estimativa do estoque de riqueza tangível no Brasil, 1950-1998", *Nova Economia*, vol. 10, No. 2, Belo Horizonte, Federal University of Minas Gerais, 2000.

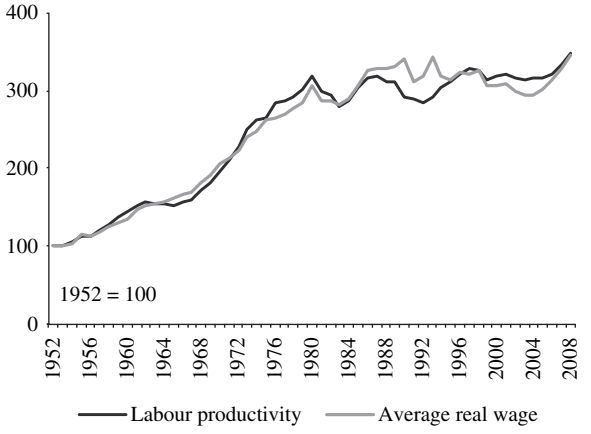
FIGURE 9

**Brazil: profit share and evolution of labour productivity and real wages, 1952-2008**

A. Profit share, 1952-2008
*(Percentages of GDP)*



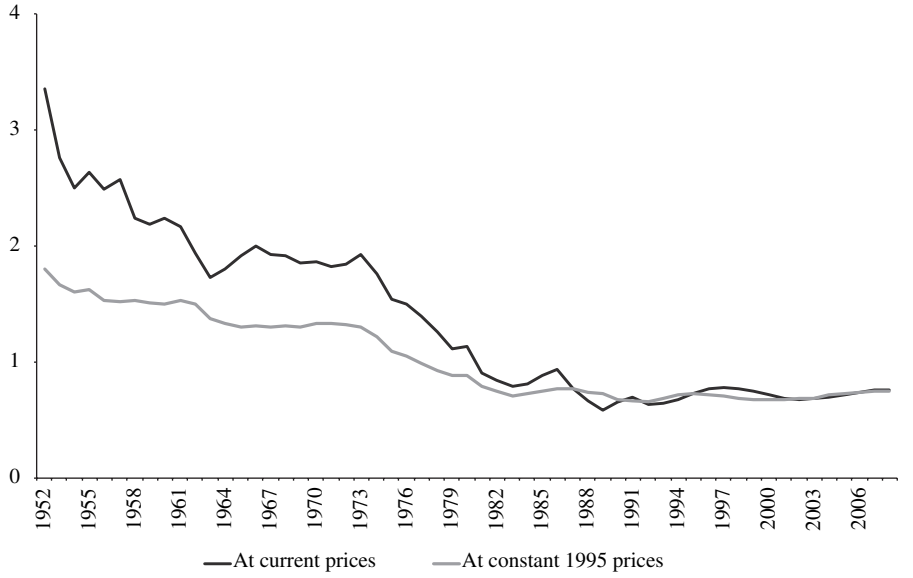

B. Labour productivity and real wages, 1952-2008
*(Percentages)*




*Source:* Brazilian Geographical and Statistical Institute (IBGE), *Sistema de Contas Nacionais – Brasil 2004/2008*, Rio de Janeiro, CD-ROM, 2010; *Estatísticas do século XX*, Rio de Janeiro, CD-ROM, 2003; and *Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1988*, Rio de Janeiro, Brazilian Geographical and Statistical Institute Foundation, 1990; A. Heston, R. Summers and B. Aten, "Penn World Table Version 6.2", Center for International Comparisons of Production, Income and Prices, 2006 [online] http://pwt.econ.upenn.edu8.

FIGURE 10

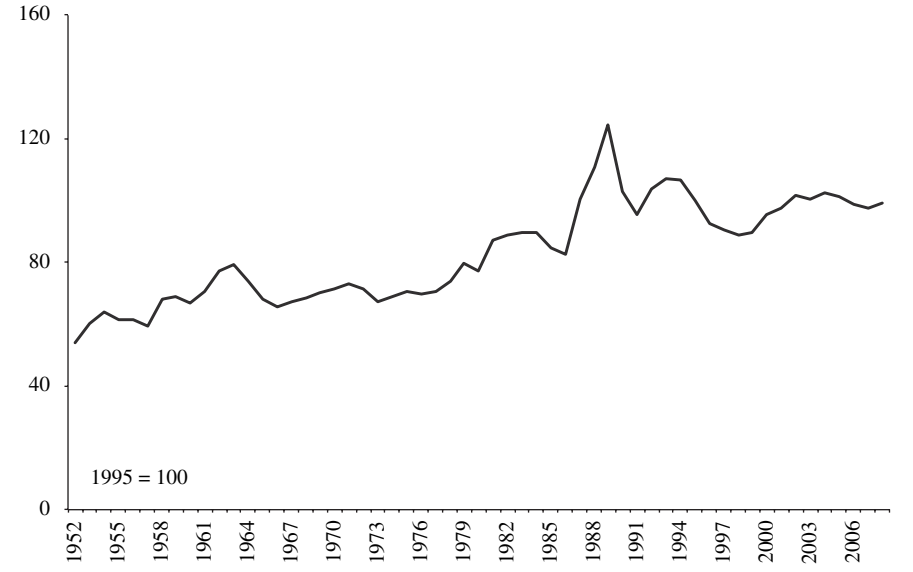
**Brazil: capital productivity, 1952-2008**




*Source:* Brazilian Geographical and Statistical Institute (IBGE), *Sistema de Contas Nacionais – Brasil 2004/2008*, Rio de Janeiro, CD-ROM, 2010; *Estatísticas do século XX*, Rio de Janeiro, CD-ROM, 2003; and *Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1988*, Rio de Janeiro, Brazilian Geographical and Statistical Institute Foundation, 1990; A. Marquetti, "Estimativa do estoque de riqueza tangível no Brasil, 1950-1998", *Nova Economia,* vol. 10, No. 2, Belo Horizonte, Federal University of Minas Gerais, 2000.

FIGURE 11

**Brazil: capital goods price deflator relative to the GDP deflator, 1952-2008**
*(Percentages)*




*Source:* Brazilian Geographical and Statistical Institute (IBGE), *Sistema de Contas Nacionais – Brasil 2004/2008*, Rio de Janeiro, CD-ROM, 2010; *Estatísticas do século XX*, Rio de Janeiro, CD-ROM, 2003; and *Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1988*, Rio de Janeiro, Brazilian Geographical and Statistical Institute Foundation, 1990; A. Marquetti, "Estimativa do estoque de riqueza tangível no Brasil, 1950-1998", *Nova Economia*, vol. 10, No. 2, Belo Horizonte, Federal University of Minas Gerais, 2000.

# V

## Capital accumulation and technical progress

Capital accumulation measures the speed at which the country is enlarging its stock of productive capital, which comprises non-residential buildings, machinery and equipment. Consequently, as long as labour is available, capital accumulation measures the speed at which the country's capacity for producing wealth is expanding. The net capital accumulation rate is determined by the rate of profit and the investment rate. If the pattern of technical progress is Marx-biased, the trend of the accumulation rate ought to be downward, tracking the decline of the rate of profit.

Figure 12 presents the capital accumulation rate in the Brazilian economy between 1952 and 2008. Three significant aspects of capital accumulation in Brazil can be observed. First, five cycles can be distinguished in the period of study, namely: 1955-1965, peaking in 1959; 1965-1983, peaking in 1975; 1983-1993, peaking in 1986; 1993-2003, peaking in 1997; and, lastly, the present cycle, which began in 2003. Second, the net accumulation rate shows a downward trend much like the one observed in the net rate of profit due to the Marx-biased pattern of technical change. The peaks (except that of 1975) and troughs of each successive cycle were lower than those of the previous one. Third, two different periods can be observed for the capital accumulation rate in Brazil. Between 1952 and the late 1970s, economic growth was led by the industrial sector, in the framework of an import substitution industrialization model. The Brazilian economy mechanized during that period. The rate of profit fell sharply in the second half of the 1970s and the early 1980s, and this marked the transition between the stage with a high capital accumulation rate in the Brazilian economy and the stage with a more subdued rate. From the early 1980s to the start of the 1990s, the low rate of accumulation was due to a combination of poor profitability and the external debt crisis. A neoliberal model was applied in Brazil from the early 1990s until 2003 but, despite higher profitability, the accumulation rate was low because of the fall in the investment rate.

FIGURE 12

**Brazil: net capital accumulation rate, 1952-2008**
*(Percentages)*


*Source:* Brazilian Geographical and Statistical Institute (IBGE), *Sistema de Contas Nacionais – Brasil 2004/2008*, Rio de Janeiro, CD-ROM, 2010; *Estatísticas do século XX*, Rio de Janeiro, CD-ROM, 2003; and *Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1988*, Rio de Janeiro, Brazilian Geographical and Statistical Institute Foundation, 1990; A. Marquetti, "Estimativa do estoque de riqueza tangível no Brasil, 1950-1998", *Nova Economia*, vol. 10, No. 2, Belo Horizonte, Federal University of Minas Gerais, 2000.

Figure 13 shows the evolution of the capital accumulation rate and the net rate of profit between 1952 and 2008. The downward trend in the accumulation rate was similar to that observed in the net rate of profit, indicating a long-run relationship between these two variables. The drop in profitability caused by the decline in capital productivity was one of the factors responsible for the decline in the accumulation rate in the Brazilian economy. As indicated earlier, these are the long-run tendencies of the Marx-biased pattern of technical change.

The path of the capital accumulation rate and the net investment rate is shown in figure 14. Cyclical changes in the capital accumulation rate are strongly influenced by the net investment rate. The Goals Plan, which provided for a large increase in investment from 1956 to 1960 led by the public sector and State enterprises and with strong participation by external capital, yielded rapid investment growth.

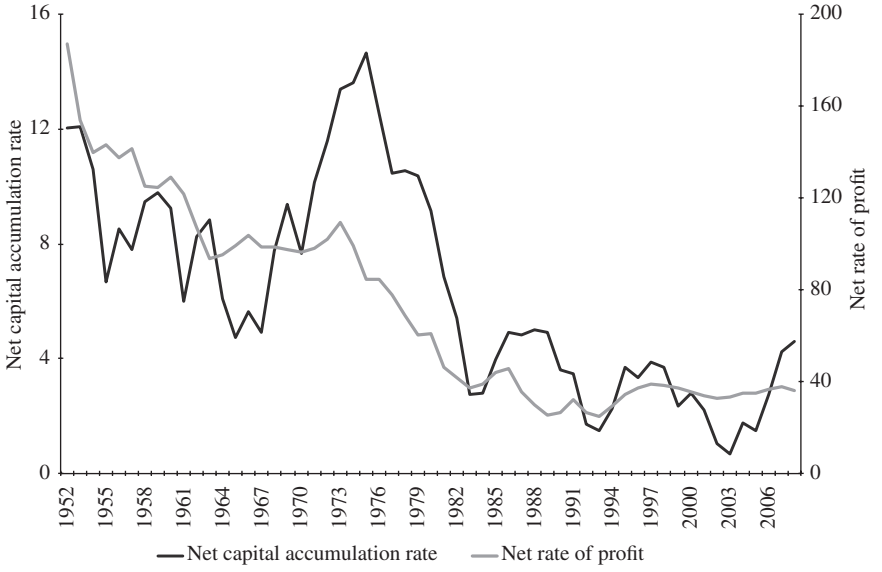
The early 1960s was a time of great political upheaval, culminating in the 1964 military coup. After a series of institutional changes, investment recovered in the late 1960s. The net accumulation rate grew robustly during the so-called Brazilian economic miracle between 1968 and 1973, exceeding 12% a year between 1974 and 1976. It should be noted that the investment rate peaked during the second National Development Plan, a time of sharply falling profitability. The high rate of investment was due to State leadership in the process, which was financed by external borrowing.

The 1980s were characterized by a decline in the net investment rate, and this continued through the 1990s and the early 2000s. This rate bottomed out in 2003 and then began to rise again.

The reduction in the accumulation rate in the Brazilian economy in 1975 is accounted for by the sharp fall in the rate of profit after 1973. In the 1980s, the accumulation rate also began to suffer the negative effects of the declining investment rate. The strategy adopted with the second National Development Plan resulted in higher external debt, exacerbating the country's financial fragility. The effects of the second oil crisis and, chiefly, the rise in international interest rates were very damaging to the Brazilian economy. The ability to generate wealth, as measured by the labour productivity growth rate, was necessary for the country to cope with future payments, but it barely increased relative to the rise in external debt and the likelihood of negative external shocks. The servicing of this debt meant a huge transfer of resources abroad in the 1980s, causing the net investment rate to decline.

FIGURE 13

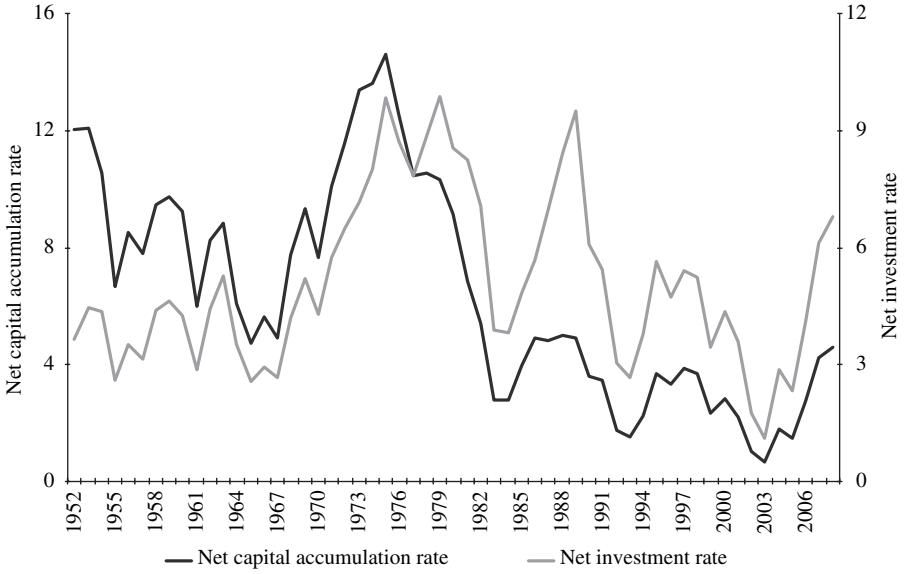
**Brazil: net capital accumulation rate and net rate of profit, 1952-2008**
*(Percentages)*




*Source:* Brazilian Geographical and Statistical Institute (IBGE), *Sistema de Contas Nacionais – Brasil 2004/2008*, Rio de Janeiro, CD-ROM, 2010; *Estatísticas do século XX*, Rio de Janeiro, CD-ROM, 2003; and *Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1988*, Rio de Janeiro, Brazilian Geographical and Statistical Institute Foundation, 1990; A. Marquetti, "Estimativa do estoque de riqueza tangível no Brasil, 1950-1998", *Nova Economia*, vol. 10, No. 2, Belo Horizonte, Federal University of Minas Gerais, 2000.

FIGURE 14

**Brazil: net capital accumulation rate and net investment rate, 1952-2008**
*(Percentages)*




*Source:* Brazilian Geographical and Statistical Institute (IBGE), *Sistema de Contas Nacionais – Brasil 2004/2008*, Rio de Janeiro, CD-ROM, 2010; *Estatísticas do século XX*, Rio de Janeiro, CD-ROM, 2003; and *Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1988*, Rio de Janeiro, Brazilian Geographical and Statistical Institute Foundation, 1990; A. Marquetti, "Estimativa do estoque de riqueza tangível no Brasil, 1950-1998", *Nova Economia,* vol. 10, No. 2, Belo Horizonte, Federal University of Minas Gerais, 2000.

Moreover, concurrent increases in the domestic debt, the real interest rate in the domestic market and inflation associated with the indexation mechanism resulted in a transfer of resources from the productive sector to the financial sector. These factors, together with the fall in the rate of profit, account for the reduction in the accumulation rate in the Brazilian economy from the late 1970s onward. The origin of the Brazilian economic crisis lay in the slackening of technical progress in the mid-1970s. The decline in the net investment rate from the late 1970s worsened the situation, which was already having a negative effect on the accumulation rate.

This study endorses the analysis of the causes of Brazilian inflation in the late 1970s and early 1980s conducted by Celso Furtado in 1984. According to that author:

> […] the root cause of the inflation is the decrease in the productivity of the economic system […] The average productivity of investments has traditionally been high in Brazil. To achieve a one per cent increase in domestic product it was only necessary to invest two per cent of this same product […] What has been occurring recently is a notable fall in productivity. Today, we need to invest four to six per cent of domestic product to achieve a one per cent increase in the product […] the main reason [for this] is the lack of coordination of public investments, and of private investments induced by it (Furtado, 1984, pp. 7-8).

It is interesting to note that the downward trend in the capital accumulation rate and the net investment rate continued throughout the 1990s, despite rising profitability. The so-called lost decade of the 1980s was a period of crisis and transition from the import substitution industrialization model to the neoliberal model. Neoliberalism represented the adoption of a "market-friendly" model of growth whereby the State's role in the economy was reduced, State firms were privatized, capital and labour markets were liberalized and there was greater international integration. This model's supporters believed that, by introducing neoliberal reforms, Brazil would benefit from globalization and receive a fresh inflow of international investment that would increase capital accumulation and productivity in the economy (Franco, 1998).

From 1990 onward, the Brazilian economy underwent a series of neoliberal reforms. They included the adoption of a new form of international integration via trade and financial liberalization (Cysne, 1998) and the privatization programme, involving sell-offs of firms in

the petrochemical and metal ores sectors being sold off. External debt renegotiation under the Brady Plan enabled Brazil to return to the international financial market and build up sufficient reserves to launch the Real Plan in 1994. The Plan comprised two parts: a macroeconomic policy to control inflation and a programme of neoliberal reforms to stimulate growth.

High interest rates and Brazil's return to the international capital market allowed the currency to appreciate and inflation to fall to single-digit levels. After 1994, the privatization of public services began, with sell-offs of telecommunication, electricity and banking firms.

One of the main problems with the Real Plan was that it increased the external financial fragility of the Brazilian economy, and this, combined with the volatility of international capital, caused the real to depreciate in early 1999. The Brazilian crisis was preceded by a string of international upheavals that started with the 1994 Mexican crisis, followed by the 1997 Asian crisis and the 1998 crisis in the Russian Federation. The country's economic authorities responded to the crisis by adopting a policy that combined an inflation target, a primary fiscal surplus and a floating exchange rate. Monetary policy played a fundamental role in controlling the exchange rate via an interest rate high enough to attract international capital and thus keep inflation down to near the desired level.

With the Real Plan, Brazil fully adopted the neoliberal agenda. Although the policies successfully brought down inflation, they were unable to restore dynamism to the Brazilian economy. The net accumulation rate was very low, despite the shift in the pattern of technical change in the Brazilian economy, which meant only a limited recovery in profits. After picking up again between 1993 and 1997, the net investment rate fell again, bottoming out in 2003.

The net investment rate and the accumulation rate recovered from 2004 onward. The fundamental question is whether the recovery represented a cyclical change or a break from the period of low growth in the Brazilian economy lasting from 1980 to 2003. Initially, the country benefited from a rise in exports thanks to growth in international sales of commodities to China and India. In a second stage, however, investment expanded strongly thanks to the Growth Acceleration Programme. This is a programme whose main objective is to stimulate the country's economic growth through State action to promote and induce investment by the public sector and by State and private-sector firms. The net investment rate and the capital accumulation rate in 2007 and 2008 were the highest since 1990.

# VI

## Final considerations

Analysis of technical progress in the Brazilian economy has revealed that a Marx-biased labour-saving and capital-using pattern predominated in the period from 1952 to 2008. Since functional income distribution was fairly stable, the rate of profit in the Brazilian economy declined in the period studied.

This pattern was not uniform in all the years studied, however. Three phases of technical progress can be distinguished: 1952-1975, 1975-1991 and 1991-2008. The first phase, at the height of the import substitution industrialization strategy, saw rapid growth in the Brazilian economy, a 4.45% annual increase in labour productivity and an annual decline of 1.93% in capital productivity. During the second phase, marked by the crisis and the end of import substitution, the rate of profit and capital accumulation fell sharply. Labour productivity increased by just 0.71% a year and capital productivity fell by 3% a year. Lastly, the third phase involved a new pattern of technical progress, particularly where capital productivity was concerned, with labour productivity growing by 0.75% a year and capital productivity by 0.55%.

The Brazilian crisis that began in the mid-1970s reproduced a situation that had already arisen in the developed economies and that entailed a sharp decline in capital productivity and stagnation of labour productivity in those countries. The drop in the rate of profit in the Brazilian economy from 1973 onward led to the capital accumulation rate decreasing, and with it the capacity of the Brazilian economy to achieve significant increases in labour productivity. The 1980s debt crisis aggravated the decline in the accumulation rate and the weak growth capacity of the Brazilian economy. From the late 1970s, there was also a sharp drop in the net investment rate.

Growth in the Brazilian economy was moderate during the 1990s, despite the opportunities represented by the increased dynamism of technical change associated with the new ICTs and the increase in the rate of profit. This rise should have been accompanied by growing investment, but this did not happen. Investment did not expand consistently until the Growth Acceleration Programme was implemented. Labour productivity grew by 2% a year and capital productivity by 1.9% between 2003 and 2008. When supply conditions are right, Keynesian policies can stimulate greater economic growth and higher productivity.

## ANNEX

### Database and methodology

This appendix presents the information sources and procedure used to build the database employed in this article. The main difficulty in conducting long-run empirical studies of the Brazilian economy is to find a consistent way of organizing information. National accounts began to be published in Brazil in 1947. The last major methodological change in the System of National Accounts took place with the publication of *Sistema de Contas Nacionais – Brasil, Referência 2000*. The alterations were made to bring it more into line with the System of National Accounts 1993. In future, there will have to be further amendments to adapt the country's national accounts to the System of National Accounts 2008.

The data for real GDP and the GDP deflator were obtained from IBGE (1990) and IBGE (2003) for the 1952-1985 period. The data for 1995-2008 were taken from IBGE (2010). Owing to changes in methodology, 1995 GDP is 8.84% greater in IBGE (2010) than in IBGE (2003). The data for 1986-1994 were calculated by taking real GDP growth rates from IBGE (2003) and increasing them by distributing that 8.84% over the period. Thus, the data source for real GDP is IBGE (2003) for 1985 and IBGE (2010) for 1995. The differences between the series were adjusted right across the 1986-1994 period. A similar procedure was used for the other variables.

The number of workers for the 1995-2008 period was calculated from IBGE (2010). Census year data were also taken from IBGE (1990). The information needed to complete the years without data was taken from Heston, Summers and Atten (2006). It should be noted that IBGE (2003) gives the number of workers for the years from 1990 to 1995.

Worker wage and wage share data for 1995-2008 were taken from IBGE (2010) and, in the case of census years, from IBGE (2010). Mixed income is divided into two parts, with one being added to wages and the other to the operating surplus. In the years for which no information was available, the average wage was estimated econometrically.

The net stock of non-residential fixed capital was estimated using the perpetual inventory method. The source of information on gross fixed capital formation (GFCF) was IBGE (2003) from 1947 to 1985 and IBGE (2010) from 1995 to 2008. To connect the two series, a procedure similar to the one used to calculate GDP was employed for the years from 1986 to 1994. The data source for the years prior to 1947 is Marquetti (2000). The perpetual inventory method employed in this study is similar to the one used by the Bureau of Economic Analysis. The rate of depreciation is calculated as $R/T$, where $R$ is the rate at which an asset value declines and $T$ is the lifespan of the asset. There are two main differences from the methodology of the Bureau of Economic Analysis. First, $R$ is taken as being equal to 2, in line with the double declining balance depreciation method. Second, the asset is withdrawn when it reaches its average lifespan. Because of the enormous differences in gross capital formation in machinery and equipment and non-residential building between IBGE (2003) and IBGE (2010), the capital goods category consists of just one asset. The working life of this asset is 26 years. Fixed capital consumption is measured as the sum of the net fixed capital stock and GFCF at the start of the period, minus the net fixed capital stock at the end of the period.

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# Mexico: Combining monthly inflation predictions from surveys

*Pilar Poncela, Víctor M. Guerrero, Alejandro Islas, Julio Rodríguez and Rocío Sánchez-Mangas*

**ABSTRACT**

We examine the problem of combining Mexican inflation predictions or projections provided by a biweekly survey of professional forecasters. Consumer price inflation in Mexico is measured twice a month. We consider several combining methods and advocate the use of dimension reduction techniques whose performance is compared with different benchmark methods, including the simplest average prediction. Missing values in the database are imputed by two different databased methods. The results obtained are basically robust to the choice of the imputation method. A preliminary analysis of the data was based on its panel data structure and showed the potential usefulness of using dimension reduction techniques to combine the experts' predictions. The main findings are: the first monthly predictions are best combined by way of the first principal component of the predictions available; the best second monthly prediction is obtained by calculating the median prediction and is more accurate than the first one.

**KEYWORDS** Inflation, economic projections, Mexico

**JEL CLASSIFICATION** E37, E53

**AUTHORS**

Pilar Poncela is a Professor with the Department of Quantitative Economics of the Universidad Autónoma de Madrid, Spain. pilar.poncela@uam.es

Víctor M. Guerrero is a Full-time Professor with the Academic Department of Statistics of the Instituto Tecnológico Autónomo de México (ITAM), Mexico. guerrero@itam.mx

Alejandro Islas is a Full-time Professor with the Department of Statistics of the Instituto Tecnológico Autónomo de México (ITAM), Mexico. aislas@itam.mx

Julio Rodríguez is Professor with the Department of Quantitative Economics of the Universidad Autónoma de Madrid, Spain. jr.puerta@uam.es

Rocío Sánchez-Mangas is Professor with the Department of Quantitative Economics of the Universidad Autónoma de Madrid, Spain. rocio.sanchez@uam.es

# I
# Introduction

By all accounts, Mexico's monetary policy for the last 25 years has been successful in achieving price stability: inflation declined from a monthly average rate of 4.3% during the 1980s to 0.4% during the early years of the twenty-first century. To pursue price stability, Mexico's monetary authorities have used different monetary instruments ranging from exchange-rate control to control of the monetary base and inflation targeting. It was at the end of the 1980s, during a period characterized by high macroeconomic instability that the Mexican monetary authorities decided to generate a biweekly inflation index. The underlying idea of the biweekly data is to incorporate more timely information on price dynamics during volatile periods, so that economic agents, private and public alike, may monitor closely the evolution of prices in the economy in order to make decisions that allow them to optimize the use of their resources.

Frequent inflation forecasting is important for both market and institutional operators. On the one hand, financial market operators tend to update their expectations continuously as new information is released and to use this information to modify their investment strategies; on the other hand, according to Woodford (2003), a timely update of the macroeconomic projection is essential for conducting monetary policy based on market expectations. The accuracy and timeliness of short-run inflation forecasts can thus have a significant influence on these strategies.

The aim of this paper is to generate an efficient combination of inflation forecasts for Mexico. The forecast framework is based on the dimension reduction techniques proposed by Poncela and others (2011), which allow us to obtain a single, more accurate forecast of inflation rather than several individual forecasts. Dimension reduction techniques are used to extract the common information contained in the experts' forecasts in order to produce a consensus forecast and to reveal the level of disagreement between the different forecasters.

It is well known that the combination of forecasts improves forecasting accuracy by taking advantage of the availability of information from multiple sources. Since Bates and Granger's (1969) seminal article, we have seen the development of many combining methods, ranging from the simple average to the most recent alternatives, such as dimension reduction techniques (more information on this topic can be found in Aiolfi, Capistrán and Timmermann (2011), Timmermann (2006) and Newbold and Harvey (2002), among others).

In Mexico, there are two surveys of professional forecasters (SPF): the first one conducted by the central bank of Mexico and the second one by Banco Nacional de Mexico (BANAMEX) (the second largest private bank in Mexico). Since the central bank survey is not publicly available, our forecasts of Mexican inflation are based on data provided by BANAMEX twice a month since 2007. This survey provides regular forecasts of macroeconomic variables relating to investment and production. Here, we only consider one-period-ahead forecasts of monthly inflation from 2007 to 2011. After the first forecast of each month is given, forecasts are revised in response to new information from one survey to the next, thus providing two forecasts for the same month. We have few observations, so the so-called "forecast combination puzzle" (the fact that the sample average of forecasts gives better forecasting results than more sophisticated weighting schemes) might arise. See, for instance, Smith and Wallis (2009) and Aiolfi, Capistrán and Timmermann (2011). We would like to suggest forecast combination procedures that might work better in situations in which the sample is quite short. Our assumption is also that the second forecast is more accurate than the first since it has information about the measured inflation for the first half of the month. Thus there is no need to use mixed frequency methods (such as MIDAS; see, for instance, Ghysles et al., 2004) in which we could combine higher frequency forecasts (biweekly in our case), since we can replace the inflation forecast for the first half of the month by its actual measurement. The following section explains the data provided by this SPF in detail.

There are some papers related to this one; for instance, Poncela and Senra (2006) used two principal

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components to combine United States inflation forecasts and related the second component to the level of expected inflation. The papers by Capistrán and López-Moctezuma (2010a and 2010b) are also related to forecasting of Mexican inflation, but they used the monthly SPF conducted by the central bank of Mexico and their objective was quite different from ours. In their first paper, the main concern was to show that the consensus forecast of a set of macroeconomic variables, among them inflation, does not pass tests of unbiasedness, lack of serial correlation and efficient use of available information. The second paper studies the extent to which information available to forecasters is incorporated efficiently into forecasts of inflation and GDP growth.

The remainder of this paper is organized as follows. Section II introduces the notation used throughout the study and presents information relating to the treatment of missing data, as well as the panel structure of the SPF. Section III outlines the dimension reduction techniques used here to produce a single forecast; while section IV presents the results of applying those techniques to the Mexican data and, lastly, section V presents some concluding remarks.

# II

## Notation and preparation of data

In the following calculations, $p_\tau$ denotes percentage inflation through biweekly variation in the consumer price index (b*CPI*) for $\tau = 2t\text{-}1, 2t,$ where $t = 1, \ldots, T$ indexes months, that is, $p_\tau = 100(\text{bCPI}_\tau - \text{bCPI}_{\tau\text{-}1})/\text{bCPI}_{\tau\text{-}1}$, while monthly percent inflation, $\pi t = 100(\text{CPI}_t - \text{CPI}_{t\text{-}1})/\text{CPI}_{t\text{-}1}$, is based on the monthly *CPI* given by $CPI_t = (\text{b}CPI_{2t\text{-}1} + \text{b}CPI_{2t})/2$. The official inflation figures are released by the National Statistical Institute in charge of calculating the *CPI* by the 9th of each month, for the previous month and by the 24th for the first half of the month. The official figures of $\pi t$ and $p_\tau$ are available at the website: www.inegi.org.mx.

The survey provides predictions of several macroeconomic variables, but we focus on percent inflation predictions made by each of $i = 1, \ldots, N$ experts: the inflation forecast for the first half of the month, $y_{i,\tau|\tau-1}$, and two inflation forecasts, $z_{i,t|\tau}$, which differ according to the time when they are obtained and the information used by the forecasters. To highlight this difference, the notation used for the monthly inflation forecasts $z_{i,t|\tau}$ is as follows: the first subindex $t$ is measured in monthly units while the second one, $\tau$, is measured on a biweekly basis. The three inflation forecasts are obtained as follows: (i) around the 20th of each month (three or four days before the figure for the first half of the month is published), the experts provide an inflation forecast for the first half of that month. Hence, the information up to the second half of the previous month is available to the experts and we denote such a forecast as $y_{i,2t\text{-}1|2(t\text{-}1)}$. At the same time, the experts predict monthly inflation for the current month, which we call the Monthly 1 prediction and denote as $z_{i,t|2(t\text{-}1)}$. Then, (ii) around day six of each month (again three or four days before the official monthly figure is released) the experts provide another monthly inflation prediction for the previous month, say Monthly 2 prediction, and call it $z_{i,t|2t\text{-}1}$.

The forecasts (either for the first half or for the whole month) are always conditioned on information relating to the previous half month and the forecast generation scheme can be seen in table 1. Thus, the SPF provides forecasts for the first half of each month, $y_{i,2t\text{-}1|2(t\text{-}1)}$, as well as monthly predictions $z_{i,t|2(t\text{-}1)}$ and $z_{i,t|2t\text{-}1}$ for months $t = 1, \ldots, T,$ with $T = 60$ (covering the period January 2007-December 2011) and $N = 18$ experts. The number of experts participating in the survey has changed over the years, but there have been approximately 18 regular respondents in each survey (this study does not consider experts who have left the group or those who have entered recently).

Since the original survey database has missing values for all experts at different dates, we decided to employ a systematic estimation procedure to fill in the gaps. In order to check for the sensitivity of results we proposed two different procedures, each of these was selected with the criteria that: (i) it makes use only of the historical record of predictions for the expert in consideration and (ii) it takes into account some salient features of the observed data. The procedure that comes to mind is the easy-to-use optimal missing estimation procedure contained in the Time Series Regression with ARIMA Noise, Missing Observations and Outliers (TRAMO) program (see Gómez and Maravall, 1996), available at the Bank of Spain website. However, this procedure does not satisfy the aforementioned criterion

TABLE 1

**Inflation forecasting scheme for the first half of the month and the whole month provided by expert *i***

| Period | | Percent inflation predictions | | | Prediction made on the... |
|---|---|---|---|---|---|
| Month | Half month | First half | Whole month | | |
| T | τ | $y_{i,2t\text{-}1\mid 2(t\text{-}1)}$ | $z_{i,t\mid 2(t\text{-}1)}$ | $z_{i,t\mid 2t\text{-}1}$ | |
| 1 | 1 | $y_{i,1\mid 0}$ | $z_{i,1\mid 0}$ | - | 20th of month 1 |
| | 2 | - | - | $z_{i,1\mid 1}$ | 6th of month 2 |
| 2 | 3 | $y_{i,3\mid 2}$ | $z_{i,2\mid 2}$ | - | 20th of month 2 |
| | 4 | - | - | $z_{i,2\mid 3}$ | 6th of month 3 |
| … | … | … | … | … | … |
| T | 2T-1 | $y_{i,2T\text{-}1\mid 2(T\text{-}1)}$ | $z_{i,T\mid 2(T\text{-}1)}$ | - | 20th of month T |
| | 2T | - | - | $z_{i,T\mid 2T\text{-}1}$ | 6th of month T+1 |

*Source:* prepared by the authors.

(i) and its application was therefore discarded. The first procedure we use is based on the fact that the series of predictions for all the experts do not show a trend, as can be seen in figure 1 for the case of a particular expert (BANAMEX). Thus, the series' first differences can be considered reasonably constant over time, so that the average of past differences provides a reasonable estimate of the current difference for the respective prediction, be it monthly or biweekly. Hence, for the first monthly prediction of the whole month we have

$$z_{i,t\mid 2(t-1)} - z_{i,t-1\mid 2(t-1)-2} = \sum_{j=1}^{t-2} \frac{z_{i,t-j\mid 2(t-j)-2} - z_{i,t-1-j\mid 2(t-j-1)-2}}{t-2} \quad (1)$$

so that the prediction for month t, given data up to time 2(t-1), is given by

$$z_{i,t\mid 2(t-1)} = z_{i,t-1\mid 2(t-1)-2} + \frac{\left(z_{i,t-1\mid 2(t-1)-2} - z_{i,1\mid 0}\right)}{\left(t-2\right)} \quad (2)$$

and for the second monthly prediction we get

$$z_{i,t\mid 2t-1} = z_{i,t-1\mid 2(t-1)-1} + \frac{\left(z_{i,t-1\mid 2(t-1)-1} - z_{i,1\mid 1}\right)}{\left(t-2\right)} \quad (3)$$

Similarly, for a first half of the month prediction we have

$$y_{i,2t-1\mid 2(t-1)} - y_{i,2(t-1)\mid 2(t-1)-1} = \sum_{j=1}^{2(t-1)-1} \frac{y_{i,2t-1-j\mid 2(t-1)-j} - y_{i,2(t-1)-j\mid 2(t-1)-1-j}}{2\left(t-1\right)-1} \quad (4)$$

this leads us to

$$y_{i,2t-1\mid 2(t-1)} = y_{i,2(t-1)\mid 2(t-1)-1} + \frac{\left(y_{i,2(t-1)\mid 2(t-1)-1} - y_{i,1\mid 0}\right)}{2\left(t-1\right)-1} \quad (5)$$

The second procedure arises from inspection of the autocorrelation structure of the official inflation figures. There we see that a seasonal difference of order 12 is required to render the series approximately stationary. Then, since the predictions try to resemble the official figures, we assume the series of predictions of all the experts share the same order of integration. Hence, we use the following expressions to estimate missing values of first and second monthly predictions

$$z_{i,t\mid 2(t-1)} = z_{i,t-12\mid 2t-26} + \sum_{j=1}^{t-13} \frac{\left(z_{i,t-j\mid 2(t-j)-2} - z_{i,t-12-j\mid 2(t-j)-26}\right)}{\left(t-13\right)} \quad (6)$$

and

$$z_{i,t\mid 2t-1} = z_{i,t-12\mid 2t-25} + \sum_{j=1}^{t-13} \frac{\left(z_{i,t-j\mid 2(t-j)-1} - z_{i,t-12-j\mid 2(t-j)-25}\right)}{\left(t-13\right)} \quad (7)$$

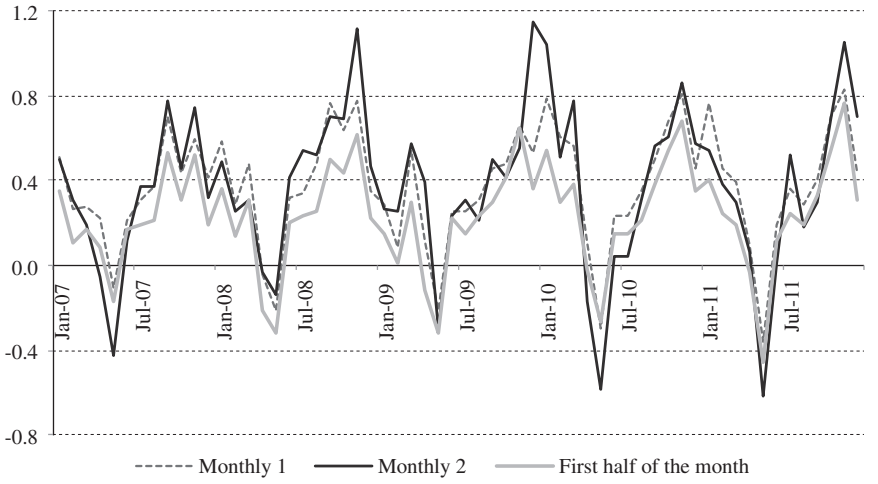
which are valid for $t = 14, \ldots, T$. Similarly, the estimate of a missing prediction for the first half of the month is given by

$$y_{i,2t-1\mid 2(t-1)} = y_{i,2t-13\mid 2t-14} + \sum_{j=1}^{t-7} \frac{\left(y_{i,2(t-j)-1\mid 2(t-j-1)} - y_{i,2(t-j)-13\mid 2(t-j)-14}\right)}{\left(t-7\right)} \quad (8)$$

for $t = 7, \ldots, T$, with the sum equal to *0* if $t = 7$. When the previous expressions cannot be calculated (for $t < 7$), we replaced the missing values with the official figures. An example of the application of method 2 appears in figure 1, where the following missing values were estimated: the first monthly predictions for December 2007 and October 2011; the second monthly predictions for April 2008, December 2008, December 2009 and December 2010; and the first-half-of-the-month predictions for December 2007 and October 2011. In fact, the observations may be said to be missing for all the experts because the survey was not sent out on those dates, for different reasons. Thus, strictly speaking, they are not missing values.

FIGURE 1

**First and second monthly forecasts (monthly 1 and monthly 2) and forecasts for the first half of the month**
*(Percentages)*




*Source:* prepared by the authors.

It is interesting to note that inflation forecasts for the second half of each month, say $y_{i,2t|2t-1}$, can be derived from the monthly forecasts $z_{i,t|2t-1}$, since at the time this forecast is made, the official biweekly inflation figure for the first half of the month, $p_{2t-1}$, is already available. In the annex we show how these forecasts are derived. However, it should be clear that a prediction for the second half of each month does not really add more information to that in table 1, since it is derived from the second monthly prediction.

### Panel data analysis

As mentioned above, the SPF data used in this paper have a panel structure, with 18 individual units —the experts— and 60 time periods, that is, their monthly forecasts (or those for the first half of the month) from January 2007 to December 2011. We can exploit the panel data structure to decompose the prediction made by the expert $i$ at time $t$ in several components. Focusing on the monthly predictions, we can write

$$z_{i,t|\tau} = z_i + z_t + \varepsilon_{i,t|\tau} \quad (9)$$

where $\tau = 2(t-1)$ for the first monthly forecasts and $\tau = 2t-1$ for the second ones.

The first component, $z_i$, represents the time-invariant individual effect. It captures the intrinsic characteristics of expert $i$ and can be written as

$$z_i = \frac{1}{T}\sum_{t=1}^{T} z_{i,t|\tau} \quad (10)$$

for $i = 1,\ldots,N$. It captures the average level of the predictions made by forecaster $i$ over the sample period. The second component, $z_t$, is an individual-invariant aggregate effect that captures the common dynamics

of the predictions provided by the experts. It can be written as

$$z_t = \frac{1}{N}\sum_{i=1}^{N}\left(z_{i,t|\tau} - z_i\right) \qquad (11)$$

for $t = 1,\ldots, T$. This component averages across experts the predictions provided by all of them for period $t$, once the individual effects have been eliminated. The third component is an error term given by $\varepsilon_{i,t|\tau} = z_{i,t|\tau} - z_i - z_t$. It has both time and individual variation, representing the part of the forecast that cannot be isolated either as a time-invariant effect or as an individual-invariant effect.

The individual (time-invariant) effect and the aggregate (individual-invariant) effect are orthogonal by construction. The error term is the residual of the projection of $z_{i,t|\tau}$ into these components, and thus, it is orthogonal to them. The orthogonality of the components allows the variance of the forecast $z_{i,t|\tau}$ to be written as the sum of the variance of each component. This decomposition provides information about the contribution of the individual-specific effects and the common beliefs of the experts to the total variance. The panel decomposition can also be applied to the forecast errors, with analogous interpretation of the components. Taking into account the patterns of the predictions, we have performed this decomposition for the forecast errors. The results are shown in table 2. We show the total variance of the forecast errors, for the two imputation methods we use, for the first monthly predictions (columns 1 and 2) and for the second monthly predictions (columns 3 and 4). We also show the percentage contribution of the individual, aggregate and residual components to this variance.

As expected, the variance of the forecast errors is lower in the second monthly prediction than in the first one, since the experts have more information when they do the second forecast. Regarding the panel decomposition, it is clear that the individual effect does little to explain the total variance of the forecast errors. The most important component is the aggregate effect. The most relevant feature of these results is the information they provide on the potential usefulness of the different forecast combination schemes. In the second monthly predictions, the contribution of the aggregate effect to the variance of the forecast error is lower than in the first ones. In terms of the variance of the forecast, this means that the contribution of the aggregate effect is higher in the second monthly prediction than in the first one. Thus, in the second case almost all of the variability of the forecasts comes from common beliefs, from the commonality among experts, represented by the aggregate effect. We would expect that simple combination schemes, such as the average or the median would perform well. In the first monthly predictions, the contribution of the aggregate effect is higher in the forecast error (i.e., lower in the forecast) and thus, more sophisticated combination schemes, such as the dimension reduction techniques shown in the next section, may have a chance to surpass the simple methods.

TABLE 2

**Panel decomposition of the variance of the forecast errors**

| | Forecast error from | | | |
|---|---|---|---|---|
| | First monthly prediction $\pi_t - z_{i,t\|2(t-1)}$ | | Second monthly prediction $\pi_t - z_{i,t\|2t-1}$ | |
| | Imputation method 1 | Imputation method 2 | Imputation method 1 | Imputation method 2 |
| Total variance | 0.044 | 0.042 | 0.025 | 0.026 |
| Contribution to the total variance of the forecast error (*percentage*) | | | | |
| Individual effect | 1.08 | 1.12 | 2.54 | 0.55 |
| Aggregate effect | 77.29 | 78.21 | 55.52 | 74.35 |
| Residual term | 21.63 | 20.67 | 41.94 | 25.10 |

*Source:* prepared by the authors.

# III

## A summary of dimension reduction techniques

Dimension reduction techniques were introduced for forecast combination by Poncela and Senra (2006) and extended in Poncela and others (2011). The key insight is to see the forecast combination as a way to reduce the dimension from $N$ (the number of forecasters at each period of time) to a single one. This can be done in two steps: in a first step, reduce the number of individual forecasts to just $r \geq 1$ linear combinations of them. Each linear combination is formed as

$$f_{js} = w_{js}'x_s, \qquad j = 1,\ldots, r \tag{12}$$

where $w_{js}$ is the weighting vector for the $j$-th linear combination for forecast period $s$ and $x_s = (x_{1,s}, \ldots, x_{N,s})'$ is the $N$-vector of forecasts for time period $s$ with any of the three possible types of forecasts available within the survey. That is, $x_{i,s}$ could be equal to $y_{i,2t-1|2(t-1)}$ if we work with forecasts made for the first half of the month with data up to the previous month; $z_{i,t|2(t-1)}$ if we use the monthly forecasts at $t$ with data up to the previous month; or $z_{i,t|2t-1}$ if we are interested in the previous biweekly forecast of the present month.

In a second step, regress the linear combinations on previous known data of the type to be forecasted, where we can add an intercept for bias correction. In the present case, we used just one linear combination, $r = 1$, since there is a large commonality among forecasters (all of them try to forecast inflation for a certain period), and that is what we want to pick up through dimension reduction techniques. Besides, this choice was also empirically supported by an analysis with up to three components aimed at finding out which option provided the minimum root mean square error (RMSE) forecast. Then,

$$\pi_{s-1} = \beta_0 + \beta_1 f_{s-1} + e_{s-1} \tag{13}$$

where the coefficients are estimated by ordinary least squares (OLS), with observed data up to period $s-1$ in order to generate a true ex-ante forecast for period $s$. When the variable to be predicted and its forecasts are non-stationary they must be co-integrated as we emphasized when presenting imputation method 2.

With regard to the dimension reduction techniques in the first step of our procedure, we used the following: principal components (PC), both static and dynamic factor models (FM) and partial least squares (PLS). The main difference between PC and PLS is that the former do not take into account the variable to be forecasted when reducing the dimension of the problem to form the linear combination, while the last ones do. A brief review of these methods is given below.

### 1. Principal components

Let $z_s$ be an $N\times 1$ vector of random variables such that $\text{var}(z_s) = S$ for all $s = 1, 2,\ldots, T$. The first principal component (PC) is defined as the linear combination given by the weighting vector $w = (w_1,\ldots, w_N)'$ such that $w$ is the maximizer of $w'Sw$ subject to $w'w = 1$. A non-stationary PC was proposed by Lee and Carter (1992).

### 2. Factor models

Poncela and others (2011) demonstrated that simple factor models (FMs) are better suited for forecast combination than more complicated factor schemes, probably because the number of parameters estimated to form the weights for the combination is lower than in more complex factor alternatives. In particular, they found that static FMs performed quite well. When there is one factor, we decompose the $x_s$ vector as the sum of two orthogonal components: a common factor $f_s$ plus an idiosyncratic error $\eta_s$, as

$$x_s = Pf_s + \eta_s \tag{14}$$

where $P$ is the $(N\times 1)$ factor loading matrix and $Q = \text{var}(\eta_s)$ is a diagonal matrix.

In dynamic FMs both the common and idiosyncratic components can exhibit dynamic behaviour. We assume auto-regressive (AR) processes for both the common factor and the idiosyncratic component. In other words, the equation for the common factor is

$$\phi(B)f_s = u_s \tag{15}$$

where $\phi(B) = 1 - \phi_1 B - \ldots - \phi_p B^p$ with $B$ the backshift operator, $p < \infty$ and the error $u_s$ comes from a white noise process. The equation for the idiosyncratic components is

$$\Phi(B)\eta_s = v_s \tag{16}$$

where $\Phi(B) = I - \Phi_1 B - \ldots - \Phi_q B^q$ is a diagonal polynomial matrix with $q < \infty$ and $v_s$ comes from a multivariate white noise process with diagonal variance matrix $R = \text{var}(v_s)$. If in dynamic FMs, the idiosyncratic component is white noise, the model is of the type given in Peña and Box (1987). In that case, the variance-covariance structure of the data is

$$C(k) = E(x_s - \mu_x)(x_{s-k} - \mu_x)' = E(f_s - \mu_f)(f_{s-k} - \mu_f)PP' \tag{17}$$

where $\mu_x = E(x_s)$ and $\mu_f = E(f_s)$. Then, the factor loading vector $P$ is associated with the non-zero eigenvalue of the lagged covariance matrices and it is the same for all non-zero lags. If the idiosyncratic components are not white noises, the above decomposition is only approximate. We shall denote this type of FMs by L1FM in the forecasting exercise. This model was extended to the non-stationary case by Peña and Poncela (2004 y 2006) and Lam, Yao and Bathia (2011), while seasonal dynamic FMs were analysed in Alonso and others (2011).

### 3. Partial least squares

The first partial least squares (PLS) component is built by projecting each forecast in the direction of the observed variable (inflation in our case). The goal is to explicitly take into account the variable being forecast when forming the pooled forecast. In fact, PLS regression analysis assumes that both the $X$ variables (inflation forecasts in our case) and the response variable $Y$ (that is, the variable being forecast) depend on latent variables that are related. Recall that $x_s$ is the $N$-vector of forecasts for period s and the response is measured inflation $\pi_s$. Then,

$$x_s = Pl_s + u_s \tag{18}$$

$$\pi_s = Qm_s + v_s \tag{19}$$

where $P$ and $Q$ are the loadings, $l_s$ and $m_s$ are the latent variables, and $u_s$ and $v_s$ are the error terms. The first PLS component is obtained by projecting the mixed products between the variable being forecasted and the forecast themselves, $\sum_s \pi_s x_{i,s}$, in the direction of the forecasts.

# IV
# Analysis of the forecasting results

This section presents some of the most important results obtained during a forecasting exercise that mimics a real-time forecasting application with a recursive factor and a parameter estimation. The available predictions cover the period January 2007 through December 2011 (60 months). We decided to start the estimation with 36 pre-sample values and obtained one-step-ahead predictions recursively from there on, so that a forecasting sample of 24 values was used in the exercise. Since the first PC accounts for 89% of total variation and the second PC increases this amount only by 2 percentage points, we decided to use only one component in the combining methods.

For comparative purposes, we also used two common methods for combining forecasts: OLS and the bias corrected mean (BC_mean) of the forecasts at each period $s$. The OLS forecast combination is found by fitting the multiple linear regression model

$$\pi_s = c + \beta' x_s + e_s \tag{20}$$

where the estimated coefficients found with data up to period s were used to form the true ex ante forecast combination at $s+1$. Similarly, to obtain the BC_mean of the forecasts, we fitted the simple linear regression model

$$\pi_s = c + \beta\overline{x_s} + e_s \tag{21}$$

imposing $\beta = 1$, where $\overline{x_s} = \frac{1}{N}\sum_{i=1}^{N} x_{i,s}$ is the average forecast at time s. The benchmark methods for the

comparisons below are the median and the average of the forecasts.

The results shown in table 3 correspond to the first monthly predictions with missing data imputed with either of the two methods described before. ME denotes the mean prediction error that allows us to appreciate potential biases in the prediction method; RMSE is the root mean square error employed as a measure of absolute precision, since it is expressed in the same units of the inflation rate; and Theil's U is used to establish comparisons of relative precision against the average prediction, considered as the benchmark since it is the simplest combining method. We used precision as the main measure to qualify the predictions and it can be seen that, with $N = 18$, the second imputation method is only slightly better than the first imputation method, so that the imputation method is not really that important. Then, since five experts had up to 20% missing first monthly predictions and up to 35% missing second monthly predictions, we used only the 13 remaining experts for this exercise. In the rightmost part of table 3, we report the results pertaining to $N = 13$, where it becomes clear that reducing the number of experts does not affect the conclusions that can be obtained with the second method of imputation and $N = 18$.

Some conclusions from table 3 follow. According to the MEs, there is no important bias in any of the combining methods. In fact, the signal to noise ratio $|\sqrt{24}\text{ME}/\text{RMSE}|$ similar to a $|t|$ statistic lies in (0.77, 1.40) for the first method of imputation and $N = 18$, in (1.17, 1.40) for the second method of imputation and $N = 18$, and in (0.98, 1.40) for $N = 13$. The highest of these ratios is always obtained with the average, irrespective of the method of imputation or the number of experts used. The RMSEs and Theil's U statistics point towards the combining methods (PC, FM, L1FM and PLS) as the best in terms of accuracy when using the second method of imputation and to OLS when using the first one. As a result, we decided to use the simplest combining method, that is, PC.

As a complement of table 3, we present figure 2 where we can visually appreciate the performance of the combined prediction, as well as the corresponding prediction errors. In this figure, it is clear that there are no systematic patterns present in the prediction errors and that the behaviour is similar whether inflation goes up or down, although it seems that the combined prediction tends to exaggerate in the lowest and highest episodes of inflation. The level and variance of the prediction errors are reasonably stable, showing no evidence of inadequacy.

As with the previous exercise, in table 4 and figure 3, we provide a summary of the results for the combination of second monthly predictions (with missing data imputed with methods 1 and 2). Table 4 reveals that, in general, the MEs are smaller than those in table 3 so that, again, none of the combining methods induce important biases. The RMSEs are also smaller in general than those in table 3 (in a ratio of about 11:18, except for the OLS method, whose performance is poor in comparison with the others), indicating that the combined second monthly predictions are more accurate than the previous ones. This

TABLE 3

**First monthly forecasting results[a]**

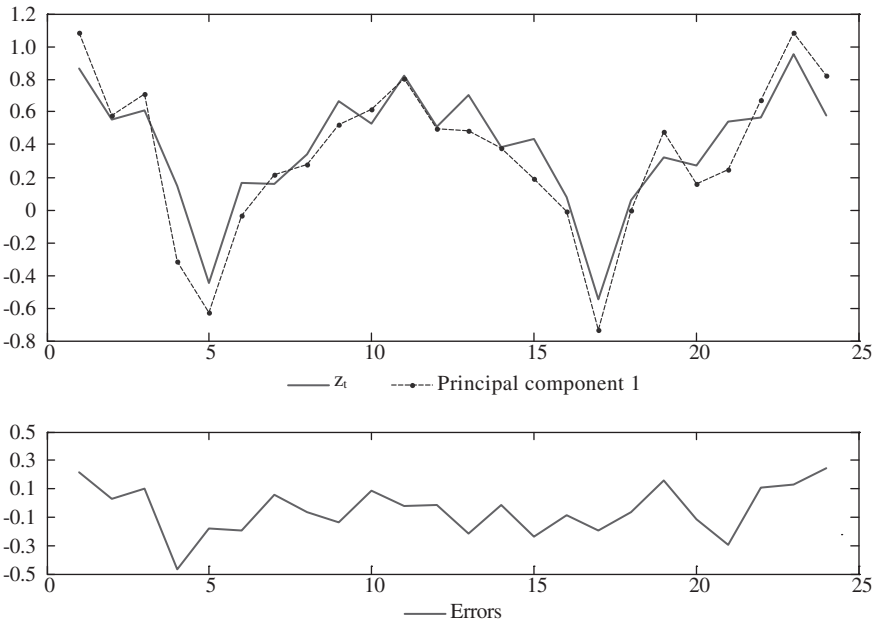
| Experts | Imputation method 1 | | | Imputation method 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | $N^b = 18$ | | | $N^b = 18$ | | | $N^b = 13$ | | |
| Combining methods | ME | RMSE | Theil's U | ME | RMSE | Theil's U | ME | RMSE | Theil's U |
| Principal components | -0.03 | 0.19 | 0.80 | -0.05 | 0.18 | 0.73 | -0.04 | 0.18 | 0.75 |
| Factor models | -0.04 | 0.19 | 0.76 | -0.05 | 0.18 | 0.73 | -0.05 | 0.18 | 0.74 |
| L1FM | -0.03 | 0.19 | 0.79 | -0.05 | 0.18 | 0.73 | -0.04 | 0.18 | 0.74 |
| Partial least squares | -0.04 | 0.19 | 0.78 | -0.05 | 0.18 | 0.72 | -0.04 | 0.18 | 0.75 |
| OLS | -0.05 | 0.18 | 0.72 | 0.06 | 0.23 | 1.25 | 0.04 | 0.20 | 0.91 |
| Bias corrected_mean | -0.04 | 0.21 | 0.98 | 0.06 | 0.21 | 1.00 | -0.04 | 0.21 | 1.00 |
| Median | -0.05 | 0.21 | 0.95 | -0.05 | 0.21 | 1.00 | -0.05 | 0.20 | 0.97 |
| Average | -0.06 | 0.21 | - | -0.06 | 0.21 | - | -0.06 | 0.21 | - |

*Source:* prepared by the authors.

[a] Based on information up to the previous month. Forecasting sample = 24.
[b] $N$ = number of experts under consideration.
RMSE: root mean square error.
ME: mean forecast error.
OLS: ordinary least squares.

FIGURE 2

**First monthly combined predictions obtained with principal components**
*(Percentages)*




*Source:* prepared by the authors.

happens mainly for the average and median combining methods, and the only combining method that surpasses the average is the median. On the other hand, figure 3 is clear in showing the closeness between the combined prediction —the median— and the observed inflation. Even the exaggeration that was evident in the combined first monthly predictions is substantially diminished when combining the second monthly predictions.

In summary, on the basis of tables 3 and 4, we may say that the choice of an imputation method is basically irrelevant when comparing the combining methods; nevertheless we prefer to use the second method because it allows us to see things a little bit more clearly. Besides, it does not make sense to discard the data from the five experts that exhibit more missing data than the others because the results of the combining procedures are robust to the presence of these experts (with their missing data imputed by the second imputation method, of course). With respect to the choice of a combining method it is clear that there is room for improvement on the average to combine the experts' predictions. On the one hand, the first monthly predictions are best combined by way of PC, which is chosen because it is easy to use and provides a reasonably simple interpretation of the combination employed. On the other hand, the second monthly predictions should be combined by way of the median, which is also a very simple and easy-to-use technique. These results are in line with the conclusions stemming from the panel decomposition shown in table 2: in short samples, when the contribution of the common beliefs to the total variance of the forecast is higher, the simple methods are more suitable than the multivariate dimension reduction techniques, since they do not convey the estimation of any parameters. On the contrary, when the contribution of the common beliefs to the total variance of the forecast error is higher, dimension reduction techniques seem to outperform simpler benchmarks.

To complement the previous analysis of forecast bias and precision we now focus on forecast accuracy. Table 5 presents Diebold-Mariano test statistics (see Diebold and Mariano, 1995) for the null hypothesis of no difference in the accuracy of two competing forecasts, that is, each one of the combining methods versus the average. Each calculated statistic should be compared with a standard, normal distribution in order to declare statistical significance. The test results for imputation method 2 are all significant at the 5% level for all the dimension reduction techniques, with a negative sign for the first monthly forecast and a positive sign for the second monthly forecast. Since the difference is given by d = forecast square error of the combining method-

TABLE 4

**Second monthly forecasting results[a]**

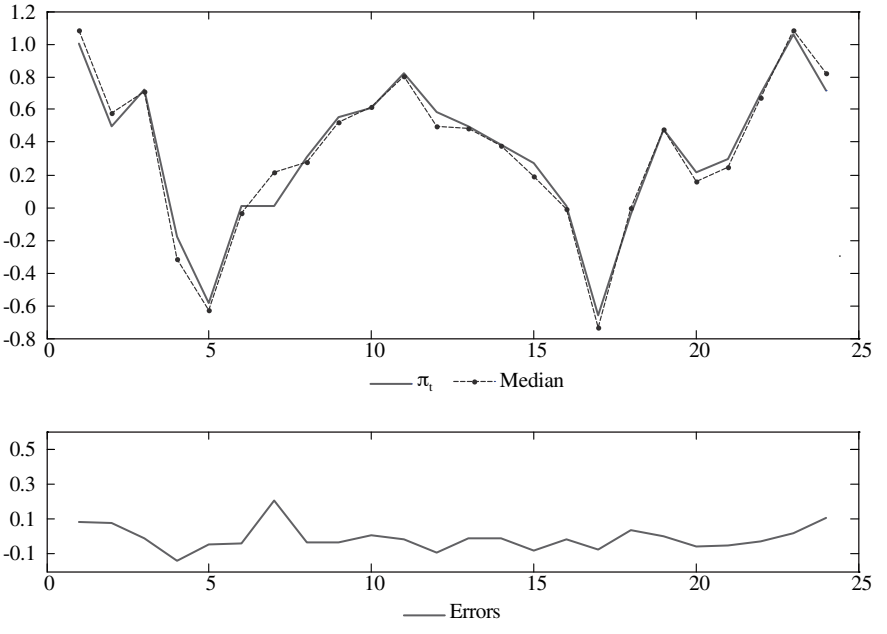
| Experts | Imputation method 1 | | | Imputation method 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | $N^b = 18$ | | | $N^b = 18$ | | | $N^b = 13$ | | |
| Combining methods | ME | RMSE | Theil's U | ME | RMSE | Theil's U | ME | RMSE | Theil's U |
| Principal components | -0.01 | 0.12 | 1.17 | -0.01 | 0.11 | 1.70 | -0.01 | 0.11 | 1.99 |
| Factor models | -0.01 | 0.11 | 0.99 | -0.01 | 0.10 | 1.45 | -0.01 | 0.10 | 1.92 |
| L1FM | -0.01 | 0.12 | 1.17 | -0.01 | 0.11 | 1.72 | -0.01 | 0.11 | 2.01 |
| Partial least squares | -0.01 | 0.12 | 1.17 | -0.01 | 0.11 | 1.70 | -0.01 | 0.11 | 1.92 |
| Ordinary least squares | -0.06 | 0.15 | 1.85 | -0.04 | 0.17 | 3.98 | -0.05 | 0.16 | 4.31 |
| Bias corrected_mean | -0.01 | 0.11 | 1.02 | -0.01 | 0.09 | 1.01 | -0.01 | 0.08 | 1.00 |
| Median | -0.02 | 0.10 | 0.78 | -0.01 | 0.07 | 0.67 | -0.01 | 0.07 | 0.89 |
| Average | -0.01 | 0.11 | - | -0.01 | 0.09 | - | -0.02 | 0.08 | - |

*Source:* prepared by the authors.

[a] Information up to the first half of the month. Forecasting sample = 24.
[b] $N$ = number of experts under consideration.
RMSE: root mean square error.
ME: mean forecast error.

FIGURE 3

**Second monthly combined with the median predictions**
*(Percentages)*




*Source:* prepared by the authors.

forecast square error of the average, the results can be interpreted as saying that, with the former forecast, such techniques provide a statistically significant improvement on forecasting accuracy over the average, while the opposite occurs with the latter.

Conversely, with imputation method 1, it is shown that significantly different accuracies occur only for the first monthly forecasts (at the 5% level, except for FM). Besides, the forecast accuracy of the other combining methods employed does not differ from that of the average at the 5% level, except in the case of the second monthly forecasts, where OLS is significantly less accurate than the average for both imputation methods and for the median, which is more accurate than the average at the 5.4% level. Again, these results provide empirical support for the use of reduction techniques for combining the first monthly predictions and for the use of the median for the second monthly predictions.

TABLE 5

**Diebold-Mariano test statistics for equal predictive accuracy of each combining method versus the average**[a]

| Combining methods | First monthly forecasts | | | Second monthly forecasts | | |
|---|---|---|---|---|---|---|
| | Imputation 1 | Imputation 2 | | Imputation 1 | Imputation 2 | |
| | $N^b = 18$ | $N^b = 18$ | $N^b = 13$ | $N^b = 18$ | $N^b = 18$ | $N^b = 13$ |
| Principal component | -2.26 | -2.29 | -2.24 | 1.79 | 2.19 | 2.18 |
| Factor model | -1.94 | -2.28 | -2.26 | 1.79 | 2.13 | 2.16 |
| L1FM | -2.21 | -2.31 | -2.26 | 1.80 | 2.20 | 2.20 |
| Partial least squares | -2.25 | -2.32 | -2.28 | 1.79 | 2.17 | 2.17 |
| OLS | -1.53 | 0.34 | -0.29 | 2.48 | 2.66 | 3.02 |
| Bias corrected_mean | -0.32 | -0.14 | -0.10 | 0.92 | 0.73 | -0.13 |
| Median | -0.95 | -0.01 | -0.80 | -1.89 | -1.93 | -1.40 |

*Source:* prepared by the authors.

[a] Forecasting sample = 24.
[b] $N$ = number of experts.
OLS: ordinary least squares.

# V
# Conclusions

The main purpose of this study is to show that the information on monthly inflation predictions provided by the SPF carried out by BANAMEX can be best exploited by means of reduction dimension and forecast combination techniques. In fact, two of the simplest techniques used here (PC and median) were shown to outperform the average and therefore also outperform each individual expert's predictions. To establish this fact we considered as the benchmark the average prediction, which is typically hard to beat by more sophisticated combining techniques.

The combined first monthly predictions are seen to be reasonably unbiased and precise, but the second monthly predictions are even better. This suggests that the experts do, indeed, incorporate the most recent information into their second predictions. This is corroborated by the fact that the second monthly predictions do not require an application of dimension reduction techniques in order to get the combined forecast, but just a simple median calculation. Moreover, we do not need to estimate any weighting vector when using the median. In the first survey, the heterogeneity among individuals could be the reason why optimal estimated weights give better forecasting results than assigning the same weight to all the forecasters (and therefore, treating the panellists as homogeneous). In the second survey, the homogeneity across forecasters is greater (as was demonstrated by the panel analysis). In this case, both the sample of forecasts and the median outperform the dimension reduction techniques. In this particular second survey, the median gave the best forecasting results.

**ANNEX**

Predictions for the second half of the month

To obtain the required forecast we first see that

$$\pi_t = 100\left[\frac{\left(bCPI_{2t-1}+bCPI_{2t}\right)/2-\left(bCPI_{2(t-1)-1}+bCPI_{2(t-1)}\right)/2}{\left(bCPI_{2(t-1)-1}+bCPI_{2(t-1)}\right)/2}\right]$$

so that

$$p_{2t} = \frac{\left(2\pi_t CPI_{t-1}-2p_{2t-1}bCPI_{2(t-1)}-p_{2(t-1)}bCPI_{2(t-1)-1}\right)}{\left(bCPI_{2t-1}\right)}.$$

Thus, for each expert $i = 1, \ldots, N$, we can get predictions for the second half of the month by means of

$$y_{i,2t|2t-1} = \frac{\left(2z_{i,t|2t-1}CPI_{t-1}-2p_{2t-1}bCPI_{2(t-1)}-p_{2(t-1)}bCPI_{2(t-1)-1}\right)}{\left(bCPI_{2t-1}\right)}$$

in such a way that we can obtain a biweekly time series of predictions for the first and second half of each month, that is, for $2t\text{-}1 = 1, 3, \ldots, 2T\text{-}1$, as well as for $2t = 2, 4, \ldots, 2T$.

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# Expectations and industrial output in Uruguay: Sectoral interdependence and common trends

*Bibiana Lanzilotta*

**ABSTRACT**

This paper examines the interdependence between expectations and growth by analysing Uruguayan manufacturing industry, divided for the purpose into four industry groupings differentiated by trade participation and production specialization. The study shows that there is a long-run relationship between industrialists' expectations and output growth in each grouping. In the most trade-oriented groupings the relationship is one of predetermination, showing how useful expectations are as a guide to sectoral growth. Expectations in the four industrial groupings are shown to follow a common long-run trend, identified with the one guiding the export grouping. Impulse-response simulations derived from a multisectoral vector autoregression (VAR) model confirm the important role of the industries most exposed to international competition in spreading shorter-term shocks.

**KEYWORDS** Industry, manufactured goods, industrial development, production specialization, industrial production, econometric models, Uruguay

**JEL CLASSIFICATION** E32, D84, C32

**AUTHOR** Bibiana Lanzilotta is a senior researcher at the Centre of Economic Research (CINVE) in Montevideo, Uruguay. bibiana@cinve.org.uy

# I
# Introduction

Both economic theory and applied research have demonstrated the importance of studying expectations as they relate to economic fundamentals and cyclical fluctuations. Empirical studies conducted in the past few years have stressed the influence of expectations in inducing and amplifying recent international fluctuations (Karnizova, 2010; Leduc and Sill, 2010; Patel, 2011, among others), advancing an argument that to financial economists appears indisputable (Conrad and Loch, 2011): macroeconomic fluctuations are not only a product of the current situation in an economy but are very frequently influenced by agents' expectations of future developments.

Expectation indicators developed from opinion polls, whether carried out among business people, consumers or experts, are now widely used for essentially two purposes: to explore the mechanisms whereby expectations are formed and to ascertain their predictive power. In their extensive review of this empirical literature, Pesaran and Weale (2006) show that a number of different approaches have been used to address many of these issues.

Those who have engaged with the subject, chiefly for the purpose of identifying and predicting changes in cyclical fluctuations, include Svensson (1997), Berk (1999), Pesaran, Pierse and Lee (1993), Rahiala and Teräsvirta (1993), Smith and McAleer (1995), Kauppi, Lassila and Teräsvirta (1996), Öller (1990), Hanssens and Vanden Abeele (1987) and Alfarano and Milakovic (2010).

Authors such as Eusepi and Preston (2008), meanwhile, have shown the potential of disaggregated analysis for research into the genesis of cyclical fluctuations, focusing on the role of information disparities between agents linked by the production chain. Others (Long and Plosser, 1983; Blanchard, 1987; Durlauf, 1991; Caballero and Lyons, 1990) have emphasized various mechanisms whereby sectoral interactions in the formation of expectations —such as the build-up of small menu costs, disjointed decision-making and coordination failures— influence macroeconomic dynamics.

Although there is an extensive empirical literature on other economies, little research has been done on the subject in Uruguay. Because it is a small, open country, its economy has traditionally been subject to external shocks, particularly from its neighbours Argentina and Brazil. Those shocks have resulted in strong cyclical fluctuations and episodes of crisis, the last of which took place in the early 2000s. Despite this, only one study (Lanzilotta, 2006) is known to have addressed the role of expectations in generating economic fluctuations. That study revealed the influence of business expectations on overall economic activity, showing that the information they provided could be useful for predicting and anticipating cyclical fluctuations in Uruguay.

This paper follows on from Lanzilotta (2006), taking a predominantly empirical and exploratory approach. It examines the influence of Uruguayan industrialists' expectations on their own long-run performance, breaking down the sector into four groupings differentiated by their trade participation and production specialization. To investigate the relationship between the expectations of these four industry groupings and the spread of shocks between them, a dual procedure is followed, consisting of a long-run approach based on a cointegration analysis of expectations in the groupings, employing the procedure proposed by Johansen (1995) and Johansen and Juselius (1989), and the identification of common underlying trends through the estimation of multivariate structural time series models (Engle and Kozicki, 1993; Vahid and Engle, 1993), supplemented by analysis of the dynamics of the short-run transmission of expectation shocks using a multisectoral vector autoregression (VAR) model.

The empirical analysis makes use of the expectation measurements collected by the Chamber of Industry of Uruguay (CIU) and industrial production indicators from the Monthly Survey of Manufacturing Industry conducted by the National Institute of Statistics (INE). Monthly data from January 1998 to July 2011 are considered.

The findings show that the trend of industrialists' expectations tends to be tracked by sectoral production. In the most trade-oriented industry groupings the relationship is one of predetermination, showing how useful these indicators are for predicting growth in the sector. This common trend is identified with the one guiding the evolution of expectations in the export-oriented grouping, and expectations in the other groupings all depend on it to some degree. Lastly, impulse-response simulations derived from a multisectoral VAR model confirm the important role of the industries most exposed to international competition in spreading shocks in the short term.

This document is organized as follows. Sections II and III outline the conceptual approach and methodology, respectively. Section IV discusses the advantages and drawbacks of using expectation indicators compiled from surveys (on which the empirical analysis is based). Section V presents the data and the proposed industry breakdown. Section VI characterizes the industry groupings defined previously. Section VII presents the findings (empirical evidence), and conclusions are drawn in Section VIII. There are two annexes.

# II

## Expectations and production dynamics

The process whereby expectations are formed has been a key element in the study of economic problems in which agents must predict unknown variables.

Much of the most recent empirical research on expectations has refocused on the possibility that they may be a relevant factor in explaining business cycles. Authors such as Beaudry and Portier (2006) have found that in the United States economy, share prices are predictors of total factor productivity growth and financial booms are accompanied by a broad economic expansion. Karnizova (2010) has put forward a model to explain fluctuations caused by expectations, incorporating what she calls the intrinsic desire for wealth accumulation. Other authors (Eusepi and Preston, 2008) have developed a theory of fluctuations driven by expectations based on learning, with agents possessing incomplete information. Using a neoclassical model, Floden (2007) has shown that excessive optimism about future productivity can lead to immediate economic expansions (on the assumption of variable capacity utilization). Li and Mehkari (2009) have presented a model incorporating endogenous product creation, and Patel (2011) has studied the effect of investors' expectations on their investment decisions, finding that they are particularly important in contexts of poor-quality or limited information on assets.

Several studies with different approaches have stressed the importance of sectoral interactions in the transmission of shocks over time. In the literature on real business cycles, the importance of sectoral interactions is linked, for example, to the possibility that various types of agents, with rational expectations and interrelationships in the production chain, may have differing information, with this being reflected in dynamic responses to shocks affecting the economy. From another perspective, there has been discussion of the role of sectoral interactions and their influence on macroeconomic dynamics through mechanisms such as cost adjustments resulting from factors that may include the cumulative effects of small menu costs at the individual level, disjointed and unsynchronized decision-making and coordination failures. For example, Long and Plosser (1983) have analysed the spread of shocks between sectors via the production and use of intermediate inputs, Gordon (1981) and Blanchard (1987) have suggested that decisions taken in an industrial sector are influenced by price or production signals in other sectors located up- or downstream in the production chain, while Durlauf (1991) and Caballero and Lyons (1990) have shown how sectors influence one another through technological complementarities.

Beaudry and Portier (2007) argue that although expectations are often singled out as a factor that helps explain fluctuations, interactions can only be observed from a disaggregated sectoral analysis, i.e., a more detailed representation of the economy than macroeconomic models can provide. This influence arises because of production complementarities between the various sectors of the economy.

Lee and Shields (2000) elaborated on previous work by Lee and Pesaran (1994), Lee (1994) and Lee, Pesaran and Pierse (1992) to develop an intersectoral VAR model for industrial production in the United Kingdom which uses direct measurements of expectations (gathered by the Confederation of British Industry). The authors found that these data provided invaluable information on the role of expectations and could be used to identify the sources of persistent effects from shocks and the mechanisms whereby these effects were transmitted across sectors and over time.

This paper analyses the importance of business expectations in predicting industrial production, on the basis of previous studies for Uruguay (Lanzilotta, 2006) showing that these are a valuable input for a leading indicator of overall activity. Breaking industry down into broad groupings reveals some aspects of the interplay between expectations and production that would not otherwise come to light (Beaudry and Portier, 2007; Eusepi and Preston, 2008).

# III
## The methodological framework

The methodology used by Lee and Shields (2000), which is based on econometric VAR methods, and the cointegration approach proposed by Johansen (1995) have been adopted to study interactions in the formation of expectations and those between expectations and the level of output in each industry grouping.

Impulse-response functions derived from the models estimated are analysed in all these cases. These functions, calculated from the reduced-form VAR errors, represent the combined effect of all the primary shocks that might affect a variable. As Stock and Watson (2001) point out, given that the endogenous variables in VAR models are usually correlated, so too are the error terms of the different reduced-form VAR equations.

Recursive model estimation has been one way to solve the problem of error correlation in VAR models. This methodology yields residuals that are intercorrelated between equations, so that the impulse-response function is calculated using impulses that are mutually orthogonal. The results will depend on the order in which the variables have been incorporated into the VAR, so that changing this order can yield different results. The order of the variables should not therefore be left to chance. The criterion followed here will be the one established by Litterman (1980), who ordered the variables by their degree of exogeneity (from most to least exogenous). This is a widely used process which consists in attributing the entire effect of any common component to the variable first specified in the VAR model. Operationally, it means that variables should be sorted from highest to lowest relative exogeneity.

Lastly, common trends among expectations are identified by estimating multivariate structural models, following Engle and Kozicki (1993) and Vahid and Engle (1993). Annex I describes the econometric methods applied.

# IV
## Indicators of expectations

The use of indicators that represent agents' expectations as ascertained from surveys is widespread in countries with advanced statistical systems. The latest global economic crisis has shown the need for timely economic data and the difficulty of anticipating the future. The fact that opinion poll data become available fairly swiftly, usually in advance of official quantitative statistics, means they have enormous potential for decision-makers seeking to analyse the economic outlook (Remond-Tiedrez, 2005). Timeliness is an important dimension of the quality of statistical information, and data from surveys of business and consumer expectations usually possess this.

Indicators of expectations have been widely used in the applied literature to capture and anticipate movements in an array of variables, such as interest rates, unemployment and prices, and to shed light on the formation of expectations and business planning. The questions that empirical studies on expectations seek to answer include: (i) What is the nature of expectations? (ii) How are they formed and to what extent do people learn from experience? (iii) What is the relationship between the standard assumptions of economic theory and the formation of expectations in practice? (iv) How much can data on expectations improve the performance of conventional prediction methods? For a review of this literature, see Pesaran and Weale (2006).

The empirical literature contains numerous examples where the object of study is statistics on expectations and their usefulness for predicting and detecting changes in cyclical fluctuations. Svensson (1997) and Berk (1999) examined the measurement of expected inflation, while Pesaran, Pierse and Lee (1993), Rahiala and Teräsvirta (1993), Smith and McAleer (1995), Kauppi, Lassila and Teräsvirta (1996), Öller (1990) and Hanssens and Vanden Abeele (1987) focused on production growth, and Batchelor (1982) considered employment. Authors such as Batchelor (1982), Smith and McAleer (1995) and Alfarano and Milakovic (2010) have explored the use of data from opinion polls as indicators of business behaviour to test different models for the formation of expectations or interactions among agents.

These studies have served to identify a set of problems with the processing and interpretation of data from opinion polls which cast doubt on whether these data are a suitable proxy for agents' actual expectations. One of the most significant studies (Chan-Lee, 1980) argues that opinion poll results are sensitive to errors in sampling and the wording of questions. Another of the most serious criticisms is that respondents may express opinions different from those that ultimately guide their actions and may try to manipulate their responses strategically in order to bring about the result they want (Nardo, 2003). Another problem pointed out by Nardo is framing, which may also introduce biases into responses.

In their review of the literature on the use of expectations data, Pesaran and Weale (2006) stress two crucial aspects: the way responses are gathered and the way they are converted into aggregate quantitative data. This paper has attempted to deal with both aspects.

The information on business expectations used here comes from the monthly industrial surveys conducted by the CIU since 1997. In addition to collating sales figures, this survey looks at expectations about the future performance of the company's own business, foreign and domestic markets, the branch of industrial activity in which the company operates (industry sector) and the economy as a whole. Indicators of expectations studied in this paper concern the two last (expectations about the sector and about the national economy). Given that both the CIU and the INE collect sales information, the representativeness of the CIU survey can be ascertained by comparing the two series. The good fit between the CIU sales series and the official one provides reassurance that there are no serious sampling errors. Nonetheless, mismatches between the views expressed by industrialists and their true expectations (owing to problems of framing or strategic bias, for example) could in principle be an issue.

A second aspect to be considered is the method of aggregation. In the monthly CIU survey, respondents from each company are asked the following question: "*In view of the current situation, how do you expect the national economy, your sector and your company to perform in the next six months?*" They are asked to state whether they expect the situation (in each of the three dimensions) to improve, worsen or remain the same. The balance statistic method is used to aggregate these responses. This procedure is employed by Eurostat and is routinely used in applied studies on the subject, among the most recent being Kangasniemi, Kangassalo and Takala (2010) and Kangasniemi and Takala (2012). This methodology involves the construction of aggregate indicators of expectations by subtracting the number of negative responses from the number of positive responses then dividing by the total number of responses. Each response is accorded equal weight in the indicator regardless of the size of the company or the branch of activity in which it operates.

Internationally, few attempts have been made in the literature to compare the different quantification methods in a simulation context. One such effort was made by Common (1985), who concluded that no specific method appeared to be preferable to another. Nardo (2003) and Nardo and Cabeza-Gutés (1999) found that the method performed moderately well, although their conclusions depended on the process chosen to produce the data for their simulations.

Lastly, a further point needs to be made about the characteristics of expectation indicators. By construction, the balance statistic limits quantitative indicators of expectations to within a range of [-1,1]. A value of -1 is produced in the hypothetical case that all respondents expect the situation to worsen, and 1 if they all expect it to improve. This means that the indicator cannot theoretically worsen once it reaches -1 or improve once it attains the maximum of 1, which could be restrictive in terms of capturing the expectations of industrialists. However, none of the expectation indicators in the sample analysed here came anywhere near the extremes at any point in the period.

# V

## The data

In addition to the indicators of expectations discussed above, this paper also considers industrial production data from the INE physical volume index (PVI) for manufacturing industry (Monthly Survey of Manufacturing Industry, base year 2006). Production at the State oil refinery is not included in the index, and this division of industry is accordingly excluded from all the results. The data analysed in this study concern the period from January 1998 to July 2011 and are monthly.

Given the small size of the databases available, which made it impossible to analyse industry by division, the decision was taken to break industry down into groupings for multisectoral modelling purposes.

The criterion for grouping branches of industry was that applied by Laens and Osimani (2000), who disaggregate industry by patterns of trade and production specialization, considering import and export flows and domestic production of goods in the branch of industry concerned.[1] This disaggregation criterion ensures that growth determinants act in a reasonably homogeneous way within each group. As Lorenzo, Lanzilotta and Sueiro (2003) state, breaking industry down into homogeneous groupings enhances the diagnosis since sectoral specificities are manifested in clearly differentiated patterns of behaviour.

Production variables are log-transformed and are expressed as *pvi_i*, with *i* being the industry grouping: export industries (*x*), import-substitution industries (*m*), intra-branch trade industries (*it*) or low-trade industries (*lt*). Similarly, indicators of expectations about the economy are expressed as *iec_i* and those of expectations about the sector as *isec_i*. All variables are shown in figure 1.

The conclusion from statistical analysis of the production and expectations series for each of the industry groupings is that they are all integrated of order 1 (I(1)) (see table A.1 in the econometric annex). The analysis applied the augmented Dickey-Fuller (ADF) test and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationarity test. In the ADF test, the null hypothesis holds that the process is integrated in the first order and this hypothesis is accepted unless there is clear evidence to the contrary, whereas in the KPSS test the null hypothesis is stationarity. This complements the ADF test, which has low power against stationarity when there are near-unit root processes.

Expectation variables behave like random walks with drift. The PVI industrial series for groupings *m*, *it* and *lt* present a markedly seasonal pattern, so a seasonal difference was applied in these cases.

[1] These authors classify 73 industrial sectors (disaggregated at the four-digit level of the International Standard Industrial Classification of all Economic Activities (ISIC revision 2)) into four groupings: export industries, low-trade industries, import-substitution industries and intra-branch trade industries. First, sectors with an openness ratio (exports plus imports as a share of overall output) of under 5% are separated out and placed in the low-trade grouping. Sectors with an openness ratio of over 5% are then analysed for intra-industry trade using the relevant Grubel-Lloyd indices. Branches of industry with a Grubel-Lloyd index value of over 0.50 are placed in a second grouping, intra-industry trade. Those with Grubel-Lloyd scores of less than 0.50 are then separated according to whether their sectoral trade balance is positive or negative, sectors with a positive trade balance being classed as exporters and those with a negative balance as import-substitution industries.

FIGURE 1

**Physical volume index (PVI) and indicators of expectations about the economy (IEC) and industry groups' own sector (ISEC), January 1998 to July 2011**

*(Physical volume index values in logarithms from index with base 100 in 2006, index of expectations)*

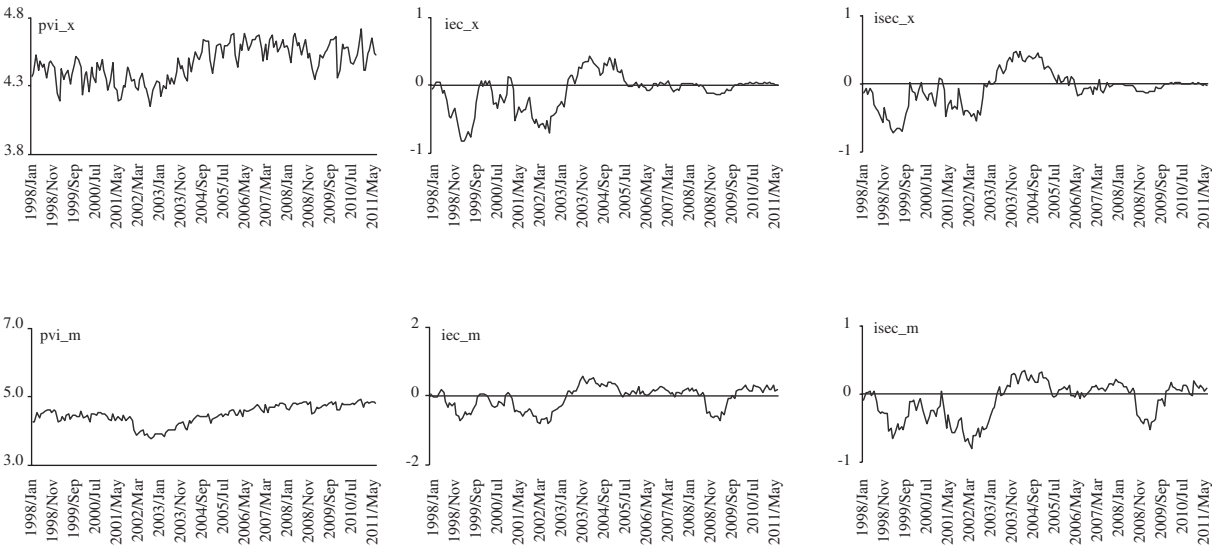
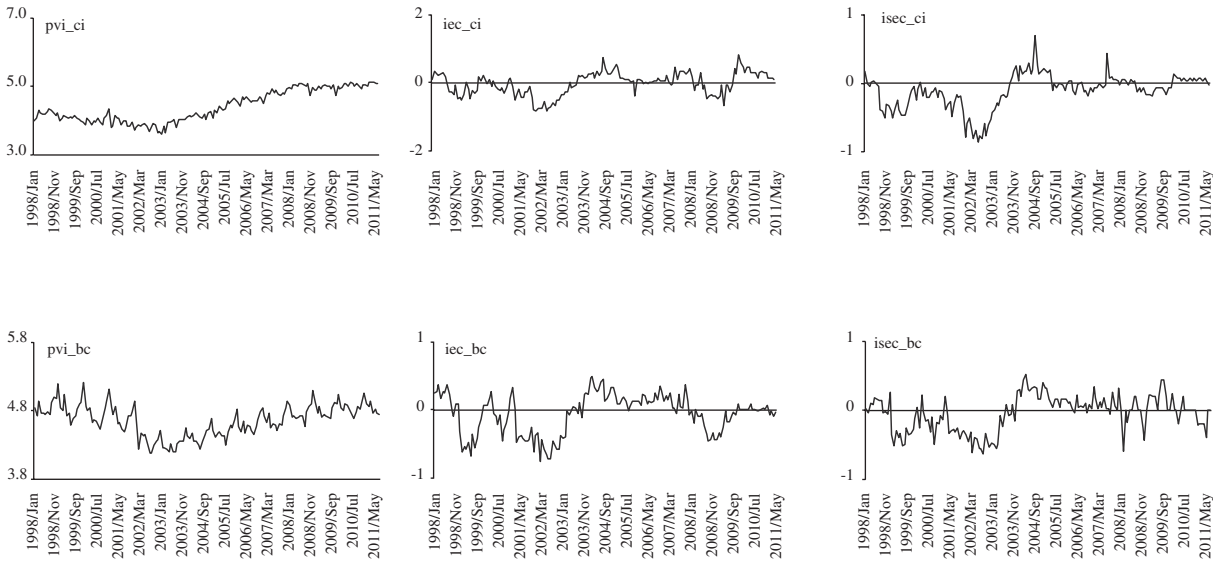


FIGURE 1 (*concluded*)




*Source:* prepared by the author on the basis of data from the Uruguayan National Institute of Statistics (INE) and the Chamber of Industry of Uruguay (CIU).

# VI

## Brief characterization of the groupings

Uruguay's manufacturing industry, which is predominantly trade-oriented, accounted for an average of about 15% of the economy's gross domestic product (GDP) and a little over 23% of its gross value of production (GVP) in the period under study. Against that background, a brief characterization of the four groupings is provided here to give an initial idea of the key factors that motivate business behaviour as regards expectations and the way these factors interact. Table 1 shows each grouping's share of GVP and gross value added (GVA) in the manufacturing sector for two selected years, 1997 and 2007, taken from near the beginning and end of the sample analysed.[2]

The export industries grouping makes the greatest contribution to total industrial GVP and GVA (46% and 34%, respectively), while import-substitution industries are responsible for over a quarter of both. Between 1997 and 2007, the low-trade industries grouping lost some of its share of overall production to intra-branch trade industries. The latter group and import-substitution industries accounted for over a quarter of total manufacturing GVP at the end of the period.

Production structures are presented in table 2. Although intermediate consumption trended upward over the period across almost all the groupings (the exception being intra-branch trade), the actual quantities involved are one of the characteristics that differentiate them. The volume of inputs, and particularly domestic inputs, used in production gives an idea of potential productive linkages between groupings. It also provides a lead to the possible multiplier effects of a particular grouping in the sector as a whole.

The export industries grouping presents the lowest proportion of value added in its GVP. Over half its intermediate consumption is in the form of purchases of raw materials, chiefly domestically sourced agricultural

[2] 1997 is the earliest year available with the disaggregation needed to construct the groupings.

TABLE 1

**Groupings' share of industrial GVP and GVA, 1997 and 2007**
*(Percentages)*

| Grouping | 1997 | | 2007 | |
|---|---|---|---|---|
| | GVP | GVA | GVP | GVA |
| Export | 51.0 | 38.0 | 45.9 | 34.0 |
| Import-substitution | 20.0 | 27.0 | 27.7 | 26.4 |
| Intra-branch trade | 10.0 | 10.0 | 17.0 | 26.0 |
| Low-trade | 19.0 | 25.0 | 9.4 | 13.6 |
| Industry total[a] | 100.0 | 100.0 | 100.0 | 100.0 |

*Source:* prepared by the author on the basis of the National Institute of Statistics (INE) 1997 Annual Survey of Industry (EIA) and 2007 Survey of Economic Activity (EAE).

[a] Excluding oil refinery.
Note: GVP: gross value of production. GVA: gross value added.

TABLE 2

**Production structure by industry grouping, 1997 and 2007**
*(Percentages)*

| Grouping | 1997 | | | 2007 | | |
|---|---|---|---|---|---|---|
| | GVA | Intermediate consumption | GVP | GVA | Intermediate consumption | GVP |
| Export | 27.2 | 72.8 | 100.0 | 21.7 | 78.3 | 100.0 |
| Import-substitution | 50.5 | 49.5 | 100.0 | 28.0 | 72.0 | 100.0 |
| Intra-branch trade | 38.1 | 61.9 | 100.0 | 44.7 | 55.3 | 100.0 |
| Low trade | 50.9 | 49.1 | 100.0 | 42.8 | 57.2 | 100.0 |

*Source:* National Institute of Statistics (INE), 1997 Annual Survey of Industry (EIA) and 2007 Survey of Economic Activity (EAE).

Note: no disaggregated data on intermediate consumption are available for 2007. GVA: gross value added. GVP: gross value of production.

products.[3] Import-substitution industries had a structure similar to that of exporters in the later period (although their composition was initially balanced between value added and inputs). However, unlike the exporters, the import-substitution industries are characterized by having a high share of inputs from abroad. The low-trade and intra-branch trade industries had a higher ratio of value added to GVP than the other two groupings in 2007. Domestic raw materials were a preponderant share of inputs in both cases, at least at the beginning of the period (the only time for which data are available).

It is important to note that of the four groupings, the export and import-substitution industries are the most exposed to international competition, the former because of the markets they trade in, particularly when they are international, and the latter because of foreign competition for products they sell mainly in the domestic market (although also to MERCOSUR) and the cost of the inputs they use, which are chiefly imported.

In intra-branch trade industries, trade and competition take place within the branch itself. The main destination market for goods produced by this grouping is MERCOSUR, especially Argentina. The main destination for goods from low-trade industries is, by definition, the domestic market. Some branches within this group may, however, be indirectly linked to the foreign market by dint of supplying inputs to industries that export to the region or the wider world.[4] Although inputs account for a smaller share of the production structure in these latter two groupings than in the other two, productive linkages with other industrial and non-industrial sectors via the supply of local inputs are growing in importance.

[3] Information available for 1997 only.

[4] In fact, some branches in this grouping (manufacture of soft drinks and tobacco) are indirectly affected by international competition owing to the informal trade in illegally imported products.

# VII
# Empirical evidence

The empirical research focused on identifying interactions between sectoral expectations and production growth (see section II). Sectoral interdependence in long-term expectations —or, what comes to the same thing, the existence of common underlying trends between expectations in the four industry groupings— was also examined (see sections III and IV). Lastly (see section V), short-term interactions between expectations and production are presented as part of a multisectoral VAR model.

## 1. Expectations and industrial production

Firstly, it was ascertained whether equilibrium relationships existed between expectations and industrial production in each grouping, with a view to determining whether there was a common underlying trend linking industrial performance and industrialists' perceptions of the future of the economy and their sector.

In all cases, expectations and the level of industrial production in each grouping were found to follow a common long-term trend. The Johansen test showed that there was a positive relationship in the long term between year-on-year production growth in the sector and sectoral expectations about the economy and the sector itself. Table 3 presents the relationships arrived at by estimating the vector error correction model.[5]

The size of the coefficients shows that industrialists' perceptions of the future performance of their own sector have a greater effect on sectoral production than do expectations about the economy at large. In the intra-branch trade and low-trade industry groupings, sectoral expectations and production are mutually determining.

[5] The full estimates are available from the author on request.

TABLE 3

**Cointegrating relationships between expectations and industrial production**

| Unrestricted estimates | | (Weakly) exogenous variable | Endogenous variables: error correction mechanism (ECM) coefficient | Restrictions (specification and test statistic) |
|---|---|---|---|---|
| Expectations about the performance of the economy | | | | |
| Equation 1 (ECM[$\Delta_{12}pvi\_x$, *iec_x*]) | $\Delta_{12}pvi\_x = 0.024 + 0.213*iec\_x$ (0.015) (0.064) | *iec_x* | $\alpha(\Delta_{12}pvi\_x) = -0.662$ | $\beta(\Delta_{12}pvi\_x) = 1$; $\alpha(iec\_x) = 0$; $\chi^2 = 3.461$, pr. = 0.063 |
| Equation 2 (ECM[$\Delta_{12}pvi\_m$, *iec_m*]) | $\Delta_{12}pvi\_m = 0.005 + 0.452*iec\_m$ (0.003) (0.092) | *iec_m* | $\alpha(\Delta_{12}pvi\_m) = -0.330$ | $\beta(\Delta_{12}pvi\_m) = 1$; $\alpha(iec\_m) = 0$; $\chi^2 = 3.732$, pr. = 0.053 |
| Equation 3 (ECM[$\Delta_{12}pvi\_it$, *iec_it*]) | $\Delta_{12}pvi\_it = 0.107 + 0.442*iec\_it$ (0.002) (0.071) | | $\alpha(\Delta_{12}pvi\_it) = -0.470$, $\alpha(iec\_it) = 0.338$ | |
| Equation 4 (ECM[$\Delta_{12}pvi\_lt$, *iec_lt*]) | $\Delta_{12}pvi\_lt = 0.225 + 0.385*iec\_lt$ (1.071) (0.083) | *iec_lt* | $\alpha(\Delta_{12}pvi\_lt) = -0.404$ | $\beta(\Delta_{12}pvi\_lt) = 1$; $\alpha(iec\_lt) = 0$; $\chi^2 = 2.631$, pr. = 0.105 |
| Expectations about the performance of the economy | | | | |
| Equation 5 (ECM[$\Delta_{12}pvi\_x$, *isec_x*]) | $\Delta_{12}pvi\_x = 0.014 + 0.272*isec\_x$ (0.013) (0.063) | *isec_x* | $\alpha(\Delta_{12}pvi\_x) = -0.714$ | $\beta(\Delta_{12}pvi\_x) = 1$; $\alpha(isec\_x) = 0$; $\chi^2 = 0.210$, pr. = 0.646 |
| Equation 6 (ECM[$\Delta_{12}pvi\_m$, *isec_m*]) | $\Delta_{12}pvi\_m = 0.058 + 0.519*isec\_m$ (0.022) (0.083) | *isec_m* | $\alpha(\Delta_{12}pvi\_m) = -0.457$ | $\beta(\Delta_{12}pvi\_m) = 1$; $\alpha(isec\_m) = 0$; $\chi^2 = 0.204$, pr. = 0.651 |
| Equation 7 (ECM[$\Delta_{12}pvi\_it$, *iec_it*]) | $\Delta_{12}pvi\_it = 0.157 + 0.635*isec\_it$ (0.041) (0.158) | | $\alpha(\Delta_{12}pvi\_it) = -0.342$, $\alpha(iec\_it) = 0.143$ | |
| Equation 8 (ECM[$\Delta_{12}pvi\_lt$, *iec_lt*]) | $\Delta_{12}pvi\_lt = 0.006 + 0.589*isec\_lt$ (0.014) (0.057) | | $\alpha(\Delta_{12}pvi\_lt) = -0.423$, $\alpha(iec\_lt) = 0.671$ | |

*Source:* prepared by the author.

$\Delta_{12}$: twelfth difference.
ECM: error-correction mechanism coefficient.

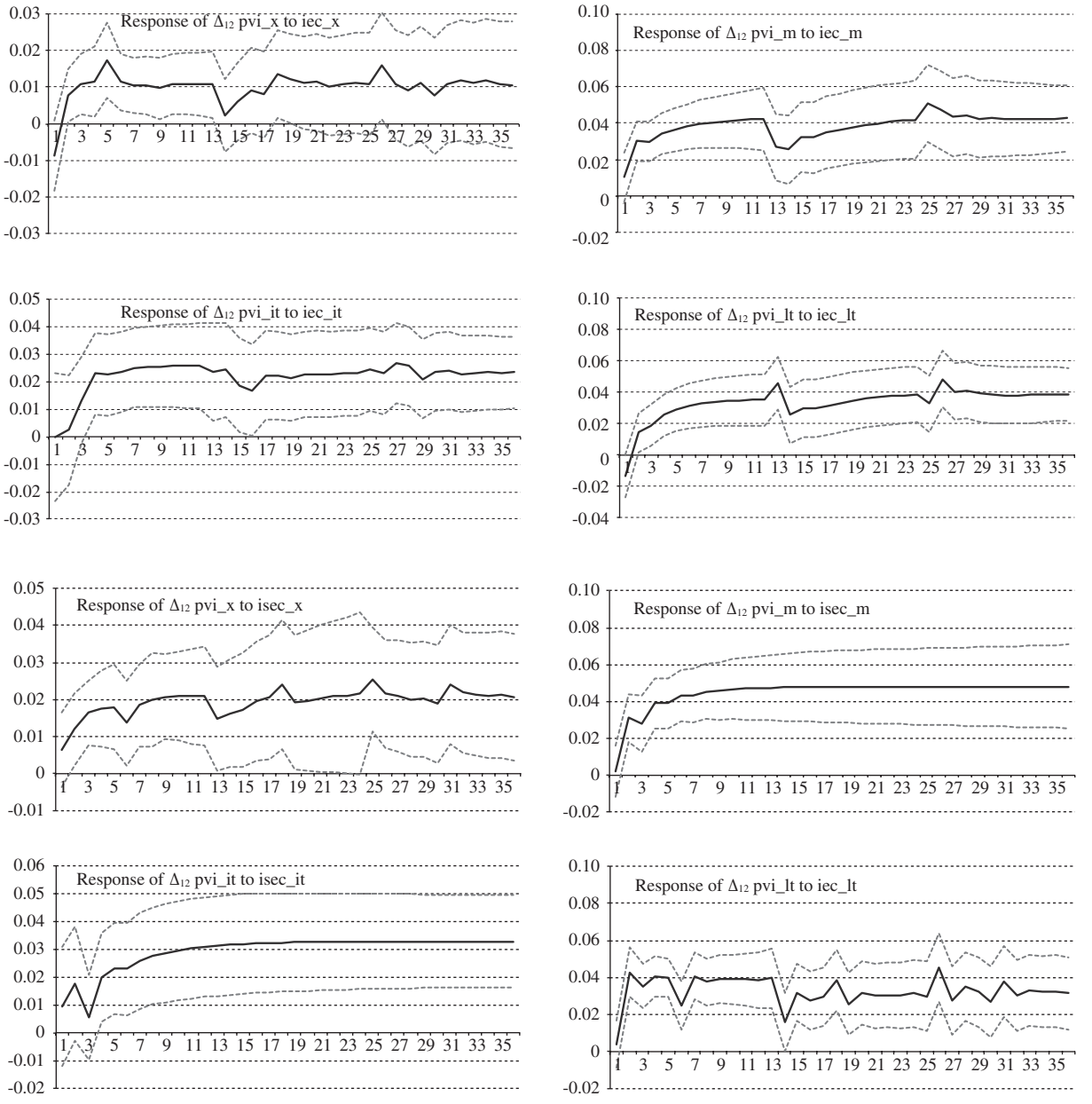
In the export and import-substitution groupings, the hypothesis that sectoral expectations are weakly exogenous cannot be rejected (at 5%). This would mean that in these two groupings, unlike the others, there was no feedback between their own performance and their perceptions of the future. Expectations about the economy, meanwhile, have an exogenous effect for all industry groupings except intra-branch trade.

The impulse-response analysis presented in figure 2 shows the dynamic reactions of industrial output to

FIGURE 2

**Impulse-response simulations, equations 1 to 8**

*(Shock simulated: 1 standard deviation; 36 periods)*




*Source:* prepared by the author.

Note: confidence intervals are standard errors calculated using Monte Carlo simulations (with 1,000 repetitions).
$\Delta_{12}$: twelfth difference.

expectation shocks.[6] These simulations reveal both the magnitude of the impact and the time needed to absorb it. What emerges from the simulations is that responses to expectation shocks are not usually instantaneous, although they are rapid, with no more than three or four quarters being required for the whole effect to be absorbed.[7]

The results of the cointegration analysis, the weak exogeneity tests (table 3) and the strong exogeneity tests (see the Granger test in table A.5 of annex I) show that the expectations of export and import-substitution industrialists contain information of relevance for predicting and anticipating their production performance. The intuition behind this is simple. Industrialists have a wealth of information on the economic environment directly affecting their business and can therefore perceive deteriorations or improvements in economic prospects before production falls or rises. What is more, their own optimism or pessimism can influence variables such as investment and decisions about stocks, employment and other variables that go to determine their level of production. This serves to corroborate at a sectoral level the results of previous studies showing expectations to be a useful leading indicator for the cycle of economic activity in Uruguay (Lanzilotta, 2006).

## 2. Sectoral interdependence in the formation of expectations

The second phase of the research focused on determining the role played by sectoral interrelationships in forming expectations in the four groups. More specifically, it aimed to ascertain whether expectations in the four groups (represented in figure 3) followed a common long-term trajectory.

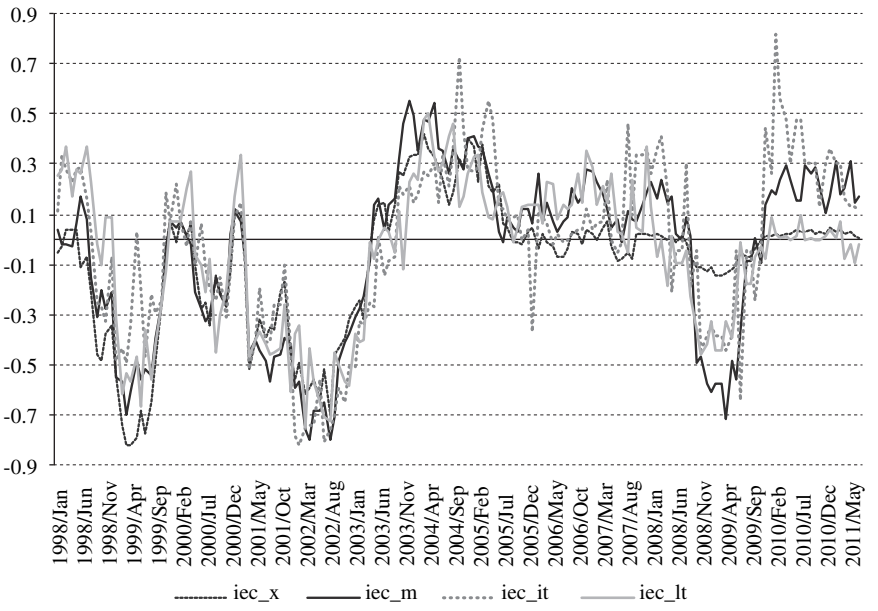
With this in view, the existence of cointegrating relationships between expectations in the four groupings was investigated and, where these were found to exist, vector error correction models were estimated to determine how exogenous the indicators were. The relationships determined are presented in table 4.

The results show that there are (three) long-term linear relationships between the four industry groupings'

[6] In all cases, the size of the shock simulated is one standard deviation.
[7] The variables were ordered by their degree of exogeneity. However, the robustness of the results was checked against other specifications (by reordering the variables) and no significant alteration was seen in the responses.

FIGURE 3

**Expectations about the economy, January 1998 to July 2011**
*(Index values)*




*Source:* prepared by the author on the basis of data from the Chamber of Industry of Uruguay (CIU).

Note: *iec_i*: expectations about the economy; *iec_x*: expectations about export industries; *iec_m*: expectations about import-substitution industries; *iec_it*: expectations about intra-branch trade industries; *iec_lt*: expectations about low-trade industries.

TABLE 4

**Long-term equations between expectations about the economy**

| Error-correction mechanism (ECM) coefficient [*iec_x, iec_m, iec_it, iec_lt*], three cointegrating relationships (restricted estimates) | | (Weakly) exogenous variable | Endogenous variable: error-correction mechanism (ECM) coefficient | Constraints |
|---|---|---|---|---|
| Equation 9 | *iec_m* = 0.056 + *iec_x*<br>(0.053) | *iec_x* | -0.129 | $\beta(iec\_x) = \beta(iec\_m) = 1$<br>$\beta(iec\_it) = \beta(iec\_lt) = 0$<br>$\alpha(iec\_x) = \alpha(iec\_it) = \alpha(iec\_lt) = 0$ |
| Equation 10 | *iec_it* = 0.007 + *iec_m*<br>(0.034) | *iec_m* | -0.304 | $\beta(iec\_it) = \beta(iec\_m) = 1$<br>$\beta(iec\_x) = \beta(iec\_lt) = 0$<br>$\alpha(iec\_x) = \alpha(iec\_m) = \alpha(iec\_lt) = 0$ |
| Equation 11 | *iec_lt* = 0.025 + *iec_x*<br>(0.043) | *iec_x* | -0.223 | $\beta(iec\_x) = \beta(iec\_lt) = 1$<br>$\beta(iec\_it) = \beta(iec\_m) = 0$<br>$\alpha(iec\_x) = \alpha(iec\_it) = \alpha(iec\_m) = 0$ |
| Joint restriction test: $\chi(12) = 20.8962321$<br>Probability = 0.051921 | | | | |

*Source:* prepared by the author.

Note: iec_x: expectations about export industries; iec_m: expectations about import-substitution industries; iec_it: expectations about intra-branch trade industries; iec_lt: expectations about low-trade industries.

expectations about the economy, with two groupings being involved in all relationships.

Two aspects should be stressed. First, the existence of three cointegrating relationships means that there is only one single common long-term trajectory underlying the expectations of all four groupings. Second, the variables identified as (weakly) exogenous are the expectations of exporters and of import-substitution industries, with the former acting as determinants of the latter. This means that perceptions about the future of the economy in the industries most exposed to international competition (which probably have most access to information on the external context, something that is crucial for an economy as small and open as Uruguay's) appear ultimately to set the overall mood or stance of expectations in industry as a whole.

This evidence about the direction of determination of expectations between groups indicated the correct approach for the impulse-response simulations showing short-term dynamics in response to shocks (see the panels in figure 4).[8]

The simulations showed that:

(i) Shocks to the expectations of exporters have a significant and long-lasting positive impact on expectations in the other groupings. The effect is immediate and is fully absorbed in less than half a year.

(ii) Shocks to the expectations of import-substitution industries also affect the other groupings positively, but to a lesser degree. The greatest effect is on expectations in intra-branch trade industries.

(iii) Shocks to the expectations of intra-branch trade industries and those producing for the domestic market have no effect whatever on perceptions in the other groupings.

As for the relationship between sectoral expectations in the four groupings, no single common trajectory could be shown to exist. For this reason and with a view to exploring short-term interactions, a multisectoral VAR model was estimated (using stationarity-transformed variables). The results of the impulse-response simulations are presented in figure 5.

These simulations show that:

(i) Once more, a shock to exporters' expectations has a very significant effect on the other industry groupings. The effect on the latter's expectations is also rapid and is fully absorbed within six months.

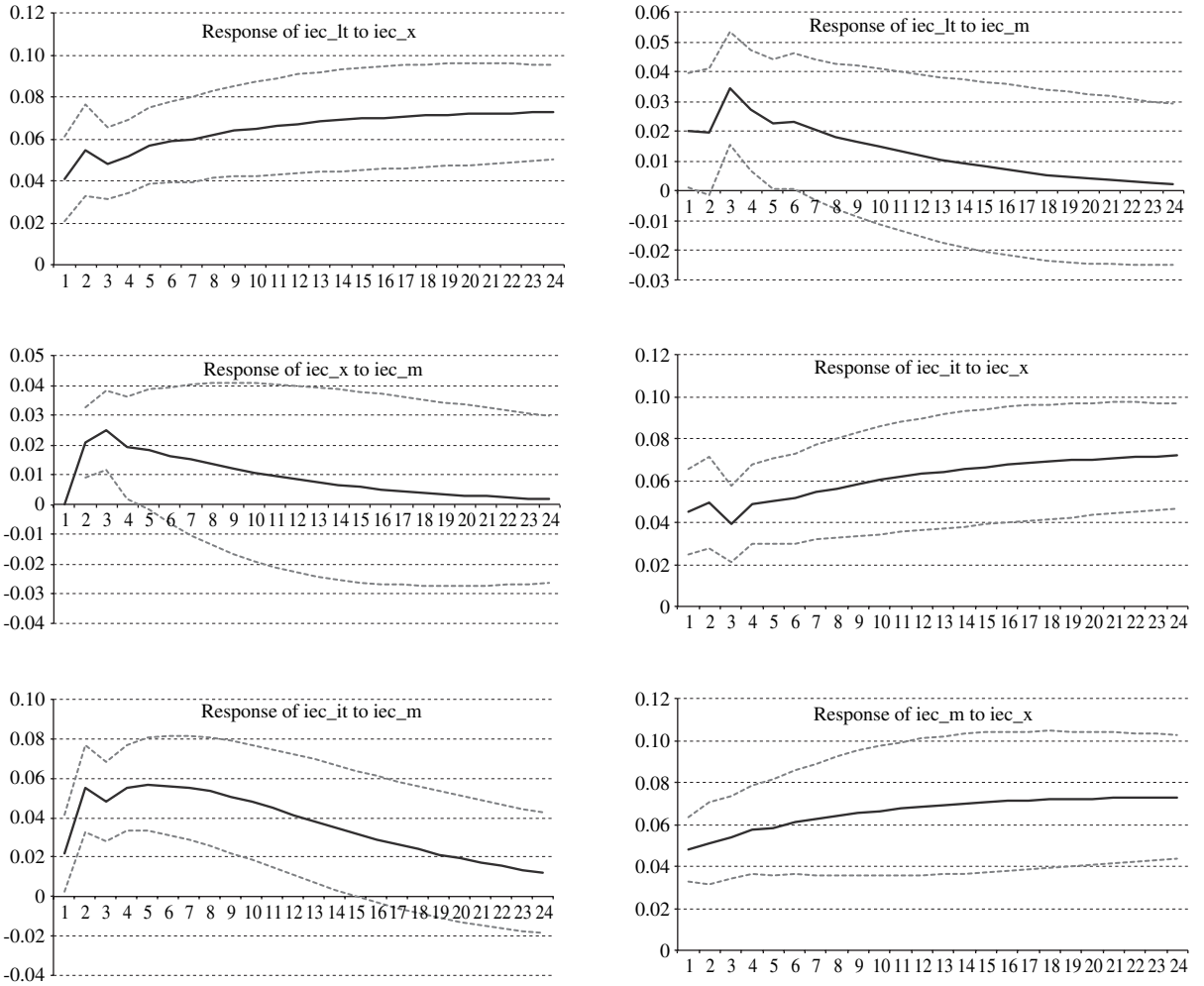
(ii) A shock to import-substitution industries also has a significant spillover effect, although it is of lesser magnitude and is substantial for only two groupings: exporters and intra-branch trade industries.

[8] As noted earlier, for the impulse-response function to be calculated using mutually orthogonal impulses, it is necessary to obtain residuals that are uncorrelated between the VAR model equations. One possible method of orthogonalizing impulses is the one proposed by Cholesky, which involves using the inverse of the Cholesky factor of the residual covariance matrix to orthogonalize the impulses. This imposes an order on the variables in the VAR such that the full effect of any common component is attributed to the variable ranked first in the system. The variables should not therefore be ordered randomly but from most to least exogenous.

FIGURE 4

**Impulse-response representations from the VECM model of expectations about the economy[a]**

*(Shock simulated: 1 standard deviation; 24 periods)*




*Source:* prepared by the author.

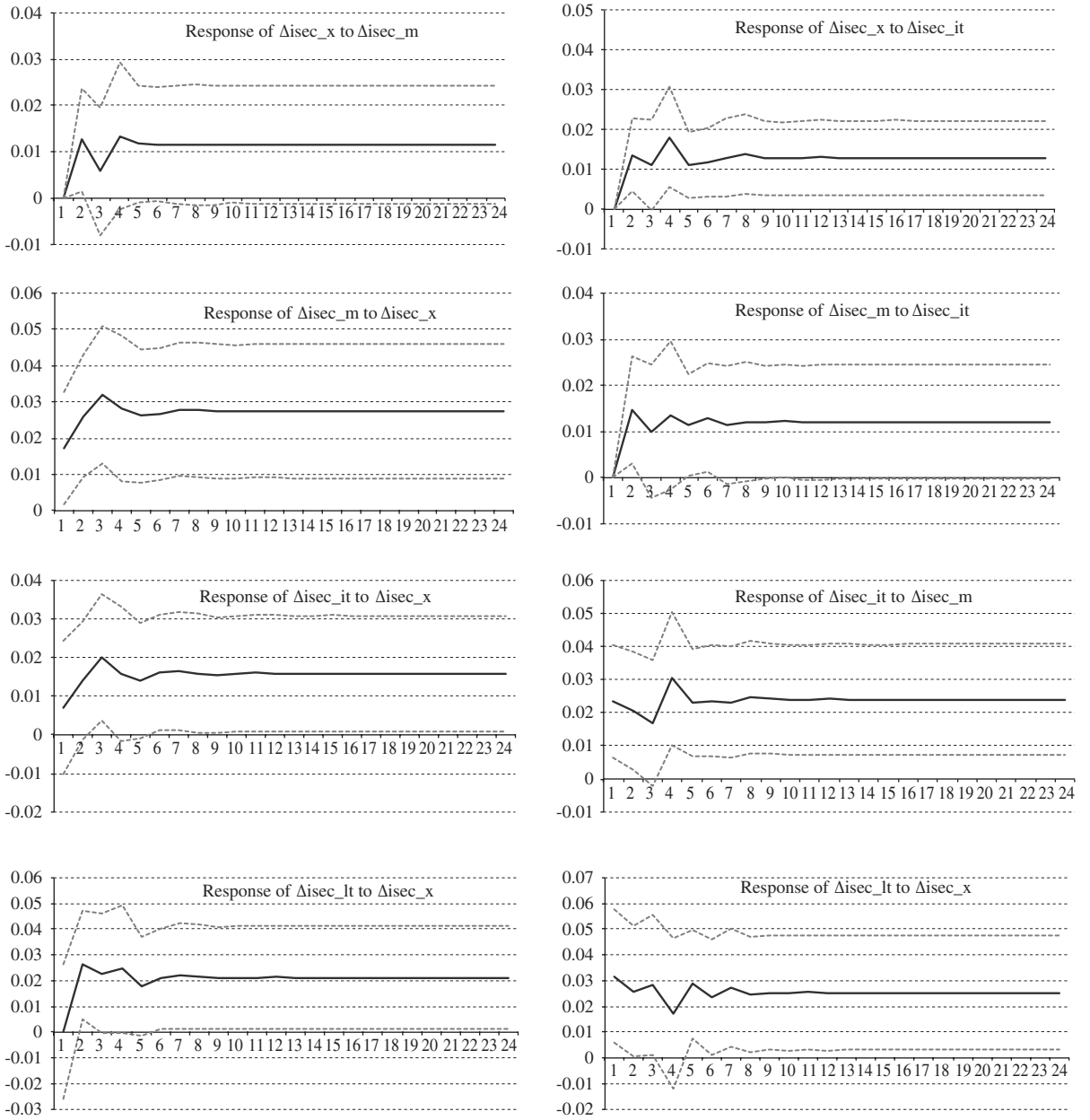
[a] VECM: vector error correction model.

Note: only significant responses are reported. The order of the variables in the impulse definition was: *iec_x, iec_m, iec_it, iec_lt.*

FIGURE 5

**Impulse-response representations from the VAR model of sectoral expectations**[a]

*(Shock simulated: 1 standard deviation; 24 periods)*




*Source:* prepared by the author.

[a] VAR: multisectoral vector autoregression model.

Note: only statistically significant impulse-response simulations are reported. Confidence intervals are standard errors calculated using Monte Carlo simulations (with 1,000 repetitions). Responses are cumulative.

(iii) Shocks to the expectations of low-trade industries and intra-branch trade industries have no significant lasting effect on the other groupings.

## 3. Common trends in expectations

The evidence for a cointegrating relationship between the macroeconomic expectations of the four industry groupings suggests that expectations follow a single underlying trend in the long term. A multivariate structural model like the one in Section III is estimated to identify this trend, setting out from an unrestricted specification of a local oscillation relative to the variable of the level component (in accordance with the characteristics of the four series). The results are presented in table 5.

The model's variance-covariance matrix shows a high degree of correlation between the levels of the expectations series (see table 6).

The high degree of correlation suggests the existence of common trends. At the same time, the eigenvalues of the variance-covariance matrix demonstrate that the matrix rank is 1 (2 at a lower significance level). This justified the restriction of common levels between the series (consistent with the findings of the previous section). In consideration of the eigenvalues of the matrix of variances and in accordance with the results of the cointegration analysis, the expectations series for intra-branch trade, low-trade and import-substitution industries were specified as dependent. The results are presented in table 7 and figure 6.[9]

The model estimated (ignoring cyclical and autoregressive components) can be written as:

$$iec\_x_t = \mu_t^* + \varepsilon_{iecxt},$$
$$iec\_m_t = 1.334\mu_t^* + 0.05132 + \varepsilon_{iecmt},$$
$$iec\_it_t = 1.374\mu_t^* + 0.09907 + \varepsilon_{iecitt},$$
$$iec\_lc_t = 1.135\mu_t^* + 0.04753 + \varepsilon_{ieclct},$$

[9] As an alternative, a test was carried out with a non-dependent specification for expectations in import-substitution industries.

TABLE 5

**Unrestricted multivariate structural model. Vector of endogenous variables: [*iec_x, iec_m, iec_it, iec_lt*]**[a]

| Model estimated: Y = Level + Irregular + Cycle + AR(1) (strong convergence) | *iec_x* | *iec_m* | *iec_it* | *iec_lt* |
|---|---|---|---|---|
| I. Standard deviations of the component residues: | | | | |
| Irregular | 0.0337925 | 0.02795049 | 0.09649927 | 0.00051 |
| Level | 0.0783388 | 0.00973299 | 0.015386 | 0.00000 |
| Cycle | 0.0324932 | 0.07674432 | - | 0.02451 |
| AR(1) | - | - | 0.06820286 | - |
| II. Model diagnostic statistics: | | | | |
| Residual standard error | 0.094989 | 0.11361 | 0.17006 | 0.13458 |
| Normality (Bowman-Shenton) | 35.033 | 14.921 | 16.476 | 8.4247 |

*Source:* prepared by the author.

[a] A full list of outputs is available from the author on request.
Note: *iec_x*: expectations about export industries; *iec_m*: expectations about import-substitution industries; *iec_it*: expectations about intra-branch trade industries; *iec_lt*: expectations about low-trade industries.
AR(1): autoregressive process (order = 1).

TABLE 6

**Variance-covariance matrix of the residuals**

| | *iec_x* | *iec_m* | *iec_it* | *iec_lt* |
|---|---|---|---|---|
| *iec_x* | 0.006137 | 0.995000 | 0.952900 | 0.922100 |
| *iec_m* | 0.007574 | 0.009441 | 0.973700 | 0.956000 |
| *iec_it* | 0.007036 | 0.008917 | 0.008883 | 0.969100 |
| *iec_lt* | 0.005938 | 0.007635 | 0.007508 | 0.006756 |

*Source:* prepared by the author.

Note: *iec_x*: expectations about export industries; *iec_m*: expectations about import-substitution industries; *iec_it*: expectations about intra-branch trade industries; *iec_lt*: expectations about low-trade industries. Grey shading denotes significant values.

TABLE 7

**Multivariate structural model with common trends.**
**Vector of endogenous variables: [*iec_x, iec_m, iec_it, iec_lt*]**

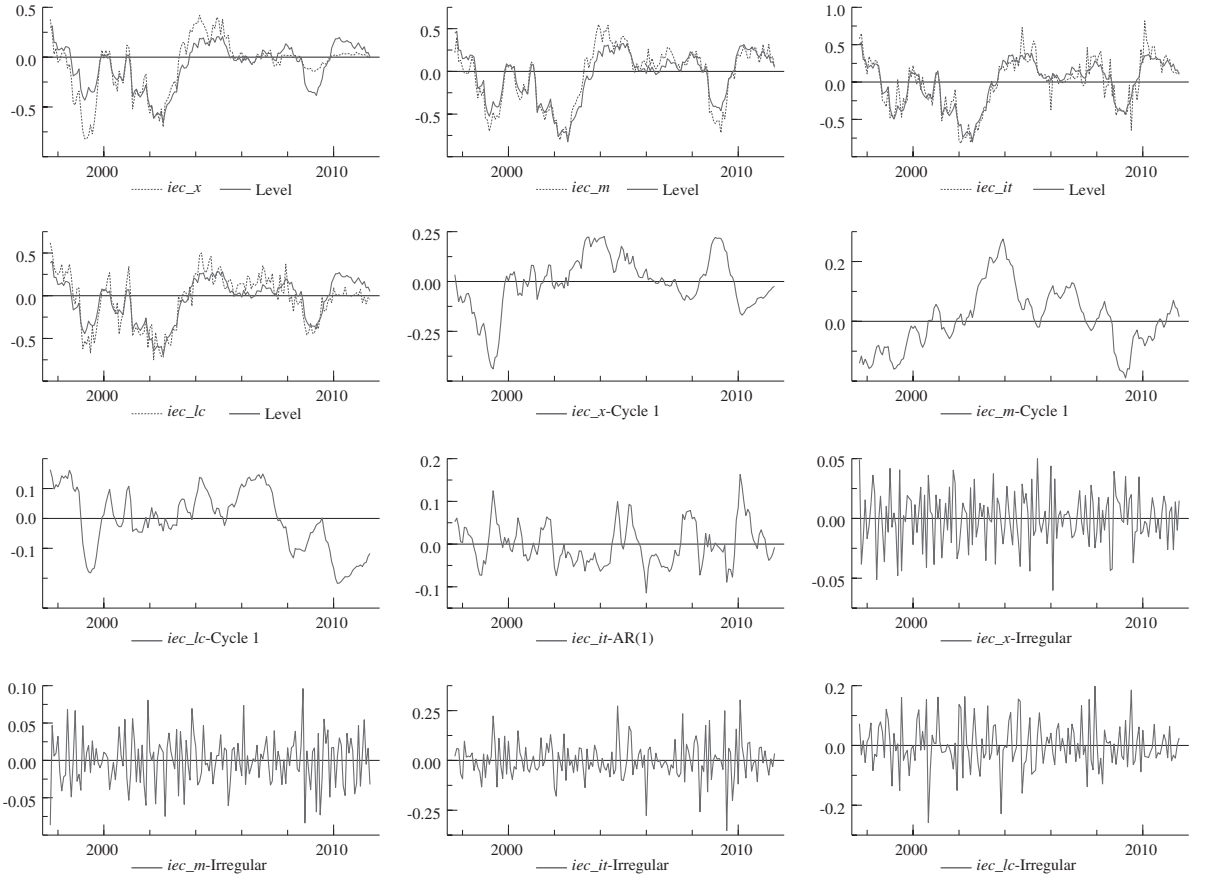
| Model estimated:<br>Y = Level + Irregular + Cycle + AR(1) (strong convergence)<br>*iec_m, iec_it* and *iec_lt*: dependent | *iec_x* | *iec_m* | *iec_it* | *iec_lt* |
|---|---|---|---|---|
| I. Standard deviations of the component residues: | | | | |
| Irregular | 0.0296749 | 0.02685736 | 0.10344999 | 0.00000 |
| Level | 0.0688404 | | | |
| Cycle | 0.0545438 | 0.11828271 | | 0.11564 |
| AR(1) | | | 0.06102221 | |
| II. Model diagnostic statistics: | | | | |
| Residual standard error | 0.094989 | 0.11361 | 0.17006 | 0.13458 |
| Normality (Bowman-Shenton) | 35.033 | 14.921 | 16.476 | 8.4247 |

*Source:* prepared by the author.

Note: *iec_x*: expectations about export industries; *iec_m*: expectations about import-substitution industries; *iec_it*: expectations about intra-branch trade industries; *iec_lt*: expectations about low-trade industries. AR(1): autoregressive process (order = 1).

FIGURE 6

**Components of the multivariate structural model with common trends, January 1998 to July 2011**
*(Index values)*




*Source:* prepared by the author.

where $\mu_t^*$ is a univariate random walk. Therefore, the level components have the following relationship:

$$\mu_{iec\_mt} = 1.334\mu_{iec\_xt} + 0.05132,$$
$$\mu_{iec\_itt} = 1.374\mu_{iec\_xt} + 0.09907,$$
$$\mu_{iec\_lct} = 1.135\mu_{iec\_xt} + 0.04753,$$

where the common trend is the one estimated for export industries: $\mu_{iec\_xt}$.

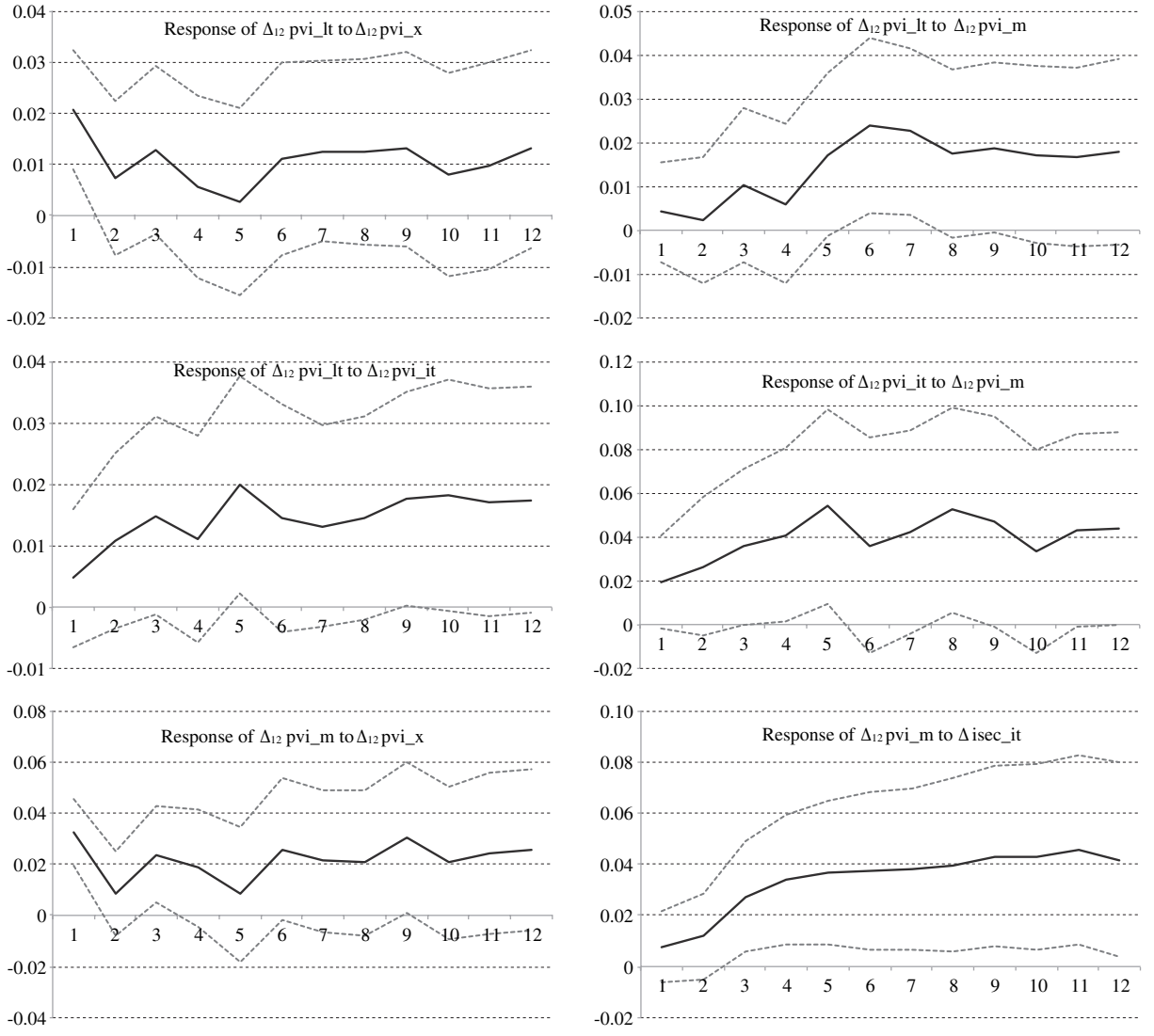
## 4. Expectations and industrial production in a multisectoral model

On the basis of the findings for the above points, a multisectoral model incorporating the variables of expectations and sectoral industrial production was estimated and yielded the impulse-response simulations presented in figure 7.

FIGURE 7

**Impulse-response representations from the VAR model of expectations and sectoral industrial production**

*(Shock simulated: 1 standard deviation; 12 periods)*




*Source:* prepared by the author.

Note: only significant responses are included. Impacts on the grouping itself are not included. Confidence intervals are standard errors calculated using Monte Carlo simulations (with 1,000 repetitions). Responses are cumulative.
$\Delta_{12}$: twelfth difference. VAR: multisectoral vector autoregression model.

The VAR model and its simulations demonstrate once more that industries producing for the external market are net recipients of shocks that initially affect the other industries, with their greater trading profile and exposure to international competition. Intersectoral influences can also be observed between the import-substitution and intra-branch trade groupings and from export industries to the former.

# VIII
## Main conclusions

This study, which is predominantly empirical and exploratory in nature, provides evidence on some aspects of the formation of industrialists' expectations and sheds light on how these ultimately affect levels of industrial production. The main results are summarized below.

The research confirms what a number of international studies have maintained, among the most recent being Kangasniemi, Kangassalo and Takala (2010) and Kangasniemi and Takala (2012): that business expectation variables provide information of value for anticipating and predicting the future course of production. This study on Uruguayan industry confirms that the perceptions industrialists form of future economic developments and their own industry sector are leading indicators of future sectoral performance in local manufacturing industry.

The results show that these forward-looking indicators follow the same long-term trajectory as industrial production in the sector to which they relate. Even in the two largest industry groupings, they precede developments in a strict sense (by at least six months). The survey ascertains expectations for the coming six months, which would suggest that industrialists make decisions fully in line with their stated expectations. The results match those reported in numerous international research projects and previous studies on Uruguay, which have highlighted the relevance of such indicators for predicting developments in overall economic activity. Indicators reflecting the opinion of economic agents are widely used around the world, especially in countries with well-developed statistical systems.

Analysis involving the breakdown of industry into groupings characterized by trade participation and productive specialization provides a way of considering how expectations are transmitted (or spread) among industrialists. Macroeconomic expectations in the four industry groupings are found to follow a single common trajectory that is ultimately determined by expectations in the export grouping. The same results emerge from cointegration analysis and estimation of the underlying common trend from multivariate structural models. The impulse-response simulations produced by the error-correction model estimated, which reveals the short-term dynamics of sectoral responses, reaffirm the importance of export industries in spreading macroeconomic expectation shocks.

No cointegrating relationships linking sectoral expectations in all four industry groupings were found, so the influences between sectors were studied using a multisectoral VAR model in first differences. The results again highlighted the significant role played by the most trade-oriented industries in spreading expectation shocks. The multisectoral VAR models of expectations and industrial production confirm that there is cross-sectoral influence both in expectations and in actual production, and corroborate previous findings as to which groupings are most influential.

The key role played by the most trade-oriented industries tallies with these groupings' large share of industrial production. Export industries account for over 50% of industrial GVP and nearly 40% of GVA (excluding the State oil refinery), while import-substitution industries account for more than 20% of the industry total on each measure. As the latter's production structure suggests, they have a backward spillover effect because of the enormous share of production expenditure represented by inputs, particularly those sourced domestically. These findings match those of Long and Plosser (1983), Gordon (1981) and Blanchard (1987).

Besides their representativeness in terms of industrial production, these industries' greater exposure to international trade makes them more competitive and provides them with access to extensive and complete information on the relevant macroeconomic and international context. Conversely, the intra-branch trade and low-trade sectors play less of a role in spreading expectations. In particular, industries producing for the domestic market seem more likely to be recipients than senders of expectation signals.

The learning hypothesis of Eusepi and Preston (2008), which they make the basis for the transmission of expectations resulting in economic fluctuations, may also explain the findings of this research. This learning is held to take place among agents who do not receive information directly.

The identification of a common trend in industrialists' expectations about the future of the economy, guided by the expectations of the export grouping, reveals and reflects the production structure of what is clearly an open economy whose dynamics are highly dependent on the long-term performance of the external sector. Although this research is exploratory, its findings have potentially important implications for economic policy. The influence of the most trade-oriented industries on expectations and then on sectoral production is a pointer for policymakers seeking to mould expectations and create a climate of optimism during recessions so that their duration is lessened. The question of which factors ultimately determine expectations in these key sectors is certainly one of the issues raised by this study, and could be the subject of future research.

**ANNEX I**

Econometrics

TABLE A.1

**Unit root tests**
*(ADF and KPSS)*

| Period: January 1998-July 2011 | Augmented Dickey-Fuller (ADF) test $H_0$ = presence of unit root | | Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test $H_0$ = stationarity |
|---|---|---|---|
| | Value of the statistic in levels | Value of the statistic in first difference | Value of the statistic in levels |
| Export industries' expectations (*iec_x*) | *-2.173** (5 lags, without test)<br>-2.243 (0 lags, with test) | *-5.194* (4 lags, without test) | *0.492** (Bandwidth: 10, test) |
| Low-trade industries' expectations (*iec_lt*) | -2.541* (4 lags, without test)<br>-2.993 (1 lag, with test) | *-11.335* (1 lag, without test) | 0.546* (Bandwidth: 2, test) |
| Import-substitution industries' expectations (*iec_m*) | *-2.199** (0 lags, without test)<br>-2.216 (0 lags, with test) | *-12.373* (0 lags, without test) | *0.523** (Bandwidth: 6, test) |
| Intra-branch trade industries' expectations (*iec_it*) | *-2.485** (3 lags, without test )<br>-2.737 (2 lags, with test) | *-9.590** (2 lags, without test) | *0.518** (Bandwidth: 6, test) |
| Export industries' sectoral expectations (*isec_x*) | *-2.173** (5 lags, without test)<br>-2.243 (5 lags, with test) | *-5.194** (4 lags, without test) | *0.469** (Bandwidth: 10, test) |
| Low-trade industries' sectoral expectations (*isec_lt*) | *-2.569** (3 lags, without test)<br>-2.787 (2 lags, with test) | *-13.364** (1 lag, without test) | *0.479** (Bandwidth: 8, test) |
| Import-substitution industries' sectoral expectations (*isec_m*) | *-2.236** (0 lags, without test)<br>-2.339 (0 lags, with test) | *-13.807** (0 lags, without test) | *0.506** (Bandwidth: 10, test) |
| Intra-branch trade industries' sectoral expectations (*isec_it*) | *-1.914* (2 lags, without test)<br>*-2.091* (2 lags, with test) | *-12.298** (1 lag, without test) | *0.490** (Bandwidth: 102, test) |
| Exporters' PVI (*pvi_x*) In lags, seasonally differentiated | *-1.560* (4 lags, without test)<br>*-1.560* (4 lags, with test) | *-5.141** (11 lags, without test) | *0.532** (Bandwidth: 1, test) |
| Low-trade industry PVI (*pvi_lt*) In logs, seasonally differentiated | *-1.790* (13 lags, without test)<br>*-1.829* (13 lags, with test) | *-6.097** (13 lags, without test) | *0.537355** (Bandwidth: 9, test) |
| Import-substitution industry PVI (*pvi_m*) In logs, seasonally differentiated | *-2.558* (12 lags, without test)<br>*-2.567* (12 lags, with test) | *-9.236** (11 lags, without test) | *0.559** (Bandwidth: 3, test) |
| Intra-industry trade PVI (*pvi_it*) In logs, seasonally differentiated | *-2.225** (14 lags, without test)<br>*-2.861* (13 lags, with test) | *-7.316** (11 lags, without test) | *0.545** (Bandwidth: 9, test) |

*Source:* author's estimates.

Note: the test specification is given in parentheses. The number of lags was determined using the Akaike information criterion (AIC). The Newey-West procedure was used to select bandwidth. * Rejection of the null hypothesis at 95%.

TABLE A.2

**Cointegration tests[a]**

Equation 1 [DLOG(*pvi_x*, 0.12), *iec_x*] - Adjusted sample: Oct 2000-Jul 2011, 130 observations

| No. of cointegrating relationships | Characteristic value | Trace statistic | Probability | Maximum characteristic value | Probability |
|---|---|---|---|---|---|
| None | 0.209096 | 36.20674 | 0.0002** | 30.49524 | 0.0001** |
| At least 1 | 0.042983 | 5.711503 | 0.2142 | 5.711503 | 0.2142 |

Restricted constant, lags: 1, 4, 12
Exogenous: atypical. Date = Jan 2001 Date = Apr 2001 Date = Dec 2001 D(Date = Aug 2002) Date = Apr 2003 Date = Apr 2009; effect of special days: D(CARNI) D(EASTER)

Equation 2 [DLOG(*pvi_m*, 0.12), *iec_m*] - Adjusted sample: Oct 2000-Jul 2011, 130 observations

| No. of cointegrating relationships | Characteristic value | Trace statistic | Probability | Maximum characteristic value | Probability |
|---|---|---|---|---|---|
| None | 0.135876 | 25.26535 | 0.0094** | 15.8921 | 0.0158* |
| At least 1 | 0.047161 | 6.280279 | 0.1702 | 9.164546 | 0.1702 |

Restricted constant, lags: 1, 6, 12
Exogenous: atypical. D(Date ≥ Apr 2001) D(Date ≥ Feb 2003) D(Date = Sep 2003) D(Date ≥ Mar 2004) D(Date ≥ Apr 2008) D(Date ≥ Oct 2008); effect of special days: D(EASTER)

Equation 3 [DLOG(*pvi_it*,12), *iec_it*] - Adjusted sample: Oct 2000-Jul 2011, 130 observations

| No. of cointegrating relationships | Characteristic value | Trace statistic | Probability | Maximum characteristic value | Probability |
|---|---|---|---|---|---|
| None | 0.211948 | 35.97638 | 0.0002** | 30.96483 | 0.0001** |
| At least 1 | 0.037817 | 5.011549 | 0.2822 | 5.011549 | 0.2822 |

Restricted constant, lags: 1, 2, 12
Exogenous: atypical. Date = Apr 2001 Date = Dec 2001 Date = Oct 2004 Date = Jan 2006 D(Date = Aug 2007) Date = May 2008 D(Date = Aug 2008) Date = Nov 2008 D(Date = Jun 2009) Date = Aug 2009 Date = Dec 2009

Equation 4 [DLOG(*pvi_lt*,12), *iec_lt*] - Adjusted sample: Oct 2000-Jul 2011, 130 observations

| No. of cointegrating relationships | Characteristic value | Trace statistic | Probability | Maximum characteristic value | Probability |
|---|---|---|---|---|---|
| None | 0.162296 | 29.28397 | 0.0022** | 23.02179 | 0.0032** |
| At least 1 | 0.047029 | 6.262182 | 0.1714 | 6.262182 | 0.1714 |

Restricted constant, lags: 1, 12
Exogenous: atypical. Date = Apr 2001 D(Date = Mar 2002) Date = Feb 2003; effect of special days: D(EASTER) D(CARNI)

Equation 5 [DLOG(*pvi_x*, 0,12), *isec_x*] - Adjusted sample: Oct 2000-Jul 2011, 130 observations

| No. of cointegrating relationships | Characteristic value | Trace statistic | Probability | Maximum characteristic value | Probability |
|---|---|---|---|---|---|
| None | 0.203634 | 32.59118 | 0.0006** | 29.60053 | 0.0002** |
| At least 1 | 0.022742 | 2.990645 | 0.5824 | 2.990645 | 0.5824 |

Restricted constant, lags: 1, 5, 12
Exogenous: atypical. Date = Dec 2000 Date = Apr 2001 D(Date = Oct 2001) Date = Sep 2002; effect of special days: D(EASTER) D(CARNI)

Equation 6 [DLOG(*pvi_m*, 0,12), *isec_m*] - Adjusted sample: Oct 2000-Jul 2011, 139 observations

| No. of cointegrating relationships | Characteristic value | Trace statistic | Probability | Maximum characteristic value | Probability |
|---|---|---|---|---|---|
| None | 0.177562 | 34.17117 | 0.0003** | 25.41263 | 0.0012** |
| At least 1 | 0.065154 | 8.758538 | 0.0597 | 8.758538 | 0.0597 |

Restricted constant, lags: 1, 3, 12
Exogenous: atypical. D(Date ≥ Apr 2001) D(Date ≥ Aug 2002) D(Date ≥ Mar 2004) D(Date ≥ Oct 2008); effect of special days: D(EASTER)

Table A.2 (*concluded*)

Equation 7 [DLOG(*pvi_it*,12), *isec_it*] - Adjusted sample: Oct 2000-Jul 2011, 138 observations

| No. of cointegrating relationships | Characteristic value | Trace statistic | Probability | Maximum characteristic value | Probability |
|---|---|---|---|---|---|
| None | 0.103872 | 21.52488 | 0.0333* | 15.13478 | 0.0654 |
| At least 1 | 0.045249 | 6.390104 | 0.1627 | 6.390104 | 0.1627 |

Restricted constant, lags: 1, 4
Exogenous: atypical. D(Date = Dec 2001) D(Date ≥ Sep 2004) D(Date = Jul 2007)

Equation 8 [DLOG(*pvi_lt*,12), *isec_lt*] - Adjusted sample: Oct 2000-Jul 2011, 130 observations

| No. of cointegrating relationships | Characteristic value | Trace statistic | Probability | Maximum characteristic value | Probability |
|---|---|---|---|---|---|
| None | 0.323584 | 56.92973 | 0.0000** | 50.82308 | 0.0000** |
| At least 1 | 0.045888 | 6.106644 | 0.1827 | 6.106644 | 0.1827 |

Restricted constant, lags: 1, 5, 12
Exogenous: atypical. D(Date ≥ Feb 2003) D(Date ≥ Feb 2008) D(Date ≥ Dec 2008); effect of special days: D(EASTER) D(CARNI)

Equations 9-11 [*iec_lt*, *iec_x*, *iec_it*, *iec_m* ] - Adjusted sample: Nov 1997-Jul 2011, 165 observations

| No. of cointegrating relationships | Characteristic value | Trace statistic | Probability | Maximum characteristic value | Probability |
|---|---|---|---|---|---|
| None | 0.268718 | 107.9238 | 0.0000** | 51.63786 | 0.0000** |
| At least 1 | 0.194458 | 56.28598 | 0.0001** | 35.67963 | 0.0004** |
| At least 2 | 0.081527 | 20.60635 | 0.0448* | 14.03212 | 0.0958 |
| At least 3 | 0.039061 | 6.574237 | 0.1508 | 6.574237 | 0.1508 |

Restricted constant, lags: 1
Exogenous: atypical. D(Date ≥ May 1999) D(Date ≥ Apr 2001) D(Date ≥ Dec 2001) D(Date = Mar 2002) D(Date ≥ Jan 2006) D(Date ≥ Aug 2007) D(Date = Oct 2008) D(Date ≥ Dec 2009) D(Date ≥ Feb 2010)

*Source:* prepared by the author.

[a] See Section VII, points 1 and 2.
Note: ** Significant at 1%; * significant at 5%.

TABLE A.3

**Normality tests: equations 1 to 11**
*(Residual normality test)*

| | Asymmetry (probability) | Kurtosis (probability) | Jarque-Bera | Probability (J-B) |
|---|---|---|---|---|
| Equation 1 | 0.9187 | 0.1246 | 4.335119 | 0.3625 |
| Equation 2 | 0.1724 | 0.4442 | 5.138588 | 0.2734 |
| Equation 3 | 0.4717 | 0.7125 | 2.180904 | 0.7025 |
| Equation 4 | 0.7961 | 0.3879 | 2.349808 | 0.6717 |
| Equation 5 | 0.9526 | 0.1809 | 3.516415 | 0.4754 |
| Equation 6 | 0.3138 | 0.4853 | 3.763709 | 0.4389 |
| Equation 7 | 0.0662 | 0.7151 | 6.101225 | 0.1917 |
| Equation 8 | 0.209 | 0.8225 | 3.521203 | 0.4747 |
| Equation 9[a] | 0.6125 | 0.2853 | 7.701276 | 0.4632 |
| Equation 10[a] | | | | |
| Equation 11[a] | | | | |

*Source:* prepared by the author.

[a] On the three-equation system.
Note: orthogonalization: Cholesky (Lutkepohl). $H_0$: multivariate normal residuals.

TABLE A.4

**Exclusion tests: equations 1 to 11**

| | $\beta_1 = 0$ | | $\beta_2 = 0$ | | $\beta_3 = 0$ | | $\beta_4 = 0$ | |
|---|---|---|---|---|---|---|---|---|
| | Chi squared | Probability | Chi squared | Probability | Chi squared | Probability | Chi squared | Probability |
| Equation 1 (ECM[Δ12*pvi_x, iec_x*]) | 24.112 | 0.000 | 11.708 | 0.001 | - | - | - | - |
| Equation 2 (ECM[Δ12*pvi_m, iec_m*]) | 11.530 | 0.001 | 10.830 | 0.001 | - | - | - | - |
| Equation 3 (ECM[Δ12*pvi_it, iec_it*]) | 29.173 | 0.000 | 23.048 | 0.000 | - | - | - | - |
| Equation 4 (ECM[Δ12*pvi_lt, iec_lt*]) | 18.048 | 0.000 | 13.915 | 0.000 | - | - | - | - |
| Equation 5 (ECM[Δ12*pvi_x, isec_x*]) | 26.453 | 0.000 | 12.060 | 0.001 | - | - | - | - |
| Equation 6 (ECM[Δ12*pvi_m, isec_m*]) | 16.376 | 0.000 | 9.367 | 0.002 | - | - | - | - |
| Equation 7 (ECM[Δ12*pvi_it, isec_it*]) | 7.898 | 0.005 | 6.031 | 0.014 | - | - | - | - |
| Equation 8 (ECM[Δ12*pvi_lt, iec_lt*]) | 38.182 | 0.000 | 40.487 | 0.000 | - | - | - | - |
| Equation 9 [*iec_x, iec_m, iec_it, iec_lt*] | 26.723 | 0.008 | 30.282 | 0.003 | - | - | - | - |
| Equation 10 [*iec_x, iec_m, iec_it, iec_lt*] | - | - | 36.835 | 0.000 | 43.906 | 0.000 | | - |
| Equation 11 [*iec_x, iec_m, iec_it, iec_lt*] | 34.166 | 0.001 | - | - | - | - | 31.658 | 0.002 |

*Source:* prepared by the author.

Note: in equations 9, 10 and 11, the tests were performed on the restricted system so that all vectors were identified.
ECM: error-correction mechanism coefficient.

TABLE A.5

**Causality tests**

| Null hypothesis: | F-statistic | Probability |
|---|---|---|
| DLOG(*pvi_x*, 0.12) does not Granger-cause *iec_x* | 1.2826 | 0.2378 |
| *iec_x* does not Granger-cause DLOG(*pvi_x*, 0.12) | 1.7887 | 0.0576 |
| DLOG(*pvi_m*, 0.12) does not Granger-cause *iec_m* | 0.7361 | 0.7137 |
| *iec_m* does not Granger-cause DLOG(*pvi_m*, 0.12) | 2.5935 | 0.0043 |
| DLOG(*pvi_lt*, 0.12) does not Granger-cause *iec_lt* | 0.6698 | 0.7773 |
| *iec_lt* does not Granger-cause DLOG(*pvi_lt*, 0.12) | 1.6562 | 0.0855 |
| DLOG(*pvi_x*, 0.12) does not Granger-cause *isec_x* | 0.9598 | 0.4910 |
| *isec_x* does not Granger-cause DLOG(*pvi_x*, 0.12) | 2.2826 | 0.0120 |
| DLOG(*pvi_m*, 0.12) does not Granger-cause *isec_m* | 1.0471 | 0.4113 |
| *isec_m* does not Granger-cause DLOG(*pvi_m*, 0.12) | 2.4495 | 0.0069 |

*Source:* prepared by the author.

**ANNEX II**

Cointegration and common trends

The existence of cointegration between two integrated time series implies a trend common to both. The basis for identifying common trends between time series is the application of multivariate structural models. The methodological framework for thus identifying common trends and common factors more generally was developed by Engle and Kozicki (1993) and Vahid and Engle (1993) and applied in a number of studies, such as Carvalho and Harvey (2005) and Carvalho, Harvey and Trimbur (2007).

To that end, take the multivariate local oscillation model relative to the variable of the level component (the development is based on Koopman and others, 2009):

$$\begin{aligned} y_t &= \mu_t + \varepsilon_t, & \varepsilon_t &\sim NID\left(0, \Sigma_\varepsilon\right) \\ \mu_t &= \mu_{t-1} + \eta_t, & \eta_t &\sim NID\left(0, \Sigma_\eta\right) \end{aligned} \qquad \text{(A.1)}$$

where $\Sigma_\varepsilon$ and $\Sigma_\eta$ are variance-covariance matrices and $\eta_t$ and $\varepsilon_t$ are normal disturbances uncorrelated with each other in all periods. Now suppose that the range of $\Sigma_\eta$ is $K < N$. In this case, the model contains $K$ levels or *common trends*, and can be written as:

$$\begin{aligned} y_t &= \Theta\mu_t^* + \varepsilon_t, & \varepsilon_t &\sim NID\left(0, \Sigma_\varepsilon\right) \\ \mu_t^* &= \mu_{t-1}^* + \eta_t^*, & \eta_t^* &\sim NID\left(0, D_\eta\right) \end{aligned} \qquad \text{(A.2)}$$

where $\eta_t^*$ is a $K$ x 1 vector, $\Theta$ is an $N$ x $K$ standardized factor loading matrix, $D_\eta$ is a diagonal matrix and $\mu$ is an $N$ x 1 constant vector, in which the first $N$ - $K$ elements are null and the remaining $K$ elements are contained within a $\overline{\mu}$. vector. The $\Theta$ matrix consists of $K$ rows and has ones in the diagonal, so that $\theta_{ii} = 1, i = 1, \ldots\ldots, K$, while $\theta_{ij} = 0$ whenever $j > i$.

To estimate both levels and common slopes, take a general multivariate local linear trend model in which the level variance matrix is of rank $K_\eta$ and the slope variance matrix is of rank $K_\beta$:

$$\begin{aligned} y_t &= \mu_t + \varepsilon_t, & \varepsilon_t &\sim NID\left(0, \Sigma_\varepsilon\right), \\ \mu_t &= \mu_{t-1} + \Theta_\beta \beta_{t-1}^* + \beta_\theta + \eta_t, & \eta_t &\sim NID\left(0, \Sigma_\eta\right), \\ \beta_t^* &= \beta_{t-1}^* + \zeta_t^*, & \zeta_t^* &\sim NID\left(0, D_\zeta\right) \end{aligned} \qquad \text{(A.3)}$$

where the $N$ x $K_\beta$ matrix $\Theta_\beta$ is such that e $\sum_\zeta \Theta_\beta D_\zeta \Theta_\beta'$, $\beta_\theta = \left(0', \overline{\beta'}\right)'$ with $\overline{\beta}$ a vector of length (N - $K_\beta$). If $K_\beta = 1$ ($\Theta_\beta$ is a vector of ones), letting $\overline{\beta} = 0$, the inference is that all the series have the same underlying growth rate (when modelling in logarithms). This is possible even where there are no common levels. The implication is that the trends in the prediction function remain parallel, in other words the long-run growth paths are the same. However, unless there are similar restrictions on the levels, the growth paths within the sample will not necessarily stay together.

In a common trend model such as the one given in equation A.2, a cointegrated system is expressly established, given the restrictions on the number of unobservable components that it entails (Harvey, 1989). If the $y_t$ elements are integrated of order 1 (I(1)), there will be $N$ - $K$ linear combinations of $y_t$ that are stationary. This means that there is a matrix of order ($N$ - $K$) x $N$ of cointegration vectors $A$, so that $Ay_t$ is a stationary process ($N$ - $K$) x 1. It therefore follows that A'$\Theta$ = 0, and consequently:

$$Ay_t = A\mu + A\varepsilon_t \qquad \text{(A.4)}$$

The tests for identifying common trends in a multivariate structural model were developed by Nyblom and Harvey (2001).

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# Argentina: Impacts of the child allowance programme on the labour-market behaviour of adults

*Roxana Maurizio and Gustavo Vázquez*

**ABSTRACT**

In 2009 Argentina implemented the Universal Child Allowance for Social Protection (AUH), a cash transfer programme for households with children. Coverage provided by the contributory family allowance programme was extended to parents who are unemployed or who work in the informal sector (domestic workers, for example). This paper uses the difference-in-difference estimator and propensity score matching techniques to evaluate the short-term effects of the AUH on adult labour participation and income generation. The results suggest that, during its first year of operation, no significant disincentives to work were generated by the programme, given that it did not discourage adults from working or lead to a reduction in the number of hours worked. These findings are highly relevant in the Latin American context where these kinds of cash transfers have become an important component of social protection systems.

**KEYWORDS** Social security, child welfare, households, child benefit, action programmes, family income, evaluation, Argentina

**JEL CLASSIFICATION** J22, I38, J08

**AUTHORS** Roxana Maurizio is a Research fellow with Universidad Nacional de General Sarmiento and the National Council of Scientific and Technical Research (CONICET) of Argentina. roxanadmaurizio@gmail.com

Gustavo Vázquez is a Research fellow with Universidad Nacional de General Sarmiento of Argentina. gmvazque@ungs.edu.ar

# I
# Introduction

In 2009 Argentina implemented a major cash transfer programme for children and adolescents called Universal Child Allowance for Social Protection (AUH, Asignación Universal por Hijo para Protección Social), which extended the coverage of the contributory family allowance programme to new segments of the population.

The AUH is a monthly cash transfer paid to a parent, guardian or relative (up to the third degree of consanguinity) for each child under 18 years of age. In the case of children with disabilities, the age limit is not applicable. The AUH is a semi-conditional cash transfer: 80% of its value is paid on a monthly basis to the beneficiary, and the remaining 20% is deposited into a savings account in their name. The latter sum may be withdrawn once the beneficiary has provided evidence of school attendance and medical check-ups. AUH beneficiaries may not claim any other social benefit provided by the national government, by provincial or municipal governments or by the Autonomous City of Buenos Aires, and all earlier programmes targeting similar groups were phased out.

Several studies conducted ex-ante evaluations simulating the impact of the AUH on inequality, poverty and extreme poverty indicators.[1] They all arrive at the conclusion that, once the entire target population has been reached, AUH implementation would significantly reduce indigence and, to a lesser extent, poverty, while also having a positive effect on inequality. Nevertheless, these studies do not take into account the possible impact of these transfers on adults' decisions to work and on the number of hours they work.

The present study proposes to fill this gap by carrying out an ex-post evaluation of the AUH. Through the application of a non-experimental econometric strategy, we evaluate the short-term impact of the AUH on economic participation decisions, employment, unemployment, number of hours worked and income generation. Hence, this study contributes to enrich the scant but growing literature on the impact of cash transfers on the labour-supply behaviour of adults in developing countries.

On the basis of the results obtained, we cannot conclude that the programme generated any disincentives to work among the adult members of beneficiary households between 2009 and 2010, in terms of encouraging them to leave the labour force or cut back on the number of hours worked.

However, at least four caveats apply to our results. First, unlike other studies that perform impact assessments as part of their evaluation of this kind of programme, no surveys have been specifically designed for this purpose in Argentina. Second, in the household survey employed, AUH beneficiaries are only indirectly identified. Third, differences in unobserved characteristics might arise between the treatment and control groups, although the methodology employed aims to reduce the likelihood of this problem. Lastly, the analysis covers a relatively short period of time, and the results could change over a longer time horizon, particularly in terms of the programme's impact on labour-market participation.

Section II of this article provides a brief description of the main characteristics of the programme. Section III then presents the theoretical framework and a review of the empirical evidence for Latin America. Section IV details the source of information employed, while section V specifies the econometric strategy. Section VI provides some descriptive statistics and section VII discusses the impacts on labour-market outcomes. Lastly, section VIII offers some concluding remarks.

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1 These include Roca (2010); Agis, Cañete and Panigo (2010); Gasparini and Cruces (2010), ILO (2010); and Bertranou and Maurizio (2012).

# II

## Brief description of the programme

Given the greater incidence of poverty among children and adolescents compared to other age groups, Latin American countries have been implementing and expanding non-contributory cash transfer programmes (conditional cash transfer programmes) to households with children and adolescents since the mid-1990s. They have gradually become important mechanisms within social policies and regional poverty reduction strategies.

In November 2009 the Argentine government implemented a major cash transfer programme for children called Universal Child Allowance for Social Protection (AUH). This extended the coverage of the contributory family allowance programme to include the children of:

(i) workers not registered in the social security system (informal workers) or domestic workers whose labour income is below the minimum wage;
(ii) *monotributistas sociales*;[2]
(iii) unemployed persons without unemployment insurance, and
(iv) economically inactive workers without pensions.

Two groups of workers were excluded from AUH despite the fact that they do not receive any contributory benefits: domestic workers whose wages exceed the minimum wage, and workers registered in the *monotributo* scheme, except for those in the *monotributo social*.

The AUH is a cash transfer that is paid on a monthly basis to a parent, guardian or relative (up to the third degree of consanguinity) for every child under 18 years of age. The age limit is not applicable in the case of children with disabilities. The children must be Argentine nationals or have been resident in the country for at least three years. Both the children and the parents must have a national identity document. When parents share custody, the programme gives priority to mothers as beneficiaries. The benefit is a set amount per child and it can be claimed for up to five children in one's charge. Its initial value was 180 pesos (US$ 47) per child and 720 pesos for a child with disabilities (four times the standard benefit). It was later updated to take into account the erosion of its purchasing power by inflation.

At present, the AUH covers about 30% of children (3.5 million) and 15% of households (1.8 million) in Argentina. Government expenditure on the programme represents approximately 0.8% of GDP, making it one of the largest programmes in the region.

Receiving any other type of social benefit is incompatible with the AUH, and all earlier programmes targeting similar groups were phased out. In particular, the new policy replaced the Unemployed Heads of Household Plan and the Family Programme for Social Inclusion, the two most important Argentine conditional cash transfer programmes of the 2000s. As a result of this, in its initial stages the AUH absorbed significant flows of individuals that were former beneficiaries of these two programmes.

The AUH is a semi-conditional cash transfer programme: 80% of its value is paid on a monthly basis to beneficiaries, while the remaining 20% is deposited into a savings account in their name. The latter sum may be withdrawn once the holder has provided evidence of completion of the vaccination programme and relevant health checks in the case of children under 5 years of age, and has presented a certificate of school-year completion for school-age children.[3] AUH conditionality is therefore similar to that of most conditional cash transfer programmes implemented in Latin America.

Even though reducing poverty and extreme poverty is one of its objectives, the AUH is not an ad-hoc programme designed to alleviate the situation of families with socially vulnerable children, as in the case of the *Bolsa Família* programme in Brazil or the Oportunidades programme in Mexico. As mentioned above, it is an extension of the existing contributory child allowance

[2] The *monotributo* is a simplified tax regime under which the worker pays a single fixed amount (whose value depends on the income declared), which includes a social security component and a tax component. The *monotributo social* is a tax category for individuals in a socially vulnerable situation who are part of labour cooperatives or production projects of up to three people, and whose income falls below a certain level.

[3] The regulations of the programme establish that the AUH monthly payment will be suspended if certificates are not duly presented, and 20% of the bank deposit will be withheld until the situation is regularized. In some cases, parents were unable to comply with the conditionalities because there were no health centres nearby or because they could not get an appointment with the doctor to certify the health check-ups (Pautassi, Arcidiácono and Straschnoy, 2013). For this reason, checks on compliance with conditionalities were not exhaustive in the early stages of the programme, and only became more rigorous as time went by.

programme covering the children of formal workers, unemployed persons with unemployment insurance and pensioners. The amount received is, in fact, the same in both systems.

This point is important because, unlike a means-tested conditional cash transfer programme, the restrictions imposed by the AUH are not directly related to family incomes but rather to the employment status of the adults in charge of the children, and to their labour incomes if they are employed (in informal jobs). However, the difficulties involved in monitoring informal labour incomes hamper the enforcement of such restrictions.

# III

# Theoretical framework and empirical evidence

## 1. Theoretical framework

There is a broad debate surrounding the impact that cash transfers to households may have on adults' labour behaviour. Such impacts concern receipt of non-labour incomes, on the one hand, and fulfilment of programme conditionality, on the other.

The neoclassical theory of individual labour supply provides that this type of non-labour income produces a pure income effect in the household, which leads to an increase in the demand for normal goods. If leisure is a normal good then the supply of labour will decrease, a behaviour that could lead to labour-market exits (corner solution) or to a reduction in the number of hours worked (interior solution).

Nevertheless, it could be argued that the actual impact of the cash transfer will depend on its magnitude. Other factors could affect the decision to remain in or leave the labour force in response to such benefits, such as the characteristics of the occupation other than its remuneration (job conditions, commuting distance or number of hours worked) or the demands of care and household chores.

While transfers might discourage labour participation if they are of a high enough value, the opposite effect is also possible. In other words, this benefit might allow households to overcome entry barriers to certain productive or entrepreneurial activities or to implement certain economic decisions that would otherwise be impossible (Medeiros, Britto and Veras Soares, 2008; Teixeira, 2010).

In the more complex family labour supply model (Killingsworth, 1983), decisions regarding time allocation are linked to the decisions of other household members. Hence, a second channel may be introduced through which transfers might lead to changes in the labour supply behaviour of adults, that is, the impacts associated with fulfilment of the programme's conditionalities. By being linked to school attendance, the benefit reduces the opportunity cost of study, which might lead to a decline in the demand for study-substitute goods and to an increase in the demand for study-complementary goods. If work is a substitute for study, this will lead to a reduction in the child labour supply. However, if work and study are not perfect substitutes, the impact on child labour supply could be ambiguous (Ravallion and Wodon, 2000).

This raises two important points regarding the adult labour supply. One is the question of how the labour supply of the other household members would react to a reduction in the labour supply of children. This behaviour might partially offset the impact of the transfers on total household incomes, causing the potential disincentive effect on adults to be fairly small. Skoufias and Parker (2001) point out that the impact of these transfers will vary between households depending on their personal circumstances. In particular, for certain types of households, the amount of the transfer might be lower than the loss of income caused by the reduced labour supply of children once they start going to school, thus discouraging enrolment in the programme.

Second, fulfilment of conditionality could itself alter the time allocation of adults: if school attendance reduces the time spent on childcare, this could increase the time available for work; conversely, the time needed to ensure school attendance and medical check-ups could reduce the time spent working (Parker and Skoufias, 2000).

The distribution of time and tasks within households is thus another central aspect of these types of transfers, and these factors become even more relevant from a gender perspective. As pointed out by Gammage (2010), the potential effects of the programme on women's allocation of time between paid and unpaid work must be taken into account when analysing the results of these programmes, since responsibility for the tasks derived from programme conditionalities usually falls to women.

Lastly, the fact that these programmes have an "exit door" associated with improvement of the household's economic conditions might discourage participation in the labour market since it could affect eligibility to continue in the programme. In the case of the AUH, gaining access to and remaining in the programme do not depend on family income but rather on the labour incomes of the adults in charge of the children. However, monitoring compliance with this restriction is fairly difficult in a context of labour informality, which might weaken the significance of the types of behaviours that tend to reduce the labour supply. In the case of unemployed or economically inactive individuals, the AUH does not create any explicit disincentives to work. A formal job would give them access to a contributory child allowance, while an informal job would allow them to continue receiving the AUH. Moreover, the benefit consists of a fixed amount per child and does not depend on the level of labour incomes. All of these particular characteristics of the AUH might lessen the potential impact of the transfer on work-related decisions.

## 2. Empirical evidence for Latin American countries

An increasing number of studies are analysing the impact of conditional cash transfer programmes on adult labour-market behaviour in Latin America. However, the empirical evidence is not conclusive.

The results obtained by Ferro and Nicollela (2007) for the Brazilian programme *Bolsa Família* suggest that it did not have a disincentive effect on the labour supply although it did on the number of hours worked, but the aggregate impact seems to have been rather small. In particular, while beneficiary mothers living in urban areas work 1.5 hours per week more than non-beneficiary mothers, mothers and fathers in rural areas exhibit the opposite behaviour. The reduction in the number of hours worked might be a result of having to allocate more time to compliance with programme conditionality or to housework previously done by children. The potential income effect of the transfers may have played a part as well. A subsequent study by Ferro, Kassouf and Levison (2010) found similar results: the programme led to an increase in the economic participation of mothers and fathers in urban areas but had no significant effects in rural areas.

Foguel and Paes de Barros (2010) find that the programme had null effects on the economic participation of women and a small impact among men. Regarding the number of hours worked, they find a negative effect of minor magnitude for women and no significant effects for men.

Medeiros, Britto and Veras Soares (2008) find that female heads of household who are beneficiaries of this programme are less likely to participate in the labour market than non-beneficiaries. No significant effects were found for other groups. The results obtained by Teixeira (2010) also suggest an average null effect of the *Bolsa Família* programme on the probability of working and a very small reduction in the number of hours worked by adults. The elasticity of response is greater among women and informal workers, and it increases with the size of the benefit.

Conversely, Soares, Ribas and Osório (2007) find an increase in the participation rates of men and women associated with the *Bolsa Família* programme, with more variation among women. Along the same lines, Tavares (2008) finds that the likelihood of working rises by around 6% for beneficiary mothers, while the number of hours they work per week increases by 2%.

In the case of Mexico, Parker and Skoufias (2000) find that the Progresa programme (now the Oportunidades programme) has no disincentive effects on adults' work-related decisions. A more detailed analysis of women's allocation of time reveals that the programme led to an increase in the number of hours spent on meeting the conditionality requirements. On the other hand, the programme has no significant effects on the number of hours spent on leisure by men or women. The results obtained by Skoufias and Di Maro (2008) confirm that the Mexican programme does not create disincentive effects.

Amarante, Ferrando and Vigorito (2011) found a similar pattern is found in Uruguay, where the introduction of the National Social Emergency Plan (PANES) did not lead to changes in the labour supply or in the number of hours worked.

Soares, Ribas and Hirata (2008) analyse the impact of Paraguay's Tekoporã programme. They find that the programme has a negative impact on the labour supply of men, which is even stronger in moderately poor and in rural areas. However, when temporary workers are excluded, this negative impact remains only in moderately poor areas. Non-significant effects were found for women and for the population as a whole.

Galasso (2006) analyses the impact of the Chile Solidario programme during its first two years of operation. The author finds that, even though access to this benefit resulted in greater participation in employment programmes, which might improve employability in the medium term, the overall proportion of employed members in beneficiary households does not seem to have

increased in the short term. Only in rural areas does the author find a rise in the labour force participation rate. In any case, the author highlights that "the short term horizon of the current analysis might not be sufficient to observe any impact along these dimensions".

Alzúa, Cruces and Ripani (2010) conduct a comparative evaluation of transfer programmes in Honduras, Mexico and Nicaragua. Again, the authors find that decisions regarding labour participation and working hours are unaffected by these transfers, apart from in Nicaragua, where they found a reduction in the number of hours worked at the household level, especially where the head of household is female. In fact, the authors find that the Progresa programme had positive effects on men's hourly wages and on total labour incomes in beneficiary households, suggesting the presence of indirect impacts on local labour-market conditions.

Lastly, Garganta and Gasparini (2012) evaluate the effects of the AUH on transitions between formality and informality. They conclude that the programme significantly discourages the formalization of beneficiaries, but found no evidence of incentives for registered wage earners to become informal workers.

It is possible to conclude, therefore, that assessment of the impact of the AUH programme is an empirical matter. However, the more recent evidence for Latin American countries suggests that cash transfers have no significant disincentive effects on the labour-market insertion of adult beneficiaries.

# IV
# Data

The data employed in this paper come from the regular household survey of Argentina, the Permanent Household Survey (PHS) carried out by the National Institute of Statistics and Censuses (INDEC), which covers 31 urban areas and collects information on labour-market variables in particular.

Even though the PHS is not a longitudinal survey and does not include retrospective questions, its rotating panel sample enables flow data to be drawn from the survey, that is, a selected household is interviewed in four moments or waves: the household appears in the sample for two successive quarters, followed by a break for the following two quarters, and appears again in two successive quarters, one year later. By comparing the situation of an individual in a given wave to that of the same individual in another wave, it is possible to determine whether the person has experienced changes in diverse variables, including occupational and demographic ones.

In particular, annual panel data constructed for the QI2009-QIII2010 period are employed in this study so as to include information prior and subsequent to implementation of the AUH in November 2009.[4] To ensure that a greater number of observations were available, a pool with these three annual panels was constructed.

[4] Data from the fourth quarter of 2009 were excluded because the programme was launched in November of that year and this quarter already includes information on the programme's beneficiaries.

# V
# Approach and methodology

## 1. Econometric specification

To evaluate the impacts of the AUH, a non-experimental method will be employed. This method is based on the application of matching techniques to define a control group, making it possible to estimate what the situation of beneficiaries would have been had they not gained access to the programme. Then, having accurately defined the control group and by comparing outcome variables between the beneficiary and non-beneficiary groups, it is possible to attribute the observed differences to the particular policy under study.

Following the traditional terminology of this approach, $D$ is defined as a variable that indicates receipt of the transfer ($D = 1$ if the household/person receives the transfer; $D = 0$ if not), and $Y$ is the outcome of interest ($Y^1$ being outcome in the presence of the benefit, and $Y^0$ in its absence). The impact of the transfer is measured by the average treatment effect on the treated (ATT), which is conditional on a propensity score model, P(X), where X represents a vector of observable characteristics:

$$ATT(X) = E\left[Y^1 - Y^0 \middle/ P(X), D = 1\right]$$

where $E[.]$ is the expectation of the difference between the two outcomes, with and without the treatment, over the population receiving the transfer ($D = 1$).

Since the counterfactual, $E[Y^0 / P(X), D = 1]$, is not an observable situation, propensity score matching techniques are employed to estimate it. Given that only the ATT needs to be identified, it is sufficient to verify the assumptions suggested in Heckman, Ichimura and Todd (1997, 1998) (i) "Ignorability of treatment in the sense of conditional mean independence"; and (ii) "Matching condition". The first condition implies that the selection of treated and control groups is made purely on the basis of the propensity score, and then, after accounting for it, the assignment to treatment is independent of mean outcomes; the second condition ensures that for every possible value of propensity score there exist beneficiary and non-beneficiary control cases.

To estimate the ATT parameter, a difference-in-difference matching estimator (DD) will be implemented on the basis of the available information from before and after policy implementation, through comparing the temporal changes of the outcome variable in the beneficiary group with the changes in the same variable in the control group. The advantage of this strategy lies in the possibility to control for biases derived from time invariant unobserved characteristics. Its expression is given by,

$$\widehat{ATT^{DD}} = \frac{1}{n^1}\sum_{\substack{i=1 \\ \{D_i=1\}}}^{n^1} Y^1_{i,t_1}\left(X_{i,t_1}\right) - Y^1_{i,t_0}\left(X_{i,t_0}\right) - \widehat{E}\left[Y^0_{i,t_1}\left(X_{i,t_1}\right) - Y^0_{i,t_0}\left(X_{i,t_0}\right) \middle/ P\left(X_{i,t_0}\right), D_i = 0\right]$$

where $n^1$ represents the quantity of cases that receive the benefit, $t_0$ is the moment prior to programme implementation, and $t_1$ the moment after implementation.

Hence, by adapting assumptions (1) and (2) to the context of this estimator, the following expressions are derived:

$$E\left[Y^0_{t_1}(X) - Y^0_{t_0}(X) \middle/ P(X), D = 1\right] = E\left[Y^0_{t_1}(X) - Y^0_{t_0}(X) \middle/ P(X), D = 0\right]$$

$$0 < Pr\left(D = 1 \middle/ X\right) < 1$$

Lastly, we focus our attention on estimation of the ATT parameter on the support region common to both beneficiaries and the control group. To estimate the counterfactuals, two alternatives of matching are applied: nearest neighbour (NN)[5] and local linear regression (LLR).[6]

## 2. Strategies for identifying the treatment group and the control group

The basis for this study is the correct identification of AUH beneficiary households (treatment group) and those that will constitute the control group.

Unfortunately, the PHS does not inquire about this matter directly so identification must be addressed indirectly. In order to identify households receiving the AUH in 2010 we resorted to a question that captures the sum of cash transfers received by household members from, for example, the government, private institutions and the Church. Given that the question includes a rather wide range of entities, it cannot be assumed that the answers relate exclusively to this programme. Therefore,

[5] Under this alternative, the counterfactual for each case treated is estimated using a simple average of the outcomes for a subset of cases belonging to the control group, whose conditional probability of receiving the benefit is similar on the basis of a set of observable attributes. Here, each subset is composed of the five nearest "neighbours".

[6] In this case, each counterfactual is estimated on the basis of a weighted average of outcomes for a subset of cases in the control group assigned to each beneficiary unit, in terms of the proximity measure mentioned in footnote 5. The weights are thus built to assign greater importance to the comparison units closest to the respective beneficiary case, and are estimated for each subgroup using weighted linear regressions of the outcome for a constant and the difference between estimated propensity scores and that for each beneficiary case. The weightings used for the regressions use a kernel function whose arguments are given by the measure of proximity used, and the bandwidth or smoothing parameter chosen (a concept analogous to the number of "neighbours" used in the first alternative). Fan (1992) analyses the properties of this estimator compared to other traditional linear smoothers and concludes that it is the most efficient in asymptotic terms and in finite samples, and it adapts to different design densities of the data.

households were initially classified as AUH beneficiaries only when the amounts declared matched the values established by the programme, i.e. the amount of the transfer was used as treatment indicator.

Considering the frequency of the cash values appearing in this question it may be assumed that some households declared the amount that was actually received on a monthly basis as benefit (80% of the sum of the benefit), while others declared the full amount. The values of the AUH per number of children in one's charge in the period under analysis are shown in table 1.

TABLE 1

**Value of the AUH, by number of children**
*(Argentine pesos)*

| Number of children | Value of the AUH | |
|---|---|---|
| | Total | 80% |
| 1 | 180 | 144 |
| 2 | 360 | 288 |
| 3 | 540 | 432 |
| 4 | 720 | 576 |
| 5 | 900 | 720 |

*Source:* prepared by the authors on the basis of data from the Permanent Household Survey of the National Institute of Statistics and Censuses (INDEC).

However, values close to the amount of the benefit were also considered as AUH in order to account for the possibility of errors in income statements and the fact that households tend to round off the amounts declared. In order to minimize the possibility of misclassification, the frequency of each of these values in 2010 was compared to 2009 (before AUH implementation) so as to verify that values considered as AUH were not present in the year before implementation. This procedure clearly showed that the values corresponding to AUH transfers started to appear as payments made by other national programmes begun to disappear (this applies to the Unemployed Heads of Household Plan, the Family Programme for Social Inclusion and Training and Employment Insurance) owing to the fact that the AUH cannot be delivered in conjunction with any other type of social benefit (see figure 1).[7]

Also, when the values observed suggested that more than one person per household was receiving the AUH, the total amount of the benefit received by the household was compared to the number of children in the household. Since several cases were found in which the amount of the benefit erroneously appeared for more than one adult member, we excluded from the analysis households with more than one recipient member and those whose total AUH incomes suggested the presence of more children than the number actually living in the household.[8]

In addition, the group of households classified as beneficiaries was further reduced by excluding those without children. This responded to the need to reduce the heterogeneity of this group in relation to the control group, which was made up of AUH-eligible households (which therefore contain children).

The eligible households (control group) are those that meet all the requirements to receive the AUH but do not receive it. As already mentioned, potential beneficiaries are:

(i) households with children under 18 years old whose heads or spouses are non-registered wage earners (informal workers) or domestic workers whose incomes fall below the minimum wage;
(ii) *monotributistas sociales;*
(iii) unemployed persons not in receipt of unemployment insurance, and
(iv) economically inactive workers without pensions

Therefore, the analysis will be limited to those households (and their members) with children that were eligible for the AUH in 2009, differentiating between them according to whether they gained access to the benefit in 2010 (treated group) or not (control group). Thus, the eligibility condition corresponds to 2009, but the recipient condition corresponds to 2010.

Households with incomplete information or with imputed values for individual or family incomes were excluded from the sample. In addition, outlier values of total family incomes and their components (labour and non-labour incomes) were dropped from the analysis using a robust data standardization method.

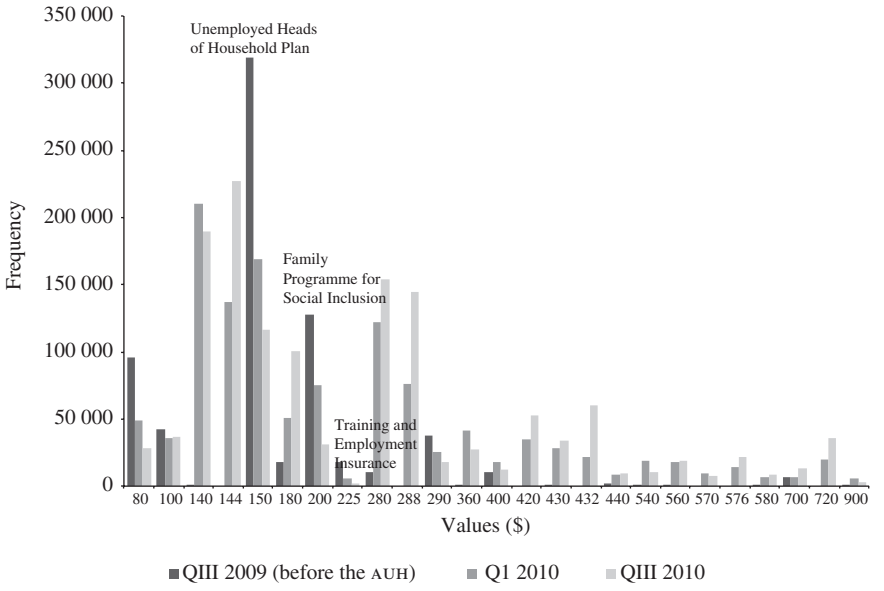
Since we are interested in evaluating the effects of the AUH on adult labour-market behaviour, the sample in the analysis of individuals is comprised of people

[7] Based on figure 1, it seems reasonable to assume that values such as 140 pesos and 280 pesos also correspond to the AUH, because they first appear in 2010 and because the amounts are very similar to those established by the programme (144 pesos and 288 pesos, respectively).

[8] These households represented 3% of the total number of households initially classified as AUH beneficiaries. Even though this would mean that some households are excluded from the analysis in spite of having correctly declared more than one beneficiary per household, the comparison between the actual number of children living in the household and the number derived from the total sum of the benefit per household suggests that the error of including these cases would be more significant than the error of excluding them.

FIGURE 1

**Frequency of public transfers' monetary values before and after AUH implementation**
*(Argentine pesos)*




*Source:* prepared by the authors on the basis of data from the Permanent Household Survey of the National Institute of Statistics and Censuses (INDEC).

in economically active age groups: men aged between 18 and 64 years, and women aged between 18 and 59 years. In both cases, the upper age limit corresponds to the legal retirement age.

Before concluding this section, some points must be clarified regarding the composition of the eligible households group. Given that the AUH aims to achieve universal coverage for households with children not covered by the contributory system, it is curious that a group of households remained outside the AUH programme during its first year, despite being eligible. Even though the causes of this phenomenon are not entirely known, certain factors might have played a role.

First, as mentioned earlier, in order to enter the AUH programme, both children and the parents must have national identity documents that serve as a proof of identity. According to some qualitative studies, this requisite seems to have represented a major barrier to programme access, at least in its early stages. Delays in enrolling the newborn in the programme in first-child households might have also been another reason for not entering the programme. Other family issues might also have played a part (Pautassi, Arcidiácono and Straschnoy, 2013).

In addition, some individuals who might appear to qualify for the benefit according to the PHS are in fact registered as *monotributistas*, and as such are not eligible for the programme. However, since it is impossible to identify this group in the survey, they remained in the eligible group in the analysis.

As was also discussed above, programme impact can vary according to households' constraints and preferences (Moffit, 2002; Skoufias and Parker, 2001). In particular, eligible households might exclude themselves from the programme owing to certain administrative procedures or requisites associated with the conditionalities imposed for programme access.

It is important to mention that compliance with conditionalities is not being used to determine household eligibility. This is for two reasons. First, the PHS does not provide complete information on this matter, particularly in terms of health checks. With regard to education, even though the survey does identify whether a child goes to school or not, if the child does not attend school the household does not necessarily become non-eligible, because it can still receive the AUH for another minor that does attend school. However, the minor for whom the household receives the benefit cannot be identified in

the PHS. In any case, 90% of eligible households would still be eligible if a restriction was imposed stating that every child living in the household must attend school. Second, enforcement of conditionalities was more lax in the early stages of the programme but became more rigorous over time.

As already mentioned, the evaluation relates to the programme's first year of implementation and thus the existence of a group of non-beneficiary eligible households could also be due to registration delays. The distance between the households and the administrative offices of the programme might have been another factor discouraging enrolment in the early stages, before the implementation of ad hoc measures to reach the most distant population.

Lastly, two additional points need to be made. First, accurately identifying the programme's impact requires the absence of anticipation effects (Ashenfelter's dip), that is, the eligible group must not change its behaviour because it anticipates implementation of the programme.[9] Given that the announcement of the AUH was totally unexpected, that its implementation took place very fast and that, by November 2009, the first operative month, the programme already covered 3.3 million children and that this number then remained relatively stable at about 3.5 million, it may be assumed that there were no significant anticipation effects on the part of the population aimed at gaining eligibility to access the programme, which could have resulted in selection biases.

Second, unfortunately, given the short-term panel structure of the PHS, it is not possible to control whether households in the treatment and control groups showed similar trends in outcome variables prior to programme implementation, as suggested by, for example, Duflo (2001).

[9] Ashenfelter (1978); and Heckman and Smith (1999).

# VI
# Descriptive statistics

This section presents the characteristics of AUH beneficiaries (treatment group), which are then compared to non-beneficiary eligible households (control group) before programme implementation.

## 1. Beneficiary characteristics

Table A.1 in the annex summarizes the demographic and labour characteristics of AUH beneficiaries and their families in 2010.[10] For the sake of comparison, the table also includes individuals of economically active ages living in non-beneficiary households. Approximately 58% of beneficiaries are spouses and 34% are heads of household. As may be expected, these figures vary significantly by gender, since almost 90% of men are heads of household, while 64% of women are spouses. Women make up the vast majority of beneficiaries (89%), which could be at least in part explained by the reassignment of beneficiaries from previous public transfer programmes, which had a high number of women among their beneficiaries. Also, as mentioned above, AUH programme regulations give priority to mothers as beneficiaries. The relatively higher level of informality among women, on average, could also be a factor.

The average age of beneficiaries is 35, with female beneficiaries being younger than men. Levels of education are quite low in both cases: around 9.4 (men) and 9.6 (women) schooling years. The results for the overall non-beneficiary population at economically active ages are 10.9 and 11.8 years of schooling for men and women, respectively.

With regards to beneficiaries' employment status, a similar proportion of employed and inactive workers was found. However, among women, 52% are inactive and 42% are employed, while these figures for men are 5% and 90%, respectively. On average, female beneficiaries work 27 hours per week and men work 43 hours. Labour-market participation is thus lower for female beneficiaries, both in terms of activity rates and hourly intensity.

[10] Even though the PHS data expanded to the whole country shows a total number of beneficiaries that is lower than the total shown by administrative records, the composition of the population in terms of personal variables is very similar in both sources of information. The underestimation of beneficiaries is the result —at least in part— of the fact that the PHS is not specifically designed to identify these types of transfers. At the same time, expanding the survey to the whole country might itself lead to some errors. Nonetheless, some authors such as Galasso and Ravallion (2004) have employed the same source of information to assess the Unemployed Heads of Household Plan, also in a context of beneficiary number underestimation.

The average number of members living in beneficiary households (non-beneficiary households) is 4.7 (4.4), while the average number of children is 2.5 (2.0). In spite of the benefit, the incidence of poverty across these households was still very high in 2010: approximately 64% of beneficiary households were poor, while 18% were extremely poor.[11] In the case of non-beneficiary households, these figures were 18% and 7%, respectively.

Lastly, in 2010 the AUH covered approximately two children per beneficiary household, representing a monthly transfer of about 300 pesos (US$ 75). This value accounted for around 40% of total family income net of transfers. Even though this benefit is significant in relation to these households' self-generated income, the poverty gap was still very large even after receiving the benefit (around 40%).

[11] Households are identified as poor if their total income falls below the poverty line. The poverty line for 2009 and 2010 was constructed by updating the value registered in 2007 using the variation in the official consumer price index surveyed for nine provinces of the country. This decision was based on the controversy surrounding the consumer price index published by the National Institute of Statistics and Censuses (INDEC).

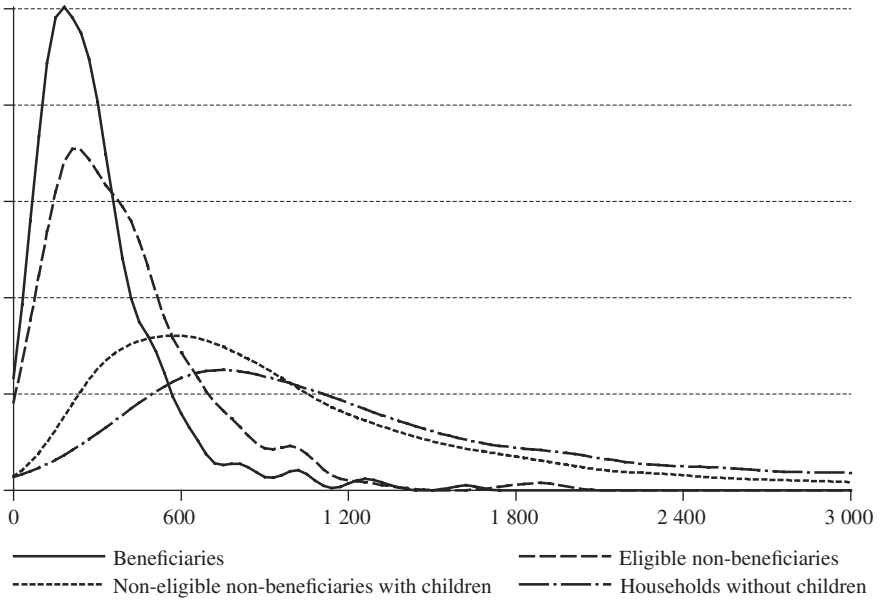
## 2. Comparison between beneficiary households and eligible non-beneficiary households in 2009 (baseline)

As may be observed in annex table A.2, households that became AUH beneficiaries in 2010 had larger families and more children than non-beneficiary households in 2009. Family incomes were also significantly lower. The kernel density functions of per capita family incomes clearly show that the distribution of eligible households that accessed the AUH is further to the left in relation to the rest of the households, followed by eligible non-beneficiary households and then by non-eligible non-beneficiary households with children and adult-only households (see figure 2). This suggests that the AUH has been mainly focused on households at the lower end of the income distribution.

Owing to lower family income levels, beneficiary households exhibited higher rates of poverty and extreme poverty. In 2009, 74% of those households were poor, compared with 65% of non-beneficiary households. In the case of extreme poverty, the figures are 31% and 26% for beneficiary and non-beneficiary households, respectively.

FIGURE 2

**Kernel density curves: per capita family income, third quarter of 2009**
*(Argentine pesos)*




*Source:* prepared by the authors on the basis of data from the Permanent Household Survey of the National Institute of Statistics and Censuses (INDEC).

Since about 92% of beneficiaries are heads of household or spouses, annex table A.2 compares the characteristics of these individuals to those of their counterparts in non-beneficiary households. No statistically significant differences were found in the percentage of female spouses in both sets of households. The differences in the percentage of female heads of household in the treated and control groups were not significant either.

Both heads of household and spouses in households that gained access to the AUH in 2010 had lower average ages than those in the other group of households in 2009. The educational level of household heads and spouses in beneficiary households was also significantly lower, on average, than in the other households.

Lastly, no significant differences were found between the spouses of both groups when it came to labour participation rates and composition. The behaviour of heads of both types of households regarding these variables was no different either. However, the opposite is observed for the hourly intensity of spouses: those living in beneficiary households worked, on average, fewer hours (-5.8 per week) than spouses in non-beneficiary households in 2009.

To sum up, the two groups of households exhibited differences in some observable variables before the programme was launched. Such pre-existing dissimilarities will be taken into account in the econometric analysis in order to accurately estimate the impacts of the AUH on labour-market outcomes.

# VII
# Econometric results

This section analyses the econometric results derived from the difference-in-difference estimator (DD) calculated using pooled panels of micro-data from the three first quarters of 2009 and 2010. As mentioned earlier, this estimator is applied to all households with children that were eligible in 2009, some of which became AUH beneficiaries in 2010 and some of which did not access the programme.

The analysis is carried out at three levels of comparison: (i) beneficiary households vs. non-beneficiary eligible households; (ii) members of each of those households (beneficiary and non-beneficiary), differentiating by gender and by whether they are heads or spouses; and (iii) beneficiaries vs. comparable individuals living in households in the control group.[12]

## 1. Beneficiary households vs. eligible non-beneficiary households

Annex table A.3 presents the results of the estimations at the household level. For each outcome variable, it shows the mean change for the treatment and control groups, the ATT, the bootstrap standard errors,[13] the p-values and the number of observations included in each group.

Even though the sign of the ATT parameters relating to labour-market variables suggests that the AUH has a negative impact on economic participation decisions —measured by the proportion of active members to total adult members— and on the household employment rate, these changes are not statistically significant under either of the two matching alternatives employed (NN and LLR). Likewise, no significant impact is observed on the incidence of unemployment or on the average number of hours worked by the employed members of the household.

In the same manner, differences regarding the behaviour of total and per capita family incomes between beneficiary households and those in the control group are not statistically different from zero. However, this common pattern observed in the dynamics of total incomes of both groups of households is, in fact, the result of greater increases in non-labour incomes that offset the somewhat weaker dynamism of labour incomes in beneficiary households vis-à-vis the control group. The negative ATT coefficient of labour incomes turns out to be

[12] The results of the Logit models used to calibrate scores are not included owing to space restrictions. They are available upon request, however.

[13] The theoretical standard errors were also computed, but they are not presented here because there were no significant differences from the bootstrap standard errors.

significant only at the 10% level of significance under LLR. The results concerning non-labour incomes, however, are significant at 1% in both matching alternatives, mainly as a result of the AUH.

To sum up, the lack of statistical significance in the labour-market results would seem to suggest that AUH implementation has not created any major disincentives to work among adults in the short term (considering that panel data used in this study only follows households for a few quarters). However, at the household level, this situation could be a net result of different effects of the AUH on its members. In order to analyse these findings in greater detail, the results of the estimations carried out separately for different adult members of the households are presented below.

## 2. Beneficiary household members vs. members of eligible non-beneficiary households

Table 2 presents the composition of beneficiary households by gender and household position of the adult members. As may be observed, the most important groups are: (i) total heads and spouses; (ii) women; (iii) female spouses; (iv) heads; (v) female heads; (vi) male heads. For this reason, at the individual level the analysis will be limited to these groups, who will be compared to their counterparts in the control group households.

TABLE 2

**Composition of members in beneficiary households, by gender and household position, 2010**

*(Percentages)*

| | Men | Women | Total |
|---|---|---|---|
| Heads | 31 | 14 | 45 |
| Spouses | 3 | 30 | 33 |
| Subtotal | 34 | 44 | 78 |
| Children | 8 | 10 | 18 |
| Other members | 2 | 2 | 4 |
| Total | 44 | 56 | 100 |

*Source:* prepared by the authors on the basis of data from the Permanent Household Survey of the National Institute of Statistics and Censuses (INDEC).

Annex table A.4 presents the econometric estimates for these six groups. The results at this level of analysis are consistent with those obtained at the household level in that the majority of beneficiary household members do not behave significantly differently from household members in the control group. In particular, the ATTs corresponding to the activity and employment conditions are not statistically significant for all household members and under the two matching techniques employed. However, the relative increase observed in the unemployment rate among female spouses in beneficiary households is statistically significant at the 5% or 10% level, depending on the matching technique employed.

With regard to the average hours worked (calculated only for those individuals that are employed in both observations), it is notable that, even though the number of hours worked by women in beneficiary households decreases while the opposite occurs in non-beneficiary households, the average differences between the two groups are not statistically significant, and are not so for the rest of the members considered.

With regard to family income variations and their sources, the greater increase in non-labour incomes registered among AUH beneficiary households is a result of what happened among women in general and among female spouses in particular. This is consistent with the fact that women represent about 90% of total AUH beneficiaries. The very low or null significance found for the differences in labour incomes at the household level is also confirmed at the individual level. As a result of this, the differences observed in non-labour incomes translate into the dynamics of total income gaps. In fact, women in general and female spouses in particular (in the case of NN) experience significant increases in total individual incomes as a consequence of receiving the AUH.

In summary, as with previous results, the findings relating to household members do not allow us to conclude that receiving a monetary transfer such as the AUH represents a disincentive to participate in the labour market or reduce the number of hours worked for those that continue to be employed in the short term.

## 3. Female AUH beneficiaries (heads of household or spouses) vs. women in eligible non-beneficiary households

Lastly, we evaluate the AUH by comparing beneficiaries' behaviour with that of household members in the control group. The difference with the previous exercise is that we compared the members of beneficiary households to those of the control group without identifying the beneficiaries in the first group.

Given that almost all beneficiaries are women, the analysis will be restricted to this subgroup of individuals. In particular, work decisions and income generation are evaluated for all female beneficiaries (and compared with those of adult women in eligible non-beneficiary

households) and then for heads of household and spouses separately. In the latter two cases the comparison is carried out with respect to female heads and spouses of households in the control group, respectively.

The results are presented in annex table A.5. Once again they confirm that the AUH had no significant effects on work decisions between 2009 and 2010. In particular, this programme does not seem to have encouraged net exits towards inactivity or caused a reduction in the number of hours worked by women, and thus it did not lead to a decrease in their labour supply (among both heads of households and spouses). It is important to note that the relative increase observed in the unemployment rate of women in beneficiary households (although the difference between both groups was significant only at the 5%/10% levels) becomes negligible when the analysis is restricted to female beneficiaries. The ATT is significant only at the 10% level in the case of LLR.

The absence of significant effects of the AUH on work decisions is consistent with the null impact of the programme on female beneficiaries' labour incomes. In fact, a significant double-difference estimated average effect is found in the case of non-labour incomes of beneficiaries (in particular, of those who are spouses) as a result of receiving the benefit which, in the absence of negative changes to other income sources, results in net increases of total incomes received by beneficiaries.[14]

[14] The estimates have been based on the comparison of those groups of households and individuals that remain in the sample after the exclusions mentioned in section III. However, there are some beneficiaries inside the common support region whose probabilities of being treated are close to zero. Following Heckman, Ichimura and Todd (1997), we use the trimming method to avoid the biases that might arise in the estimates when including these cases. The results support earlier conclusions.

# VIII
## Conclusions

The introduction of the AUH represents a major step forward in meeting the challenges involved in closing the social protection child coverage gap in Argentina. This programme has a direct connection with the contributory social security system in that it extends the existing system of family allowances for children and adolescents available to workers in the formal economy.

This study is the first to measure the impacts of the AUH on adult labour participation, employment, unemployment, hours worked, and labour and non-labour income generation, by using the difference-in-difference estimator and propensity score matching techniques.

On the basis of the results obtained, it cannot be concluded that this programme generated short-term disincentives to work among the adult members of beneficiary households between 2009 and 2010, in terms of encouraging them to leave the labour force or reduce the number of hours worked. These results are consistent with much of the empirical evidence for similar transfer programmes in other Latin American countries and they are highly relevant to the discussion surrounding the design of social public policies in the region, given that any potential negative side effects of these programmes on the labour market must be minimized, and that these kinds of cash transfers have acquired increasing relevance as a constitutive part of the social protection system.

However, at least four caveats apply to our conclusions. First, unlike other studies that perform impact assessments as part of their evaluation of this kind of programme, no surveys have been specifically designed for this purpose in Argentina. Second, in the household survey employed, AUH beneficiaries are only indirectly identified. Third, differences in unobserved characteristics might arise between the treatment and control groups, although the differences-in-differences methodology aims to reduce the likelihood of this problem. Lastly, this paper covers a relatively short period of time, and the impacts on labour-market participation could change when analysing a longer time horizon.

Hence, reliable and updated information is essential to perform continuous follow-up and an accurate assessment of the possible impacts of the AUH and other social protection programmes. Argentina presents significant lags in this area compared to other countries in the region that have similar income levels and social security developments.

Moreover, even though AUH implementation marks a significant improvement in social coverage for children, important challenges remain. For example, the programme excludes informal workers who earn more than the minimum wage. Insofar as the AUH is considered an extension of the contributory scheme, progress should be made towards standardizing the requirements of the two schemes, particularly the upper earnings limit, which is currently significantly higher in the contributory system than in the AUH regime.

With regard to meeting the conditionalities for accessing the cash benefit, the availability of health centres and educational establishments in the beneficiaries' neighbourhoods and surrounding areas must be considered, along with the quality of the services they provide. Also, AUH regulations state that beneficiaries may not participate in any other social assistance programmes. This regulation seems reasonable when the benefit replaces other programmes that target similar needs. However, this does not take into account that other cash transfer programmes have different objectives: for example, some seek to improve the employability of unemployed workers or workers in the informal economy. Therefore, progress should be made towards integrating and articulating the various components of the social protection system.

Lastly, all these policies should be framed within a long-term economic development strategy built on the basis of an integrated production structure that leads to high efficiency, systemic competitiveness and increased labour demand.

## ANNEX

TABLE A.1

**Characteristics of AUH beneficiaries and non-beneficiaries, 2010**

| Characteristics | Beneficiaries | | | Non-beneficiaries (active) | | |
|---|---|---|---|---|---|---|
| | Total | Women | Men | Total | Women | Men |
| Family relationship | | | | | | |
| Head | 33.6% | 26.8% | 88.5% | 41.9% | 19.8% | 69.3% |
| Spouse/partner | 57.9% | 64.3% | 6.2% | 34.9% | 57.8% | 6.7% |
| Other members | 8.5% | 8.9% | 5.3% | 23.2% | 22.4% | 24.1% |
| Age | 35.1 | 34.6 | 38.8 | 35.9 | 35.4 | 36.6 |
| Years of education | 9.6 | 9.6 | 9.4 | 11.4 | 11.8 | 10.9 |
| Employment status | | | | | | |
| Employed | 47.1% | 41.8% | 89.6% | 65.7% | 49.1% | 86.3% |
| Unemployed | 6.6% | 6.7% | 5.6% | 5.3% | 5.5% | 5.2% |
| Inactive | 46.4% | 51.6% | 4.8% | 29.0% | 45.4% | 8.6% |
| Hours worked | 30.0 | 26.6 | 43.0 | 40.0 | 31.5 | 45.9 |
| Gender | | | | | | |
| Women | 88.9% | | | 55.3% | | |
| Household members (*average*) | | | | | | |
| Members 0-5 | 1.4 | | | 1.3 | | |
| Members 6-12 | 1.6 | | | 1.4 | | |
| Members 13-17 | 1.4 | | | 1.4 | | |
| Members 18-59/64 | 2.2 | | | 2.3 | | |
| No. of children | 2.5 | | | 2.0 | | |
| Total | 4.7 | | | 4.4 | | |
| Poor household | 63.7% | | | 26.1% | | |
| Extremely poor household | 17.9% | | | 7.1% | | |
| Children covered by AUH | 2.1 | | | | | |
| Amount of AUH benefit | 305.08 | | | | | |
| Amount of AUH benefit/family income | 38.5% | | | | | |
| Poverty gap (*net family income*) | 45.0% | | | | | |
| Poverty gap (*family income*) | 38.0% | | | | | |

*Source:* prepared by the authors on the basis of data from the Permanent Household Survey of the National Institute of Statistics and Censuses (INDEC).

TABLE A.2

**Characteristics of AUH beneficiaries and non-beneficiaries, 2009**

| Characteristics | Non-beneficiaries | Beneficiaries | Difference | |
|---|---|---|---|---|
| Household | | | | |
| Members | 4.6 | 4.8 | -0.13 | |
| Children | 2.3 | 2.6 | -0.31 | *** |
| Total income (*Argentine pesos*) | 1 253.5 | 1 130.7 | 122.9 | *** |
| Labour income (*Argentine pesos*) | 290.3 | 251.6 | 38.7 | *** |
| Per capita income (*Argentine pesos*) | 1 112.2 | 979.9 | 132.2 | *** |
| Non-labour income (*Argentine pesos*) | 141.4 | 150.7 | -9.4 | |
| Poor | 65.1% | 74.4% | -9.3 p.p. | *** |
| Extremely poor | 26.2% | 30.5% | -4.4 p.p. | ** |
| Head | | | | |
| Women | 64.9% | 68.5% | -3.5 p.p. | |
| Age | 39.9 | 37.5 | 2.3 | *** |
| Years of education | 9.3 | 9.0 | 0.3 | ** |
| Employment status | | | | |
| Employed | 80.5% | 79.4% | 1.1 p.p. | |
| Unemployed | 6.5% | 8.5% | -2.0 p.p. | * |
| Inactive | 13.0% | 12.1% | 0.9 p.p. | |
| Hours worked | 42.0 | 42.2 | -0.2 | |
| Spouse | | | | |
| Women | 8.2% | 7.8% | 0.4 p.p. | |
| Age | 36.1 | 34.1 | 1.9 | *** |
| Years of education | 10.0 | 9.4 | 0.6 | *** |
| Employment status | | | | |
| Employed | 41.1% | 41.2% | -0.1 p.p. | |
| Unemployed | 6.1% | 5.1% | 1.0 p.p. | |
| Inactive | 52.8% | 53.7% | -0.9 p.p. | |
| Hours worked | 33.6 | 27.8 | 5.8 | *** |

*Source:* prepared by the authors on the basis of data from the Permanent Household Survey of the National Institute of Statistics and Censuses (INDEC).

Note: *** p-value<0.01; ** p-value<0.05; * p-value<0.1; p.p. = percentage points.

TABLE A.3

**AUH effects on household level indicators and income generation**

| Outcome variable | Matching technique[a] | Differences in differences | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean change treatment group | Mean change control group | ATT | | SE[b] | P-value[c] | Obs. common support | |
| | | | | | | | | Treated | Control | Total |
| Activity | nn(5) | -0.024 | -0.005 | -0.019 | | 0.018 | 0.279 | 749 | 1 291 | 2 040 |
| | llr | -0.024 | -0.006 | -0.018 | | 0.017 | 0.283 | 749 | 1 291 | 2 040 |
| Employment | nn(5) | -0.011 | 0.002 | -0.013 | | 0.020 | 0.512 | 749 | 1 291 | 2 040 |
| | llr | -0.011 | 0.008 | -0.019 | | 0.021 | 0.366 | 749 | 1 291 | 2 040 |
| Unemployed/total household members | nn(5) | -0.013 | -0.007 | -0.006 | | 0.013 | 0.619 | 749 | 1 291 | 2 040 |
| | llr | -0.013 | -0.014 | 0.001 | | 0.012 | 0.923 | 749 | 1 291 | 2 040 |
| Unemployment | nn(5) | -0.007 | -0.026 | 0.019 | | 0.017 | 0.266 | 687 | 1 200 | 1 887 |
| | llr | -0.007 | -0.014 | 0.008 | | 0.131 | 0.953 | 687 | 1 200 | 1 887 |
| Hours worked | nn(5) | 1.0 | 0.0 | 1.1 | | 1.2 | 0.388 | 626 | 1 111 | 1 737 |
| | llr | 1.0 | 0.4 | 0.6 | | 1.2 | 0.631 | 626 | 1 111 | 1 737 |
| Total family income | nn(5) | 543.5 | 510.9 | 32.6 | | 53.1 | 0.540 | 749 | 1 291 | 2 040 |
| | llr | 543.5 | 526.0 | 17.5 | | 60.5 | 0.773 | 749 | 1 291 | 2 040 |
| Per capita family income | nn(5) | 104.2 | 111.1 | -6.9 | | 13.0 | 0.596 | 749 | 1 291 | 2 040 |
| | llr | 104.2 | 111.6 | -7.4 | | 12.3 | 0.549 | 749 | 1 291 | 2 040 |
| Labour income | nn(5) | 302.6 | 389.5 | -86.8 | | 54.4 | 0.111 | 749 | 1 291 | 2 040 |
| | llr | 302.6 | 404.5 | -101.9 | * | 55.3 | 0.066 | 749 | 1 291 | 2 040 |
| Non labour income | nn(5) | 240.9 | 121.5 | 119.4 | *** | 19.0 | 0.000 | 749 | 1 291 | 2 040 |
| | llr | 240.9 | 121.5 | 119.4 | *** | 18.2 | 0.000 | 749 | 1 291 | 2 040 |

*Source:* prepared by the authors on the basis of data from the Permanent Household Survey of the National Institute of Statistics and Censuses (INDEC).

[a] Local linear regression weights were computed using the Epanechnikov kernel function with Silverman's plug-in estimate of the bandwidth.
[b] Bootstrapped standard errors with 300 replicates.
[c] *** p-value<0.01; * p-value<0.1.

TABLE A.4

**AUH effects on adult labour decisions and income generation**

| Outcome variable | Matching technique[a] | Group | Differences in differences | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean change treatment group | Mean change control group | ATT | | SE[b] | P-value[c] | Obs. common support | |
| | | | | | | | | | Treated | Control | Total obs. |
| Activity | nn(5) | Heads and spouses | -0.019 | -0.002 | -0.017 | | 0.018 | 0.341 | 1 231 | 2 061 | 3 292 |
| | | Heads | -0.013 | -0.007 | -0.006 | | 0.019 | 0.759 | 689 | 1 170 | 1 859 |
| | | Male heads | 0.004 | -0.009 | 0.014 | | 0.016 | 0.412 | 473 | 767 | 1 240 |
| | | Women | -0.024 | 0.004 | -0.027 | | 0.027 | 0.315 | 886 | 1 635 | 2 521 |
| | | Female heads | -0.051 | -0.021 | -0.030 | | 0.056 | 0.592 | 215 | 394 | 609 |
| | | Female spouses | -0.022 | -0.013 | -0.009 | | 0.038 | 0.810 | 502 | 820 | 1 322 |
| | llr | Heads and spouses | -0.019 | -0.006 | -0.013 | | 0.042 | 0.758 | 1 231 | 2 061 | 3 292 |
| | | Heads | -0.013 | -0.011 | -0.002 | | 0.017 | 0.902 | 689 | 1 170 | 1 859 |
| | | Male heads | 0.004 | -0.007 | 0.011 | | 0.015 | 0.430 | 472 | 767 | 1 239 |
| | | Women | -0.024 | 0.001 | -0.025 | | 0.025 | 0.326 | 886 | 1 635 | 2 521 |
| | | Female heads | -0.051 | -0.048 | -0.003 | | 0.218 | 0.989 | 215 | 394 | 609 |
| | | Female spouses | -0.022 | -0.006 | -0.016 | | 0.034 | 0.644 | 502 | 820 | 1 322 |
| Employment | nn(5) | Heads and spouses | -0.004 | 0.018 | -0.022 | | 0.019 | 0.261 | 1 231 | 2 061 | 3 292 |
| | | Heads | 0.015 | 0.020 | -0.006 | | 0.024 | 0.811 | 689 | 1 170 | 1 859 |
| | | Male heads | 0.030 | 0.019 | 0.011 | | 0.027 | 0.692 | 473 | 767 | 1 240 |
| | | Women | -0.017 | 0.024 | -0.041 | | 0.028 | 0.140 | 886 | 1 635 | 2 521 |
| | | Female heads | -0.019 | 0.010 | -0.029 | | 0.058 | 0.620 | 215 | 394 | 609 |
| | | Female spouses | -0.022 | 0.015 | -0.037 | | 0.035 | 0.293 | 502 | 820 | 1 322 |
| | llr | Heads and spouses | -0.004 | 0.016 | -0.020 | | 0.018 | 0.261 | 1 231 | 2 061 | 3 292 |
| | | Heads | 0.015 | 0.010 | 0.005 | | 0.024 | 0.844 | 689 | 1 170 | 1 859 |
| | | Male heads | 0.030 | 0.021 | 0.008 | | 0.052 | 0.874 | 472 | 767 | 1 239 |
| | | Women | -0.017 | 0.022 | -0.039 | | 0.026 | 0.143 | 886 | 1 635 | 2 521 |
| | | Female heads | -0.019 | -0.022 | 0.003 | | 0.122 | 0.979 | 215 | 394 | 609 |
| | | Female spouses | -0.022 | 0.019 | -0.041 | | 0.039 | 0.299 | 502 | 820 | 1 322 |
| Unemployment | nn(5) | Heads and spouses | -0.015 | -0.019 | 0.005 | | 0.013 | 0.707 | 1 231 | 2 061 | 3 292 |
| | | Heads | -0.028 | -0.028 | 0.000 | | 0.018 | 1.000 | 689 | 1 170 | 1 859 |
| | | Male heads | -0.025 | -0.028 | 0.003 | | 0.025 | 0.905 | 473 | 767 | 1 240 |
| | | Women | -0.007 | -0.020 | 0.014 | | 0.014 | 0.320 | 886 | 1 635 | 2 521 |
| | | Female heads | -0.033 | -0.032 | -0.001 | | 0.032 | 0.977 | 215 | 394 | 609 |
| | | Female spouses | 0.000 | -0.028 | 0.028 | * | 0.016 | 0.074 | 502 | 820 | 1 322 |
| | llr | Heads and spouses | -0.015 | -0.022 | 0.007 | | 0.010 | 0.475 | 1 231 | 2 061 | 3 292 |
| | | Heads | -0.028 | -0.021 | -0.007 | | 0.015 | 0.644 | 689 | 1 170 | 1 859 |
| | | Male heads | -0.025 | -0.029 | 0.003 | | 0.031 | 0.918 | 472 | 767 | 1 239 |
| | | Women | -0.007 | -0.021 | 0.014 | | 0.010 | 0.188 | 886 | 1 635 | 2 521 |
| | | Female heads | -0.033 | -0.026 | -0.006 | | 0.162 | 0.970 | 215 | 394 | 609 |
| | | Female spouses | 0.000 | -0.025 | 0.025 | ** | 0.012 | 0.041 | 502 | 820 | 1 322 |

Table A.4 (*continued*)

| Outcome variable | Matching technique[a] | Group | Differences in differences | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean change treatment group | Mean change control group | ATT | | SE[b] | P-value[c] | Obs. common support | |
| | | | | | | | | | Treated | Control | Total obs. |
| Hours worked | nn(5) | Heads and spouses | -0.4 | -0.8 | 0.4 | | 1.1 | 0.740 | 623 | 1 104 | 1 727 |
| | | Heads | -0.5 | 0.0 | -0.4 | | 1.4 | 0.750 | 475 | 838 | 1 313 |
| | | Male heads | -0.3 | -2.1 | 1.8 | | 1.6 | 0.251 | 367 | 623 | 990 |
| | | Women | -0.8 | 0.1 | -0.9 | | 2.2 | 0.678 | 255 | 531 | 786 |
| | | Female heads | -1.3 | 4.1 | -5.5 | | 3.9 | 0.161 | 106 | 198 | 304 |
| | | Female spouses | -1.1 | -0.7 | -0.4 | | 2.9 | 0.877 | 116 | 195 | 311 |
| | llr | Heads and spouses | -0.4 | 0.0 | -0.4 | | 1.3 | 0.749 | 623 | 1 104 | 1 727 |
| | | Heads | -0.5 | -0.8 | 0.4 | | 1.7 | 0.827 | 475 | 838 | 1 313 |
| | | Male heads | -0.3 | 0.7 | -1.0 | | 2.3 | 0.659 | 367 | 623 | 990 |
| | | Women | -0.8 | 0.7 | -1.5 | | 2.9 | 0.604 | 255 | 531 | 786 |
| | | Female heads | -1.3 | 4.1 | -5.5 | | 13.1 | 0.676 | 106 | 198 | 304 |
| | | Female spouses | -1.3 | -0.2 | -1.1 | | 4.9 | 0.828 | 115 | 195 | 310 |
| Total income | nn(5) | Heads and spouses | 246.1 | 214.2 | 31.9 | | 27.7 | 0.250 | 1 231 | 2 061 | 3 292 |
| | | Heads | 227.5 | 281.1 | -53.7 | | 43.6 | 0.218 | 689 | 1 170 | 1 859 |
| | | Male heads | 234.6 | 273.3 | -38.7 | | 57.4 | 0.500 | 473 | 767 | 1 240 |
| | | Women | 242.9 | 176.5 | 66.4 | *** | 24.7 | 0.007 | 886 | 1 635 | 2 521 |
| | | Female heads | 212.2 | 243.0 | -30.8 | | 62.9 | 0.625 | 215 | 394 | 609 |
| | | Female spouses | 280.1 | 172.1 | 108.0 | *** | 34.7 | 0.002 | 502 | 820 | 1 322 |
| | llr | Heads and spouses | 246.1 | 222.3 | 23.8 | | 28.0 | 0.395 | 1 231 | 2 061 | 3 292 |
| | | Heads | 227.5 | 98.2 | 129.3 | | 2 972.0 | 0.965 | 689 | 1 170 | 1 859 |
| | | Male heads | 234.3 | 263.7 | -29.4 | | 71.8 | 0.682 | 472 | 767 | 1 239 |
| | | Women | 242.9 | 169.9 | 73.0 | *** | 22.8 | 0.001 | 886 | 1 635 | 2 521 |
| | | Female heads | 212.2 | 225.6 | -13.4 | | 104.5 | 0.898 | 215 | 394 | 609 |
| | | Female spouses | 280.1 | 173.0 | 107.2 | | 107.2 | 0.318 | 502 | 820 | 1 322 |
| Labour income | nn(5) | Heads and spouses | 114.2 | 148.0 | -33.7 | | 25.0 | 0.177 | 1 231 | 2 061 | 3 292 |
| | | Heads | 158.0 | 223.4 | -65.4 | | 39.8 | 0.100 | 689 | 1 170 | 1 859 |
| | | Male heads | 202.1 | 251.6 | -49.6 | | 56.2 | 0.378 | 473 | 767 | 1 240 |
| | | Women | 62.2 | 89.3 | -27.2 | | 21.9 | 0.214 | 886 | 1 635 | 2 521 |
| | | Female heads | 61.2 | 118.2 | -57.1 | | 58.9 | 0.333 | 215 | 394 | 609 |
| | | Female spouses | 54.0 | 79.4 | -25.4 | | 30.2 | 0.400 | 502 | 820 | 1 322 |
| | llr | Heads and spouses | 114.2 | 158.9 | -44.7 | * | 23.9 | 0.062 | 1 231 | 2 061 | 3 292 |
| | | Heads | 158.0 | 46.1 | 111.9 | | 628.1 | 0.859 | 689 | 1 170 | 1 859 |
| | | Male heads | 201.7 | 243.5 | -41.8 | | 129.6 | 0.747 | 472 | 767 | 1 239 |
| | | Women | 62.2 | 83.5 | -21.3 | | 17.6 | 0.225 | 886 | 1 635 | 2 521 |
| | | Female heads | 61.2 | 104.1 | -43.0 | | 110.0 | 0.696 | 215 | 394 | 609 |
| | | Female spouses | 54.0 | 88.2 | -34.2 | | 26.8 | 0.203 | 502 | 820 | 1 322 |

Table A.4 (*concluded*)

| Outcome variable | Matching technique[a] | Group | Differences in differences | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean change treatment group | Mean change control group | ATT | | SE[b] | P-value[c] | Obs. common support | |
| | | | | | | | | | Treated | Control | Total obs. |
| Non-labour income | nn(5) | Heads and spouses | 131.9 | 66.2 | 65.6 | *** | 10.3 | 0.000 | 1 231 | 2 061 | 3 292 |
| | | Heads | 69.5 | 57.7 | 11.7 | | 12.3 | 0.341 | 689 | 1 170 | 1 859 |
| | | Male heads | 32.5 | 21.7 | 10.8 | | 10.8 | 0.315 | 473 | 767 | 1 240 |
| | | Women | 180.8 | 87.2 | 93.6 | *** | 13.2 | 0.000 | 886 | 1 635 | 2 521 |
| | | Female heads | 151.1 | 124.8 | 26.3 | | 34.4 | 0.445 | 215 | 394 | 609 |
| | | Female spouses | 226.1 | 92.7 | 133.4 | *** | 17.6 | 0.000 | 502 | 820 | 1 322 |
| | llr | Heads and spouses | 131.9 | 63.4 | 68.5 | *** | 10.0 | 0.000 | 1 231 | 2 061 | 3 292 |
| | | Heads | 69.5 | 52.1 | 17.3 | | 11.1 | 0.118 | 689 | 1 170 | 1 859 |
| | | Male heads | 32.6 | 20.2 | 12.4 | | 9.8 | 0.208 | 472 | 767 | 1 239 |
| | | Women | 180.8 | 86.5 | 94.3 | * | 54.5 | 0.084 | 886 | 1 635 | 2 521 |
| | | Female heads | 151.1 | 121.5 | 29.6 | | 250.8 | 0.906 | 215 | 394 | 609 |
| | | Female spouses | 226.1 | 84.8 | 141.3 | *** | 31.5 | 0.000 | 502 | 820 | 1 322 |

*Source:* prepared by the authors on the basis of data from the Permanent Household Survey of the National Institute of Statistics and Censuses (INDEC).

[a] Local linear regression weights were computed using Epanechnicov kernel function with Silverman's plug-in estimate of the bandwidth.
[b] Bootstrapped standard errors with 300 replicates.
[c] *** p-value<0.01; ** p-value<0.05; * p-value<0.1.

TABLE A.5

**AUH effects on beneficiary women**

| Outcome variable | Matching technique[a] | Group | Differences in differences | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean change treatment group | Mean change control group | ATT | | SE[b] | P-value[c] | Obs. common support | |
| | | | | | | | | | Treated | Control | Total obs. |
| Activity | nn(5) | Women | -0.030 | -0.003 | -0.027 | | 0.027 | 0.314 | 701 | 1 695 | 2 396 |
| | | Female heads | -0.056 | -0.034 | -0.021 | | 0.060 | 0.727 | 180 | 404 | 584 |
| | | Female spouses | -0.009 | 0.008 | -0.017 | | 0.040 | 0.670 | 448 | 838 | 1 286 |
| | llr | Women | -0.030 | -0.002 | -0.028 | | 0.025 | 0.260 | 701 | 1 695 | 2 396 |
| | | Female heads | -0.056 | -0.041 | -0.014 | | 0.188 | 0.940 | 180 | 404 | 584 |
| | | Female spouses | -0.009 | 0.002 | -0.011 | | 0.216 | 0.961 | 448 | 838 | 1 286 |
| Employment | nn(5) | Women | -0.020 | 0.014 | -0.034 | | 0.031 | 0.271 | 701 | 1 695 | 2 396 |
| | | Female heads | -0.006 | 0.003 | -0.009 | | 0.071 | 0.900 | 180 | 404 | 584 |
| | | Female spouses | -0.013 | 0.022 | -0.035 | | 0.036 | 0.327 | 448 | 838 | 1 286 |
| | llr | Women | -0.020 | 0.021 | -0.041 | | 0.058 | 0.482 | 701 | 1 695 | 2 396 |
| | | Female heads | -0.006 | -0.004 | -0.001 | | 0.121 | 0.991 | 180 | 404 | 584 |
| | | Female spouses | -0.013 | 0.020 | -0.033 | | 0.034 | 0.326 | 448 | 838 | 1 286 |
| Unemployment | nn(5) | Women | -0.010 | -0.017 | 0.007 | | 0.015 | 0.655 | 701 | 1 695 | 2 396 |
| | | Female heads | -0.050 | -0.038 | -0.012 | | 0.033 | 0.712 | 180 | 404 | 584 |
| | | Female spouses | 0.004 | -0.014 | 0.018 | | 0.017 | 0.291 | 448 | 838 | 1 286 |
| | llr | Women | -0.010 | -0.023 | 0.013 | | 0.012 | 0.300 | 701 | 1 695 | 2 396 |
| | | Female heads | -0.050 | -0.037 | -0.013 | | 0.050 | 0.798 | 180 | 404 | 584 |
| | | Female spouses | 0.004 | -0.018 | 0.023 | * | 0.013 | 0.084 | 448 | 838 | 1 286 |
| Hours worked | nn(5) | Women | -1.3 | 0.6 | -2.0 | | 2.3 | 0.383 | 208 | 541 | 749 |
| | | Female heads | -1.5 | 1.7 | -3.2 | | 4.2 | 0.444 | 90 | 199 | 289 |
| | | Female spouses | -1.9 | 0.9 | -2.8 | | 3.3 | 0.399 | 105 | 200 | 305 |
| | llr | Women | -1.3 | 0.9 | -2.2 | | 5.7 | 0.694 | 208 | 541 | 749 |
| | | Female heads | -1.5 | 7.4 | -8.9 | | 15.2 | 0.559 | 90 | 199 | 289 |
| | | Female spouses | -1.9 | 0.2 | -2.1 | | 11.9 | 0.860 | 104 | 200 | 304 |
| Total income | nn(5) | Women | 281.7 | 173.7 | 108.0 | *** | 27.7 | 0.000 | 701 | 1 695 | 2 396 |
| | | Female heads | 251.2 | 218.6 | 32.6 | | 66.0 | 0.622 | 180 | 404 | 584 |
| | | Female spouses | 304.1 | 167.0 | 137.0 | *** | 33.4 | 0.000 | 448 | 838 | 1286 |
| | llr | Women | 281.7 | 178.6 | 103.1 | *** | 33.2 | 0.002 | 701 | 1 695 | 2 396 |
| | | Female heads | 251.2 | 242.2 | 9.0 | | 167.6 | 0.957 | 180 | 404 | 584 |
| | | Female spouses | 304.1 | 136.2 | 167.8 | *** | 32.9 | 0.000 | 448 | 838 | 1 286 |

Table A.5 (*concluded*)

| Outcome variable | Matching technique[a] | Group | Differences in differences | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean change treatment group | Mean change control group | ATT | | SE[b] | P-value[c] | Obs. common support | |
| | | | | | | | | | Treated | Control | Total obs. |
| Labour income | nn(5) | Women | 57.1 | 83.2 | -26.1 | | 24.4 | 0.286 | 701 | 1 695 | 2 396 |
| | | Female heads | 76.9 | 108.1 | -31.1 | | 57.8 | 0.590 | 180 | 404 | 584 |
| | | Female spouses | 52.9 | 80.0 | -27.1 | | 29.9 | 0.364 | 448 | 838 | 1 286 |
| | llr | Women | 57.1 | 89.8 | -32.7 | | 23.8 | 0.170 | 701 | 1 695 | 2 396 |
| | | Female heads | 76.9 | 116.3 | -39.4 | | 330.4 | 0.905 | 180 | 404 | 584 |
| | | Female spouses | 52.9 | 92.9 | -40.1 | | 29.2 | 0.171 | 448 | 838 | 1 286 |
| Non-labour income | nn(5) | Women | 224.6 | 90.5 | 134.1 | *** | 15.5 | 0.000 | 701 | 1 695 | 2 396 |
| | | Female heads | 174.3 | 110.6 | 63.7 | | 42.2 | 0.131 | 180 | 404 | 584 |
| | | Female spouses | 251.2 | 87.0 | 164.2 | *** | 17.4 | 0.000 | 448 | 838 | 1 286 |
| | llr | Women | 224.6 | 88.8 | 135.9 | *** | 15.7 | 0.000 | 701 | 1 695 | 2 396 |
| | | Female heads | 174.3 | 125.9 | 48.4 | | 47.0 | 0.994 | 180 | 404 | 584 |
| | | Female spouses | 251.2 | 43.3 | 207.9 | *** | 16.9 | 0.000 | 448 | 838 | 1 286 |

*Source:* prepared by the authors on the basis of data from the Permanent Household Survey of the National Institute of Statistics and Censuses (INDEC).

[a] Local linear regression weights were computed using the Epanechnikov kernel function with Silverman's plug-in estimate of the bandwidth.
[b] Bootstrapped standard errors with 300 replicates.
[c] *** p-value<0.01; * p-value<0.1.

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# Occupational mobility and income differentials: The experience of Brazil between 2002 and 2010

*Sandro Eduardo Monsueto, Julimar da Silva Bichara and André Moreira Cunha*

**ABSTRACT**

Since the start of the twenty-first century, the Brazilian economy has experienced a growth cycle with characteristics unlike those of its previous historical experience, combining growth, macroeconomic stability and distributive progress. In this context, the study aims to analyse the factors and distributive effects of occupational mobility in Brazil, based on data obtained from the Monthly Employment Survey. The results suggest that: (i) mobility has been used in Brazil as a way to raise wages, even when it involves a drop in socio-occupational status; (ii) nonetheless, the wage increase obtained by changing job or occupational segment is smaller for poorer workers than for wealthier ones; and (iii) consequently, mobility helps to increase income, but it also tends to widen wage gaps.

**KEYWORDS** Employment, labour market, labour mobility, wages, equality, Brazil

**JEL CLASSIFICATION** J31, J62

**AUTHORS**

Sandro Eduardo Monsueto is Assistant Professor at the Economic Studies and Research Nucleus (NEPEC) of the Faculty of Management, Accounting Sciences and Economic Sciences of the Federal University of Goiás, Brazil. monsueto@ufg.br

Julimar da Silva Bichara is a Professor at the Autonomous University of Madrid (UAM), Spain. julimar.dasilva@uam.es

André Moreira Cunha is Associate Professor on the Postgraduate Programme in Economics of the Federal University of Rio Grande do Sul (UFRGS) and a Research Officer at the National Council for Scientific and Technological Development (CNPq), Brazil. andre.cunha@ufrgs.br

# I
# Introduction

Although Brazil is one of the most unequal countries in the world, since the start of this new century income inequality has been gradually but almost continuously declining, whether measured by the Gini inequality coefficient or through the ratios of the proportions of total income received by the different segments of the income distribution (Barros, De Carvalho and Mendonça, 2010). Another significant feature of this reduction in inequality is that it has coincided with a cyclical upswing in income in a context of relative macroeconomic stability, involving, among other things, moderate inflation, a declining trend in the net public-sector debt, and greater external solvency. There has also been growth in the net supply of jobs, their formalization, and in real wages, while economic poverty has retreated (IPEA, 2010; Ferrari-Filho, Cunha and Bichara, 2014).

There are many factors driving this reduction in income inequality, including the persistence of economic stability (Rocha, 2000), the federal government's conditional cash transfer programmes and a rising trend in labour incomes (Barros, De Carvalho and Mendonça, 2007 and 2010). That virtuous labour-market behaviour could be linked to the vigorous creation of formal jobs, optimization of human capital, reduction in wage discrimination based on gender and skin colour, and a decrease in sectoral and geographic segmentation.

While the importance of the labour market in the development process is not a novelty in economic analysis, it has not been greatly emphasized, particularly in developing countries. The labour market is the key factor explaining how growth is distributed in society, since the distribution of the benefits of growth is closely tied to the quantity and quality of the jobs created during the expansionary period (Paci and Serneels, 2007). Nonetheless, the evolution of that structure through time, in other words labour-market mobility, is also significant. Knowing how workers can gain access to better-paid jobs is fundamental for understanding how the income generated by economic growth is distributed. This makes it necessary to understand the factors that determine occupational mobility, the barriers that exist, the wage premium obtained from mobility, and the effects of that mobility on the distribution of income from work. That is the basic objective of this study.

There is evidence that workers may be using occupational mobility to obtain wage increases, and also as a way of exiting from precarious employment situations, involving informality or a high rate of involuntary unemployment (Holzer, Lane and Vilhuber, 2003; García Pérez and Rebollo Sanz, 2005; Davia, 2006). Nonetheless, those benefits may be non-existent or limited in the face of barriers imposed by labour-market segmentation. In Brazil, apart from the studies by Oliveira and Machado (2000) and Pinto and Neri (2000), who found differences in the return to mobility between the different population groups, there are few data that adequately show the effect of occupational mobility on income inequality. Accordingly, it is not yet clear whether or not occupational mobility has helped reduce inequality, particularly during the most recent period. To contribute to the debate, this article aims to analyse the factors that affect occupational mobility and verify whether this involves socioeconomic progress, and to assess its effects on income inequality in Brazil, using data from the Monthly Employment Survey for the period from 2002 to 2010.

The specific objective is to analyse the wage-differential effect of mobility, in terms of labour-market segmentation (which generates differences relating to socioeconomic and occupational progress, for example) and differential returns to mobility, observing whether or not occupational movements alter the income distribution by reducing wage differentials. New data on the effect of human capital are put forward and an analysis is made of the socioeconomic destination of the workers, to ascertain whether mobility is being used to move ahead in the social structure and in the distribution of income, or whether distribution is limited by labour-market segmentation. This approach to mobility and inequality makes it possible to evaluate the size of the group of workers who, despite the occupational changes they make, fail to break out of structure of small wage

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increases and little technological growth, with relatively less institutional protection. Following this introduction, section II makes a brief review of the bibliography of the relation between occupational mobility and wages. Section III then describes the methodology, the data, the results, and the corresponding analysis; and, lastly, section IV sets forth final thoughts summarizing the main results of the study.

# II

## Literature review: empirical data and their political consequences

There is abundant empirical data on occupational mobility and its effects on wages, particularly for the United States but also, more recently, for European countries and a few Latin American ones too (Beccaria and Maurizio, 2003). A study by Paci and Serneels (2007), which addresses the relation between the labour market and development, considers the structure of the labour market and occupational mobility to be key variables for explaining the income distribution. In the case of Brazil, the main studies are Pinto and Neri (2000) and Oliveira and Machado (2000), which use longitudinal data from the Monthly Employment Survey conducted by the Brazilian Geographical and Statistical Institute (IBGE).

Most empirical studies stress the role of the occupational distribution of workers as an essential tool for explaining wages. Accordingly, social and labour-market factors, discrimination, and differences in investment in or access to human capital are topics that are inherent to the debate on income distribution in Brazil. From that standpoint, the labour market simply reflects the social inequalities that already exist in the country (Barros and Mendonça, 1995), while also acting as a creator of inequality, because it is characterized by segmentation and by both gender and racial discrimination (Oliveira and Ribeiro, 1998; Oliveira, 1998 and 2003; Soares and Oliveira, 2004; Matos and Machado, 2006). Nonetheless, the Brazilian labour market can also provide a way out of situations involving very low incomes or poverty (Barros, Machado and Mendonça, 1997).

The international literature stresses the role of human capital, both specific and general, in explaining occupational mobility and the associated wage outcomes. Booth and Francesconi (1999), for example, note that the length of time spent in the labour market has a negative effect on the mobility of British workers, and that the duration of a specific employment experience is negatively correlated with internal changes. The same results have been found in Brazil (Orellano and Picchetti, 2001; Menezes-Filho, 2004; Flore and Menezes-Filho, 2008). Nonetheless, higher education can apparently reduce the probability of mobility (Kambourov and Manovskii, 2004). This result is also found when considering specific human capital, represented by the training received inside the firm, owing to the rise in opportunity cost (Dolton and Kidd, 1998).

Occupational mobility also depends apparently on the economic sector being considered, and its technological level (Zimmermann, 1998), and it can be related to firm size (Cheng and Kalleberg, 1996). In the research undertaken, differences have been found in mobility patterns between different population groups, genders, races and income levels. In general, it would seem that mobility is higher among men than among women (Gabriel, 2003; Parrado and Wolff, 1999), and that the higher-income groups are more stable (Parrado, Caner and Wolff, 2007). Occupational mobility towards high-paid jobs is also somewhat limited, and in such cases the movement would be hindered by discrimination, partial information, deficient employment networks, and agents' preferences (Holzer, Lane and Vilhuber, 2003).

This article aims to highlight the effect of occupational mobility on wage levels; and, in this connection, mobility seems to help improve the income distribution (Fitzenberger and Kunze, 2005) and may even boost wage growth (García Pérez and Rebollo Sanz, 2005). As noted above, there are very few studies on occupational mobility and its effects on income distribution in developing countries. One good example, however, is the study by Paci and Serneels (2007), which reports results for a number of developing countries and shows that there are significant barriers to occupational mobility in the countries of the Middle East and North Africa, according to an analysis of mobility between formal and informal segments. These authors also state

that there are major barriers to upward mobility among self-employed workers in Mexico, which are determined by education and access to capital. In another study on Ethiopia, Ghana and the United Republic of Tanzania, they analysed the effect of mobility between sectors defined according to occupational status, and found strong barriers to mobility; and, when mobility exists, the main factor driving wage growth is the size of the firm.

As in the previous cases, a key feature of the Brazilian labour market is its segmentation between formal and informal workers. This gives rise to clear differences, because occupational mobility is less than among formal workers and, particularly, among those with most experience (Neri and others, 1997). Moreover, the mobility pattern is different, depending on gender and race, so that women and Afrodescendants in Brazil are over-represented in low-paid jobs and in generally unfavourable employment tracks, such as downward mobility and declining wages (Oliveira and Machado, 2000; Pinto and Neri, 2000). For these groups, therefore, mobility would be synonymous with a mere turnover of labour, involving frequent job changes without adding skills or increasing productivity.

The occupational structure is thus relevant for explaining the wage gap. The way workers change job or succeed in moving out of a given occupational segment can change the configuration of the income distribution. Moreover, occupational segmentation and segregation are phenomena that restrict worker mobility and mean that, among other things, a change of job only reproduces through time the unequal structure of labour allocation, without involving progress in terms of the individual's social condition (Fitzenberger and Kuzne, 2005; Maltseva, 2005). In other words, wage inequality can be affected both by the occupational structure and by worker movements that alter the structure. Nonetheless, as shown in the literature review, the role played by occupational mobility during the recent period of the Brazilian economy is not yet clear. In that context, this article seeks to improve understanding of occupational mobility and its effects on the socioeconomic structure of workers and the distribution of income in Brazil. It also seeks to determine whether mobility has been used by the worker to progress within the income distribution, or whether it is merely reproducing a segmented labour market.

# III

## Data and methodology

To fulfil the objective of this study, microdata from the Monthly Employment Survey have been used to compare workers' situations in terms of their employment characteristics, education level, age or wage, through a panel of monthly data in six of the country's metropolitan regions: Belo Horizonte, Porto Alegre, Recife, Rio de Janeiro, Salvador and São Paulo. The econometric strategy is divided into two stages. The first analyses factors driving mobility between jobs or occupational segments; and the second estimates the effects of this mobility on the income distribution.

Using a panel from the Monthly Employment Survey makes it possible to compare information on the job held by the individual at two different points in time, and thus obtain four types of results with respect to workers in employment, without considering people who leave the sample:

(i) the individual in question had the same job in both periods;
(ii) he or she had different jobs;
(iii) was unemployed, or
(iv) was inactive.

The occupational mobility rate expresses the percentage of employed workers who had a different job in the second period from that declared in the first. Thus, the first part of research entails determining the probability that an individual changes his/her job.

Jobs are classified in socio-employment status groups, using a methodology based on average hourly wages, education level, informality and similarity between activities, inspired in the work of Jannuzzi (2004), as shown in table 1. This classification can be used to describe the socio-employment structure of the Brazilian labour market, and also to analyse the workers' occupational mobility (upwards or downwards) in socioeconomic terms (wage and social status).

To capture those multiple changes, the study estimates the following multinomial logit model, which expands the binary choice models:

TABLE 1

**Brazil: socio-employment status categories and typical jobs in the Monthly Employment Survey, 2002-2010**
*(Reais and years)*

| Socio-employment status | Average hourly wage (*R$*) | Average education level (*years' schooling*) | Some typical jobs |
|---|---|---|---|
| 1. Higher | 14.50 | 10.18 | Managers; company directors, laboratory technicians, higher-grade professionals, navigation professionals and supervisors. |
| 2. Middle | 6.43 | 9.08 | Middle ranking technicians generally; jewellers and goldsmiths; industrial supervisors; industrial operators; navigation technicians, transport workers and salespeople. |
| 3. Lower | 3.86 | 7.14 | Hotel, food, security workers, among others; farm supervisors and workers; commercial and residential workers; domestic employees; travelling sales persons, commercial suppliers and personal services. |

*Source:* Monthly Employment Survey, 2002-2010.

$$Pr\left(Y_i = j\right) = \frac{e^{\beta'_j \, x_i}}{1 + \sum_{k=0}^{2} e^{\beta'_j \, x_i}}, \quad j = 0, 1, 2 \qquad (1)$$

where *Pr* represents the probability that the individual experiences event *j*; $x_i$ is the vector of expansion variables, and β is the vector of parameters to be estimated. The model was used by Budría and Pereira (2004), for example, to analyse the probability that workers in Portugal participate in training programmes; and by Souza and Lima (2011), to investigate the probability that a person is unemployed, has a formal job, or has an informal job in Brazil.

Variables explaining the probability of achieving upward or downward socio-employment mobility include demographic, human capital and labour-market factors; and the following model is estimated to capture elements of the two main groups of theories explaining mobility (human capital and segmented markets):

$$Pr\left(Y_i = j\right) = f\left(sex,\ colour,\ head,\ age, \sum skill, \right.$$
$$\left. formal, \sum sector, \sum region, \sum year\right) \qquad (2)$$

where *y* takes the value 0 if the worker remains in the same category in the two periods considered, 1 if he/she rises in category, and 2 if he/she moves to a lower category; *sex* is a binary variable (male or female); *colour* takes the value 1 for persons of white race and 0 in other cases; *head* is a dummy variable that captured the worker's status in the family; *age* is the worker's age; *skill* represents the worker's education level;[1] *formal* is a binary variable of value 1 in the case of formal workers; *sector* represents a set of dummy variables for the sectors of economic activity;[2] *region* corresponds to dummy variables representing the six metropolitan regions, and *year* refers to the dummy variables of annual effects.

After estimating the occupational mobility factors, a quantile regression analysis is made (Koenker and Basset, 1978) of the effect of mobility on the wage level and distribution of wage incomes. Quantile regressions make it possible to compare marginal effects, or wage premia associated with the different factors, of the wealthiest and poorest workers within the wage distribution. This, in turn, makes it possible to verify whether mobility has a differential impact according to the individual's income level. For example, if poorer workers gain higher premia for moving up the socio-employment ladder, then mobility can help reduce wage differences between the different income brackets. To determine whether the differences are real and significant, interquantile regressions can be used (Koenker, 2000).

The estimated model, both for the regressions conditional on the quantiles and for the inter-quantile regressions, are given by the following equation:

[1] Unskilled (up to three years' schooling); low skilled (4 to 7 years'); semiskilled (8 to 10 years'), and skilled (more than 10 years').
[2] Basic products; manufacturing; and construction sectors; tertiary sector and other activities.

$$\ln(w_2) = f\left(sex,\ colour,\ head,\ age,\ age^2, \sum skill,\ formal,\ \sum sector, \sum region, \sum year,\ upward,\ downward\right) \quad (3)$$

where $w_2$ is the wage received in the second period (following the decision to change job, or not as the case may be); *sex, colour, head, age, skill, formal, sector, region* and *year* are defined as above; "*upward*" and "*downward*" are dummy variables indicating the workers' direction of movement, taking as a reference those who change their socio-employment segment. Thus, within the inter-quantile regression model, if ability has a significant negative effect, it means that the occupational movements help reduce the wage difference between the quantiles considered and, therefore, reduce inequality. The quantiles analysed are the 10th, 25th, 75th and 90th, because the first two capture the incomes of the poorest workers, and the two last represent individuals with the highest hourly wages.

The analysis covers the period 2002-2010 and used a sample of private-sector wage-earners aged between 18 and 65 (including domestic employees) who had a job in the reference week. Mobility is analysed by comparing the information from the fourth and eighth interviews; and the panels are combined as proposed by Ribas and Soares (2008). The monetary values were converted into reais at December 2010 prices, as indicated by Corseuil and Foguel (2002). In total, the database contains 79,736 observations, as noted in table 2, which also presents brief statistics on the database used. The variance matrix for each model was estimated using the bootstrap technique to control for heteroscedasticity (Buchinsky, 1998). The results of the econometric analysis are shown and their analytical consequences are studied below.

TABLE 2

**Brazil: average of descriptive statistics, 2002-2010**
*(Percentages, reais and years' schooling)*

| | Average | Poorest 25% | Wealthiest 25% |
|---|---|---|---|
| Workers who changed job | 29.0 | 27.7 | 32.4 |
| Workers who changed segment | 15.3 | 12.6 | 19.7 |
| Hourly wage in the second period (*reais*) | 6.2 | 2.3 | 14.4 |
| Men | 59.9 | 45.0 | 70.9 |
| Persons of white race | 54.7 | 38.6 | 73.3 |
| Heads of family | 51.9 | 40.4 | 63.9 |
| Mean age | 35.7 | 34.8 | 37.9 |
| Skill level | | | |
| Unskilled (up to 3 years' schooling) | 7.0 | 12.6 | 1.6 |
| Low skilled (4-7 years' schooling) | 23.2 | 33.0 | 8.6 |
| Semiskilled (8-10 years' schooling) | 19.7 | 23.7 | 10.6 |
| Skilled (over 10 years' schooling) | 50.1 | 30.7 | 79.3 |
| Formality rate | 79.3 | 66.6 | 87.6 |
| Sector of economic activity | | | |
| Basic products | 9.0 | 8.8 | 8.2 |
| Manufacturing | 14.3 | 6.1 | 23.4 |
| Construction | 5.4 | 5.7 | 4.4 |
| Tertiary | 70.1 | 78.2 | 62.1 |
| Other activities | 1.3 | 1.2 | 2.0 |
| Metropolitan regions | | | |
| Recife | 5.8 | 10.8 | 2.7 |
| Salvador | 7.7 | 12.8 | 6.0 |
| Belo Horizonte | 17.7 | 20.4 | 15.1 |
| Rio de Janeiro | 27.3 | 32.0 | 23.2 |
| São Paulo | 25.65 | 13.3 | 36.7 |
| Porto Alegre | 15.9 | 10.82 | 16.29 |
| No. of observations | 79 736 | 19 992 | 19 906 |

*Source:* prepared by the authors on the basis of data from the Monthly Employment Survey.

# IV
# Results and analysis

This section presents the results of the analysis of the effect of mobility on wage differentials, using data from the Monthly Employment Survey; and it shows the results of the probability model of occupational change and regressions of the wage estimated using quantile regressions.

## 1. Socio-employment mobility factors

The socio-employment categories used are based on average hourly wages, education level, and the informality rate within each job, grouped into three levels: higher, medium and lower. Bearing in mind that the labour market is the main source of income, and the way workers enter this market can determine their horizon of opportunities, these categories can be used to represent an overview of the country's socioeconomic structure. Table 3 shows that the socio-employment structure remained relatively stable in the decade of 2000, and the only feature to note is the two percentage point rise in the number of workers in activities pertaining to the lower segment.

TABLE 3

**Brasil: socio-employment categories, 2002-2009**
*(Percentages)*

| Year | Upper | Middle | Lower |
|---|---|---|---|
| 2002 | 11.5 | 42.0 | 46.4 |
| 2003 | 11.0 | 40.9 | 48.1 |
| 2004 | 11.0 | 39.8 | 49.2 |
| 2005 | 11.0 | 40.5 | 48.5 |
| 2006 | 10.8 | 41.3 | 47.8 |
| 2007 | 10.4 | 40.9 | 48.7 |
| 2008 | 11.6 | 40.4 | 48.0 |
| 2009 | 10.3 | 40.3 | 49.4 |
| Total | 10.9 | 40.7 | 48.4 |

*Source:* prepared by the authors on the basis of data from the Monthly Employment Survey.

Considering the original job classification in the Monthly Employment Survey, on average nearly 30% of workers had a different job than declared initially. Among those who changed their job: (i) 53% moved to another socio-employment segment; and (ii) 47% remained in the same segment. The mobility rate between segments is, on average, 15% for the entire sample, because 7.6% of workers displayed upward mobility, in other words they left a lower occupational segment and moved to a higher one, whereas 7.7% displayed downward mobility.

The results of the probability model represented by equation (2) are shown in table 4, taking socio-employment immobility as the reference the situation. As the categories are formed by taking account of the workers' education levels, among other factors, two models are prepared —with and without the binary variables of skill and formality—. The results are expressed in terms of marginal effects and, for reasons of space, the annual dummy variables are omitted, although they can be obtained from the authors (this procedure will be used also in the other tables showing the econometric results).

The two estimated models produce similar results, so the signs of the marginal effects remain consistent. Women are less likely to change their occupation, while men are more flexible both for upwards and for downward mobility. A similar result is observed when analysing the effect of the dummy variable representing skin colour, because white workers display greater mobility than those of other races, as also reported by Pinto and Neri (2000), who used data from the Monthly Employment Survey for the 1990s. Among heads of family, the positive sign and significant status of the marginal effect on the probability of immobility may indicate greater risk aversion among individuals who are responsible for sustaining a family.

In the case of human-capital factors, age and education display different signs, which confirms the hypothesis that different forms of human capital have differentiated effects on occupational mobility (Mincer and Jovanovic, 1979). Age, which can be interpreted as representing experience and, thus, specific human capital, indicates that the older individuals tend to remain in the same occupational segment. In contrast, workers with higher levels of education or general human capital are more flexible and change socio-employment segment more easily.

On average, formal and informal workers both have a similar rate of mobility between jobs, of around 29% for both groups. Nonetheless, the estimated model shows

TABLE 4

**Brazil: marginal effects on the probability of socio-employment mobility, 2002-2010**

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| | Immobility | Upward | Downward | Immobility | Upward | Downward |
| Gender | -0.0543[a] | 0.0262[a] | 0.0280[a] | -0.0555[a] | 0.0272[a] | 0.0282[a] |
| | (0.003) | (0.002) | (0.002) | (0.003) | (0.002) | (0.002) |
| Skin colour | -0.0126[a] | 0.0065[a] | 0.0061[a] | -0.0226[a] | 0.0112[a] | 0.0113[a] |
| | (0.003) | (0.002) | (0.002) | (0.003) | (0.002) | (0.002) |
| Head of family | 0.0136[a] | -0.0107[a] | -0.0029 | 0.0177[a] | -0.0122[a] | -0.0055[b] |
| | (0.003) | (0.002) | (0.002) | (0.003) | (0.002) | (0.002) |
| Page | 0.0014[a] | -0.0010[a] | -0.0004[a] | 0.0021[a] | -0.0013[a] | -0.0007[a] |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Low skill (4-7 years' schooling) | -0.0185[a] | 0.0077 | 0.0108[b] | | | |
| | (0.007) | (0.005) | (0.005) | | | |
| Semiskilled (8-10 years' schooling) | -0.0556[a] | 0.0220[a] | 0.0336[a] | | | |
| | (0.008) | (0.006) | (0.006) | | | |
| Skilled (over 10 years' schooling) | -0.0792[a] | 0.0337[a] | 0.0455[a] | | | |
| | (0.006) | (0.005) | (0.005) | | | |
| Formal | 0.0035 | 0.0093[a] | -0.0128[a] | | | |
| | (0.003) | (0.002) | (0.003) | | | |
| Manufacturing | -0.0025 | -0.0082[a] | 0.0107[a] | -0.0100[b] | -0.0050 | 0.0150[a] |
| | (0.005) | (0.003) | (0.004) | (0.005) | (0.003) | (0.004) |
| Construction | 0.0470[a] | -0.0107[a] | -0.0363[a] | 0.0543[a] | -0.0152[a] | -0.0392[a] |
| | (0.005) | (0.004) | (0.003) | (0.005) | (0.004) | (0.003) |
| Tertiary | 0.0610[a] | -0.0309[a] | -0.0301[a] | 0.0580[a] | -0.0300[a] | -0.0280[a] |
| | (0.005) | (0.003) | (0.003) | (0.005) | (0.003) | (0.003) |
| Other activities | -0.0282[b] | 0.0258[a] | 0.0024 | -0.0300[a] | 0.0269[a] | 0.0031 |
| | (0.011) | (0.009) | (0.007) | (0.011) | (0.009) | (0.008) |
| Recife | -0.0493[a] | 0.0250[a] | 0.0243[a] | -0.0521[a] | 0.0263[a] | 0.0259[a] |
| | (0.006) | (0.005) | (0.005) | (0.006) | (0.005) | (0.005) |
| Salvador | 0.0113[b] | -0.0055 | -0.0058 | 0.0057 | -0.0030 | -0.0027 |
| | (0.005) | (0.004) | (0.004) | (0.005) | (0.004) | (0.004) |
| Belo Horizonte | -0.0127[a] | 0.0067[b] | 0.0060[b] | -0.0105[a] | 0.0062[b] | 0.0042 |
| | (0.004) | (0.003) | (0.003) | (0.004) | (0.003) | (0.003) |
| Rio de Janeiro | 0.0410[a] | -0.0196[a] | -0.0214[a] | 0.0434[a] | -0.0208[a] | -0.0226[a] |
| | (0.003) | (0.002) | (0.002) | (0.003) | (0.002) | (0.002) |
| Porto Alegre | -0.0085[b] | 0.0055[c] | 0.0030 | -0.0014 | 0.0027 | -0.0012 |
| | (0.004) | (0.003) | (0.003) | (0.004) | (0.003) | (0.003) |
| Pseudo $R^2$ | 0.0339 | | | 0.0286 | | |
| No. of observations | 79 736 | | | 79 736 | | |
| $\chi 2$ | 2 982.34 | | | 2 480.89 | | |

*Source:* prepared by the authors on the basis of data from the Monthly Employment Survey.

[a] p<0.01.
[b] p<0.05.
[c] p<0.10.

Note: annual dummy variables suppressed. Robust standard deviations in parentheses.

that this mobility does not produce the same results when the destinations of the workers are considered. Those in the formal sector who change their job generally move upwards to occupations in better segments, whereas the mobility of informal workers more often tends to be downwards. Thus, in addition to promoting job stability, possession of a work contract could be promoting additional protection for people. These results suggest that the worker's formalization can be seen as a factor that promotes career advancement, and consequently, a rising socio-employment status.

The results show that mobility and flexibility, understood respectively as the flow of workers between jobs or segments and the degrees of freedom provided by the market for these changes and also for the hiring or firing of labour, are closely related topics. While, on the one hand, the analysis corroborates the results, for example, of Barros and others (1997), which reveals a

considerable degree of flexibility in the labour market in Brazil, it also provides additional information by showing that the effect of that flexibility is not homogeneous between groups of workers. Informal wage earners who, in principle, are the most flexible, are not benefiting from that flexibility as much as workers who are institutionally protected by the employment contract. This finding suggests that the elimination or reduction of institutional protection do not seem consistent with policies to bring about a redistribution of income through the labour market.

Assuming true the hypothesis that occupational integration is one of the main factors determining income levels, the manner and velocity with which workers move from one occupational segment to another may also indicate changes in the country's income distribution. The next subsection presents the results of an estimation of wage equations that captures the effect of socio-employment mobility across the quantiles of the hourly wage distribution.

### 2. Wage determination: quantile regressions

Quantile regressions form the basis for determining the return to mobility in each income bracket. Conditional regressions were estimated with respect to the 10th, 25th, 75th and 90th quantiles. The first two capture the poorest workers, while the last two represent individuals with the highest hourly wages.

The results are shown in table 5, which, alongside the general model, also presents an alternative estimation without the education and formality variables, since these form the basis for the aggregation of the occupation segments and could be unduly correlated with the mobility dummy variables. For each personal or labour-market characteristic in the traditional quantile variables, marginal incomes are calculated through the first derivative applied to the equation of the conditional distribution of the hourly wage.

The typical variables of the Mincer equations have the expected signs (Corseuil, 2002), but with different intensities in the different conditional quantiles. The binary variable representing gender, for example, captures the difference between men and women in the labour market, whereas the variable relating to skin colour shows the wage differential between white race individuals and those of other races. In both cases, the marginal effects increase as one moves up the conditional distribution of hourly wage, which shows that the differences between the demographic groups intensify among the wealthier workers. With regard to the skill of the workers, two conclusions can be drawn from the estimated results. Firstly, taking unskilled workers as a reference, the marginal effects rise for higher skill levels. Secondly, workers from higher quantiles report greater marginal effects, in other words, more opportunities or greater facility to turn the acquired skill into a wage. These results are consistent both with the earliest studies that used quantile regressions in Brazil, such as de Maciel, Campelo and Raposo (2001), and with more recent analyses, such as Sampaio (2009). Possession of an employment contract seems to lose force in explaining the income level of workers with higher wages, because, for them, other factors have an influence beyond formalization of the job through a contract (Pianto and Pianto, 2002).

In the case of mobility between socio-employment segments, the positive sign and significant status in most cases show that, in the Brazilian labour market, mobility has the effect of increasing individuals' wages, even when the movement is to a lower socio-employment segment. These results show that when two workers are compared, one of whom recently changed job while the other has remained for longer in the same activity, the first tends to have a higher hourly wage. In this regard, mobility in Brazil seems to be being used as a strategy for obtaining a higher wage, rather than length of time in the job or employment category (Fitzenberger and Kunze, 2005).

Nonetheless, the positive outcome of mobility should not necessarily be seen as contradicting expectations according to length of service. Albuquerque (2008) suggests that, at least in the case of the youngest workers, turnover is related to wage increases, which can also be interpreted as moving up professionally. Moreover, time in a job also has a positive sign, which shows that the more experienced workers are generally paid better. In this regard, more specific research could be undertaken by age groups, to compare the effects of mobility between young people entering the labour market and other older people with greater professional experience.

When the long-term effects of the quantiles are analysed, socio-employment mobility seems to have little repercussion on the wage of the poorest workers, but becomes more important in the two middle quantiles of the distribution. For the wealthiest workers, mobility, even downward, entails a positive wage premium. In the occupational-matches approach (McLaughlin, 1991), workers with the highest wages and, generally, the best jobs, only decide to change job when that decision benefits them, which demonstrates the greater presence of voluntary changes in this group. The results reported here thus show that mobility could reflect the fact that

TABLE 5

**Brazil: quantile equations of wages, 2002-2010**

| Quantiles | Model 1 | | | | Model 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | 10th | 25th | 75th | 90th | 10th | 25th | 75th | 90th |
| Gender | 0.1216[a] | 0.1524[a] | 0.1991[a] | 0.1927[a] | 0.1333[a] | 0.1739[a] | 0.2085[a] | 0.1844[a] |
| | (0.0048) | (0.0052) | (0.0060) | (0.0108) | (0.0052) | (0.0039) | (0.0057) | (0.0123) |
| Skin colour | 0.0821[a] | 0.1085[a] | 0.2321[a] | 0.2749[a] | 0.1056[a] | 0.1468[a] | 0.4381[a] | 0.7193[a] |
| | (0.0048) | (0.0045) | (0.0068) | (0.0084) | (0.0046) | (0.0037) | (0.0073) | (0.0091) |
| Head of family | 0.0754[a] | 0.0857[a] | 0.1452[a] | 0.1804[a] | 0.0526[a] | 0.0588[a] | 0.1102[a] | 0.1714[a] |
| | (0.0042) | (0.0050) | (0.0060) | (0.0092) | (0.0053) | (0.0045) | (0.0081) | (0.0146) |
| Age | 0.0054[a] | 0.0081[a] | 0.0172[a] | 0.0206[a] | 0.0013[a] | 0.0029[a] | 0.0095[a] | 0.0154[a] |
| | (0.0002) | (0.0002) | (0.0002) | (0.0004) | (0.0003) | (0.0002) | (0.0003) | (0.0006) |
| Low skill | 0.0982[a] | 0.1116[a] | 0.1459[a] | 0.1508[a] | | | | |
| (4-7 years of schooling) | (0.0083) | (0.0058) | (0.0105) | (0.0123) | | | | |
| Semiskilled | 0.1773[a] | 0.2017[a] | 0.2968[a] | 0.3310[a] | | | | |
| (8-10 years of schooling) | (0.0063) | (0.0070) | (0.0090) | (0.0130) | | | | |
| Skilled | 0.3408[a] | 0.4343[a] | 0.8844[a] | 1.1918[a] | | | | |
| (over 10 years) | (0.0068) | (0.0078) | (0.0101) | (0.0131) | | | | |
| Formal | 0.2807[a] | 0.2116[a] | 0.1356[a] | 0.1116[a] | | | | |
| | (0.0060) | (0.0058) | (0.0054) | (0.0098) | | | | |
| Manufacturing | 0.1270[a] | 0.1585[a] | 0.1993[a] | 0.1906[a] | 0.1514[a] | 0.1989[a] | 0.3371[a] | 0.2929[a] |
| | (0.0080) | (0.0093) | (0.0094) | (0.0174) | (0.0111) | (0.0079) | (0.0156) | (0.0211) |
| Construction | 0.0633[a] | 0.0617[a] | 0.0677[a] | 0.0855[a] | -0.0674[a] | -0.0390[a] | -0.0295 | -0.0203 |
| | (0.0106) | (0.0096) | (0.0142) | (0.0207) | (0.0130) | (0.0095) | (0.0198) | (0.0325) |
| Tertiary | -0.0174[b] | -0.0042 | 0.0118[c] | 0.0056 | -0.0212[b] | 0.0076[b] | 0.0491[a] | 0.0107 |
| | (0.0070) | (0.0061) | (0.0066) | (0.0132) | (0.0084) | (0.0034) | (0.0156) | (0.0155) |
| Other activities | -0.0302 | 0.0641[a] | 0.2412[a] | 0.2929[a] | -0.0975[a] | -0.0217 | 0.4702[a] | 0.5001[a] |
| | (0.0257) | (0.0241) | (0.0392) | (0.0490) | (0.0223) | (0.0345) | (0.0505) | (0.0698) |
| Recife | -0.3474[a] | -0.3876[a] | -0.4731[a] | -0.4999[a] | -0.3103[a] | -0.3484[a] | -0.4691[a] | -0.5422[a] |
| | (0.0124) | (0.0087) | (0.0135) | (0.0180) | (0.0145) | (0.0066) | (0.0156) | (0.0282) |
| Salvador | -0.3163[a] | -0.3198[a] | -0.3210[a] | -0.3438[a] | -0.2797[a] | -0.2865[a] | -0.2120[a] | -0.1779[a] |
| | (0.0070) | (0.0074) | (0.0113) | (0.0168) | (0.0117) | (0.0063) | (0.0168) | (0.0273) |
| Belo Horizonte | -0.1583[a] | -0.1629[a] | -0.1832[a] | -0.2110[a] | -0.1302[a] | -0.1575[a] | -0.2166[a] | -0.2923[a] |
| | (0.0066) | (0.0048) | (0.0084) | (0.0134) | (0.0054) | (0.0044) | (0.0111) | (0.0187) |
| Rio de Janeiro | -0.1647[a] | -0.1689[a] | -0.1956[a] | -0.2107[a] | -0.1686[a] | -0.1839[a] | -0.2396[a] | -0.3270[a] |
| | (0.0063) | (0.0031) | (0.0090) | (0.0109) | (0.0044) | (0.0051) | (0.0151) | (0.0142) |
| Porto Alegre | -0.0703[a] | -0.0998[a] | -0.2224[a] | -0.2685[a] | -0.0688[a] | -0.1052[a] | -0.3415[a] | -0.5461[a] |
| | (0.0077) | (0.0045) | (0.0068) | (0.0120) | (0.0066) | (0.0061) | (0.0142) | (0.0209) |
| Upward | 0.0089 | 0.0197[a] | 0.0470[a] | 0.0121 | 0.0108 | 0.0362[a] | 0.1401[a] | 0.0996[a] |
| | (0.0070) | (0.0071) | (0.0162) | (0.0190) | (0.0114) | (0.0077) | (0.0115) | (0.0199) |
| Downward | -0.0063 | -0.0031 | 0.0277[b] | -0.0212[c] | -0.0003 | 0.0183[a] | 0.1261[a] | 0.0877[a] |
| | (0.0081) | (0.0061) | (0.0109) | (0.0127) | (0.0074) | (0.0058) | (0.0127) | (0.0178) |
| Constant | 0.0972[a] | 0.2104[a] | 0.3357[a] | 0.5075[a] | 0.6159[a] | 0.7451[a] | 1.0699[a] | 1.3469[a] |
| | (0.0137) | (0.0141) | (0.0147) | (0.0215) | (0.0145) | (0.0100) | (0.0243) | (0.0334) |
| Pseudo $R^2$ | 0.1819 | 0.1749 | 0.2393 | 0.3025 | 0.1092 | 0.1041 | 0.1166 | 0.1515 |
| No. of observations | 79 736 | 79 736 | 79 736 | 79 736 | 79 736 | 79 736 | 79 736 | 79 736 |

*Source:* prepared by the authors on the basis of data from the Monthly Employment Survey.

[a] p<0.01.
[b] p<0.05.
[c] p<0.10.
Nota: annual dummy variables are suppressed. Robust standard deviations obtained by bootstrapping in parentheses.

the worker has found new occupational matches that give rise to greater productivity. Among the poorest, in contrast, involuntary mobility may be more frequent, as a result of the firm's perception that the worker's productivity is below expectations. It would therefore be worth conducting additional studies to verify whether mobility among the poorest workers provides fewer benefits, precisely owing to the possibly greater incidence of forced occupational changes among them.

When the results are broken down according to the type of labour contract, table 6 shows that the marginal effects of socio-employment mobility are significant for workers who have a signed employment contract, including those located at the top end of the wage distribution. Among informal workers, socio-employment mobility only produces positive and significant effects for individuals with a higher hourly wage. This result seems to show that informal workers, who are supposedly the most flexible, do not benefit financially from that flexibility; and this reinforces the idea that, for this group, mobility is merely synonymous with labour turnover.

These analyses of data from the Monthly Employment Survey make it possible not to reject the hypothesis that mobility between jobs and occupational segments has a significant effect on workers wages, as indicated in Oliveira and Machado (2000). Nonetheless, when the estimation considers both the analysis by quantiles and the type of job breakdown, it adds new information to the empirical analysis in Brazil. Quantile regressions reveal differences between the quantiles of the hourly wage distribution. Mobility has a greater effect on higher paid workers and, depending on the level of disaggregation, a practically nonexistent or negative effect on the poorest. This means that, despite its capacity to raise income, mobility can worsen the distortion of the wage distribution and hinder the expected reduction in income inequality.

## 3. Determination of the differential between rich and poor: inter-quantile regressions

The foregoing results show a higher value for the marginal effect of mobility among the highest-income workers. Bearing this in mind, this subsection presents the estimation of inter-quantile regressions, which evaluate whether this difference between the marginal returns of two conditional quantiles is or is not significant.

Table 7 shows the results for differences between the 10th and 90th quantiles and between the 25th and 75th. The positive signs, provided the coefficients are significant, indicate that the factor analysed has a greater marginal effect on the hourly wage in the higher quantiles. Thus, they can be interpreted as factors that increase the wage differential between the quantiles being compared, whereas negative signs indicate that the component contributes to a reduction in inequality between points of the distribution. In the case of binary variables, a positive sign on the estimated coefficient can be interpreted as an increase in the inter-quantile hourly wage differential in relation to the reference category.

Among the variables used in the models, only the regional and formality dummy variables display negative signs, which indicates that the difference between the richest and poorest workers could be narrowing as a result of the convergence of regional wages and formalization, among other causes. In the case of informality, this fact can help to explain the recent fall in inequality in the country, because the percentage of informal jobs has also been systematically declining (Mello and Santos, 2009). This provides an additional test of the role played by institutional protection, particularly in balancing out the differences between the extremes of income distribution. Once again, this effect raises the need for new studies on the role of segmentation between formal and informal jobs

TABLE 6

**Brazil: marginal effects of mobility for formal and informal workers by quantiles, 2002-2010**

| Quantiles | Formal sectors | | | | Informal sectors | | | |
|---|---|---|---|---|---|---|---|---|
| | 10th | 25th | 75th | 90th | 10th | 25th | 75th | 90th |
| Upward | 0.0183[a] | 0.0325[a] | 0.1404[a] | 0.0912[a] | -0.0102 | 0.0201 | 0.0803[b] | 0.1337[a] |
| | (0.0066) | (0.0086) | (0.0141) | (0.0178) | (0.0333) | (0.0178) | (0.0328) | (0.0367) |
| Downward | 0.0165[a] | 0.0408[a] | 0.1379[a] | 0.1059[a] | -0.0360 | -0.0146 | 0.0313 | 0.0464 |
| | (0.0062) | (0.0093) | (0.0173) | (0.0241) | (0.0224) | (0.0139) | (0.0294) | (0.0363) |

*Source:* prepared by the authors on the basis of data from the Monthly Employment Survey.

[a] p<0.01.
[b] p<0.05.
Note: robust standard deviations obtained by bootstrapping in parentheses.

TABLE 7

**Brazil: inter-quantile regressions, 2002-2010**

| Quantiles | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | 10th - 90th | 25th - 75th | 10th - 90th | 25th - 75th |
| Gender | 0.0711[a] | 0.0468[a] | 0.0510[a] | 0.0346[a] |
| | (0.0105) | (0.0051) | (0.0174) | (0.0072) |
| Skin colour | 0.1928[a] | 0.1236[a] | 0.6137[a] | 0.2913[a] |
| | (0.0099) | (0.0071) | (0.0081) | (0.0062) |
| Head of family | 0.1050[a] | 0.0595[a] | 0.1188[a] | 0.0513[a] |
| | (0.0078) | (0.0044) | (0.0127) | (0.0092) |
| Age | 0.0152[a] | 0.0090[a] | 0.0141[a] | 0.0066[a] |
| | (0.0005) | (0.0003) | (0.0005) | (0.0003) |
| Low skill | 0.0526[a] | 0.0343[a] | | |
| (4-7 years of schooling) | (0.0139) | (0.0091) | | |
| Semiskilled | 0.1537[a] | 0.0951[a] | | |
| (8-10 years of schooling) | (0.0184) | (0.0090) | | |
| Skilled | 0.8510[a] | 0.4501[a] | | |
| (over 10 years) | (0.0159) | (0.0110) | | |
| Formal | -0.1691[a] | -0.0760[a] | | |
| | (0.0097) | (0.0063) | | |
| Manufacturing | 0.0637[a] | 0.0408[a] | 0.1415[a] | 0.1382[a] |
| | (0.0209) | (0.0098) | (0.0265) | (0.0163) |
| Construction | 0.0222 | 0.0061 | 0.0471 | 0.0095 |
| | (0.0209) | (0.0140) | (0.0418) | (0.0155) |
| Tertiary | 0.0230 | 0.0160[c] | 0.0319 | 0.0415[a] |
| | (0.0169) | (0.0092) | (0.0200) | (0.0096) |
| Other activities | 0.3231[a] | 0.1771[a] | 0.5975[a] | 0.4919[a] |
| | (0.0705) | (0.0403) | (0.0560) | (0.0431) |
| Recife | -0.1525[a] | -0.0855[a] | -0.2319[a] | -0.1207[a] |
| | (0.0193) | (0.0116) | (0.0319) | (0.0114) |
| Salvador | -0.0275[b] | -0.0012 | 0.1017[a] | 0.0745[a] |
| | (0.0150) | (0.0152) | (0.0232) | (0.0115) |
| Belo Horizonte | -0.0527[a] | -0.0204[b] | -0.1622[a] | -0.0591[a] |
| | (0.0136) | (0.0109) | (0.0217) | (0.0110) |
| Rio de Janeiro | -0.0460[a] | -0.0267[a] | -0.1584[a] | -0.0557[a] |
| | (0.0153) | (0.0079) | (0.0204) | (0.0084) |
| Porto Alegre | -0.1982[a] | -0.1227[a] | -0.4774[a] | -0.2363[a] |
| | (0.0124) | (0.0106) | (0.0240) | (0.0138) |
| Upward | 0.0032 | 0.0273[c] | 0.0889[a] | 0.1040[a] |
| | (0.0128) | (0.0110) | (0.0176) | (0.0153) |
| Downward | -0.0149 | 0.0308[a] | 0.0880[a] | 0.1078[a] |
| | (0.0221) | (0.0094) | (0.0197) | (0.0153) |
| Constant | 0.4103[a] | 0.1253[a] | 0.7310[a] | 0.3247[a] |
| | (0.0236) | (0.0157) | (0.0478) | (0.0189) |
| No. of observations | 79 736 | 79 736 | 79 736 | 79 736 |

*Source:* prepared by the authors on the basis of data from the Monthly Employment Survey.

[a] p<0.01.
[b] p<0.10.
[c] p<0.05.
Note: annual dummy variables suppressed. Robust standard deviations obtained by bootstrapping in parentheses.

in the labour market, perhaps by expanding the analysis performed by Curi and Menezes-Filho (2004), which investigated the transition of workers between these two segments, and unemployment and inactivity, but without analysing the repercussion these shifts have on labour incomes. According to the data presented in this study, a significant relation between the mobility of formal and informal jobs and income inequality can be posited.

The variables that capture the transitions between the socio-employment segments defined in the study display positive and significant signs in the vast majority of cases, which confirms that the return or wage premium from mobility is higher among workers in the higher income brackets.

If the data analysed above are considered jointly, the results show that mobility has had a twin effect on workers' wages: firstly by increasing incomes, and secondly helping to widen wage differences. In other words, if two different groups of workers are compared, one consisting of individuals who have recently changed occupational segment and the other with those that have remained in the same category during both evaluation periods, the first group has a higher hourly wage, particularly in the case of individuals whose job change was upwards. Nonetheless, the wage premium resulting from this change, measured in terms of the marginal effect of the dummy variables representing mobility, is significantly larger among higher-paid workers than for those with an hourly wage in the lower part of the distribution. This shows that the highest-earning workers benefit more from job changes than the poorest, or that the former are better able to turn this change into a wage premium, even when the change is to a lower occupational category.

Thus, if the return to mobility is different and more favourable to workers in the upper part of the income distribution, mobility, as it has occurred up to now, seems to help widen the wage gap between rich and poor workers.

If the results show that mobility between segments helps to increase the difference between high income workers and the most poor, how can the recent reduction in inequality be explained? In reality, these facts can be seen as complementary rather than contradictory, because the most plausible explanation is that the labour market in Brazil has acted as a creator of inequalities, thereby hindering the distributive effects of the more favourable macroeconomic environment of the last two years. A significant cause of this limitation, therefore, consists of the way the labour market has encouraged workers to change from one job to another or from one occupational segment to another.

Table 8 shows the estimated coefficients when the worker sample is divided into formal and informal segments. The signs of the inter-quantile difference remain positive and are mostly significant, only varying in terms of intensity. Mobility between socio-employment segments has a greater effect on the gap between the extremes of the wage distribution among informal workers. These results seem to show that occupational mobility among the highest-paid workers could be being used mainly as a strategy for obtaining larger wage increases, because it only happens when the impact on the wage is sufficient to cover the opportunity cost of stability. In contrast, the poorest workers may be using mobility as a social survival strategy.

In short, the results show that mobility between socio-employment segments has a twin effect in the labour market. Firstly, workers use this mechanism to obtain wage increases, as an alternative to stability and the accumulation of specific human capital. This confirms the hypothesis that occupational transitions could be

TABLE 8

**Brazil: mobility coefficients from the inter-quantile regressions for formal and informal workers**

| | Formal quantiles | | Informal quantiles | |
|---|---|---|---|---|
| | 10th - 90th | 25th - 75th | 10th - 90th | 25th - 75th |
| Upward | 0.0729[a] | 0.1079[a] | 0.1439[a] | 0.0602[b] |
| | (0.0199) | (0.0148) | (0.0415) | (0.0321) |
| Downward | 0.0894[a] | 0.0971[a] | 0.0824 | 0.0459 |
| | (0.0212) | (0.0159) | (0.0521) | (0.0344) |

*Source:* prepared by the authors on the basis of data from the Monthly Employment Survey.

[a] p<0.01.
[b] p<0.10.
Note: robust standard deviations obtained by bootstrapping in parentheses.

being used as a way to escape high-risk situations, or also as a means of professional advancement. Secondly, this use has not caused a narrowing of wage differentials between the different strata of the income distribution. This is explained by the fact that workers with the highest wages are better able to turn mobility into significant wage increases.

One possible explanation of this effect could be that, among the highest-wage workers, mobility would only occur when the benefits and exceeded the cost of the change, such as loss of seniority in the previous job and other non-economic costs. For such workers, the change of job or socio-employment segment seems to be more the result of voluntary decisions, in the search for more productive occupational matches, or with the aim of achieving a higher wage return. Among the poorest workers, in contrast, particularly the informal, mobility may reflect other factors, possibly with a greater involuntary component, which forces the worker to change to a job at the same socio-employment level but does not produce a significant marginal effect (Hachen, 1992).

Consequently, despite contributing to a wage increase, this mobility widens the differential between the wages of workers at the extremes of the income distribution. Even when account is taken of recent data showing that mobility can help reduce wage differentials between certain groups (men and women, persons of black and white race, among others) (Monsueto, 2008; Ruesga, Bichara and Monsueto, 2009), the results of this study seem to indicate that those reductions occur within the same group in the distribution. In other words, the wage gap is narrowed between poor men and women and between men and women of higher wages, but not between poor and rich women, for example.

The results seem to call for a new approach to public policies in relation to the labour market, to strengthen the effect of mobility on wage increases and to offset the effect of the growth in wage disparities. Job creation should prioritize sectors in which mobility can generate benefits for the workers, particularly those of lowest incomes. In that regard, the restructuring or design of new programmes could be based, for example, on the "flexi-security" systems or flexibility with security, directly or indirectly adopted by some European countries (Auer, Berg and Coulibaly, 2005; Andersen and Svarer, 2006). For that purpose, the economy needs to operate so as to grant a certain degree of flexibility to firms when planning the size of their labour force according to the business cycle, but with a system of protection or pensions linked to programmes that update vocational training and labour relocation. At the same time, policies are needed to improve working conditions in jobs with the lowest socio-employment status, such as incentives to increase formalization and real increases in incomes through the minimum wage. As noted by Fontes, Pero and Berg (2012), these segments tend to benefit most from real increases in the minimum wage, which could help to reduce income inequality.

It should also be noted that the analysis undertaken in this article relates to a period of favourable job prospects and real increases in wages in the economy, and that the results could be different at times of economic stagnation, in which the incidence of involuntary mobility tends to be greater, also among formal workers, and there is a greater need for job-protection measures. Similarly, as shown by Firpo and Reis (2007) the policy of raising the minimum wage in real terms defined by Brazilian legislation has helped to reduce inequality. This policy may have been essential for easing the negative effects caused by occupational mobility on wage differentials between the extremes of the income distribution, by limiting wage losses among workers who switch between jobs of lower status, in other words those most affected by mere labour turnover.

# V

## Final thoughts

This article starts from the hypothesis that wage inequality in Brazil is not the result of a single factor, but of a set of related factors, including the role of the labour market and the occupational distribution of workers. If the way labour is distributed affects wages, then mobility between occupations and between segments should be capable of changing the country's income distribution. Thus, the research set out to analyse the effect of mobility on wages and on the income differential between the richest and poorest workers, seeking data on the role played by that mobility in the recent reduction in inequality in the country. Data from the Monthly Employment Surveys of 2002 to 2010 were used, applying models representing the probability of mobility between occupation segments

and quantile regressions on Mincer wage equations, using dummy variables to capture upward and downward movements by the workers.

The analysis provides topics for discussion through new results for the Brazilian case, which show, for example, that the poorest workers display a small and marginal positive effect from mobility compared to the repercussion of the same factor on the wages of higher paid workers. This shows that occupational mobility, as it has occurred in Brazil, does not generate the same benefits for different pay brackets.

Consequently, it can be argued that, among higher-paid workers, mobility only occurs when the benefits of change exceed its costs, such as the loss of specific human capital and other non-economic costs. In other words, voluntary job changes could be more frequent among this part of the labour force, as a result of the search for more lucrative occupational matches. Among the poorest workers, in contrast, the hypothesis is that changes between segments and jobs are more often caused by involuntary movements or mere labour turnover, so that the wage effects are not significant and may even be negative.

Accordingly, mobility among Brazilian workers may contribute to wage increases, because they display positive marginal returns. Nonetheless, it also fuels larger wage differentials between workers at the extremes of the income distribution. Although recent data show that mobility may help reduce wage gaps between certain groups (men and women, persons of black and white race, among others) as noted in Ruesga, Bichara and Monsueto (2009), the results of this study seem to indicate that these reductions occur within the same group of the income distribution. In other words, there is a reduction in the wage gap between poor men and women and between higher paid men and women, but not between poor and rich women, for example. In addition, the models representing the probability of occupational change show that the most flexible workers, in other words the informal, tend to move downward to segments with a lower socio-employment status when they change jobs. This means that the elimination or reduction of institutional protection does not seem to be consistent with income redistribution policies working through the labour market.

Understanding these results would be essential for formulating a set of efficient employment policies that not only improve employability, but also promote an increase in the quality of life for Brazilian workers and reduce social inequalities. It would thus be possible to promote optimal labour-productivity growth and economy-wide competitiveness. At the same time, a policy to raise the minimum wage tends to reduce the negative effects of occupational mobility between workers in jobs of lower socio-employment status, in other words the lowest paid.

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# What does the National High School Exam (ENEM) tell Brazilian society?

*Rodrigo Travitzki, Jorge Calero and Carlota Boto*

**ABSTRACT**

This article assesses the limitations and potentials of the National High School Exam (ENEM) as an indicator of school effectiveness in Brazil, and considers the effects of introducing contextual variables. A multilevel regression analysis was performed on three levels (individual, school and state) using microdata on 17,359 schools from 2009 and 2010. Contextual factors made it possible to explain 79% of the difference between schools. The raw average and value-added (random effect at the school level) produced contrasting evaluations in 34% of cases; and the average was more stable (r = 0.8) than value-added (r = 0.5) in both years. Various shortcomings in the ENEM as an indicator of school effectiveness were identified. The results show that this league table reveals more about socioeconomic conditions than the schools' own merit, in other words the value-added they are supposedly providing to the students.

**KEYWORDS** High school education, examinations, schools, league tables, education quality, measurement, Brazil

**JEL CLASSIFICATION** I24, I28, C18

**AUTHORS**

Rodrigo Travitzki has a Ph.D. in Education from the University of São Paulo, Brazil. r.travitzki@gmail.com

Jorge Calero is Chair Professor of the Department of Public Economy, Political Economy and Spanish Economy of the University of Barcelona, Spain. jorge.calero@ub.edu

Carlota Boto is a Professor at the Faculty of Education at the University of São Paulo, Brazil. reisboto@usp.br

# I
# Introduction

In the 1990s, a number of countries published school league tables with the aims of improving the quality of the schools and making them more accountable to society, while also providing information to help parents choose a school for their children (Karsten, Visscher and De Jong, 2001). This type of strategy usually forms part of moderated accountability policies which aim to inform the government and families and identify good practices in the education system, but without linking the results to rewards or penalties, as is done in carrot-and-stick accountability policies (Martínez Arias, 2009). Although the way those policies are generally formulated is important, their effects depend mainly on the quality measurements used (Ladd and Walsh, 2002). Consequently, technical and methodological controversies arise on issues related to the production of the indicators used in the league tables, and their capacity to really promote quality in the schools. In practice, the countries adopt a variety of strategies.

In England, for example, school league tables have been published since 1992 and have been used to create incentive systems (West and Pennell, 2000). At the other extreme, education policies in Spain prohibit the publication of school league tables (Government of Spain, 2006, Art. 140). Brazil is currently in an intermediate situation, because the publication of league tables is not linked to incentives, although some states have accountability policies involving rewards and penalties. Some authors support the strengthening of those policies nationwide (Andrade, 2008), while others adopt more cautious and critical attitudes, stressing the trend towards greater inequality, for example (Franco and others, 2007).

The first controversial issue is the concept of quality itself, which is highly polysemic when applied in the education field (Murillo Torrecilla, 2005). In Brazil's recent history, the idea of quality has taken different forms. Firstly, it was related to the universalization of access, then to the flow and repetition rate, and then to the performance of students in large-scale examinations (Oliveira and Araujo, 2005). The capacity to achieve good results is normally referred to as "effectiveness"; but it is worth remembering that an effective school is not necessarily a quality school, since effectiveness is a necessary but insufficient condition (Murillo Torrecilla, 2005, p. 31). In other words, quality is a broader concept than efficiency, and it has different meanings.

Although school quality is a controversial subject, it has frequently been linked to the performance of students on standardized tests, not only because of the desire to find objective measures, but also for practical reasons such as cost and viability. Although fundamental, this study will not discuss that issue, but focus exclusively one aspect of school quality: effectiveness in preparing students to do standardized tests. This is a very narrow focus, but necessary bearing in mind that in Brazil, as in the rest of the world, this type of indicator plays an increasing role in education policies and people's imagination.

Other controversies surrounding school league tables relate to their overvaluation (Brandão, 2000), increased social exclusion (West and Pennell, 2000), the reproduction of class privileges (Apple, 2001), feedback that benefits the best and damages the worst (Ladd and Walsh, 2002) and a lack of attention to the tests themselves (Reckase, 2004). The use of aggregate individual indicators (rather than taking the average, for example) is also criticized as a means of evaluating schools (Meyer, 1997), as also is the type of information chosen for publication (Van Petegem and others, 2005). Lastly, few studies have considered how the schools can use that information to improve their students' learning process (Heck, 2000).

This study makes a critical analysis of this type of indicator, using quantitative data from the National High School Exam (ENEM), which serves as a selection criterion for Brazilian universities and could become the official indicator of school quality nationally (Passarinho, 2012).[1] Some of the conclusions of this study relate to the test itself, whereas others concern more general methodological issues concerning value-added models in education. The specific aim is to evaluate what type

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[1] Index of Development of Basic Education (IDEB).

of information the ENEM league table provides to society and how the introduction of contextual variables interferes in the results by schools, both cross-sectionally and longitudinally.

### The importance of context

Like many others, the ENEM league table is based on the publication of school averages. Nonetheless, as the schools have very heterogeneous starting conditions, particularly in developing countries, contextual factors must be taken into account to more accurately evaluate the effect obtained by each school (Heck, 2000) —in other words its merit—. According to Meyer (1997, p. 298), a school's average test score, which is one of the most widely used education indicators in the United States, is highly questionable as an indicator of school performance, and is a very weak or even counter-productive instrument of accountability.

In the specialized literature, many authors defend this position, particularly in terms of accountability (Willms, 2006); but others argue that both the "raw" average and the "net" average (in other words, the average obtained after controlling for the effect of contextual variables) can produce distorted results (Tekwe and others, 2004). Moreover, even multilevel value-added models, the "latest generation" of school-quality indicators, can produce a wide variety of results, depending on the contextual variables that are considered (Keeves, Hungi and Afrassa, 2005; Ladd and Walsh, 2002).

Despite these shortcomings, if the aim is to make fair comparisons between schools for accountability purposes, it is essential to take account of the context in which each one operates. As noted by Thomas (1998, p. 92), the publication of league tables based on raw averages assists neither the initially high-achieving nor the initially low-achieving school. "In the former, the need for improvement may not be appreciated; in the latter serious demoralization of staff may occur through no fault of their own".

The same article refers to a 1992 study published in the newspaper The Guardian, which reached the conclusion that 23% of schools were evaluated differently between the "raw" and "net" league tables. To what extent are these conclusions confirmed in the ENEM data?

Following the introduction, this article proceeds as follows: section II describes value-added models according to different concepts and authors; section III asks why it is necessary to evaluate schools; section IV presents the National High School Exam (ENEM) as a school quality indicator; section V presents the main results, and section VI draws relevant conclusions.

# II
# Value-added models

There are a variety of value-added concepts, some of which may even be mutually contradictory (Saunders, 1999). While some authors believe value-added should be based on longitudinal data (Martínez Arias, Gaviria Soto and Castro Morera, 2009),[2] this study uses a broader concept (Reckase, 2004), which includes, for example, the effect of the school. The general aim is to evaluate how much students improve thanks to the work of the school rather than to its prior conditions, in an attempt to eliminate the influence of factors that are outside the school's control (McCaffrey and others, 2004).

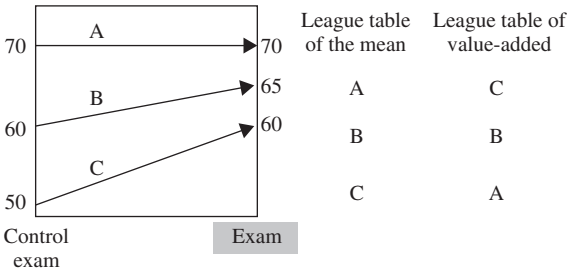
Figure 1 illustrates that general idea, which can be applied both to cross-section and longitudinal data. In the first case, which includes the school effect, there is only one test taken by the students, because the "control test" is estimated using contextual variables. In other words, the aim is to determine what the students' score (or that of the school) would have been if all had had the same contextual conditions at the outset. In the second case, the "control test" is real and, for example, was applied to students before they entered the school. In the second case, therefore, at least two different tests are applied to the same students. Each of the methodologies starts from its own assumptions and has its own limitations, so choosing one or the other depends largely on the data that are available.[3]

[2] The main argument is that previous performance condenses variables relating to socioeconomic level (Ferrão, 2009).

[3] Value-added with longitudinal data assumes, for example, that the measurement instruments used over the years have the same purpose, form, and degree of difficulty (in the case of the tests). In contrast, value-added with cross-section data not only only assumes the existence of contextual data, but that those data adequately represent the initial conditions of the student.

FIGURE 1

**General concept of value-added**




*Source:* prepared by the authors.

At the present time, value-added models are being used to guarantee accountability in Tennessee, Dallas, Chicago (United States) and in England (Martínez Arias, 2009). Models based on longitudinal data are recent, and they began to be used in England at the start of the new millennium, following the creation of an individual student identification number (Ray, Evans and McCormack, 2009). Studies on the school effect (value-added with cross-section and contextual data) have existed since the early 1980s, and they find that an estimated 5%-35% of the variance in scores obtained by students can be explained by the school in which they study (Martínez Arias, Gaviria Soto and Castro Morera, 2009).

The stability of the school effect over the years remains a controversial issue. There are data showing that few schools have results that are consistent (across different students) and stable (through time) (Thomas and others, 1997). Various studies have calculated the correlation coefficient of the school effect in different years, reporting coefficients ranging from zero (Linn and Haug, 2002) to around 0.6 (Mandeville, 1988); while (Luyten, 1994) finds correlation coefficients that are always between 0.35 and 0.65 for primary schools and between 0.70 and 0.95 in the case of high schools. Here again, it is worth asking to what extent the ENEM microdata confirm these results.

# III

## Why evaluate the schools?

In terms of the use made of the data produced by this type of indicator (based on standardized tests), there are at least two important questions that are very closely related to each other: what are the data used for and to whom are they directed? A minimally consistent approach to this topic requires its own research. For the purposes of this study, it is sufficient to identify two types of use: the accountability of public schools and the choice of a school by parents. The first aspect is related to state mechanisms, and the second to market mechanisms.

How is the aim related to the measurement instrument? It is possible to consider, for example, the size of an object. Given that "size" is an objective and consensual concept, the same rule could be used irrespective of the purpose of the measurement. In the worst of cases, the instrument is changed if the object is very large and the use of a common rule becomes impractical and inaccurate. Nonetheless, as school quality is not a consensual concept, it seems reasonable to use different indicators for different purposes. Research along these lines has sought to develop various forms for estimating the quality of schools, bearing in mind their usefulness for the family and the Government, for example (Meyer, 1997). In general, although raw averages are informative in terms of the schools' performance, they produce unfair comparisons for administrators, teachers and students (Willms, 2006). In view of this, two types of school effect were proposed, the first (Type A) related more to general performance, and the second (Type B) with the objective of isolating the factors over which the school has some control.

"The Type B effect is the effect school officials consider when evaluating the performance of those who work in schools. A school with an unfavourable context could produce a large Type B effect through the effort and talent of its staff. The school would rightly earn the respect of school evaluators even though parents shopping for a large Type A effect might not want to choose that school" (Raudenbush and Willms, 1995, p. 310).

The main ideas described above are summarized in figure 2, which also introduces another concept of value-added relative to school quality. Thus far, the value that the school adds to the student has been considered through cross-section or longitudinal data. Nonetheless, the school's value-added can be estimated over certain time period, whether by the school itself, or through educational policies, the community, or through economic and social changes, among other factors. This second concept of

value-added was used in Brazil to define the targets for each school proposed in the National Education Plan.[4]

It is clear, among other things, that the main source of information used to evaluate school quality consists of standardized individual tests (a fact that assumes a clear methodological shortcoming), and that different indicators could be used for different sectors of society. This plurality needs to be taken into account, because undue emphasis on parental choice tends to increase inequalities (Apple, 2001).

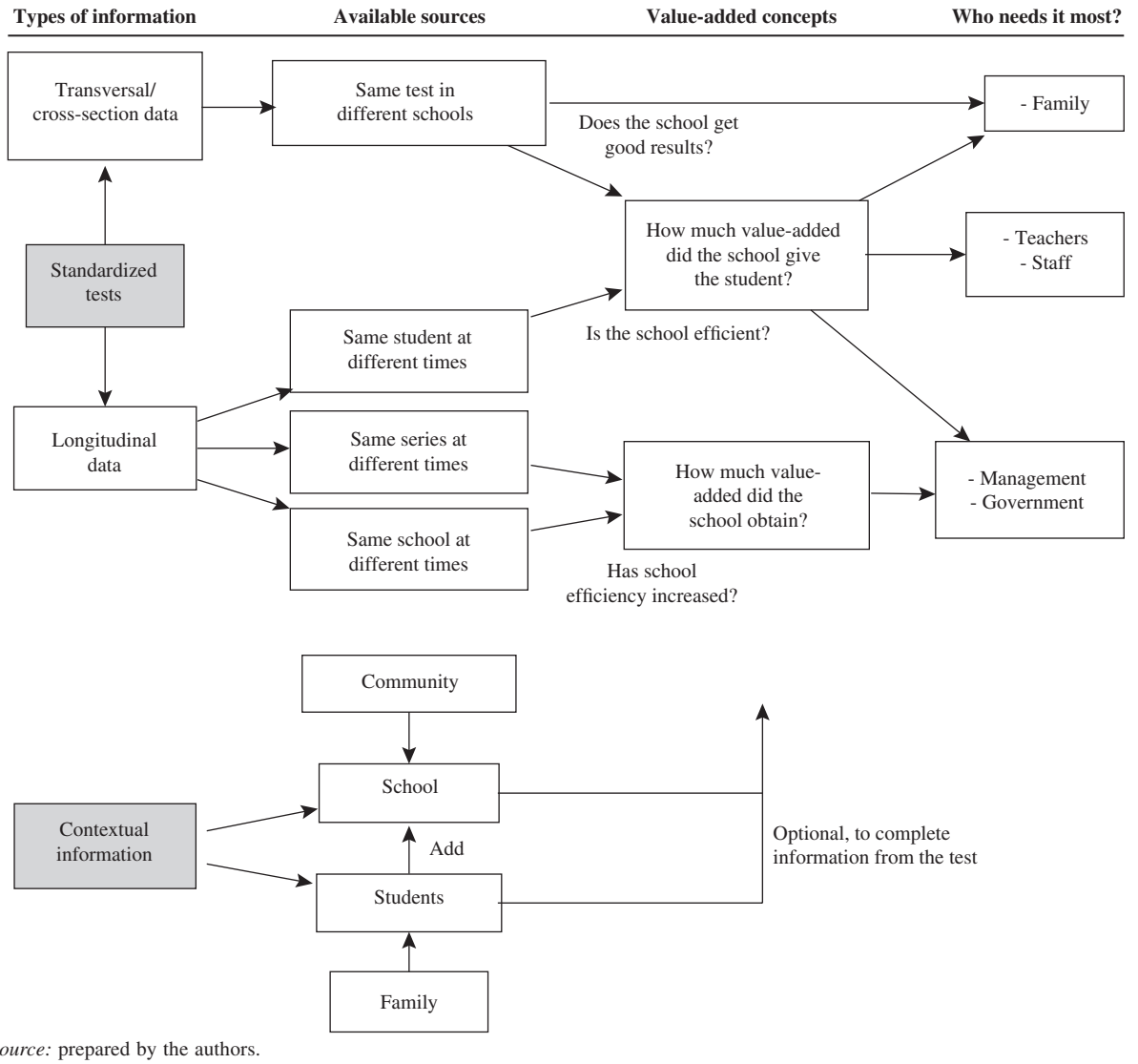
There seems to be an inherent tension in the evaluation field, which applies both to schools and to the students in each of them —namely the quality/equity dichotomy—. Dubet describes this tension in intra-school relations, by considering what a fair school system would be like, and demonstrating that there is no perfect solution but a combination of options and necessarily limited responses (Dubet, 2004, p. 540).

One could therefore ask what a fair school evaluation system that could take account of that tension and multiplicity would look like. Bearing in mind that Brazilian schools are currently only evaluated through individual exams, without taking account of context, it seems that much remains to be done in this regard.

[4] In September 2012, the Plan had not yet been approved by the National Congress.

FIGURE 2

**Overview of value-added models**




*Source:* prepared by the authors.

# IV

## The ENEM as an indicator of school quality

The National High School Exam (ENEM) was created in 1998 by the Anísio Teixeira National Institute for Educational Studies and Research (INEP), an organization attached to the Ministry of Education in Brazil, with the explicit aim of providing students with a self-evaluation at the end of basic education (MEC, 2002), although it is reasonable to assume that it also represents an initiative to create accountability policies in the country. This tool was initially not very ambitious, but it underwent various changes over the years and has become increasingly wide-ranging and deeply rooted in the educational culture. The ENEM is applied to roughly 5 million students each year, and is the second-largest high school exam in the world, after China's *goakao*, which covers 10 million (Zhang and Zha, 2010). This is explained by the fact that, despite being voluntary since its creation, the ENEM has come to be used as a selection test for admission to the public universities and for obtaining scholarships in private universities, among other purposes. Table 1 shows the rapid growth of the exam and the changes it has undergone over the years.

The ENEM league table covers 61% of Brazilian high schools and 7% of all schools, and is being used increasingly as a school-quality indicator.[5] Although the INEP itself does not publish a league table, the publication of the averages by schools enables the press to produce a league table. The first league table dates from 2006 and had at least two objectives: to galvanize society to improve teaching, and to help teachers, directors and administrators to identify shortcomings and good practices in the school environment (INEP/MEC, 2007). In 2011, along with the averages, the participation rate of each school (in four brackets) began to be published; and a recommendation was made to compare only schools with similar participation rates (INEP/MEC, 2011a). The purpose of this initiative was to minimize the sample bias caused by the voluntary nature of the exam; but, in any event, the lack of significance of a comparison of schools in which fewer than one quarter of their students participate in this indicator needs to be stressed.

[5] Based on 2009 data (see table A.1 of the annex).

TABLE 1

**Brazil: historical summary of the National High School Exam (ENEM)**

| Year | No. of participants | Changes |
|---|---|---|
| 1998 | 157 221 | First ENEM: voluntary, for self-evaluation only. |
| 2001 | 1 624 131 | Introduction of the school identification number (ID), the same as the census but different each year. |
| 2003 | 1 882 393 | Major changes in the team responsible for the exam following the presidential elections of the previous year. |
| 2005 | 3 004 491 | The ENEM starts to be used as a vehicle for gaining access to higher education and as a criterion for receiving government scholarships under the "University for All" (ProUni) program in private institutions. |
| 2006 | 3 742 827 | Publication of the first ENEM schools league table. |
| 2007 | 3 584 569 | The school's ID number is kept the same over the years, making it possible to perform longitudinal analysis. |
| 2009 | 4 148 721 | Structural changes in the exam, including the skills matrix, the format of the test and its duration. |
| 2010 | 4 626 094 | The ENEM starts to be used as a certificate of completion of high school education for any citizen over 18 years of age. Most federal universities use the ENEM as a selection criterion. |

*Source:* National Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) of 2009.

## 1. Methodology

Given the hierarchical structure of the available data, this study performed multilevel regression analyses, the technique considered most appropriate for such cases (Raudenbush and Willms, 1995). The analysis encompassed three levels (individual, school and state) and used specific open-code software packages (Bliese, 2012). The microdata for the 2009 and 2010 ENEM and the 2009 School Census were obtained from the INEP portal.

The univariate and multivariate models were adjusted using a variety of variables pertaining to the schools and students (see table A.2 of the annex), including as a random effect not only the intercepts at the state and school levels, but also an indicator of the individuals' socioeconomic status (the SES component). In other words, the aim is to control for the effect of the states and isolate the effect of the school, allowing each school to have a different relation or gradient between the socioeconomic status and the student's score, in other words, its own socioeconomic gradient slope (GSE), as defined by the Organization for Economic Cooperation and Development (OECD, 2010).

The schools' value-added (obtained from cross-section data) was the random effect of this level in the complete models, which included all significant variables. The longitudinal value-added of the schools was obtained by simple subtraction from the results of 2010 and 2009. To calculate the explained variance of the multilevel models, their residuals were compared with the null models (Raudenbush and Bryk, 2002).

The methodology used suffers from a major shortcoming. Owing to the voluntary nature of the exam, there may be sampling bias, which would justify a two-stage regression analysis (Heckman, 1976). An analysis of that type could be undertaken in future studies, because there is not yet any version of the R program that performs multilevel regressions in two stages.

## 2. Calculation of the average scores by school

According to the official documentation (INEP/MEC, 2010), three averages were prepared for each school: one for writing, another for the objective test, and another general average calculated as the weighted-average of the first two. Nonetheless, the calculation of these averages only took account of students who:

(i) stated that they were in the final year of high school;
(ii) were attending regular high school or secondary education for young people and adults (consistent with the census data) either in traditional schools or in schools divided into cycles;[6] and
(iii) were present on the test days.

Given this sample, the documentation continues, the criteria for publishing the averages were as follows:

(i) do not publish if the participation rate was less than 2%;[7]
(ii) publish the average of the objective test if at least 10 students did the four tests;
(iii) publish the average of the writing test if at least 10 students did the writing; and
(iv) publish the overall average if at least 10 students did the four tests and the writing.

This study used the same criteria to clean up the data and calculate the averages, so as to reproduce the results posted on the Internet.[8] As part of that process, it was necessary to articulate the ENEM data with those of the census.

## 3. SES component

The socioeconomic status indicator (the SES component) was created using a methodology similar to that of the Programme of International Student Assessment (PISA) of 2009. A number of adaptations had to be made, particularly owing to the differences that exist in the data available in the questionnaire, not only between the ENEM and PISA program, but also, unexpectedly, between the Brazilian exams of 2009 and 2010.

After analysing the correlation matrix with various variables, five variables were chosen and were grouped in trios to prepare four possible candidates for the SES component. These only differed in terms of the variables included (see table 2). Then the correlations between the four candidates and the school averages were calculated, along with other metrics, with the aim of comparing the candidates in terms of their power to explain the score obtained in the ENEM.

Among the four candidates, the SES 0 component corresponds to the trio of variables that is most similar to that included in the socioeconomic index of the 2009 PISA program: the sum of household possessions, highest education level of the parents, and highest professional

[6] Schools organized in cycles combine several year groups (series) in a single class, generally because they are smaller.
[7] The participation rate for schools organized by cycles is divided by three.
[8] Because the INEP does not provide microdata on ENEM schools, but only those of the students.

TABLE 2

**Brazil: different ways of calculating the SES according to the 2009 PISA program model**

| Possible SES components | Variables included | Adjusted coefficient of determination[a] (*percentages*) | Missing data[b] (*percentages*) | Proportion of variance in the first component (*percentages*) | Likelihood (Akaike information criterion)[c] |
|---|---|---|---|---|---|
| SES 0 | - Sum of possessions<br>- Highest family education level<br>- Highest family professional level | 12.5 | 10.6 | 64 | 8 477 566 |
| SES 1 | - Family incomes<br>- Highest family education level<br>- Highest family professional level | 12.0 | 10.8 | 60 | 8 481 460 |
| SES 2 | - Family incomes<br>- Average family education level<br>- Sum of possessions | 13.4 | 10.6 | 67 | 8 470 428 |
| SES 3 | - Highest family professional level<br>- Average family education level<br>- Sum of possessions | 13.2 | 11 | 66 | 8 472 236 |

*Source:* National Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) of 2009.

[a] Simple regressions with variables as the individual level.

[b] The percentage of missing data is calculated in relation to the total number of records with questionnaires replied to and the general average as calculated (811,406).

[c] To be able to compare likelihoods, the missing data from all of those variables were removed, leaving 704,481 records with the average by school and the four SES components at the individual level. These were used to reconstruct the models and calculate the Akaike information criterion (AIC) for each one.

SES: socioeconomic status indicator.

PISA: Programme of International Student Assessment.

level of the parents.[9] Nonetheless, the indicator that best fit all the criteria was component SES 2. As the aim was to control for the contextual variables to the maximum, this component was chosen as the study's socioeconomic variable. Curiously, it consists of two economic variables, unlike the indicator used in the PISA programme. The significance of this result is controversial. It could be a matter of choice, a natural variance in the indices; or else the index of professional level, prepared using the results from more developed countries, may be unsuited to the context of Brazilian society, or simply inappropriate for some other reason. It is also possible that the economic background of the family interferes more in the students' scores than the parents' profession. This study has not investigated those hypotheses, but merely sought the model the best fitted the scores of the students in the 2009 ENEM, after filtering data according to the INEP criteria.

In essence, the SES component at the individual level is a principal components analysis with three variables:

(i) the sum of household possessions;
(ii) the parents' average educational level; and
(iii) family incomes.

Once calculated at the individual level, the index is aggregated, forming averages at the school and state levels (although the latter level was not significant and, therefore, does not form part of the analyses).

For the comparison between 2009 and 2010 in the longitudinal analysis, the SES component was calculated with a different trio of variables, namely the mother's education level, the father's education level, and family incomes. This was necessary because the questionnaire was truncated from one year to the next, and information on the professional level of the parents and household possessions in 2010 was eliminated. To test the stability of the longitudinal data, correlations between the two years were calculated (Pearson correlation, $p<0.01$), using the same methodology (in terms of calculating the SES component and the variables included in the complete model). Correlations were also calculated using different methodologies (the best model of 2009 and the common model of 2009 and 2010), to test the influence of the choice of variables on the stability of the longitudinal data.

[9] Respectively the HOMEPOS, PARED and HISEI, indices described in OECD (2010).

### 4. The available data

The ENEM microdata are highly heterogeneous. The basic cleaning process left about one quarter of the data from the two years (see table 3), largely owing to the absence of the school ID number in the individual records. Moreover, even among the identified schools, little over half of the data were left after the INEP validity criteria had been applied.

This is not problematic in itself, but can impose several limitations on the ENEM, in relation to the schools comparison, which depends on a number of partly arbitrary criteria, such as a minimum of 10 students, or a minimum 2% participation rate.

TABLE 3

**Brazil: longitudinal data available on the schools in the National High School Exam (ENEM) 2009-2010**

| | ENEM 2009 | ENEM 2010 |
|---|---|---|
| Data with school identification | 1 536 023 | 1 379 447 |
| Data with school identification (*percentages*) | 37,0 | 29,8 |
| Number of schools identified | 32 006 | 32 318 |
| Number of schools participating in both years | 28 010 | |
| Number of schools valid in both years[a] | 17 359 | |

*Source:* National Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) of 2009 and 2010.

[a] According to INEP criteria for calculating and disseminating the averages by schools.

# V
# Results

Based on the foregoing observations, the first relevant question is whether the schools that participate in the ENEM constitute a representative sample of Brazilian schools. More specifically, it needs to be asked whether the lowest schools in the ENEM league table can be considered the country's worst in terms of enabling their students to enter higher education. The comparison with microdata from the 2009 school census (see table A.1 of the annex), shows that the schools that participate in the ENEM are usually better placed than the national average, so they do not constitute a particularly representative sample of all schools.[10]

In other words, the ENEM league table represents a distorted sample of Brazilian high school education overall, in which the best-placed schools are preselected. There seems to be a sample selection problem in relation to the schools, probably arising from the voluntary nature of the exam. This would be an argument against using the ENEM league table as an indicator of school effectiveness in Brazil in accountability policies. Even publication of the averages is a policy of this type (albeit moderated), so it would be desirable to investigate other arguments in greater depth, which oppose or support such publication.

A longitudinal comparison of the two years reveals a degree of stability in the results (see tables 4 and 5) despite the voluntary nature of the exam. This could be related to its consolidation in society and in the schools, and also to its use to gain access to higher education, and, in addition, to the item-response theory that was first used in this domain in 2009.[11] It is also possible that there is a relation between the stability of the averages and factors that are external to the school or exam, as will be discussed below.

[10] This result and some others presented here are also reported in Rodrigo Travitzki's Ph.D. thesis.

[11] Some studies find that item-response theory tends to produce more stable results over time, compared to the classical theory of tests or contrast, used until 2008 (Andrade, Tavares and Da Cunha Valle, 2000).

TABLE 4

**Brazil: descriptive analysis of the longitudinal data on ENEM schools 2009-2010[a]**

| | 2009 | | 2010 | |
|---|---|---|---|---|
| | Average | Standard deviation | Average | Standard deviation |
| Schools: general score | 534 | 56 | 537 | 54 |
| Schools: score on objective test | 494 | 55 | 505 | 53 |
| Schools: score on writing test | 575 | 65 | 570 | 61 |
| Schools: number of participants in the objective test | 45 | 45 | 55 | 53 |
| Schools: number of participants in the writing test | 44 | 44 | 54 | 53 |

*Source:* National Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) of 2009 and 2010.

[a] Only in the 17,359 schools that are valid in both years. The five differences between the years were statistically significant ($p<0.001$).

TABLE 5

**Brazil: correlations between the averages scores obtained by the ENEM schools and the value added by the schools 2009-2010**

| Variable | Same method,[a] different year | Different method, different year | Different method, same year |
|---|---|---|---|
| Raw average | 0.84 | 0.84 | 1 |
| Value-added | 0.46 | 0.43 | 0.96 |
| Slope of the socioeconomic gradient (GSE) | 0.18 | 0.17 | 0.83 |

*Source:* National Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) of 2009 and 2010.

[a] In reality, one small part of the method: the trio of variables introduced in the principal components analysis to prepare the socioeconomic status (SES) component.

The results for 2010 were slightly better than those of 2009, thanks to the scores obtained on the objective test, since the scores on the writing test dropped. What does this difference mean: a value-added, a difference between generations, or a normal variance in indicators of this type?

Firstly, one might interpret this as genuine progress in the school results, and that the disparity in the scores should not be attributed to a different degree of difficulty in the tests, because the questions are analysed in advance, and the scores are calculated (in reality, they are estimated) using the three-parameter logistic function of item-response theory developed by Birbaum in 1968 (INEP/MEC, 2011b). Nonetheless, the ability scales can only be adequately equalized if there are common items in the two tests (Andrade, Tavares and Da Cunha Valle, 2000), something which is unviable in a standardized and printed exam that is used as an admission test into good-quality and free universities.

Secondly, one can start from the principle that it is difficult for the school really to improve in just one year. In this regard, it would be crucial for the exam-based school effectiveness measures to be multiple, in other words that they covered more than one year. In longitudinal models of value-added (relative to how much the student improves over time), "most authors recommend using at least three measures" (Martínez Arias, 2009, p. 225).

### 1. Multilevel analysis of the 2009 ENEM

The 2009 ENEM microdata consists of the records of a total of 4,148,721 students, of whom 2,218,191 answered the socioeconomic questionnaire, and just 1,339,445 were in the final grade of high school, according to their own declarations. Applying the INEP validity criteria left 811,406 individual records for the multilevel analysis of the school league tables.

The concordance at level 1 (states) was 0.77, and at level 2 (schools) it was 0.82, which shows that there is more consistency between the scores obtained by students from the same schools than between students from the same state, as would be expected. These numbers also suggest that both levels are significant in the analysis, which was confirmed by comparing the likelihood of models with and without these variables.

The intra-class correlation coefficient, for each of the levels separately, was 0.25 for the schools and

0.03 for the states. Nonetheless, when the intra-class correlation coefficient is calculated in the three-level model, the contribution of the state remained at 3%, while that of the school dropped to 22%, which still left 75% of the total variance for the individual level (see table A.4 of the annex). This means that 3 percentage points of the 25% initially attributed to differences between the schools can in fact be attributed to the difference between states. In a multilevel regression study using results from another Brazilian exam, the Basic Education Assessment System (SAEB), it was estimated that the proportion of the variance in individual results that could be explained by the school was 39%, which is considerably more than the proportion normally found in developed countries (around 20%), and could be due to the large differences between schools in Brazil (Franco and others, 2007). In that regard, the differences between the schools included in the ENEM league table are more like those found in developed countries than between Brazilian schools generally. This is probably due to the different characteristics of the two tests, because the SAEB is done by sampling and aims to represent all Brazilian schools, whereas the ENEM is voluntary and serves as a higher education admission exam.

In order to investigate the influence of the characteristics of the students and schools on ENEM scores, the various multilevel models were adjusted using the SES component and other variables available in the microdata from the test and the questionnaire (see table A.2 of the annex).

Table A.3 of the annex reports the coefficients of those models, making it possible to determine the extent to which context alters the characteristics of the students' scores. The effect of most of the variables declines when the two SES context variables are introduced, but it is hardly altered by the introduction of the others, which suggests that the variable constructed with the 2009 PISA program methodology has a high level of explanatory power.

The variables that change most at the school level include the administrative dependency of the school. In an initial analysis, private schools seem much better than state schools, for example, but the difference between them declines significantly in the second column. Federal schools, meanwhile, remain well ahead of the others once context is taken into account, which shows that they are highly efficient institutions and capable of producing good results even in unfavourable circumstances.

Something similar happens with the proportion of individuals of white race, which is five times less important after taking account of contextual factors. Nonetheless, if one considers that skin colour is one of the variables introduced at the individual level, the fact that the proportion of white students in the school remains significant in the complete models suggests that this characteristic has a major influence on the results generated by Brazilian education. This conclusion is corroborated by the relative stability of the influence of skin colour at the individual level, as can be seen in table A.3 of the annex.

Unlike administrative dependency, the type of school seems to have an influence that is less related to context. Schools for adults, for example, achieve inferior results to all of the others in the three columns, with small variances. This suggests that the differences between the types of school are structural, and that the degree of comparison is small, a fact which should be taken into account in the way ENEM results by schools are published.

Table A.3 of the annex shows that context has a greater influence with respect to the school than to the individual. To verify this hypothesis, a model was fit with the two standardized variables (z-score), and a coefficient of 39 was obtained for the school SES and one of 10 for the individual SES.

Consequently, it can be said that for a family in less favourable circumstances, it would be worthwhile taking their children to a school attended by students from more favourable backgrounds. The fact that this analysis is based on the results of a selection test for admission to free universities (and to gain access to scholarships in the case of private universities), reinforces the conclusion.

Given the objective of investigating the effect of contextual variables in the ENEM schools league table, the magnitude of the explanatory power of context in relation to the students score, or, to be more specific, the percentage variance explained by the models, is particularly relevant. In this regard, the results of this study are significant both for the discussion of value-added methodologies, and for the ENEM schools league table as such.

On the methodological front, corroborating the foregoing conclusions, it can be seen that the SES component, inspired in the PISA program, has high explanatory power in terms of the schools' results (75%) and that introduction of the other variables increased the explained variance only slightly to 79% (see table A.4 of the annex). Accordingly, it seems reasonable to only use the SES component to control for context if the aim is to make a more practical analysis with a minimum of missing data. Nonetheless, for the purposes of this study, it is more appropriate to use the

complete model, which fit the data better according to the likelihood analysis.

In terms of using ENEM as an indicator of school quality, table A.4 of the annex highlights a number of significant limitations. Although the result with respect to individuals continues to be sufficiently explained by the variables contained in the model, the same is not true in relation to the schools and the states. That means that, at most, 21% of the variance in scores obtained in these institutions can be attributed to the school's effort and merit, since that is the percentage that is not determined by factors outside its control. If the same analysis is done separately for the two "sub-averages", this number drops to 13% in the scores on the objective test and rises to 38% in the scores on writing (see table A.5 of the annex).

Although this result (unprecedented with ENEM data) is no novelty in the international research scenario, it is still worrying, because this exam has consolidated its status as a relevant indicator of school quality in Brazil year by year.

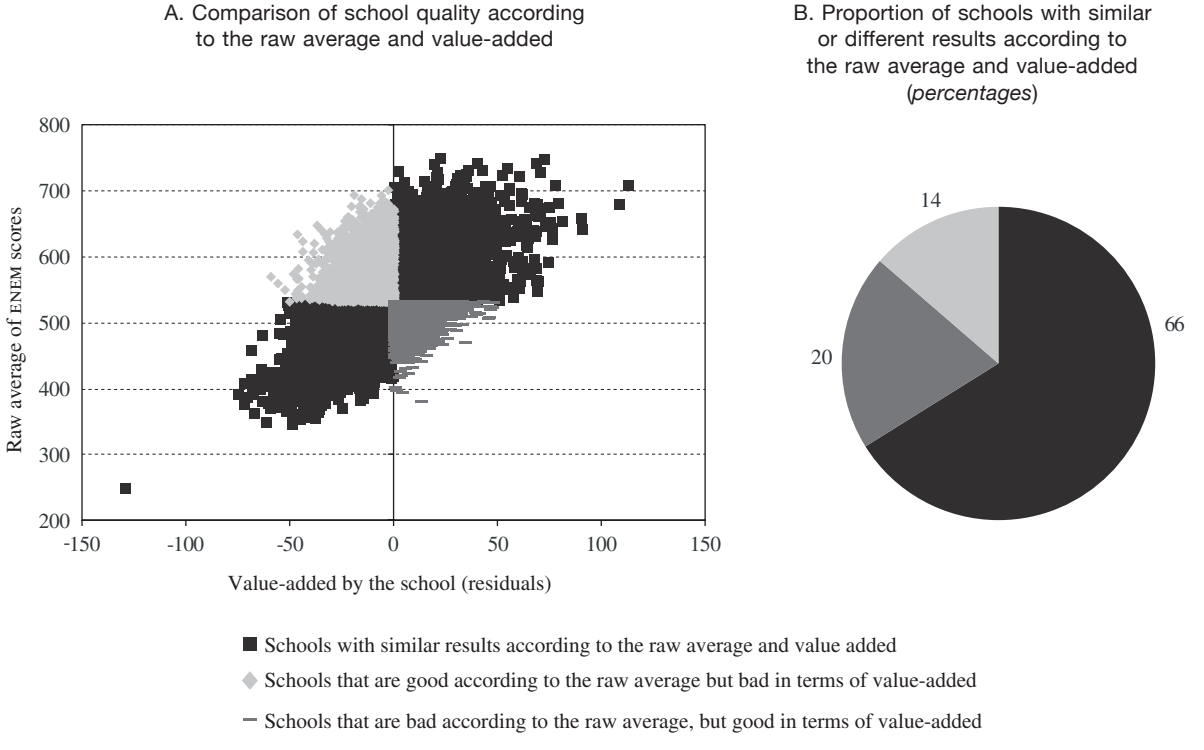
In other words, the analysis of the variance of the residuals at the different levels of the hierarchical models suggests that this individual exam could evaluate the students' merits, but contains little information on the merit of the schools and the states, when contextual conditions are taken into account.

Lastly, it is worth asking to what extent the "raw results" per school (the averages published annually) are different from the "net results", in other words the value-added after taking account of contextual conditions. There is some correlation between the two scores ($r = 0.51$ $p<0.001$) as can be seen in figure 3, where each point represents a school located in the plane defined by two quality measures.

Classifying the schools simply as "good" or "bad" (above and below the average, respectively), in 66% of cases the two indicators produced similar results. Nonetheless, some 7,000 schools were evaluated contrastingly by the two criteria, which is very significant number. More specifically, 14% of the schools were rated "good" according to the raw average, but "bad" in

FIGURE 3

**Brazil: comparison of the raw average of scores in schools participating in the ENEM, and the value-added by their schools, 2009**




*Source:* National Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) of 2009.

terms of value-added, while in 20% of cases the opposite occurred (see figure 3).

This finding is deeply problematic, because a fifth of the schools were evaluated as bad in the ENEM league table, but obtained better than expected results when their contextual conditions were take in to account. This means they were schools of merit, probably operating in an unfavourable context; yet they could be being undervalued by the annual publication of averages by schools presented in the form of a league table by the mass media. This effect is probably intensifying owing to the differences found between the schools included in the INEM and the average of Brazilian schools generally. Thus, in its current form, this policy to promote the quality of school teaching may in many cases be having the opposite effect.

## 2. Longitudinal analysis: 2009 and 2010

Thus far, this study has considered the value that the schools have supposedly added to the students (in terms of the results obtained on the Brazilian ENEM), using cross-section data. To conclude, the other concept of value-added (see figure 2) will be applied to the ENEM microdata using longitudinal data, in other words how much value has been added to the schools over a certain period. Given the shortcomings in current data (see table 1), this part will probably be more useful for the methodological analysis then for actually evaluating Brazilian schools.

How does the introduction of contextual variables affect the stability of the longitudinal data? Correlations were calculated between the raw and "net" averages (value-added) of the schools in 2009 and 2010, using two different methods in 2009. The results reveal considerable stability in the raw averages, but this is lost when contextual conditions are controlled for (see table 5). This can be taken as an argument in favour of publishing the raw averages as is currently done, because they would constitute a reasonably stable and robust measure of school effectiveness. Nonetheless, bearing in mind that 79% of the variance in the results by schools is explained by context (see table A.4 of the annex) and that the correlation between the SES components of the schools in 2009 and 2010 is 0.95, it seems plausible to conclude that the stability of the ENEM averages is more reflective of contextual conditions than the schools' own merit.

Table 5 also shows that the use of other contextual variables does not produce very different results in the schools, unlike what is reported in other studies. One possible explanation of this stability of value-added based on different variables would be the inclusion of many variables in the models (see table A.3 of the annex), which could cause a group effect that is reasonably resistant to change in any of its constituent parts. Moreover, with respect to the states, the use of different methods reduces the stability of value-added (see table 6), which demonstrates the complexity of this type of methodology.

Table 5 also shows that the slope of the GSE, in other words the magnitude of the change in scores based on the SES component, varies greatly from year to year. This raises a number of questions about the reliability of this type of measure at the school level. Among the states, however, both the slope and the value-added are highly stable between the two years when the same method is used (see table 6).

Another relevant question concerning the longitudinal stability of the ENEM league table is whether that stability is homogeneous across the different strata, in other words between schools considered good, medium, or bad. When the three strata are analysed separately, the position in the league table varies more among schools

TABLE 6

**Brazil: correlations between the averages of scores corresponding to the states in the ENEM and values added by the states, 2009-2010**

| Variable | Same method,[a] different year | Different method, different year | Different method, same year |
|---|---|---|---|
| Raw average | 1 | 1 | 1 |
| Value-added | 0.93 | 0.60 | 0.66 |
| Slope of the socioeconomic gradient (GSE) | 0.91 | 0.85 | 0.95 |

*Source:* National Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) of 2009 and 2010.

[a] In reality, one small part of the method: the trio of variables introduced in the principal components analysis to prepare the socioeconomic status (SES) component.

rated bad than among those rated good (see table A.6 of the appendix), which could be taken as a second piece of evidence[12] that the ENEM league table is not a very reliable source of information for comparing the worst schools. Nonetheless, it may be a good reference for comparing the better schools, although more in relation to effectiveness than school merit as such.

In the case middle-ranked schools particularly, small differences in their average scores cause large differences in their position in the league table, which supports the idea that the averages are being interpreted too precisely.

[12] The first is obtained from table A.1 of the annex.

# VI
## Conclusions

The results obtained here can be divided into two groups, one relating to value-added methodologies, and the other to the exam as such. The first case investigated the effects caused by the introduction of contextual variables. The second aimed to identify the type information provided by the ENEM league table to Brazilian society.

In methodological terms, the multilevel analysis of the 2009 ENEM showed that, on its own, the contextual variable based on the PISA programme has a high level explanatory power for the students' score, particularly in relation to the schools (75%), whereas the introduction of the other variables only increased the proportion of the variance explained to 79%. Context is found to be four times more important for schools than for individuals, whereas between states it was not significant compared to the other two. When comparing the performance of the schools in terms of raw average and value-added, 34% of the results were contradictory; in other words, the merit of one third of the institutions was not adequately evaluated when the different contexts were taken into account.

The longitudinal analysis showed that there was reasonable stability in the raw average between the two years (r = 0.8), which decreased when the contextual variables were introduced (r = 0.5). The slope of the GSE, in turn, was highly unstable (r = 0.2), which raises a number of questions about the reliability of this variable, particularly when a single measurement is made. At the state-level, all indicators behaved stably between 2009 and 2010.

In contrast, the performance differences between public and private schools were substantially reduced when contextual conditions were considered, which did not happen when normal schools were compared with schools for adults. Performance differences between the different "races" (skin colour) were also maintained after considering the effect of socioeconomic context, although further studies are needed on this.

The 2009 ENEM league table covers 35% of schools providing secondary education in Brazil that have infrastructure conditions above the national average, owing to the purpose and voluntary nature of the exam. The multilevel analysis revealed that 3% of the variance in scores can be attributed to the state, 22% to the schools, and 75% to the students. The scores on the objective test were more influenced by context (87%) than were the scores on writing (62%), which could mean that writing is fairer (in terms of merit) or less reliable than the former. Further studies need to be done to investigate these two hypotheses. When comparing the two years, it can be seen that the averages are more stable in the "better" schools, and that the "middle-ranked schools" display large variations in terms of their position in the league table, but small variations in terms of average score.

These results show that the ENEM league table suffers from major shortcomings as an indicator of school quality at the national level. The lowest schools in this league table should not be considered the worst in Brazil, and the difference in averages between the "middle-ranked" schools is very small. The best schools, on the other hand, display some stability in terms of raw average. This could mean that the exam is more informative for the higher strata of the ability scale, which would be understandable given its use as a higher education selection criterion. Other studies need to be done to verify this hypothesis.

Ultimately, what type of information does the ENEM school league table provide to Brazilian society? The results of this study show that, when confined to raw performance, the league table is more representative of

the socioeconomic conditions of the schools than their merit, bearing in mind the contextual differences. This is due to the fact that: (i) context can explain four-fifths of the variance in scores between schools; (ii) the raw averages are stable, and value-added is unstable; and (iii) the contextual conditions of the schools are even more stable (r = 0.95) in the two years analysed.

Consequently, this indicator of school quality could appropriately be used by families wishing to choose a university for their children and who enjoy good economic circumstances. Nonetheless, for less favoured schools and for the state (in relation to responsibility and accountability policies), the ENEM league table provides little information and can even be misleading. Giving it undue importance could aggravate inequalities between schools, because it would under-rate institutions that do a good job in precarious conditions, while favouring those that cater to the upper socioeconomic strata of Brazilian society. The fact that these conclusions confirm other results reported in international literature points to the need to create other indicators of school quality in democratic countries.

## ANNEX

TABLE A.1

**Brazil: comparison of schools present in the ENEM with total schools, 2009**
*(Number of schools and percentages)*

| Characteristic | Schools in the ENEM league table | All high schools[a] | All schools |
|---|---|---|---|
| Number of schools[b] | 18 605 | 30 554 | 255 445 |
| Urban[c] | 97.2 | 92.1 | 53.0 |
| Private[c] | 24.6 | 30.9 | 19.8 |
| Public water supply network[c] | 93.5 | 90.3 | 64.1 |
| Public sewerage network[c] | 69.0 | 66.2 | 40.7 |
| Computer on[c] | 90.3 | 81.8 | 23.2 |
| Science laboratory[c] | 53.2 | 43.4 | 7.2 |
| Sports field[c] | 80.1 | 68.6 | 21.5 |
| Library[c] | 75.1 | 71.3 | 25.3 |
| Photocopier[c] | 67.6 | 63.5 | 30.7 |
| Broadband Internet[c] | 76.5 | 71.4 | 32.2 |

*Source:* Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) and School Census of 2009.

[a] Only regular education and the education of young people and adults.
[b] Number of schools.
[c] Percentages.

TABLE A.2

**Brazil: variables included in the complete model using ENEM 2009 data**

| Variable | Level[a] | Type |
|---|---|---|
| Average | 0 | Numerical |
| Skin colour | 0 | Categorical |
| Sex | 0 | Categorical |
| Religion | 0 | Categorical |
| Individual socioeconomic status component (SES) | 0 | Numerical |
| School socioeconomic status component (SES) | 2 | Numerical |
| Administrative dependency | 2 | Categorical |
| Modality | 2 | Categorical |
| Proportion of white students | 2 | Numerical |
| Proportion of students who completed the preparatory course | 2 | Numerical |

*Source:* National Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) of 2009.

[a] The levels are numbered from the most general to the most specific (10 = state; 2 = school), and level 0 corresponds to the individual.

TABLE A.3

**Brazil: effects of the introduction of contextual variables using ENEM 2009 data**

| | Univariate models | Models with socioeconomic status components (SES) in the two levels | Complete model |
|---|---|---|---|
| Socioeconomic status component (SES) | | | |
| SES (individual) | 10 | 8 | 8 |
| SES (school average) | 41 | 36 | 22 |
| Individual level | | | |
| Sex [female] | 0 | 0 | 0 |
| Sex [male] | -15 | -17 | -17 |
| Colour [white] | 0 | 0 | 0 |
| Colour [brown] | -9 | -7 | -6 |
| Colour [black] | -16 | -13 | -11 |
| Colour [yellow] | -11 | -10 | -10 |
| Colour [indigenous] | -34 | -31 | -29 |
| Religion [Catholic] | 0 | 0 | 0 |
| Religion [Protestant/Evangelical] | 7 | 7 | 9 |
| Religion [Spiritism] | 13 | 9 | 10 |
| Religion [Umbanda/Candomblé] | -9 | -13 | -8 |
| Religion [other] | 13 | 11 | 14 |
| Religion [no religion] | 17 | 14 | 18 |
| School level | | | |
| Administrative dependency [federal] | 0 | 0 | 0 |
| Administrative dependency [state] | -108 | -65 | -66 |
| Administrative dependency [municipal] | -97 | -57 | -57 |
| Administrative dependency [private] | -17 | -39 | -41 |
| Type [regular] | 0 | 0 | 0 |
| Type [young people and adults] | -48 | -42 | -42 |
| Proportion of white students | 162 | 41 | 30 |
| Proportion of students completing the preparatory course | 109 | 8 | 8 |

*Source:* National Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) of 2009.

Note: in reality, the zeros in these categories are references of the categorical variables, whereas the coefficients in the other categories relate to the first.
Coefficients of various models ($p<0.01$), with the students' score as the response variable. In the first column, the explanatory variables are shown alone; in the second they are accompanied by the SES component with respect to the individuals and schools; and the third column shows the model consisting of or joint variables. As the variables are not standardized, comparisons must be made horizontally. The only vertical comparisons that make sense are those between factors of the same categorical variables (identified by square brackets).

TABLE A.4

**Brazil: variance of the residuals and explained variance of the ENEM results of 2009**

| | Level 1 intercept (state) | Level 2 intercept (school) | Individual residuals |
|---|---|---|---|
| Variance in model 0 | 356 | 2 507 | 8 482 |
| Variance in model 1 (only individual level variables) | 197 | 1 658 | 8 191 |
| Variance in model 2 (SES in the two levels) | 121 | 637 | 8 305 |
| Variance in model 3 (complete) | 74 | 529 | 8 129 |
| Variance within model 0 | 0.03 | 0.22 | 0.75 |
| Explained variance of model 1 | 0.45 | 0.34 | 0.03 |
| Explained variance of model 2 | 0.66 | 0.75 | 0.02 |
| Explained variance of model 3 | 0.79 | 0.79 | 0.04 |

*Source:* National Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) of 2009.

TABLE A.5

**Brazil: variance of the residuals of the ENEM objective and writing test of 2009**
*(Absolute values and percentages)*

| | Level 1 intercept (state) | Level 2 intercept (school) | Individual residuals |
|---|---|---|---|
| Score on the objective test (null model) | 453 | 2 500 | 4 133 |
| Score on the writing test (null model) | 348 | 3 064 | 23 497 |
| Score on the objective test (complete model) | 88 | 312 | 3 929 |
| Score on the writing test (complete model) | 240 | 1 160 | 22 413 |
| Explained variance of the objective test (*percentages*) | 80.6 | 87.5 | 4.9 |
| Explained variance of the writing test *(percentages)* | 31.0 | 62.1 | 4.6 |

*Source:* National Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) of 2009.

TABLE A.6

**Brazil: standard deviations of the differences in results, by strata, 2009-2010**

| | Standard deviation of the difference between raw averages | Standard deviation of the difference in positions in the league table |
|---|---|---|
| Best 2 000 in 2009 | 26.6 | 1 055 |
| Middle 2 000 in 2009 | 25.8 | 3 300 |
| Worst 2 000 in 2009 | 32.4 | 2 803 |

*Source:* National Institute for Educational Studies and Research (INEP), microdata from the National High School Exam (ENEM) of 2009 and 2010.

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# Brazil's Northeast Financing Constitutional Fund: Differentiated effects on municipal economic growth

*Fabrício Carneiro Linhares, Ricardo Brito Soares, Marcos Falcão Gonçalves and Luiz Fernando Gonçalves Viana*

**ABSTRACT**

This article investigates the effects of the investments made by the Northeast Financing Constitutional Fund (FNE) on the economic growth of that region's municipalities in the decade of 2000. To that end, it uses an empirical framework based on growth models that make it possible to form convergence clubs according to the municipalities' initial development level. The results corroborate the empirical strategy and reveal the existence of four groups of municipalities, in which investment flows through the FNE have different effects on growth. In general, the FNE produces positive and significant effects in most municipalities of the Northeast, except for those whose gross domestic product (GDP) per capita was either very low or very high at the start of the decade, in which case its effects are not significant.

**KEYWORDS**

Economic growth, regional development, municipal government, development financing, funds, evaluation, econometric models, Brazil

**JEL CLASSIFICATION**

O21, O40, R11

**AUTHORS**

Fabrício Carneiro Linhares is Assistant Professor at the School of Graduate Studies in Economics (CAEN) of the Federal University of Ceará (UFC), Brazil. flinhares@caen.ufc.br

Ricardo Brito Soares is Assistant Professor at the School of Graduate Studies in Economics (CAEN) of the Federal University of Ceará (UFC), Brazil. ricardosoares@caen.ufc.br

Marcos Falcão Gonçalves is a Research Fellow in the Technical Office of Economic Studies of the Northeast (ETENE) of Banco do Nordeste do Brazil (BNB) and Professor at Faculdade Cearense, Brazil. marcosfalcaogoncalves@gmail.com

Luiz Fernando Gonçalves Viana is a researcher in the Technical Office of Economic Studies of the Northeast (ETENE) of Banco do Nordeste do Brasil (BNB) and Professor at Faculdade de Fortaleza (FaFor) and at the Faculty of Education and Culture of Ceará (FAECE), Brazil. luizfernandogv@bnb.gov.br

# I
# Introduction

The Northeast Financing Constitutional Fund (FNE), created under Brazil's 1988 Constitution, aims to develop and improve the productive system in that zone to reduce the inequalities that have historically existed between the regions. The fund's main tool consists of expanding the supply of subsidized credit in various financing programmes, which serve firms of different sizes from various sectors. This lending programme evolved during the decades of 1990 and 2000, to become one of the main ways of stimulating regional business initiative and productive development.

The share of the FNE in total long-term financing in the Northeast reached a level of 64% between 2002 and 2009, while the investments programmed for the following years exceeded R$ 10 billion annually.[1] As the resources of the public fund increase and it consolidates as a regional policy tool, the hope is that its capacity to generate wealth in the less developed regions increases in the same proportion —as a social counterpart—; or, to put it more pragmatically, it is hoped that the injection of a larger amount of this type of subsidized credit in local economies can foster their economic growth.

This possibility has been analysed exhaustively in the European Union, where the "structural funds" aim to boost the dynamic of growth in the less developed countries and regions of that common market.[2] In the case of Brazil, empirical studies of the contribution made by regional funds to economic growth are few and far between. Apart from impact analyses which use the input-output matrix (Mesquita, 1996; Rodrigues, 1998), there are just two significant studies: Oliveira and Domingues (2005) and Resende (2012a).[3] While the first of these analyses the effects of the Centre-West financing Constitutional Fund (FCO) and the North Financing Constitutional Fund (FNO) in terms of the growth differential in the beneficiary municipalities, the second examines the effects of the FNE at the same level of macroeconomic aggregation. Each of these studies uses traditional econometric models to investigate prospects for convergence between regions, using the Barro and Sala-i-Martin (1992) approach;[4] and both report the absence of an average effect of fund-related variables.

Nonetheless, an evaluation of the effects of public funds in the municipal sector indisputably shows that their importance and repercussions can vary across municipalities with different initial development levels. In macro-regions that display relative economic backwardness (North, Northeast and Centre-West), the municipalities are clearly heterogeneous; and this is institutionalized in the National Policy for Regional Development (PNDR) itself (Ministry of National Integration, 2005). This policy distinguishes four types of municipalities (high income, low income, dynamic, and stagnated), based on a combination of variables representing average household income and per capita GDP growth; and guidelines are provided for formulating specific lines of action adapted to each municipal type. In the context of regional funds, in addition to the plans for distributing resources to each typified group of municipalities, the Ministry of National Integration requires administrators to present monitoring reports and results in accordance with this intra-regional classification.[5]

This concern about the heterogeneity of growth dynamics was built into a range of non-linear models that allow for the formation of convergence clubs following the approach proposed by Durlauf and Johnson (1995). Those models make it possible to test and estimate the differentiated effects of the co-factors affecting economic growth. The formation of convergence clubs in the municipal sector, for example, identifies municipalities that have mutually similar conditional convergence possibilities, but different across the groups (clubs). It should be noted that the identification and formation of clubs in these models is not done on an ad hoc basis, but as the result of the structure of the model and the data. In other words, it is the estimation of the differentiated growth dynamics that defines the regional typologies.

[1] See Banco do Nordeste do Brasil (2011).
[2] For a review of the literature, see Dall'Erba, Guillain and Gallo (2011).
[3] For an analysis of the microeconomic impact of the FNE at the firm level, see Silva, Resende and Silveira Neto (2009); Soares, Sousa and Pereira Neto (2009) and Resende (2012a).
[4] It should be noted that in each article, specific features of the respective case studies were added to the convergence models, such as spatial effects in Oliveira and Domingues (2005) and two-stage estimation in Resende (2012a).
[5] Banco do Nordeste do Brasil (BNB) in the case of the FNE; Banco da Amazônia (BASA) in the case of the FNO, and Banco do Brasil (BB) in the case of the FCO.

The endogenous identification of different growth patterns has previously been addressed in a number of studies on Brazil. Using dynamic panel models, Trompieri Neto, Castelar and Linhares (2008) were pioneers in analysing the process of convergence between state per capita GDP levels, with the possibility of forming clubs. Using 1985-2007 data, the authors suggest the existence of two growth-rate convergence clubs. Analogously, Cabral (2008) also identified the formation of two convergence clubs in Brazil using the methodology proposed by Phillips and Sul (2007). According to the study by Penna (2011), which approaches the topic using different methodologies, the formation of convergence clubs among Brazilian states is statistically significant, both in models that use panel data and in those using cross-section data. In another study, which uses an econometric technique and database that are similar to those adopted in this paper, Oliveira and others (2011) find evidence suggesting the existence of various convergence clubs based on the dynamic of municipal per capita GDP levels.

Against that backdrop, the present study seeks to determine whether the effects of the FNE on municipal growth can also vary according to the municipalities' initial development level. To that end, the Hansen (2000) algorithm is used for a growth model in which the variables of interest include the amount of FNE programme funds targeting the municipalities. This article's analysis of the effects of the FNE, and its heterogeneity on the economic growth of northeastern municipalities, represent a contribution to the literature on the subject.

The existence of differentiated effects not only improves the statistical properties of the estimated growth models, but also —and in particular— provides evidence of the intra-regional heterogeneity of the Northeast according to the PNDR. Nonetheless, it is possible, and even likely, that the ad hoc classifications defined in that policy do not fully coincide with those obtained from the estimated models. In that case, apart from conceptual considerations, the targeting of PNDR actions and resources could generate real inefficiencies.

This article is divided into five sections, following the introduction. Section II reviews the relation between credit and economic growth, while section III describes the FNE and its distribution in the municipalities of the Northeast. Section IV presents the data and the methodology used to estimate the FNE impact model. Section V describes and analyses the results found; and section VI concludes by offering a number of observations and inductive considerations on the subject.

# II

## Relation between credit and economic growth

Joseph Schumpeter was one of the pioneers in defending the notion of financial resources as promoters of economic development. He saw the financial system as providing a set of services that help channel society's saving into productive and innovative activities that form the cornerstones of economic growth.

The effects of financial resources on output growth (or on income) were formalized for the first time in studies by Goldsmith (1969); McKinnon (1973), and Shaw (1973). Whereas Goldsmith (1969) highlights the fact that the development of financial intermediation results in investments being allocated more efficiently in the economy, McKinnon (1973) and Shaw (1973) stress that this development can leverage the economy's saving rate and, consequently, its investment level. Irrespective of their theoretical perspectives, these authors conclude that the quantity and quality of services provided by the financial sector are partly responsible for inter-country growth-rate differentials.

According to De Gregorio and Guidotti (1995) and Levine (2004), this effect on the economy's activity rate can be seen in a simple way through traditional economic-growth models, where the path along which per capita output expands towards steady-state equilibrium is determined by the saving rate and the marginal productivity of capital.

In the Goldsmith (1969) approach, which is perhaps the most widely known, the range of different services supplied in the financial market —such as accepting deposits, supplying credit, processing and market data and managing risk— improve the resource allocation process and thus stimulate an increase in productivity. For example, Boyd and Prescott (1986) state that, without the financial intermediary sector, the investor

would have to incur high costs to identify investment opportunities and evaluate the corresponding risks; and this would hinder the dynamic of resource allocation. Some authors, such as Greenwood and Jovanovic (1990); Bencivenga and Smith (1991); Levine (1992), and King and Levine (1993), use endogenous growth models to show that the analytical and research role played by the financial intermediary helps to channel resources into the projects most likely to make productive and innovation advances —in other words those that offer the highest return.

From that perspective, which is consistent with the Schumpeterian view, the supply of credit by financial institutions, based on the advice of their analysts regarding economic activity and risk indicators, can speed up growth by raising the productivity of capital. According to estimations made by Bayoumi and Melander (2008), a 2.5% reduction in the general supply of credit in an economy generates a contraction in GDP of around 1.5%. That expected effect of credit in the economy is also mentioned by Keynes (1936) in his classic work "The General Theory of Employment, Interest and Money" in which he argues that credit is of fundamental importance for economic development, and not only through its direct impact on capital accumulation and knock-on effects on income distribution and innovative activity. Credit also is very important in forming expectations so that, if well directed and the good results of the investments are guaranteed, it boosts optimism in the economy.

McKinnon (1973) and Shaw (1973) view an operational financial system as essential for mobilizing saving and reducing the external financial constraints that make it difficult for firms and industries to expand. By meeting different demands in terms of the formation of an adequate portfolio, the diversity of financial services can provide a stimulus for savers. According to Jappelli and Pagano (1994), the financial sector eases the constraints imposed on borrowers in terms of future income prospects, thereby increasing the aggregate saving rate. Bourguignon (2002) argues that the uncertainties and imperfections of credit markets mean that the return to capital depends mainly on the initial wealth of the individuals involved, which severely penalizes society's investment capacity.

In short, the supply of credit, or, more generally, the development of financial resources, affects economic growth, either by more effectively directing resources towards the most productive activities (those most likely to generate productivity growth), or by increasing the saving rate and, consequently, investment. As theorized in the model proposed by Aghion, Howitt and Mayer-Foulkes (2004), growth rates in economies with a sufficiently high level of financial development will converge towards that established by the global technological frontier, whereas growth rates in all other economies will be strictly lower in the long run.

From the empirical standpoint, the relation between the availability and use of credit and economic growth varies according to the case study and the method of analysis chosen. In general, however, there is a positive causality correlation between these variables. Studies that provide evidence of this causality in Brazil include Matos (2002); Marques Jr. and Porto Jr. (2004); Chinelatto Neto (2007), and Rocha and Nakane (2007).

Nonetheless, the effects of publicly subsidized credit in terms of stimulating growth and reducing regional inequalities have been less widely explored in the literature. Although the use of subsidized credit as a regional policy tool is nothing new, interest in such credit has revived only since the formation of single markets and the rise of credit programmes for the lower social classes in various economic sectors in the 1990s. For example, in the European Union's cohesion policy, which transfers structural funds to finance lending programmes, the aim is to reduce the inequalities that exist between member countries, by supporting the formation of productive structures and promoting local markets.

The effects of Europe's structural funds on economic growth remain an open question, however. Dall'Erba and De Groot (2006) analysed 11 empirical studies conducted during the decade of 2000 and found both positive and insignificant or even negative effects.

# III

## The Northeast Financing Constitutional Fund and studies of its effects on growth

In Brazil, the regional constitutional funds (FNE, FCO, FNO) are financed from the annual collection of 3% of the industrialized products tax (IPI) and income tax. Their aim is to improve the growth capacity of the less-developed macro-regions (Northeast, Centre-West and North, respectively) to reduce the regional inequalities that persist in the country.

Managed by Banco do Nordeste do Brasil (BNB) since its creation in 1988, the FNE covers 1,990 municipalities located in all states of the Northeast and in the northern part of the states of Minas Gerais and Espírito Santo which are within the jurisdiction of the Northeast Development Agency (SUDENE) (Brazil, 1999). Productive investments are financed through loan programmes whose main attraction are interest rates which are subsidized at well below market levels.[6] To stimulate demand, in addition to the cash resources of bank branches, development agents are appointed to analyse and provide guidance on local opportunities for businesses in all sectors and of all sizes.[7]

As shown in figure 1, the volume of resources invested has grown throughout the fund's existence —particularly since 2002, reflecting both the faster growth of the economy and government incentives aimed at expanding the availability of credit for the Northeast region.

A review of the sectoral distribution of the resources in the period 2002-2008 shows that the FNE has financed enterprises in all sectors of the economy. Nonetheless, the rural sector absorbed 46.5% of total funding, owing to the specific dynamic of the northeastern economy, which has traditionally been dominated by agriculture. In second place were manufacturing and tourism, which accounted for 22.4% of the resources invested, followed by the commerce and services sector with 15.5% (see figure 2).

In terms of the size of the beneficiaries, large firms received 54.2% of the resources in the period studied, followed by mini/small firms (32.6%) and then medium-sized firms (13.2%) (see figure 3).

Map 1 shows the cumulative amount of funding distributed to each municipality in that period by value intervals defined for each quintile (in R$ at 2007 prices).[8] Although all municipalities benefited, the amount received varies considerably from one to another, ranging from R$ 15,900 in Santa Cecília-PB to R$ 1.3 billion in Fortaleza-CE[9] on average per year. The basic issue raised by these figures is whether the municipalities that receive proportionally more resources are in fact going faster owing to the financing.

Few studies have been made of the effectiveness of the constitutional funds. Oliveira and Domingues (2005) seek to determine whether the resources of the Centre-West and North Constitutional Funds have helped reduce growth-rate disparities in the municipalities of those regions with respect to the national average. For that purpose, they use a traditional growth model that includes spatial effects representing economic externalities. The results of this study did not provide evidence that the financing funds have had significant effect in reducing inequalities.

Resende (2012a) reached qualitatively similar conclusions for the FNE in a study of the latter's effects on the economic growth of municipalities in the area of operation of Banco do Nordeste. As a qualitative variable of the FNE, the study uses the ratio between the volume of fund resources (manufacturing, services and commerce programmes) and the gross domestic product (GDP) of the municipalities in the periods 2000-2001 and 2000-2003; and, as the result variable (macroeconomic impact), it uses per capita GDP growth in the periods between 2002 and 2006. The control variables used were indicators of education (average years of schooling), health (child

[6] The resulting interest-rate spread is even greater for investments targeting the least developed regions, such as the semi-arid zone, and the smallest firms.

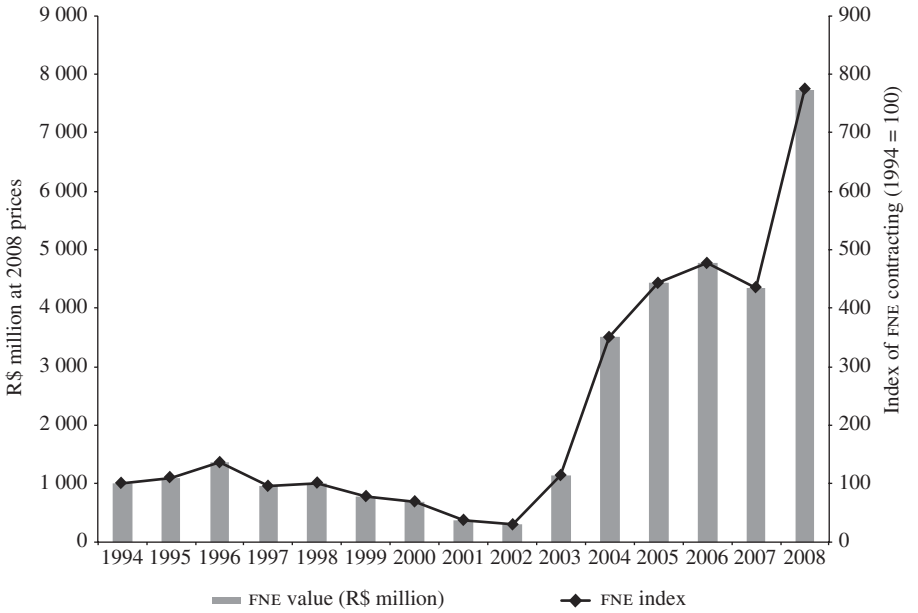
[7] For a retrospective analysis of the FNE, see Ministry of National Integration (2010).

[8] Values deflated by the general price index (IGP-DI); the total volume of funding in the period was roughly R$ 24.9 billion.

[9] It should also be noted that 15.38% of the resources were destined for municipalities defined as low-income in the PNDR classification, 31.12% for municipalities whose economies were stagnating, 27.72% for the dynamic ones, and 25.78% to high-income municipalities. In addition, with regard to the regional distribution, just 34.76% of the resources were destined for municipalities in the semiarid region of the Northeast.

FIGURE 1

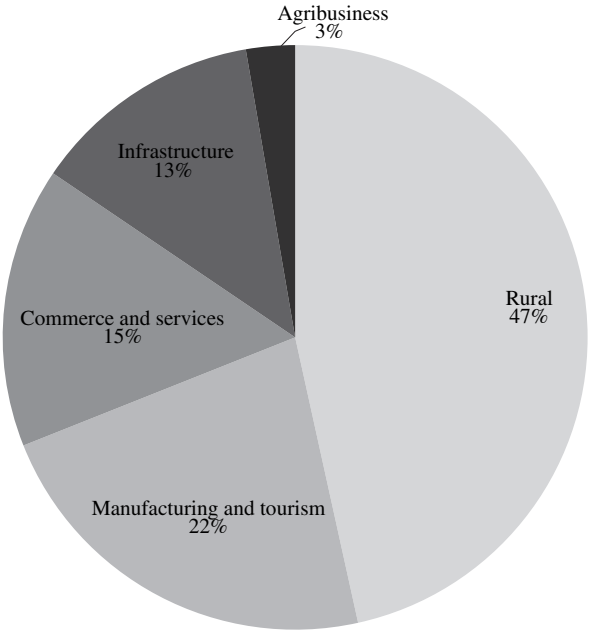
**Annual contracting by the Northeast Financing Constitutional Fund, 1994-2008**
*(Millions of R$ at 2008 prices)*




*Source:* Ministry of National Integration, *20 Anos de Fundos Constitucionais de Financiamento (FCO - FNE- FNO)*, Brasilia, 2010.

FIGURE 2

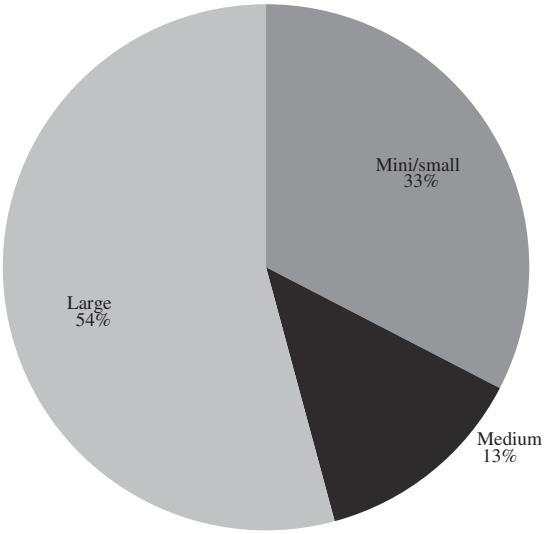
**Contracting by the Northeast Financing Constitutional Fund by sector, 2000-2008**




*Source:* prepared by the authors on the basis of data from Banco do Nordeste do Brasil.

FIGURE 3

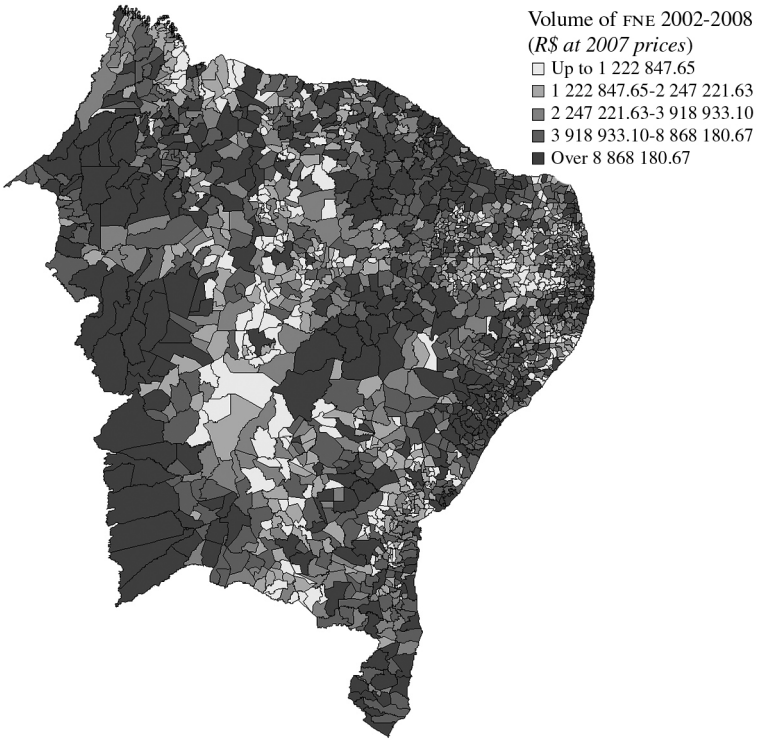
**Contracting by the Northeast Financing Constitutional Fund by beneficiary size, 2000-2008**




*Source:* prepared by the authors on the basis of data from Banco do Nordeste do Brasil.

MAP 1

**Cumulative investments of the North-East Financing Constitutional Fund, by municipality, 2002-2008, 2002-2008**




*Source:* prepared by the authors on the basis of data from Banco do Nordeste do Brasil.

mortality), demography (population density), housing (infrastructure index) and transport (the cost of transport measured by the linear distance to São Paulo), together with the variable indicating convergence (per capita GDP in 2002). Controlling for the potential problem of FNE endogeneity with a model estimated in two stages, the author does not find a positive and statistically significant effect of the FNE on economic growth.

Although this article shares the theoretical model of economic growth used in Resende (2012a), its empirical verification differs in several respects. Firstly, the period of GDP growth analysed is longer (2002-2008), and it includes an episode of high economic growth which could have been induced by FNE investments reaching maturity.[10] Secondly, it took account of FNE contributions to all programmes and not just those of the manufacturing sector. Although the latter absorbed the largest share of the value of FNE resources over the period analysed in aggregate,[11] this may not occur homogeneously throughout the municipal sector. For that reason, other sectoral dimensions of the FNE also need to be tested as key variables of the impact research.

Lastly, the effects of the FNE may be felt differently across the municipalities of the Northeast. For example, verification of the effects may depend on the amount of resources received in relation to the size of the municipal economy, or some other municipal economic indicator. The variability or heterogeneity of the macroeconomic effects of the FNE within the group of municipalities of the Northeast is a plausible possibility, which needs to be tested empirically.[12] If valid, their omission from the econometric model leads to biased and inconsistent estimates.

This article seeks to address the foregoing concerns by estimating a non-linear growth model, which captures the heterogeneities in the effects according to the initial development level of the municipalities, and covers a period of rapid growth for the Northeast (2002-2008).

[10] The period of analysis was chosen to end in 2008 because of limitations in data available on municipal GDP when this research was carried out.

[11] In addition to the manufacturing, commerce and services programmes, the FNE includes programmes for the rural sector, agribusiness and infrastructure. Historically, the rural sector has accounted for the largest volume of contracting.

[12] The heterogeneity of the effects of the FNE between municipalities was pointed out by Resende (2012b) in a study for the manufacturing sector of Ceará.

# IV
# Methodology and database

## 1. Econometric model

The effects of the FNE on the macroeconomic indicators of the region's municipalities are evaluated using a similar methodology to that used in research in the economic growth area, the main references for which are Baumol (1986) and Barro and Sala-i-Martin (1991 and 1992). In those studies, the hypothesis that the per capita GDP of the economies tends to converge over time is analysed using a regression model which converts the average rate of growth of per capita GDP between the initial and final period final ($\dot{y}_{i,T}$) into a function of its level in the initial period ($y_{i,0}$),

$$\dot{y}_{i,T} = \alpha_1 + \alpha_2 \ln\left(y_{i,0}\right) + \varepsilon_i, \qquad (1)$$

where:
$\alpha_1$ and $\alpha_2$ are parameters;
$\varepsilon_i$ is the error term; and
$i$ is the index referring to the unit of observation (economy).

If $\alpha_2$ turns out to be negative and statistically significant in the context of the equation (1), the economies display a growth pattern that is consistent with the theory of absolute convergence.

In later studies, the empirical growth model was made more flexible to control for possible long-term differences in the per capita GDP levels of the economies. That approach, known as the augmented Solow model, was discussed initially in Mankiw, Romer and Weil (1992) and was adopted in several subsequent studies as part of research on conditional convergence. The regression model would have the following form:

$$\dot{y}_{i,T} = \alpha_1 + \alpha_2 \ln\left(y_{i,0}\right) + B'X_i + \varepsilon_i, \quad (2)$$

where:
$X_i = [x_{1i} \ldots x_{ki}]$ is a vector with $k$ conditioning (control) variables;
$B' = [b_1\ b_2\ \ldots\ b_k]$ is the vector of partial gradient coefficients.

The set of regressors comprising $X_i$ is wide ranging and includes variables that characterize political, economic and social aspects of the economies. For a detailed list of those potential regressors, see Durlauf and Quah (1999) and Durlauf, Johnson and Temple (2004).

To evaluate the aggregate effect of the FNE on the municipalities of the Northeast, the following modifications to regression models (1) and (2) were adopted as an initial scheme:

$$\dot{w}_{i,T} = \beta F_i + a_1 + a_2 \ln\left(w_{i,0}\right) + \varepsilon_i, \quad (3)$$

$$\dot{w}_{i,T} = \beta F_i + a_1 + a_2 \ln\left(w_{i,0}\right) + A'X_i + \varepsilon_i, \quad (4)$$

where:
$\dot{w}_{i,T}$ is the average rate of growth of macroeconomic indicator $w$ between 2002 and 2008; and $w_{i,0}$ is its value in 2002;
$F_i$ is a measure capturing the intensity of FNE policy in the municipality;
$\beta$ is the parameter that reports the effect of the FNE on the growth of $w$;
$X_i = [x_{3i}\, x_{4i} \ldots x_{ki}]$ is a vector with $k$-2 control variables (defined in the following section);
$A' = [\alpha_3\ \alpha_4\ \ldots\ \alpha_k]$ is the vector of the other partial gradient coefficients;
$\varepsilon_i$ is the error term; and
$i$ is the index referring to the $i$-th municipality.

In equations (3) and (4), the effects of the FNE are measured by their capacity to promote per capita GDP growth. If $w$ is per capita GDP, and $F$ is the amount of FNE financing per capita, the parameter $\beta$ can be interpreted as a growth-FNE elasticity, whereby a 1% change in $F$ produces a change of $\beta$ percentage points in the rate of growth of $w$. Given that the financing provided by the FNE is generally used to promote the local economy and expand its productive infrastructure, its investment in a given municipality would be expected to raise the rate of growth of income, employment, and the average wage ($\beta > 0$).

In the analysis of the macroeconomic effects of the FNE, one of the constraints on equations (3) and (4) is the assumption that the effects are equal in all units of the cross-section. In other words, the parameter representing the effects of the FNE, $\beta$, is the same for all municipal economies. Nonetheless, municipalities with different development levels and productive structures may be affected differently by the FNE in practice.

Although recent, the idea that the parameters in the economic growth models vary between the economies has been widely discussed. Studies by Azariadis and Drazen (1990) and Durlauf and Johnson (1995), for example, modify the traditional growth model by easing the assumption that the production function is convex, and suggest the possibility of multiple steady states for per capita GDP. In the time path of income, the effects of the determinants of growth would be heterogeneous, depending on the set of specific features of the economies.

To take account of this possibility in the FNE study, equations (3) and (4) were transformed to incorporate threshold effects as proposed by Hansen (2000):

$$\begin{aligned}\dot{w}_{i,T} = &\left(\beta_1 F_i + a_{11} + a_{21}\ln\left(w_{i,0}\right)\right).I_1\left\{y_{i,0} \le \gamma_1\right\} + \\ &\left(\beta_2 F_i + a_{12} + a_{22}\ln\left(w_{i,0}\right)\right).I_2\left\{\gamma_1 < y_{i,0} \le \gamma_2\right\} + \ldots, \\ &\left(\beta_J F_i + a_{1J} + a_{2J}\ln\left(w_{i,0}\right)\right).I_J\left\{y_{i,0} > \gamma_{J-1}\right\} + \varepsilon_i,\end{aligned} \quad (5)$$

$$\begin{aligned}\dot{w}_{i,T} = {} & B_1'Z_i.I_1\left\{y_{i,0} \le \gamma_1\right\} + B_2'Z_i.I_2\left\{\gamma_1 < y_{i,0} \le \gamma_2\right\} + \ldots, \\ & B_{J-1}'Z_i.I_{J-1}\left\{\gamma_{J-2} < y_{i,0} \le \gamma_{J-1}\right\} + \\ & B_J'Z_i.I_J\left\{y_{i,0} > \gamma_{J-1}\right\} + \varepsilon_i,\end{aligned} \quad (6)$$

where:
$Z_i = [F_i 1\ \ln(w_{i,0})\, x_{3i}\, X_{4i} \ldots x_{ki}]$ is a vector of regressors;
$B'_j = [\beta_j\ \alpha_{1j}\ \alpha_{2j}\ \alpha_{3j}\ \ldots\ \alpha_{kj}]$ are vectors of parameters that include the effects of the FNE, the intercepts and the partial gradient coefficients;
$I_j\{\cdot\}$ are indicator functions with $I_j\{\Psi\} = 1$ in the event of $\Psi$ occurring; and
$I_j\{\Psi\} = 0$ otherwise;
$y_{i,0}$ is the threshold variable that affects changes in the parameters; value of per capita GDP in 2002;
$\gamma_j$ are the threshold parameters;
$j=1,\ldots,J$ is the index relating to the regime or group of municipalities that share the same values of the parameters $B_j$, and $\varepsilon_i$ is the error term.

These models make it possible to evaluate the macroeconomic effects of the FNE in $J$ possible groups of municipalities, selected according to municipal per capita GDP in 2002 (a proxy variable for the economy's development level). Heterogeneity in the effect of the FNE is characterized by the variation in the $\beta_j$ coefficients and, consequently, in the $B_j$ vectors; in other words, the influence of all determinants of $\dot{w}_{i,T}$. If the parameters are invariant, $B_1 = \ldots = B_J$, the regression models would be reduced to the initial forms expressed by equations (3) and (4).

The variation in the effects of the FNE is therefore investigated through tests on constraints on the parameters vector $\beta_j$, conditional on the indicators functions $I_j\{\cdot\}$. In the process of estimating the models, those tests make it possible to see the relevant number of groups in the evaluation of the effects of the FNE and determine the initial per capita GDP level that defines each group. In other words, along with estimations of the parameters $\gamma_j$, the value of $J$ is obtained statistically.

To simplify the explanation of the estimation of the model and determination of $J$ (the number of groups), equation (6) is considered with just two possible groups. Group 1 would consist of municipalities with an initial per capita GDP below $\gamma_1$, while group 2 would consist of municipalities with an initial per capita GDP above $\gamma_1$.

$$\dot{w}_{i,T} = B_1' Z_i . I_1\{y_{i,0} \leq \gamma_1\} + B_2' Z_i . I_2\{y_{i,0} \leq \gamma_1\} + \varepsilon_i \quad (7)$$

Equation (7) can be rewritten as

$$\dot{w}_{i,T} = \Phi(\gamma_1)' Z_i . + \varepsilon_i, \quad (8)$$

with $\Phi(\gamma_1)' = \left[B_1' I_1\{y_{i,0} \leq \gamma_1\} \;\; B_2' I_2\{y_{i,0} > \gamma_1\}\right]$.

Equation (8) is estimated using the methodology proposed in Hansen (2000). Let $P$ be the interval formed by the minimum and maximum of the threshold variable in the sample, $P = [\min_i\{y_{i,0}\}, \max_i\{y_{i,0}\}]$. For $\mu \in (0,1)$, $\Gamma$ is defined as a discreet version of the $P$ space with $100.\mu\%$ of its initial and final values excluded symmetrically,[13] formed by $m$ equidistant points. Firstly, the parameters vector $\Phi$ is estimated by least squares for all $\gamma_1 \in \Gamma$, forming $m$ values for the sum of the square of the residuals $S(\gamma_1) = \sum_i \left(\dot{w}_{i,T} - \tilde{\Phi}(\gamma_1)' Z_i\right)^2$. Then, the estimations of $\Phi$ and $\gamma_1$ are obtained, finding the value of $\gamma_1 \in \Gamma$ that minimizes the function $S(\gamma_1)$, $\left\{\hat{\Phi}, \hat{\gamma}_1\right\} = \underset{\gamma_1 \in \Gamma}{\operatorname{argmin}}\, S(\gamma_1)$.

That procedure produces two sets of estimated coefficients, $\hat{B}_1$ for municipalities with $\{y_{i,0} \leq \hat{\gamma}_1\}$ and $\hat{B}_2$ from those with $\{y_{i,0} > \hat{\gamma}_1\}$. The test of heterogeneity of the parameters under the threshold effect, $B_1 \neq B_2$, which indicates whether statistically there are two different groups of municipalities (given the context of the regression model), uses the Lagrange test statistic proposed by Hansen (1996). The critical values of that statistic, which is robust to heteroscedasticity, are found using a bootstrap procedure. If $B_1 \neq B_2$, the conclusion is that there are two groups in which the FNE and other control variables produce different effects on the rate of growth of $w$.

If two groups are found to exist, the analysis then tests for the existence of three groups. In that case, the vector of parameters of the equation (8) is given by

$$\Phi(\gamma_1, \gamma_2)' = \left[B_1' I_1\{y_{i,0} \leq \gamma_1\} \;\; B_2' I_2\{\gamma_1 < y_{i,0} \leq \gamma_2\} \;\; B_3' I_3\{y_{i,0} > \gamma_2\}\right]$$

or

$$\Phi(\gamma_1, \gamma_2)' = \left[B_1' I_1\{y_{i,0} \leq \gamma_2\} \;\; B_2' I_2\{\gamma_2 < y_{i,0} \leq \gamma_1\} \;\; B_3' I_3\{y_{i,0} > \gamma_1\}\right].$$

The parameters vector $\Phi$ is estimated by least squares for all $\gamma_2 \in \Gamma$, with $|\gamma_2 - \gamma_1| \geq \delta > 0$, forming several values for the sum of the square of the residuals $S(\gamma_1, \gamma_2) = \sum_i \left(\dot{w}_{i,T} - \tilde{\Phi}(\gamma_1, \gamma_2)' Z_i\right)^2$; and, similarly, $\Phi$, $\gamma_1$ and $\gamma_2$, are estimated by minimizing the function $S(\gamma_1, \gamma_2)$ in the space of the threshold values. Lastly, the three-group model is compared to the two-group model using the Lagrange multiplier test.

## 2. Data

The sample used in this study contains data on the per capita GDP of the municipalities of the Northeast, the amount of resources from FNE programmes invested in those localities, and the variables (co-factors) that characterize and influence the composition of municipal

[13] The exclusion of those values is a necessary condition for the good performance of the estimation of the parameters and execution of the tests.

economies, according to the growth model proposal (4). All monetary variables are deflated by the general price index with a base year of 2007.[14]

In the regression equations, $\dot{w}_{i,T}$ and $w_{i,0}$ then represent the average rate of growth of per capita GDP in each municipality in the period 2002-2008 and the level of per capita GDP of each municipality in 2002. It is important to note that the value of per capita GDP in 2002 is also used as a threshold variable; in other words, the variable on which the groups of municipalities with similar growth patterns will (or will not) be formed.[15]

The variable on which the effect of FNE resources on the growth of those indicators will be evaluated, $F_i$, is the annual per capita average of total FNE financing in the period 2002-2006.[16] Thus, at least two years are allowed to capture the maturity of the investments on the growth of the municipality; and, from the methodological standpoint, problems of policy endogeneity in the model estimations are avoided.[17]

As the FNE consists of several financing programmes targeting different aspects of the market, the fund's effect in a given municipality may depend on the type of municipality and the specific type of programme developed most intensively in that location. Programmes such as the National Programme for the Strengthening of Family Agriculture (PRONAF) and FNE-Industrial have different clientele whose action and contribution to market growth is obtained through different mechanisms. For example, it is more likely that the first produces effects on demand, because the subsistence economy would not involve progress in the productive structure, despite the fact that the accumulation of small-scale family farmers promotes the formation of organized productive clusters. In contrast, FNE-Industrial would have effects on the supply side, because in many cases it represents the expansion of the productive structure itself. Although the multiplier effects of FNE-Industrial are strong, PRONAF participation in the growth of local economies cannot be ruled out. For that reason, it was decided to use the total FNE to represent the policy variable and not just the resources provided by the industrial programmes.

The variables $x_{3i}\, x_{4i} \ldots x_{ki}$, presented in subsection 1, are other determinants of economic growth or control variables used in various empirical studies in this line of research.[18] They are chosen because of their appropriateness for the study and their availability for all municipalities in the period 2002-2008. Consequently, the following variables were selected: the logarithm of the mean of the ratios between current expenditure and municipal GDP in 2002 (*gov*), representing the size of the government; the logarithm of the number of years' schooling of individuals of at least 25 years of age in 2000 (*edu*), which represents the education and human capital conditions of the municipalities; the logarithm of the sum of the average population growth rate in the municipalities in the period 2002-2008 (*n*); the rate of growth of technology and the depreciation rate ($\delta + d$) = 5%; the proportion of households with piped water (*infra*), which measures infrastructure; the total volume of credit operations (*opc*); the municipality's distance from the respective state capital (*dist*), which captures geographic and indirect effects; and the binary variable indicating whether the municipalities located in a semiarid region (*semi*). A more detailed description of these variables and their sources can be found in table A.1 of the annex.

It should be noted that the credit operations variable provides an important control for identifying the effect of the FNE on growth in the municipalities. By controlling the potential effects of total credit channelled to the municipalities, the effect of the FNE is distinguished from other bank financing alternatives.

[14] See Ipeadata [online] www.ipeadata.gov.br.
[15] The per capita GDP values for the municipalities were obtained from Ipeadata.
[16] The values of the FNE related to the municipalities were taken from ETENE/BNB.
[17] The results of the models estimated with that variable for the period 2002-2005 were quite similar.
[18] See the review made in Tsangarides (2005).

# V
# Results

This section describes the main results of the linear models (1) and (2), referred to as global, and the models with the threshold effect (3) and (4). The models were estimated using the methodology described in section IV, along with test statistics and estimations of standard deviations that are robust to heteroscedasticity.[19] Although the linear models are presented, these were rejected by the Lagrange multiplier test, when compared to the models with a threshold effect, thereby showing that the latter are statistically more appropriate for describing the data.

The complete results of the models are shown in the annex (see tables A.2 and A.3), whereas the tables below only show the effects of the FNE on the average rate of growth of per capita GDP. The models are based on a different number of observations (municipalities), because the sample selection was based on the availability of data for all of the variables in the estimated regression equation.

It should be remembered that the threshold variable used in the analysis is the natural logarithm of initial per capita GDP, which, in this study, corresponds to 2002. The use of initial per capita GDP as that variable is very common in similar studies; and, in empirical models, it serves as a proxy variable for dividing the municipalities into groups according to the development status of their economies at the start of the growth process being analysed. Thus, in the case of models (5) and (6), the effects of the FNE could be interpreted as being separated into groups of municipalities with different development levels.

Tables 1 and 2 show the sample size (number of municipalities) and report the estimations of the effects of the FNE on the average growth rate of per capita GDP, corresponding to the global model and the model with the threshold effect, respectively, depending on whether or not the control variables $X_i$ are used. When the controls are included, the sample is reduced from 1,790 to 1,228 municipalities, because many of them do not have data for the period analysed.

It is interesting to note that, in the traditional models, the effect of the FNE was positive and significant, with and without controls relating to the determinant co-factors of economic growth. This is a qualitatively different result from that found in Resende (2012a).

TABLE 1
**Estimations of the global model**
*(Per capita GDP)*

| | Number of municipalities | Effect of the FNE |
|---|---|---|
| Result without controls ($X_i$) (Model 1) | 1 790 | 0.082* |
| Result with controls ($X_i$) (Model 2) | 1 228 | 0.085* |

*Source:* prepared by the authors.

* Significant at 5%.
FNE: Northeast Financing Constitutional Fund.
GDP: Gross domestic product.

TABLE 2
**Estimations of the model with threshold effect**
*(Per capita GDP)*

| Group (interval for $y_{i,0}$) | Number of municipalities | Effect of the FNE |
|---|---|---|
| Result without controls ($X_i$) (Model 3) | | |
| Below R$ 4 105 | 1 493 | 0.067* |
| Above R$ 4 105 | 297 | 0.117* |
| Result with controls ($X_i$) (Model 4) | | |
| Below R$ 2 143 | 204 | -0.007 |
| Between R$ 2 143 and R$ 3 866 | 794 | 0.078* |
| Between R$ 3 866 and R$ 7 406 | 177 | 0.109** |
| Above R$ 7 406 | 55 | 0.173 |

*Source:* prepared by the authors.

*Significant at 5%; ** significant at 10%.
FNE: Northeast Financing Constitutional Fund.
GDP: gross domestic product.

Nonetheless, the Lagrange multiplier tests rejected the global models in favour of the models with the threshold effect, with two groups without ($X_i$) controls and four groups with them. In the first case, one group consists of municipalities with an initial per capita GDP of less than R$ 4,105 (1,493 municipalities), and the other has municipalities with an initial per capita GDP above that level (297 municipalities). The statistically significant effects of the FNE on growth are 0.067 in the case of the lower-income group and 0.117 in relation to the higher- income group. This means that the volume of FNE resources per capita produces a greater effect on income growth in municipalities that are more economically developed. In the municipalities of the first

[19] An adapted version of the Gauss routine, provided by Hansen (2000), was used.

group, every 10% increase in FNE financing per capita generates an increase of 0.67 percentage points in the average growth rate of per capita GDP, compared to an increase of 1.17 percentage points in the second group.

According to the global model without controls (see table 1), that increase would be 0.82 percentage points in all municipalities. In contrast, one of the advantages of the model with a threshold effect is the possibility of establishing differences in the effects of the FNE and identifying the variable which determines that differentiation. The results of the model with the threshold effect but without controls in this study suggest that the influence of FNE funding on economic growth is more intensive in the higher per-capita-income municipalities. This could reflect their more dynamic economic activity and greater maturity of their entrepreneurs.

Controlling for other growth co-factors, the first group consists of municipalities with an initial per capita GDP below R$ 2,143 (204 municipalities); the second consists of municipalities with an initial per capita GDP equal to or greater than R$ 2,143 but less than R$ 3,866 (794 municipalities); the third comprises those with an initial per capita GDP equal to or greater than R$ 3,866 but less than R$ 7,406 (177 municipalities; and the fourth, those with an initial per capita income of R$ 7,406 or more (55 municipalities).

Apart from the intermediate groups (the second and third) the estimation of the effects on the FNE on per capita GDP growth is not statistically significant. It is worth noting that the group-average effects are captured independently of the aggregate amount of resources received by them. For example, table 3 shows that the groups in which the effects of the FNE were not statistically significant are those that received the smallest and largest amounts of resources per capita.

TABLE 3

**Volume of the FNE by growth clubs, 2002-2006**

| Clubs (*Per capita GDP*) | Volume of FNE (*R$ at 2007 prices*) | Average per capita volume of FNE (*R$ at 2007 prices*) |
|---|---|---|
| R$ 2 143 | 452 397 355.43 | 199.91 |
| R$ 2 143-R$ 3 866 | 3 281 973 904.51 | 254.02 |
| R$ 3 866-R$ 7 406 | 2 364 298 679.18 | 314.32 |
| R$ 7 406 | 2 700 014 000.88 | 1 716.11 |
| Total | 8 798 683 940.00 | 319.20 |

*Source:* prepared by the authors.

FNE: Northeast Financing Constitutional Fund.
GDP: gross domestic product.

In the groups of municipalities in which the FNE had a significant effect, the general patterns is quite similar to the case in which controls are not used in the regression model. In the second group, every 10% increase in FNE financing per capita generates a 0.78 percentage point increase in the average growth rate of per capita GDP in the municipalities, whereas in the third group, the corresponding increase is 1.09 percentage points. This confirms the evidence that the effect of FNE financing rises according to the initial income level of the municipalities.

Another important finding is that the effects of the FNE are found in the vast majority of the most representative municipalities —those that comprise the second and third groups, representing roughly 79% of the sample—. The endogenous distinction between municipalities that report significant effects of the FNE, and those that do not, allows for an effectiveness analysis with respect to the municipality groups classified according to the PNDR (Ministry of National Integration, 2005).

The four groups formed in this study can be referred to as growth clubs, because the municipalities comprising them display similar patterns of per capita GDP growth, bearing in mind the joint influence of the model's other co-factors. It is therefore to be expected that FNE financing would produce differentiated effects in municipalities with different initial per capita GDP levels. A comparison between the municipalities comprising the clubs defined in this study with those classified according to the PNDR is shown in table 4.

In table 4, the rows represent the clubs formed by initial per capita GDP, whereas the columns relate to the classification of the municipalities according to the PNDR. These can be classified as low income, stagnated, dynamic and high income, by making an ad hoc tabulation that combines initial per capita income and growth reported in the decade of 1990.[20] Of the 397 municipalities in the sample classified as low income by the PNDR, 300 are in growth clubs that are statistically sensitive to the effects of the FNE (270 in group 2 and 30 in group 3). Thus, if the low-income municipalities receive the same volume of financing per capita in linear fashion, the expected effectiveness is around 79.1%. From that same perspective, estimations of effectiveness in the case of the municipalities classified as stagnated, dynamic and high income, are 83.4%, 75.7% and 59.4%, respectively.

The relatively lower effectiveness in the high-income municipalities confirms the tendency of the PNDR to prioritize (albeit not exclusively, it should be

[20] There is also a difference in terms of the reference year of the PNDR ranking by initial per capita income and the initial per capita GDP of the growth clubs formed.

TABLE 4

**Classification of municipalities. Growth clubs according to the PNDR**

| Clubs according to GDP brackets | Regional National Development Policy (PNDR) | | | | Total |
|---|---|---|---|---|---|
| | Low income | Stagnated | Dynamic | High income | |
| R$ 2 143 (1) | 74 (36,3) | 54 (26,5) | 76 (37,3) | 0 (0) | 204 |
| | (19,5) | (13,2) | (18,6) | (0) | |
| R$ 2 143-R$ 3 866 (2) | 270 (34,1) | 262 (33,1) | 253(31,9) | 7 (0,9) | 792 |
| | (71,2) | (64,1) | (62,0) | (21,9) | |
| R$ 3 866-R$ 7 406 (3) | 30 (16,9) | 79 (44,6) | 56 (31,6) | 12 (6,8) | 177 |
| | (7,9) | (19,3) | (13,7) | (37,5) | |
| R$ 7 406 (4) | 5 (9,1) | 14 (25,5) | 23 (41,8) | 13 (23,6) | 55 |
| | (1,3) | (3,4) | (5,6) | (40,6) | |
| Total municipalities | 379 | 409 | 408 | 32 | 1 228 |

*Source:* prepared by the authors.

1) Per capita GDP below R$ 2,143.
2) Per capita GDP equal to or greater than R$ 2,143 and below R$ 3,866.
3) Per capita GDP equal to or greater than R$ 3,866 and below R$ 7,406.
4) Per capita GDP equal to or greater than R$ 7,406.
GDP: gross domestic product.

stressed) the municipalities of the first three categories (low-income, stagnated and dynamic), since the return to the fund would be greater in those municipalities. Moreover, the discovery of differentiated effects between the municipalities with different economic levels raises the need for more careful monitoring of municipalities that do not adequately respond to the investment flows.

As the groups include municipalities with low and high per capita incomes, attention should be paid to the specific local factors that hinder investment-induced growth. Among supply-side factors, appropriate marketing and monitoring of projects are fundamental for them to have the expected repercussions. In that connection, part of the FNE resources destined for family farmers (PRONAF) was recently put under systemized monitoring by trade agents in micro finance programmes (the *AgroAmigo* programme). This could be an encouraging factor, particularly for low-income municipalities in which the agriculture sector has a large share. As this programme was consolidated after the period researched in this paper, the growth dynamics in the Northeast should be updated in future research.

On the demand side, the structured organization of local economic agents is also important to enable them to develop and apply their business skills on a coordinated basis. For that purpose, interaction should be promoted between local government, financing agencies, and technical and scientific support institutions, to ensure that the investment becomes a sustained factor of production and productivity, rather than a mechanism for reproducing the existing economic scenario.

# VI
## Final thoughts

This article has sought to verify the effects of the Northeast Financing Constitutional Fund on the economic growth of northeastern municipalities in the decade of 2000. To that end, it used an empirical framework based on growth models (Barro and Sala-i-Martin, 1991) which made it possible to form clubs of convergence and heterogeneity in terms of the effects of the co-factors, according to the municipality's initial development level (Durlauf and Johnson, 1995).

One of the advantages of that nonlinear model consists of being able to determine, through an endogenous selection process, the composition of the "clubs" of municipalities displaying growth patterns that are mutually similar and (statistically) different from those in other groups. A test of that possibility with respect to the growth of per capita GDP in the municipalities of the Northeast in the period 2002-2008, revealed the existence of four convergence clubs with differentiated

FNE effects, discriminated according to the initial per capita GDP level of the municipalities.

The effects of the FNE were not statistically significant in municipalities with a per capita GDP of up to R$ 2,143 (204 municipalities), and in those with initial per capita GDP is above R$ 7,406 (55 municipalities). In contrast, positive and statistically significant effects were recorded in municipalities with intermediate per capita GDP levels, between R$ 2,143 and R$ 3,866 (792 municipalities) and between R$ 3,866 and R$ 7,406 (177 municipalities). In the first group, a 10% increase in the volume of FNE resources per capita would result in an average increase of 0.78 percentage points in the GDP growth rate, whereas in the second group, the corresponding increase would be 1.09 percentage points. These are considerable effects, given the history of growth rates in the region.

Overall, the results show that the FNE had a positive average effect on growth in the municipalities of the Northeast in the period 2002-2008. Although the general positive effect is important for legitimizing this regional policy tool, account needs to be taken of methodological caveats and the specific characteristics of the results.

When specifying the econometric equation for estimating the effects of the FNE in the municipalities, steps were taken to follow the empirical literature on economic growth, which is based on models designed for cross-section data. Although an evaluation using panel data could be richer given the multidimensional nature of the data, the limited availability of information prevented such an evaluation being made.

Another constraint, also related to data availability, is the absence of the explanatory variable "physical capital", which is generally present in studies of this type. It is hoped that the variable "households with piped water", as a proxy for municipal physical capital, partially captures the variation and largely reduces the potential for biases in the estimations. It would be advisable to conduct specification tests to research this problem in greater detail; but, as models with threshold effects are being used, those techniques have not yet been proposed. Lastly, although it is possible to include more than one threshold variable when forming the groups of municipalities in the estimation process (as happens in some studies that use models with that type of nonlinearity) this would make the analysis more complex in terms of identifying the factor that determines the formation of a convergence group. The use of the variable "initial per capita income" as the only threshold variable in economic growth models is a virtually universal practice.

Future complementary studies could estimate growth models at other levels of regional aggregation (for example, micro-regions), to capture any regional scale effect or reduce potential problems in measuring variables in the municipal sector.[21]

In terms of the specific results of the study, the absence of significant growth effects in the lowest-income municipalities highlights the need to more effectively monitor the amount and quality of the resources channelled to them, and also the local factors that pose obstacles to economic growth. The same reasoning also applies to the highest-income municipalities.

[21] This potential problem is addressed in Resende (2012a).

## ANNEX

TABLE A.1

**Explanatory variables**

| Variable | Definition | Source | Mean | Standard deviation |
|---|---|---|---|---|
| $F_i$ | Average total FNE financing per capita in the period 2002-2006 (*R$ at 2007 prices)* | BNB | 64.01 | 234.99 |
| $y_{i0}$ | Municipal per capita GDP in 2002 (*R$ at 2007 prices*) | Ipeadata | 3 712.06 | 7 395.23 |
| $(n + \delta + d)$ | Average rate of population growth between 2002 and 2008, plus 0.05 for a technological growth and depreciation | Ipeadata | 0.0572 | 0.01 |
| *edu* | Average years of schooling among 25-year olds | Ipeadata | 2.90 | 0.83 |
| *infra* | Proportion of households with piped water (*Percentage*) | Ipeadata | 42.95 | 19.47 |
| *gov* | Average ratio between current expenditure and municipal GDP in 2002 | Ipeadata | 45.59 | 19.32 |
| *dist* | Distance of the municipality from the respective state capital | Ipeadata | 226.58 | 148.89 |
| *opc* | Total credit operations per capita in 2002 (*R$ at 2007 prices*) | Central Bank of Brazil | 436.86 | 4 258.79 |
| *semi* | Variable equal to 1 if located in the semiarid zone, 0 otherwise. | Ipeadata | 0.63 | 0.48 |

*Source:* prepared by the authors.

FNE: Northeast Financing Constitutional Fund.
GDP: gross domestic product.
BNB: Banco do Nordeste do Brasil.

TABLE A.2

**Estimations of the global models and the model with threshold effect without control variables**

*(Per capita GDP)*

| Variables | Global | Groups | |
|---|---|---|---|
| | | Threshold | |
| | | $y_{i,0} < 8.32$ | $y_{i,0} > 8.32$ |
| *intercept* | 1.282* | 3.701* | -0.209 |
| | (5.317) | (11.569) | (-0.373) |
| $F_i$ | 0.082* | 0.067* | 0.117* |
| | (4.457) | (4.918) | (2.085) |
| $\ln(y_{i,0})$ | -0.160* | -0.462* | -0.002 |
| | (-5.458) | (-11.449) | (-0.031) |
| No. of observations | 1 790 | 1 493 | 297 |
| $S^2$ | 0.126 | 0.088 | 0.28 |

*Source:* prepared by the authors.

* Significant at 5%.
*t* -statistics in parentheses.
$S^2$: sample variance of the model.
GDP: gross domestic product.

TABLE A.3

**Estimations of the global models and threshold effect through control variables**

*(Per capita GDP)*

| Variables | Global | Groups | | | |
|---|---|---|---|---|---|
| | | $y_{i,0} < 7.67$ | $7.67 \leq y_{i,0} < 8.26$ | $8.26 \leq y_{i,0} < 8.91$ | $y_{i,0} > 8.91$ |
| *intercept* | 0.896* | -0.199 | 3.368* | 2.479 | 3.018 |
| | (2.282) | (-0.170) | (7.565) | (0.974) | (0.876) |
| $F_i$ | 0.085* | -0.007 | 0.078* | 0.109** | 0.173 |
| | (3.242) | (-0.441) | (4.606) | (1.958) | (1.588) |
| $\ln(y_{i,0})$ | -0.088* | 0.068 | -0.419* | -0.421** | -0.5668 |
| | (-2.053) | (0.402) | (-8.334) | (-1.665) | (-2.200) |
| $(n + \delta + d)_i$ | -0.127* | -0.157* | -0.120* | -0.377* | 1.496 |
| | (-2.876) | (-3.746) | (-2.683) | (-2.920) | (1.493) |
| $edu_i$ | 0.044 | 0.002 | 0.148* | 0.091 | 0.398 |
| | (1.122) | (0.030) | (3.408) | (0.688) | (0.997) |
| $infra_i$ | -0.029* | -0.023** | -0.031* | 0.121 | -0.052 |
| | (-2.313) | (-1.748) | (-2.213) | (1.556) | (-0.208) |
| $gov_i$ | -0.089* | -0.039 | -0.073* | -0.137 | 0.838* |
| | (-2.265) | (-0.819) | (-2.245) | (-1.479) | (2.009) |
| $dist_i$ | 0.006 | 0.005 | -0.001 | 0.032 | 0.048 |
| | (0.015) | (1.079) | (-0.101) | (1.062) | (0.566) |
| $opc_i$ | 0.004 | 0.005 | 0.006** | -0.005 | 0.044 |
| | (0.909) | (1.080) | (1.666) | (-0.523) | (0.698) |
| $semi_i$ | -0.077* | 0.010 | -0.071* | -0.141 | -0.290* |
| | (-3.089) | (0.310) | (-2.634) | (-1.386) | (3.018) |
| No. of observations | 1 228 | 204 | 792 | 177 | 55 |
| $S^2$ | 0.107 | 0.046 | 0.057 | 0.129 | 0.806 |

*Source:* prepared by the authors.

* Significant at 5%; ** significant at 10%.
*t* -statistics in parentheses.
$S^2$: sample variance of the model.
GDP: gross domestic product.

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