



Education, structural change
and inclusive growth in

Latin America



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Education, structural change and inclusive growth in Latin America



Alicia Bárcena
Executive Secretary

Antonio Prado
Deputy Executive Secretary

Mario Cimoli
Chief, Division of Production, Productivity and Management

Ricardo Pérez
Chief, Publications and Web Services Division

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Foreword

There is no doubt that, in order to make further progress towards inclusive growth with equality, the countries in our region need to strengthen their capacity for economic growth. However, a true revolution is also needed in education, as a complement of our values, our societies, our competencies and the promotion of economic and social innovation.

Acquiring knowledge and updating skills is an ongoing process and should be guided by the goal of social inclusion. This process will help us tackle the challenges presented by modern society, in which a vast array of new stakeholders have come to the fore. Focusing our efforts in this direction will enable us to exploit the windows of opportunity that present themselves when human talent is transformed into a driver of the knowledge society.

Capacity building should concentrate on human development that makes change and freedom possible and ensures that individuals become active participants in their social environment, while also giving due consideration to economic growth based on greater investment, productivity and competitiveness. This means recognizing the value of scientific and technological activities, which are an important aspect of the work undertaken at our universities, and strengthening them. This will be a difficult and lengthy task in our region, and our economies will need to diversify production in a process of virtuous structural change if it is to be fully realized.

The revolution in education currently under way will require progress on two fronts: a dramatic improvement in quality, in order to be able to meet the demands of today's technological revolution; and the design and implementation of mechanisms that will facilitate universal access to an education that reinforces students' values and enables them to earn sufficient income for a life of dignity, productivity and social solidarity.

The pace of technological change is imposing new modes of employment, and accordingly, of education and capacity development. The traditional paradigm of one stable job is already being replaced by that of a variety of jobs, of intermediate duration. Workers will not automatically acquire the necessary flexibility or learn it within their family environments. Schools will train people to adapt rapidly to new conditions and specialisms in the workplace. Schools will also heighten people's awareness so they can understand and take action in response to new processes, products and tools.

Given the urgency with which this must be addressed, the current situation in our region, while varying widely, is a cause for concern. The number of years of schooling continues to be lower than in developed economies, and considering that quality and results are often also of a lower standard, the gap widens further. Thus, the efforts of the past two decades to extend and improve education coverage and quality at all levels must continue. The poor, women and the rural population face even greater challenges in these areas.

These efforts must be accompanied by an unwavering commitment to innovation. An environment that fosters innovation is essential if we are to improve education and promote the most suitable labour-market skills for boosting competitiveness, increasing productivity and promoting production diversification, all of which will contribute to structural change. Among other factors, such change also requires institution building within social protection systems, as these act as safety nets and protect members against risk.

ECLAC has prepared this document to support an initiative in which it is participating enthusiastically: the Forum of University Presidents of the Americas 2015. This meeting of our educational establishments' highest authorities is the ideal place to debate the points made herein and to identify a way forward that will put an end once and for all to educational models that encourage segregation and elitism, and usher in an era characterized by high-quality, public education that is free for all.

Alicia Bárcena Ibarra
Executive Secretary
Economic Commission for
Latin America and the Caribbean (ECLAC)

Introduction

The countries of Latin America and the Caribbean are at a crossroads in terms of their future growth and distribution capacity. The so-called commodity price supercycle is showing signs of weakening. Though prices remain high, demand is slowing and the prices of agricultural and mineral products are sliding. The region, which benefited from the commodity boom (albeit with considerable variation from one country to the next), is now suffering the impact of less favourable external conditions. These conditions are threatening a growth phase that began in the mid-2000s in most countries (especially those with mining sectors) and has continued nearly unabated, with just a brief interruption in 2008 when the global financial crisis hit.

To sustain the social and economic progress that has been made and successfully meet challenges as they arise, capacity must be strengthened in the region's countries. Looking ahead, swift and sizeable productivity gains, as well as productive diversification beyond commodities, will be needed, developments that will not occur spontaneously. Investment in basic and higher education, science and technology and technical capacity for production will be indispensable to usher a new era of growth with greater equality in Latin America and the Caribbean. Productive diversification and capacity-building must be accompanied by intensified and equitable efforts to bring education to marginalized sectors.

This document has two sections, in addition to the introduction and some final reflections. The first section presents indicators that point to a derailing of the region's growth path, such as a loss of economic dynamism and the emergence of fiscal and current account imbalances. The second addresses some key problems that must be resolved to prevent a rollback of the progress made —on the social and economic fronts— over the past 10 years. The proposed policy responses suggest two courses of action: strengthen the expansion and inclusion effort in education, science and technology; and promote productive diversification, without which there would be no corresponding demand for skilled labour. This two-pronged approach, targeting both supply and demand for skills (the combination of education in a broad sense and structural change), can help to sustain growth and employment in the long run.

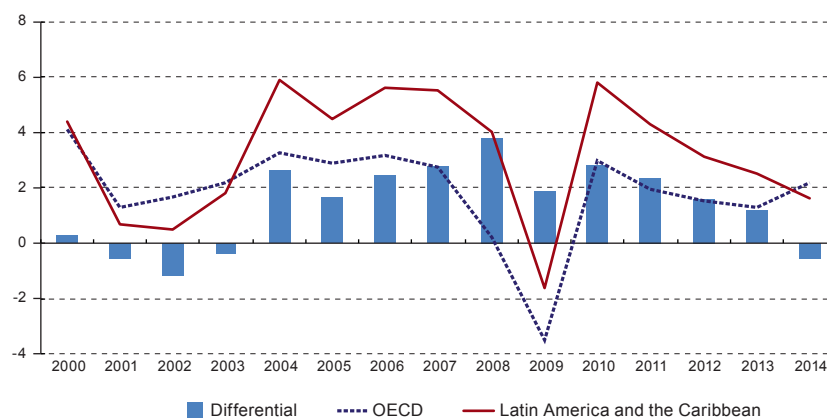
I. A growth phase that shows signs of weakening

The indicators presented below point to a reversal in the growth path seen in the region in recent years.

A. Economic growth

Whereas the region's growth rate surpassed the average for the countries of the Organization for Economic Cooperation and Development (OECD) in 2004-2013, it had fallen below that rate by 2014 (see figure I.1) and is projected to slip further in 2015: in the best case scenario, to about 2%, well below the level that marked the end of the recession in 2010 (5.2%).

Figure I.1
Latin America and the Caribbean and OECD countries: economic growth, 2000-2014
(Percentages)



Source: Organization for Economic Cooperation and Development (OECD)/Economic Commission for Latin America and the Caribbean (ECLAC)/CAF-Development Bank of Latin America, *Latin American Economic Outlook 2015: Education, skills and innovation for development*, Paris, OECD Publishing, 2014.

Estimates and projections by the International Monetary Fund (IMF) place global growth at 3.3% in 2014 and 3.8% in 2015 (IMF, 2014). However, the forecasts have been adjusted downward following limited recovery in most developed economies and a weakening in the emerging economies. The United States appears to have set itself on a firmer recovery path, which has prompted its monetary authorities to announce a phase-out of the quantitative easing policy (despite which interest rates should remain very low). Europe is still battling recession, and there are signs of uncertainty as opposition builds to austerity policies that have proved unsatisfactory at reducing debt in the European periphery. The anticipated benefits of austerity measures on expectations have not overcome the recessionary effect associated with less spending, and GDP has plummeted in the indebted countries. The rise of anti-austerity political parties and the adoption of quantitative easing in the European Union may change the landscape.

It is important to be aware of the looming threats to the region's competitiveness. The euro has lost value, but Europe has a very strong industrial base and technology and industrial policies, especially in some of the northern countries (notably Germany). With the support of a more competitive currency in combination with its endowment of technology and human capital, Europe could conceivably turn the corner in the next several years. This would have a positive impact on demand for Latin American and Caribbean products but would place more competitive pressure on industry in the region, which is already very weak, all of which underscores the need for the region to adopt its own measures to promote competitiveness, and, above all, to build capacity.

B. Investment and productivity

The export boom spurred an increase in investment, which had been very low in the 1990s and the first decade of the 2000s. Nevertheless, rates of investment across the region remained below those of the Asian economies and also below the levels needed to achieve sustainable progress towards closing the gap. Furthermore, the rising investment trajectory seemed to stall or reverse in some countries, bringing down the regional average. This was to be expected given that investment levels move on growth and earnings expectations, which have deteriorated in response to changing conditions in the international environment. As a result, the regional investment rate (measured as a percentage of GDP in 2010 constant dollars), after plateauing around 20.5% between 2011 and 2013, fell to 19.2% of GDP in 2014, even lower than the 2010 level (19.8%). As with other economic variables in the region, the outlook varies considerably from one country to another: investment as a percentage of GDP has climbed in Central America and in Colombia, Ecuador and the Plurinational State of Bolivia, but fallen in Argentina, the Bolivarian Republic of Venezuela, Brazil and Chile.

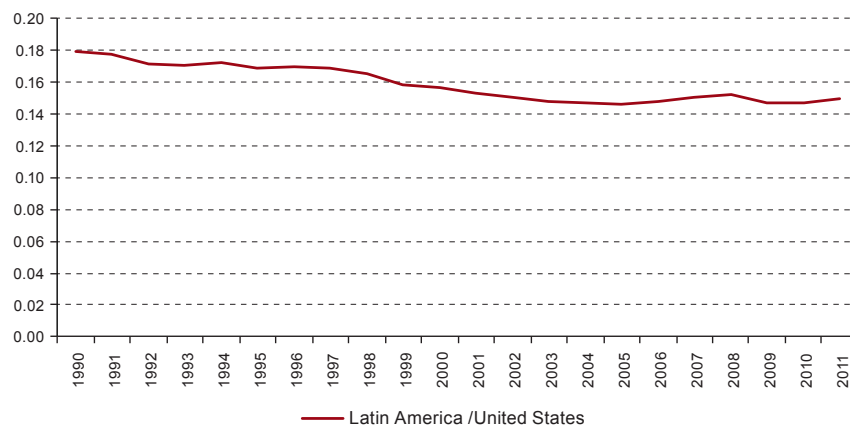
In a world of increasingly swift technical progress, a drop in investment widens technology, productivity and income gaps. This is known as the Red Queen Effect: you have to run just to stay in the same place. Failing to keep up with technological progress translates into productivity losses. As illustrated in figure I.2, the region's productivity is steadily declining relative to the technology frontier, represented in the figure by productivity in the United States.

Technology and productivity gaps translate into lost opportunities to participate in the most dynamic sectors in global trade, which, in turn, leads to imbalances in the external sector with every uptick in the economy's growth rate.

C. Imbalances in the external sector

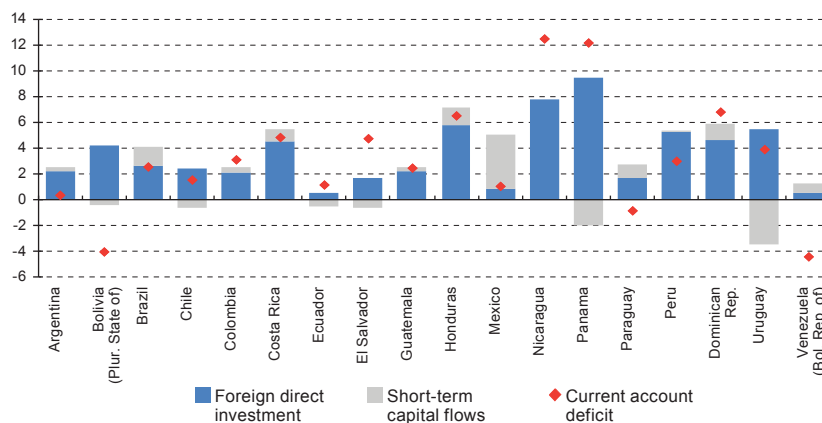
Latin America's current account deficit has been growing since 2010 (see figure I.3), making the region more vulnerable to a downturn in external financing. In general, export growth is slowing on weak foreign demand and the loss of competitiveness of exports of nonprimary goods—except in Mexico—while import growth has continued in line with internal demand. Meanwhile, net commodity exports from South America have been affected by the deterioration in the terms of trade, particularly in the case of exports of basic metals (Chile and Peru). In Brazil, manufacturing exports have also been affected. In Central America, the moderate dip in energy prices has favoured the external accounts, but weak demand from the United States in recent years and smaller remittances from workers abroad have partially offset this.

Figure I.2
Latin America and the United States: relative productivity, 1990-2011



Source: Economic Commission for Latin America and the Caribbean (ECLAC), *Structural Change for Equality: An integrated approach to development* (LC/G.2524(SES.34/3)), Santiago, Chile, 2012.

Figure I.3
Latin American (18 countries): current account deficit and capital flows, 2013
(Percentages of GDP)



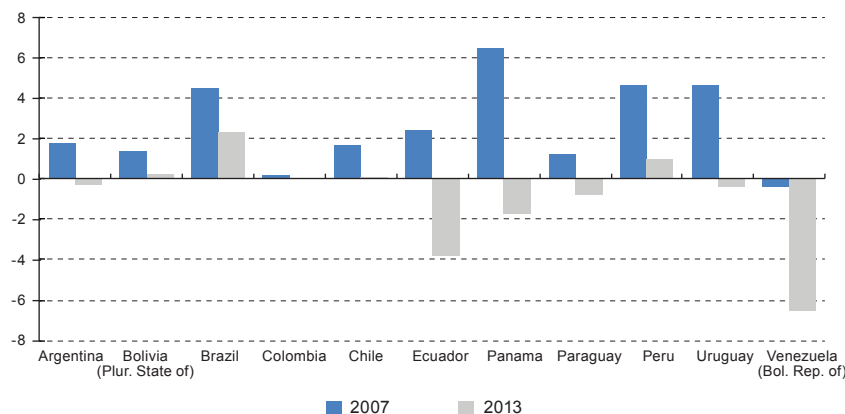
Source: Organization for Economic Cooperation and Development (OECD)/Economic Commission for Latin America and the Caribbean (ECLAC)/CAF-Development Bank of Latin America, *Latin American Economic Outlook 2015: Education, skills and innovation for development*, Paris, OECD Publishing, 2014.

The deterioration in external flows demands attention, especially in countries that already had large current account deficits. Several countries have turned to foreign direct investment (FDI), multilateral institutions and bank financing to restore balance to their external accounts, particularly in Central America. Net commodity exporters in South America, too, have seen a rapid deterioration in their current accounts, even those with surplus balances (Argentina, the Bolivarian Republic of Venezuela, Paraguay, and the Plurinational State of Bolivia). Despite these discouraging trends, the subregion's external imbalances are still at manageable levels, partly because the initial level of external debt was very low. Public debt levels have improved, though with significant differences between countries. Sovereign external debt fell from 24% of GDP in 2007 to 20% in 2013 on average, again, though, with differences between countries.

D. The fiscal dimension

Together with the first lines of defense against external shocks (availability of external assets and exchange rate flexibility), fiscal and monetary policies are crucial to counteracting adverse situations, as evidenced by the 2008-2009 crisis. Yet the region has lost manoeuvring room, particularly in the case of fiscal policy. First and foremost, the fiscal balance continues to move in close tandem with the external balance, as reflected in instances of twin surpluses (fiscal and current account) that became twin deficits in the past decade. Fiscal revenue benefited from a steady rise in the value of commodity exports, which increased the yield from income taxes, royalties, specific taxes, and direct transfers from State-owned enterprises. However, since 2011, falling commodity prices and an exchange rate appreciation trend have turned surpluses into deficits as spending has increased. This has also meant a deterioration in structural balances across the region (see figure I.4).

Figure I.4
Latin America (selected countries): structural primary fiscal balance, 2007-2013
(Percentages of GDP)



Source: Organization for Economic Cooperation and Development (OECD)/Economic Commission for Latin America and the Caribbean (ECLAC)/CAF-Development Bank of Latin America, *Latin American Economic Outlook 2015: Education, skills and innovation for development*, Paris, OECD Publishing, 2014.

A weaker fiscal position means financial constraints and macroeconomic risk. To varying degrees, 15 countries in Latin America and 10 countries in the Caribbean are contending with simultaneous deterioration in their fiscal and external balances (ECLAC, 2014a). In Central America, on average, the current account deficit stood at nearly 6% of GDP and the fiscal deficit at 3% of GDP in 2013. Central America and the Caribbean—where the respective averages are 10% and 5% of GDP—are the subregions with the most vulnerable economic outlook.

E. Social progress is waning in the region

The latest report from ECLAC (2014b) on social conditions in the region reveals that declines in poverty and indigence have plateaued after the sizeable gains made between 2004 and 2011. For example, the poverty rate has held steady at 28% in Latin America, unchanged from 2012 and 2013, which means that there were 167 million people living in poverty in 2014. Meanwhile, the indigence rate has climbed from 11.3% to 12%, so 71 million of those 167 million people were living in conditions of indigence or extreme poverty. In other words, the favourable expectations created during the commodity boom—of sustained growth, smaller gaps with the developed countries and greater equality in the most unequal region on the planet—are rapidly vanishing.

Meanwhile, the document produced at the thirty-fifth session of ECLAC (2014c) shows that when aspects of inequality are considered alongside individual income, the situation is even more troubling. Discrimination based on gender and race is responsible for a significant portion of income inequality. And the study on inequality in access to education, health, job opportunities and consumption of goods confirms a highly asymmetrical pattern between income deciles, which tend to reproduce and amplify the initial inequalities. The issue of unequal access to education is addressed in the next section.

In short, on the macroeconomic front, a downward growth trend has converged with sharper current account imbalances and tighter fiscal space to create less favourable conditions than in previous years, with negative implications for the labour market and for any prospects of increasing social spending as a tool to reduce inequality. Tapering demand for commodities is moving the issue of productive diversification up in importance on the agenda. Thus, efforts to provide stimulus for education and support for technology policy, with a focus on enhanced productivity and competitiveness, are acquiring a singular urgency.

II. Education, growth and equality

There are two crosscutting aspects of education and development that should be analysed together. First, the supply of labour with a higher level of education should be expanded: an economy that bets on productive diversification into more knowledge-intensive sectors must have a supply of workers who are better qualified to perform increasingly complex tasks. Otherwise, it exposes itself to two types of negative effects: emerging constraints on growth due to the scarcity of a production factor and rising inequality among workers inasmuch as the wages of the more educated will climb faster than those of the less educated. Second, there has to be a parallel increase in demand for skilled workers. It does no good to increase the pool of educated workers if the country offers no activities to engage them. In that case, workers will either emigrate or will be underused in simple activities. Education and training must go hand in hand with structural change in order to produce a significant impact on the economy.

A. Education and skills: level and distribution

On the supply side, there are major hurdles that must be surmounted. In Latin America, 36% of firms operating in the formal sector struggle to find workers with the necessary skills. The equivalent global figure is 21% and the OECD average is 13%. Thus, Latin America has a comparatively bigger problem than the rest of the world in terms of the supply of skilled labour. The data also suggest that a firm in Latin America is three times more likely than a firm in South Asia to face operational problems due to an insufficient pool of skilled labour, and 13 times more likely than a firm in the Asia-Pacific Rim.

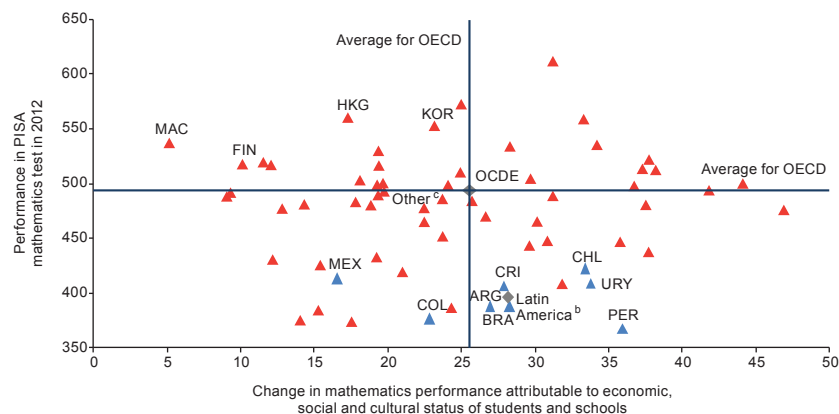
The lack of quality education places Latin American youth at a distinct disadvantage with respect to their peers in the OECD countries. A 15-year-old from Latin America and the Caribbean performs more poorly (based on 2012 PISA tests) than his or her counterpart in the OECD: the gap is equivalent to 2.4 fewer years of secondary education.

A substantial portion of education spending is privately financed in Latin America, while public spending on education is low (18% of GDP) compared with the OECD average (26% of GDP). In Chile, 46% of funding for education spending comes from private sources, compared with 16% on average in the OECD countries. The region also has lower levels of total investment in education as well as a skew towards private financing, which affects quality of education and equality of access in each country.

The impact of the education system on equality of opportunity is very strong. Two people with exactly the same ability making exactly the same effort, whose only difference is that one has better access to education thanks to family income, will find themselves at very different places on the Gini curve within the space of a few

years. Only 56% of people in the lowest income quintile have a secondary education and just 9% have attended postsecondary school, compared with 87% and 46% of people, respectively, in the highest income quintile. Meanwhile, socioeconomic status accounted for 30% of the variation in the scores obtained by Latin American students on the 2012 PISA mathematics test, compared with 26% in the OECD countries (see figure II.1).

Figure II.1
Latin America and OECD (selected countries): change in PISA mathematics performance
attributable to socioeconomic status of students, ^a 2012
(Points and percentages)



Source: Organization for Economic Cooperation and Development (OECD)/Economic Commission for Latin America and the Caribbean (ECLAC)/CAF-Development Bank of Latin America, *Latin American Economic Outlook 2015: Education, skills and innovation for development*, Paris, OECD Publishing, 2014.

^a The percentage change in mathematics performance explained by the economic, social and cultural status of students and schools is obtained from a student-level regression where the explanatory variables are the economic, social and cultural status of the student and that of the school.

^b Includes Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay.

^c Includes Kazakhstan, Latvia, Liechtenstein, Lithuania, Macao (Special Administrative Region of China), Malaysia, Montenegro, Qatar, Romania, Russian Federation, Serbia, Shanghai (China), Singapore, Chinese Taipei, Thailand, Tunisia and Arab Emirates.

There are other factors that generate asymmetries in scholastic performance. Schools attended by students from families in higher socioeconomic classes have better libraries, laboratories, information resources, etc. There is a much stronger correlation between quality of school infrastructure and socioeconomic status of students in Latin America than in the OECD countries. Countries with very good PISA test scores, like Estonia, Finland, Germany, the Republic of Korea and Slovenia, tend to distribute educational resources more equitably (see figure II.2).

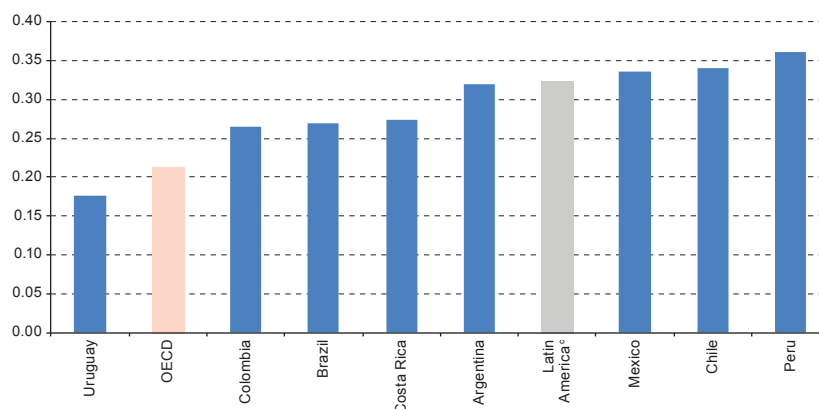
However, it is not enough to improve education and make access more equitable, though these are essential actions. There are two sides to the equation—supply and demand for skills—and both must be addressed simultaneously. Policies are needed to generate enough demand to absorb the more advanced skill sets that the education system, at all levels, will be supplying.

B. Demand for skills: innovation

The performance of the countries depends on their capacity to develop the homegrown competencies needed to innovate and disseminate innovation throughout their productive apparatus. Because competencies are used in specific activities, their accumulation leaves marks on the productive structure.¹ These marks are what the indicators of technological intensity of the productive apparatus used in this section are attempting to capture.

¹ See Narula (2004) and ECLAC (2012).

Figure II.2
Latin America and OECD (selected countries): correlation between the quality of schools' educational resources and the socioeconomic status of students, 2012^{a b}



Source: Organization for Economic Cooperation and Development (OECD)/Economic Commission for Latin America and the Caribbean (ECLAC)/CAF-Development Bank of Latin America, *Latin American Economic Outlook 2015: Education, skills and innovation for development*, Paris, OECD Publishing, 2014.

^a Schools educational resources include aspects such as scientific laboratory equipment, instructional material, computers, software, Internet connections and library material.

^b A value of 0 (minimum) represents no impact, while a value of 1 (maximum) represents full impact.

^c Includes Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay.

Productive diversification plays a role in sustaining long-term growth. There is a long analytical tradition that holds that growth and the productive structure are closely related. Antonio Serra, an Italian Renaissance economist, asserted that the wealth of a society could be determined by the number of professions that it had (Reinert and Daastol, 2011). The greater the number of professions in a city (or what could be referred to as the degree of labour division), the greater its prosperity would be. Nowadays, more sophisticated instruments must be used to capture the degree of diversification that an economy has achieved and the technological intensity of the activities it contains.²

Selecting an indicator for structural change (which is used synonymously with an increase in the technological intensity of the productive structure) is not easy. A major source of information is international trade data. One approach has been to study the composition of exports from the perspective of their technological intensity, using various available classifications.³ Another has been to use trade data to construct specific indicators that consider the interrelated criteria of diversification and technological intensity, such as the index of economic complexity (Hausmann and others, 2013). The indicators constructed with trade data have a number of advantages, including the availability of comparable data for long periods of time and large numbers of countries. However, in some cases, trade patterns do not correctly reflect local competencies.⁴ Accordingly, some authors have supplemented the use of trade indicators with others that capture an economy's innovation competencies (Griffiths, Reading and Simpson, 2004). These indicators should be viewed as useful but imperfect approximations. They include indicators of technological performance (patents, innovation), indicators of technological inputs (number of engineers, R&D) and indicators that express the weight in value added of important sectors in the generation and dissemination of

² The diversification and technological intensity of the economy have both supply and demand side effects on growth. On the demand side, an expansion in technology-intensive sectors offers a country the possibility of penetrating more dynamic markets (domestic and foreign) with above-average demand growth. On the supply side, an increase in the weight of these sectors contributes to stronger productivity growth and thus more robust growth of the economy as a whole (ECLAC, 2012).

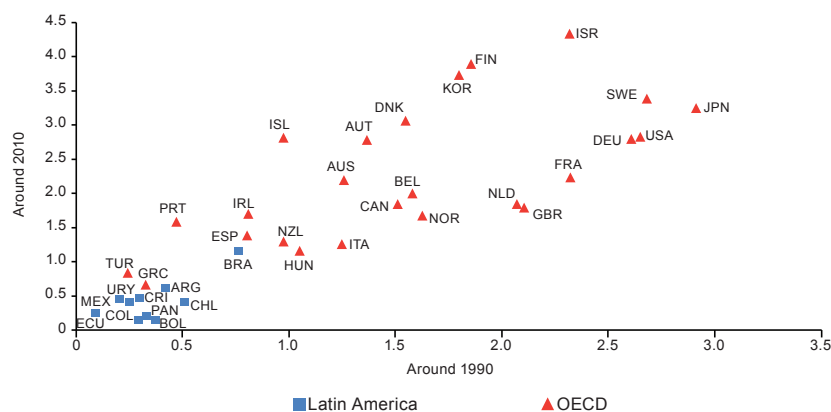
³ See, in particular, those suggested by Lall (2000) and OECD (2011).

⁴ For example, some exports of electronics goods from developing countries are statistically classified as originating from high-tech sectors when in reality they reflect the fragmentation of value chains into segments with very different levels of technological intensity. These countries are contributing low-cost labour, not the advanced competencies required to produce the most sophisticated parts in the supply chain (OECD/ECLAC/CAF, 2013).

innovation (such as the relative weight of engineering-intensive sectors). Three of these are described below: the most traditional indicators, R&D and patents and a new indicator, the stock of innovation capital.

Despite progress, R&D investment levels in Latin America still remain far below levels in the OECD countries. Figure II.3 shows the behaviour of R&D spending as a percentage of GDP at two points in time —1990 and 2010— for a very broad sample of countries in and outside the region. There are a few aspects that warrant attention in the figure.

Figure II.3
Latin America and the rest of the world (selected countries): R&D spending as a proportion of GDP, 1990 and 2010
(Percentages)



Source: Organization for Economic Cooperation and Development (OECD)/Economic Commission for Latin America and the Caribbean (ECLAC)/CAF-Development Bank of Latin America, *Latin American Economic Outlook 2015: Education, skills and innovation for development*, Paris, OECD Publishing, 2014.

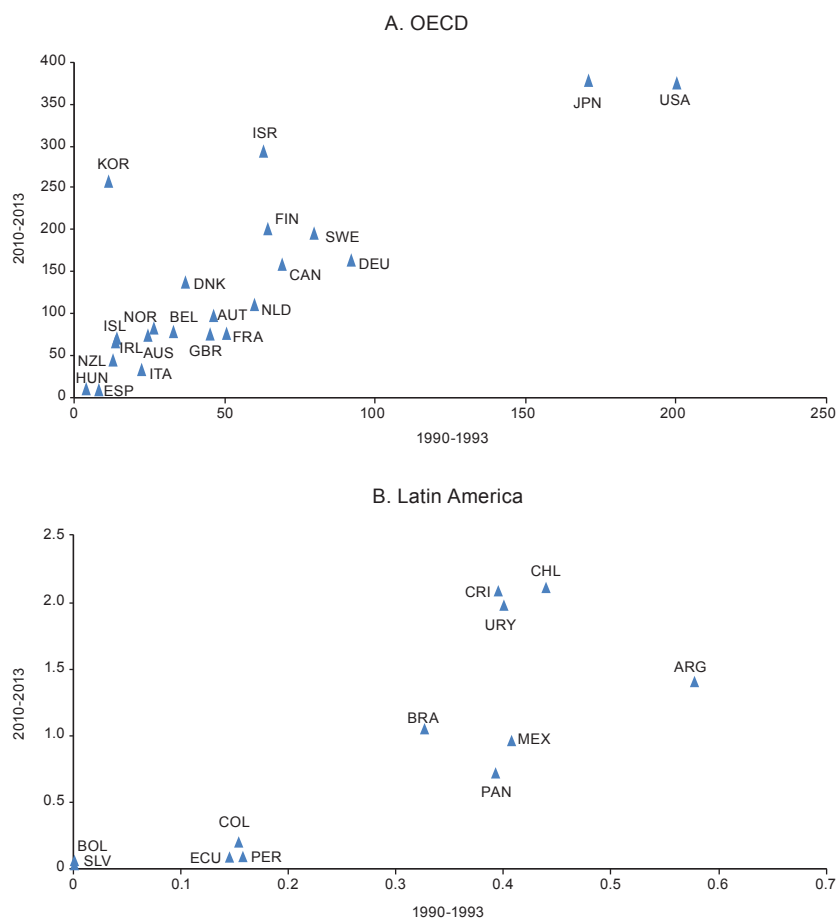
First, R&D spending increased in the vast majority of the countries. However, the rate of increase varied, based on which four groups of countries can be identified. In the first group, R&D spending in the 1990s was very low and remained so in 2010. This group includes all the countries in the region, albeit with varying levels of intensity (Brazil is a special case, investing approximately 1.2% of GDP in R&D). In the second group, R&D investment levels in the 1990s were in line with the average level among developed countries but have fallen behind in recent years (e.g. Italy and New Zealand). The third group includes a large number of developed countries that had high levels of R&D investment both in 1990 and in 2010. Lastly, the fourth group comprises a small number of countries that were identified as technologically behind in the 1990s but have made great strides in innovation and are now investing in R&D at rates that surpass the global average (e.g. China, Iceland and Ireland). Another interesting observation is that unlike in developed countries, in Latin America, it is the State, not the private or business sector, which invests most heavily in R&D (OECD/ECLAC, 2012).

A second indicator for analysing innovation potential is the use of knowledge protection mechanisms. In particular, the very low number of patents registered by countries in the region with the United States Patent and Trademark Office, compared with the number registered by OECD countries, is striking (see figure II.4). Whereas the OECD countries registered an average of 50 patents per year for every million inhabitants in 1990-1993, a figure that had climbed to 132 in 2010-2013, the corresponding numbers for the countries of Latin America were just 0.3 and 0.9, respectively. This is an extremely large gap that points up Latin America's weak innovation capacity.

Both the R&D and the patent indicators point to the weak innovation capacity of the countries of Latin America and the Caribbean.

An interesting exercise, with technical details that can be found in De Groot (2014), is to assign a value to the different flows of revenue and stocks of capital linked to technological innovation. These values can then be used to construct an indicator of the total stock of innovation capital in a country. This stock can be interpreted as the skills and infrastructure that are most directly related to the generation of innovations.

Figure II.4
Latin America and OECD (selected countries): number of patents per million inhabitants,
annual averages, 1990-1993 and 2010-2013



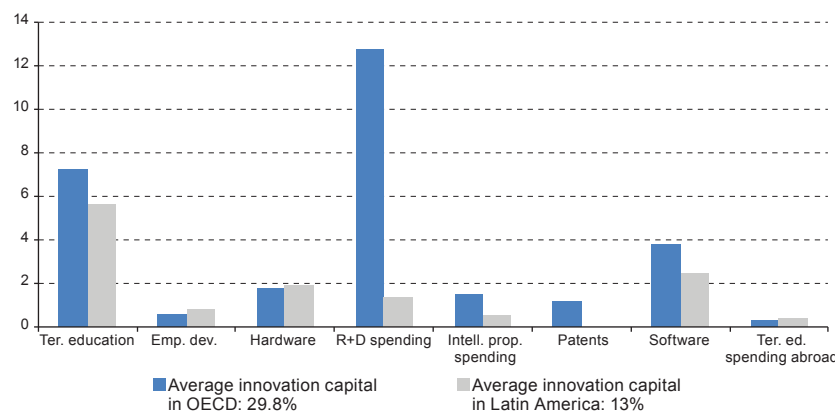
Source: Organization for Economic Cooperation and Development (OECD)/Economic Commission for Latin America and the Caribbean (ECLAC)/CAF-Development Bank of Latin America, *Latin American Economic Outlook 2015: Education, skills and innovation for development*, Paris, OECD Publishing, 2014.

The composition of innovation capital by its various sources in Latin America can be seen in figure II.5. Notably, the share of innovation capital created by R&D activities is much lower in Latin America than in the OECD countries. While the differences between the region and the OECD countries are not very significant in the tertiary education categories, they are sizeable in the R&D investment category.

Lastly, another variable that can shed light on the intensity of demand for skills in the region are the R&D projects associated with FDI. In this respect, Asia has easily outperformed Latin America. There was a sharp increase in the share of R&D investments by multinationals going to Asia, and especially to China (see figure II.6). In Latin America, the evolution has been less obvious, with a favourable trend in recent years appearing to dissipate in 2012. In fact, there was a significant increase of FDI in R&D projects in 2008-2012, but in 2013 the regional trend reverted to the levels observed during 2003-2007 and it is unclear to what extent it will be capable of resuming the positive trajectory of the previous five years.

The preceding indicators suggest that there is still a way to go for FDI to assume a more significant role in the region as a source of technology and skills. There are opportunities to explore in terms of designing new strategies to capture FDI with a larger R&D component and stronger linkage effects (productive and technological) with the recipient economy

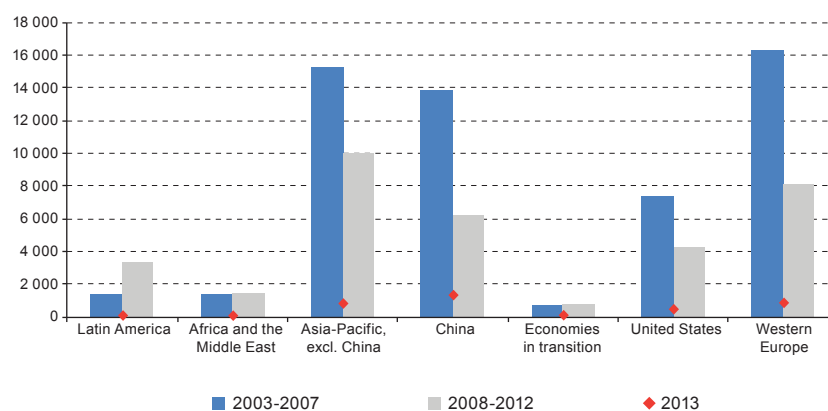
Figure II.5
Latin America and OECD (selected countries): composition of innovation capital,^a 2014
(Percentages of GDP)



Source: Organization for Economic Cooperation and Development (OECD)/Economic Commission for Latin America and the Caribbean (ECLAC)/CAF-Development Bank of Latin America, *Latin American Economic Outlook 2015: Education, skills and innovation for development*, Paris, OECD Publishing, 2014.

^a The variables used are: tertiary education expenditure, employee development, ICT infrastructure (hardware), R&D spending, intellectual-property expenditure, patents, software and databases (software), and tertiary education expenditure abroad.

Figure II.6
Selected regions and countries: R&D projects, 2003-2007, 2008-2012 and 2013



Source: Organization for Economic Cooperation and Development (OECD)/Economic Commission for Latin America and the Caribbean (ECLAC)/CAF-Development Bank of Latin America, *Latin American Economic Outlook 2015: Education, skills and innovation for development*, Paris, OECD Publishing, 2014.

C. The institutional setting

There is another dimension of Latin America's innovation potential that cannot be measured quantitatively but is no less important for that fact: the institutional environment. This aspect reflects the need to coordinate, manage and promote R&D activities. Over the past decade, the Latin American and Caribbean region has launched major institutional strengthening and reform initiatives in this area, which should be viewed as contributions without which innovation capital could not function.

First, efforts have been made to give science and technology institutions more political weight. This endeavor has taken various forms, including the creation of science, technology and innovation ministries (in Argentina, Brazil and Costa Rica), a ministerial innovation cabinet (in Uruguay) and specialized agencies (such as the Centre for Strategic Management and Studies (CGEE) of Brazil), along with national science and technology plans and efforts to consolidate information on innovation activities. Together, these three areas of activity seek to bring greater coherence to the policies. They constitute a step in the direction of the whole-of-government approach (OECD, 2007), which recognizes that innovation is the product of a set of conditions related to diverse areas of public policy that should be coordinated to produce the desired results. In addition, selective interventions for the promotion of innovation are on the rise in the region, as evidenced by the creation of technology funds and their use in calls for projects in priority sectors, the promotion of consortiums between science and technology firms and agents, policies to support clusters in Chile and the sector fund experience in Brazil. In the case of Chile, the revenue from a royalty levied on all mining operations was used to finance cluster development in priority sectors. Although the matter of whether of that strategy would be continued was debated in the 2010-2013 period, the government recently launched the Agenda for Productivity, Innovation and Economic Growth for 2014-2015, which calls for measures including the promotion of productive diversification and incentives for sectors with strong growth potential. In the case of Brazil, sector funds became the largest source of financing for innovation at the federal level. They also served as a mechanism for more effectively involving agents in policy implementation and engaging a segment of the science and technology system that had been isolated from the productive sector (Rivas, Rovira and Scotto, 2014).

Thus, the region has transitioned towards a stronger institutional framework with more political weight by taking up innovative promotion instruments that overcame the horizontal policies of the 1990s. Nevertheless, it is still a very long way from having an effective innovation and technology transfer system. Brazil is the country that has made the most progress towards a comprehensive public policy in this area, which it has done by setting up sector funds and linking innovation objectives with industrial policy. But in most of the region, a limited and compartmentalized vision of interventions prevails in the areas of development, scientific and technological competencies and industrial policy.

In short, the impact of innovation capital should be seen in conjunction with the institutional framework for science and technology policies. Major strides have been made in this regard, especially in terms of institutional strengthening and interagency coordination, as well as in the design and implementation of new instruments. However, there is still much work to do to lock in this progress.

III. Conclusions and policy implications

The region should expand the supply of quality education and use it as an effective instrument for achieving equality. Education levels in Latin America are limiting the region's ability to diversify into more complex productive processes. Access to education in the region is highly unequal and breaks along income and socioeconomic lines, which means that education is perpetuating inequality and low productivity.

Developing more diversified and sophisticated competencies is essential. Developing competencies at various levels —at companies and also within the institutional environment that coordinates and spurs innovation and the production structure— is an item of unfinished business for Latin America. The region has moved forward on many fronts over the last decade, from macro stability to the reduction of poverty and inequality, but it will be impossible to lock in these advances, in open economies, until parallel progress is made on other fronts to increase productivity, create quality jobs and reduce informality. Developing competencies is key to this endeavor.

In general, the region continues to have very low levels of investment in innovation, although varying degrees of commitment to science, technology and innovation have been identified. A major problem affecting Latin America —and one that is linked to its low productivity— are the low levels of innovation capital and its composition, which is very light on the most creative activities associated with R&D. The institutional structure is also weak and has failed to significantly increase spending on R&D, especially spending by the private sector.

In comparative terms, investment in R&D has been much more robust in other regions, such as Asia. Although there is some learning potential around FDI, that option requires linking investment flows with structural change and innovation policies. The available data suggest that although there was a positive FDI trend in R&D projects over the past decade, it has not been consolidated.

In order to disseminate best practices, active policies and coordinating institutions in science and technology are needed to help overcome the traps of limited achievement and low productivity. There are still strong asymmetries in productivity between companies and sectors. Industrial policy over the next several decades must be built on the accumulation of competencies in new technologies and a focus on innovation that is oriented toward sustainability, broadly defined as economic, social and environmental. Having competencies, or not, in new technologies determines who will be competitive, in which sectors, and who will have, or not have, a place in the international division of work in the future. At the same time, the direction of innovation matters. There are rigidities and obstacles to technological change, but there is no genetic code that determines a priori how it will be used and what its impact on society will be. It is up to institutions —through policies and changes in the rules of behaviour and sociability— to create incentives to ensure that technological change processes make environmental considerations and social inclusion a priority. Both aspects can complement greater competitiveness. Steps should be taken to avoid the risk of the region becoming a mere importer of more environmentally friendly technologies. Homegrown

competencies must be developed to prepare the region for the technological revolution, not only as a consumer but also as a producer of green technology.

The development policy of the future is defined both by its emphasis on new technologies and its goals, which are about sustainability at all levels. Institutions should act now to create incentives for innovation and competitiveness based on these objectives and should respond later to correct any market outcomes that distance society from the defined objectives. To that end, institutions in charge of innovation need to develop their strategies and define their fields of action based on technological prospecting and a long-term vision.

The need to redouble efforts to improve innovation competencies and capacities in the countries of Latin America and the Caribbean paves the way for a renewed agenda of regional cooperation in science, technology and innovation. Scientific and technological development is a highly complex and unpredictable enterprise that requires large high-risk investments made over the long term, factors that are often difficult for the region's countries to contend with individually. One possible answer is to create bilateral or multilateral spaces for technological and productive development. Ministries and institutes of science, technology and innovation are now exploring this idea. For example, in the framework of the first session of the Conference on Science, Innovation and Information and Communications Technologies,⁵ the countries of Latin America and the Caribbean have agreed to move ahead with productive integration through regional projects that allow for greater social appropriation of knowledge. They are working to identify projects in the areas of telemedicine, assisted technology, additive manufacturing, backward-linked chains for electronics and electrical equipment, and distributed generation wind and solar photovoltaic energy.⁶

⁵ See [online]: http://www.cepal.org/socinfo/noticias/noticias/1/53091/Declaracion_de_Santiago.pdf.

⁶ See ECLAC/CGEE/GIZ (2014).

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