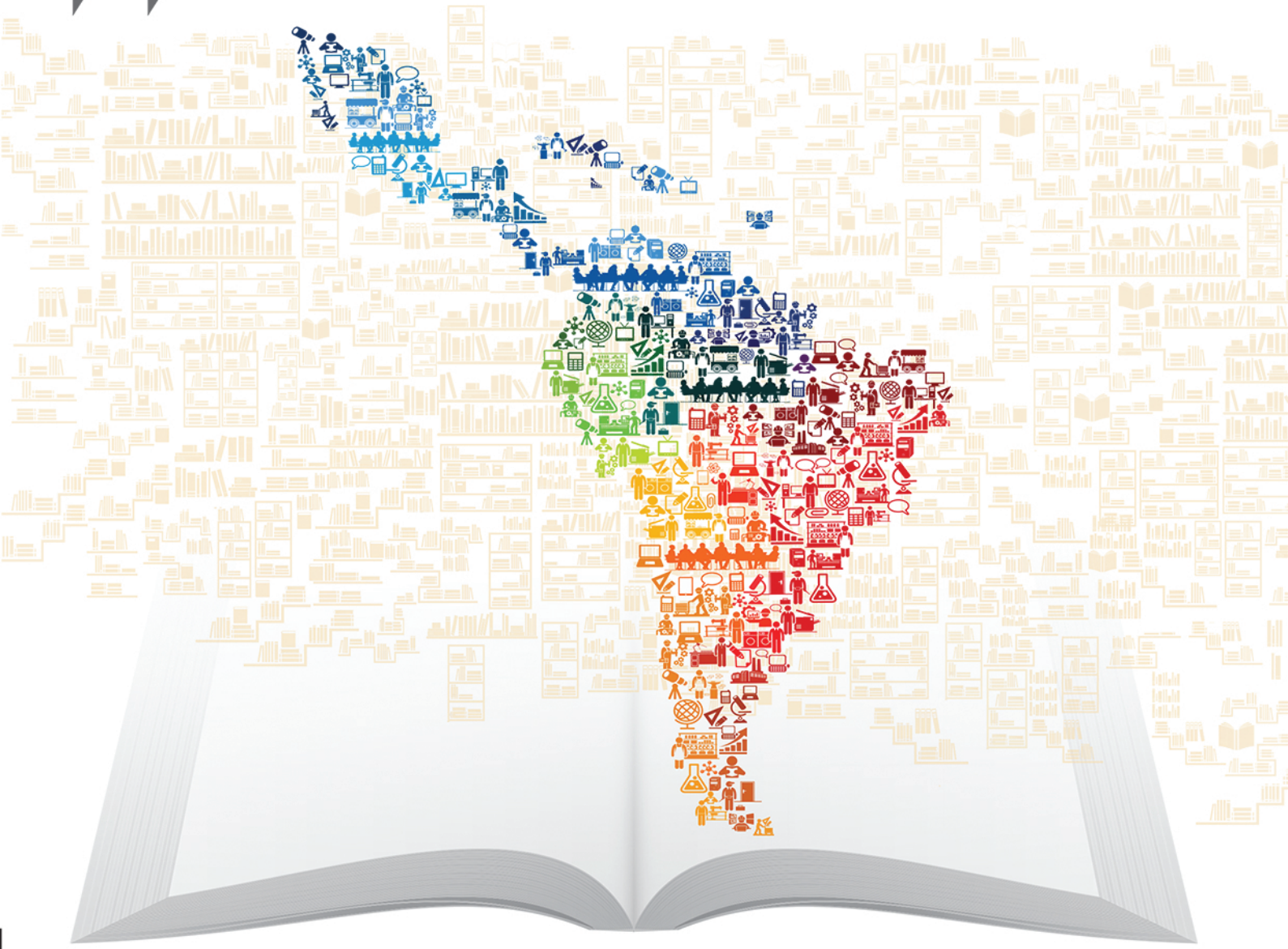
Latin American Economic Outlook 2015

EDUCATION, SKILLS AND INNOVATION FOR DEVELOPMENT



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UNITED NATIONS ECLAC

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Foreword

The *Latin American Economic Outlook* analyses issues related to Latin America's economic and social development. Ever since the first edition was launched at the 17th Ibero-American Summit of Heads of State and Government in November 2007 in Santiago (Chile), the report has offered a comparison of Latin American performance with that of other countries and regions in the world, sharing experiences and good practices with the region's public officials.

Since 2011, the report has been published in conjunction with the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) and has tied in with the economic theme of the annual Ibero-American Summit organised by the Ibero-American governments and Ibero-American General Secretariat (SEGIB). In 2013, CAF – development bank of Latin America (CAF) joined the team of authors. This edition was released during the 24th Ibero-American Summit of Heads of State and Government, held in the Mexican city of Veracruz on 8-9 December 2014.

Each edition includes a macroeconomic analysis and explores how the global context influences the region's economy. The report also includes chapters that analyse key public-policy areas identified by leaders gathered at the Ibero-American Summits, thus analysing and making recommendations about the region's challenges and priorities regarding economic development and structural policies.

This eighth edition focuses on education, skills and innovation as key inputs for more inclusive growth in the region. It provides in-depth analysis of Latin America's education systems and the region's capacity to increase enrolment in good-quality education, and looks at the development of skills training to improve economic competitiveness and labour-market integration. These inputs are analysed in association with innovation policies in the production system.

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Table of contents

Acronyms and abbreviations 11

Editorial 13

Executive summary 15

Chapter 1. **Education, skills and innovation for a more dynamic, inclusive Latin America** 17
From a short-term economic slowdown to reforms in the long run? 18
Education, skills and innovation are key factors in achieving more dynamic and inclusive growth 20
Improving labour skills to adapt to and benefit from *shifting wealth* 21
Educating citizens for inclusive growth 23
Innovation as an input of productive-development policies 26
References 28

Chapter 2. **Latin American macroeconomic outlook** 29
The challenging global environment is having a marked impact on Latin America 31
Situation and outlook in Latin America 38
Conclusions and policy recommendations 54
Annex 2.A1. Methodology for identifying temporary resource booms 55
Notes 57
References 59

Chapter 3. **Skills in Latin America and the Caribbean amid shifting wealth** 61
The limited role of skills in Latin America explains why the region remains in the middle-income trap 62
Shifting wealth impacts supply and demand for skills in various ways 65
Latin America is struggling more than other emerging regions to meet demand for skills 67
The relationship between supply and demand for skills in the labour markets can be analysed by the distribution of workers and by the returns to education 71
Conclusions and policy recommendations 81
Notes 83
References 84

Chapter 4. **Education and skills for inclusive growth in Latin America** 87
Education and skills have a considerable impact on the population's economic and social well-being 88
Towards more effective investment in education to boost enrolment rates and quality 91
Three inequality factors persist in education and in labour-market access: socio-economic background, gender, and rural vs. urban areas 103
Education policies in Latin America must deal with major challenges 114
Conclusions and policy recommendations 121
Annex 4.A1. Summary of messages and policy recommendations 123
Notes 126
References 127

Chapter 5. **Innovation for development in Latin America** 133
The structural change in the production system is essential for Latin America to achieve sustainable, long-term growth 134
Latin America has a significantly smaller stock of knowledge-based capital than the OECD economies 139
Foreign direct investment: An opportunity for innovation in the region 144
Conclusions and policy recommendations 155
Notes 157
References 158

Country notes 161

Argentina 162
Brazil 164
Chile 166
Colombia 168
Costa Rica 170
Dominican Republic 172
Mexico 174
Panama 176
Peru 178
Uruguay 180
Methodological note 182

Figures

1.1. GDP growth in Latin America and the Caribbean and the OECD 18
1.2. The *middle-income trap* in Latin America and the Caribbean 20
1.3. Share of firms identifying an inadequately educated workforce as a major constraint to their operations 22
1.4. High school student performance and equity 24
1.5. Correlation between the quality of schools' educational resources and students' socio-economic status in selected Latin American and OECD countries 25
1.6. Level and composition of innovation capital, Latin America vs. OECD countries (% GDP) 27
2.1. Volume of global trade in goods and services and changes in export and import prices 31
2.2. Chinese loans to Latin American governments and firms (2005-13) 34
2.3. Selected commodity prices 35
2.4. Monetary policy in the industrialised economies 36
2.5. Ten-year US treasury bond yields and sovereign spreads of emerging countries and Latin America 37
2.6. Portfolio flows to emerging economies 38
2.7. Resource booms and the output gap 43
2.8. Effects of shocks on commodity exports and on short-term capital flows: Impulse-response functions 44
2.9. The effects of shocks to US growth, long-term US interest rates and terms of trade: Impulse-response functions 45

2.10. Current account deficit and capital flows (% GDP, 2013) 46
2.11. Latin America: External debt (% GDP) 48
2.12. Private sector accumulation of foreign assets and liabilities (% GDP) 49
2.13. International reserves in Latin America 50
2.14. Structural primary fiscal balance (% GDP) 51
2.15. Monetary policy indicator in Latin America 53
3.1. Middle-income trap in selected Latin American and OECD countries 64
3.2. Population by education level 65
3.3. Percentage of firms that believe an inadequately educated workforce is a major constraint on their operations, by region 67
3.4. Percentage of firms that believe an inadequately educated workforce is a major constraint on its operations, by country and income per capita 68
3.5. Median of product-space variables 70
3.6. Workers by education level and occupation, according to skill level 73
3.7. Performance gap between mainstream and vocational schools 77
3.8. Wage premiums in Latin America, 1995-2010 80
4.1. Quality of education and labour productivity: Partial correlations 90
4.2. Secondary-school performance and equity in education 91
4.3. Government expenditure per student as % of GDP per capita, circa 2012 92
4.4. Enrolment rates as % by level of education 94
4.5. Effects of pre-primary education on secondary education 95
4.6. Effect on performance in mathematics 100
4.7. Distributive impact of public spending on education on Latin America's middle statuses 104
4.8. Net enrolment rates by income quintile in Latin America (%), 2011 105
4.9. Correlation between the quality of schools' educational resources and students' socio economic status 106
4.10. Performance differences between private and public schools 108
4.11. Performance differences between urban and rural schools 111
4.12. Performance differences between boys and girls 112
4.13. Student motivation and problem-solving effectiveness 117
5.1. BERD intensity, selected countries: 2002 and 2012 (or nearest available year) 135
5.2. R&D spending as a percentage of GDP 137
5.3. Number of patents per million people 137
5.4. Composition of knowledge-based capital in Latin America and in the OECD countries 142
5.5. Foreign direct investment by sector: Selected countries 144
5.6. Technology intensity of FDI in the Latin American manufacturing industry 145
5.7. R&D projects announced, by period and region 145
5.8. Average productivity by productivity group in sectors grouped by technology intensity, Brazil 150
5.9. Innovative effort of Argentinian industry and the plastics sector 152
5.10. Innovative industrial SMEs in the rubber and plastics sector 152

Tables

2.1. Temporary booms in Latin America (selected countries) 40
2.2. Temporary booms and output gap in Latin America 41
2.3. Resource booms and the trend output growth 42
2.A1.1. Temporary resource booms 56
3.1. Classification of employment by occupation (ISCO-88) 72
5.1. Indicators of the production structure's technology intensity, 2007 138
5.2. Variables used to compile the knowledge-based capital estimation 140
5.3. R&D projects in the total reported greenfield foreign investment 146

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Acronyms and abbreviations

BBVA	Banco Bilbao Vizcaya Argentaria
BNDES	Brazilian Development Bank (Banco Nacional de Desenvolvimento Econômico e Social)
BRICS	Brazil, Russia, India, China, South Africa
CAF	CAF – Development Bank of Latin America (Banco de Desarrollo de América Latina)
CEDLAS	Center for Distributive, Labor and Social Studies (Centro de Estudios Distributivos, Laborales y Sociales)
CELADE	Latin American and Caribbean Demographic Centre (Centro Latinoamericano y Caribeño de Demografía)
CEPALSTAT	ECLAC databases and statistical publications
CEQ	Commitment to Equity
CIAT	Inter-American Center of Tax Administrations
CIEPLAN	Corporación de Estudios para Latinoamérica
COMTRADE	United Nations Commodity Trade Statistics Database
CONICET	National Scientific and Technical Research Council (Consejo Nacional de Investigaciones Científicas y Técnicas), Argentina
ECB	European Central Bank
ECLAC	Economic Commission for Latin America and the Caribbean
ESCS	Economic, social and cultural status
FDI	Foreign direct investment
FED	Federal Reserve System
GDP	Gross domestic product
HEIs	Higher education institutions
IBRD	International Bank for Reconstruction and Development
ICTs	Information and communication technologies
IDB	Inter-American Development Bank
IIF	Institute of International Finance
ILO	International Labour Organization
IMF	International Monetary Fund
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
LA	Latin America
LAC	Latin America and the Caribbean
LLECE	Latin American Laboratory for Assessment of the Quality of Education (Laboratorio Latinoamericano de Evaluación de la Calidad de la Educación)
MHTE	Medium- and high-tech exports
MILA	Integrated Latin American Market
MINCyT	Ministry of Science, Technology and Productive Innovation (Ministerio de Ciencia, Tecnología e Innovación Productiva), Argentina

NBER	National Bureau of Economic Research
OECD	Organisation for Economic Co-operation and Development
OEI	Organisation of Ibero-American States for Education, Science and Culture (Organización de Estados Iberoamericanos para la Educación, la Ciencia y la Cultura)
OREALC	Regional Bureau of Education for Latin America and the Caribbean (Oficina Regional de Educación para América Latina y el Caribe)
PIAAC	Programme for the International Assessment of Adult Competencies
PISA	Programme for International Student Assessment
PPP	Purchasing power parity
RIACES	Ibero-American Network for Quality Accreditation in Higher Education (Red Iberoamericana para la Acreditación de la Calidad en la Educación Superior)
RICYT	Red de Indicadores de Ciencia y Tecnología
R&D	Research and development
SECO	State Secretariat for Economic Affairs, Switzerland
SEDLAC	Socio-Economic Database for Latin America and the Caribbean
SERCE	Segundo Estudio Regional Comparativo y Explicativo
SMEs	Small and medium-sized enterprises
TLTROs	Targeted long-term refinancing operations
TVET	Technical and vocational education and training
UIS	UNESCO Institute for Statistics
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UNODC	United Nations Office on Drugs and Crime
USPTO	United States Patent and Trademark Office
WDI	World Development Indicators
WTO	World Trade Organization

Editorial

Latin America is continuing to experience the economic slowdown that began in 2010. Average growth has lost ground on that of the OECD countries. These developments are due to both internal factors and the less favourable external environment over the past five years, during which the slowdown in the Chinese economy has reduced demand for commodities and therefore brought down commodity prices. In addition, the United States has announced that it will tighten monetary conditions. Although the situation varies greatly from one country to another, the current context underlines the need for all Latin American countries to boost productivity and potential growth. Only then will the significant progress made over the past ten years in reducing poverty and inequality be consolidated.

Better education throughout Latin America, a better-skilled present and future workforce, a more innovation-friendly environment and improved innovation policies are undoubtedly essential factors for inclusive growth in the region.

Overcoming the middle-income trap, a typical feature in Latin America, will require measures to promote labour-market integration. Productivity boosts have been disappointing compared with those in developed economies and other emerging economies. The informal economy remains too large, also affecting the new middle class. Moreover, more than in any other region in the world, companies report that in Latin America they struggle to find employees with the necessary skills to conduct their business. It is therefore urgent to improve the linkages between education and production, bolstering technical training programmes, among others.

Education is a driver of economic growth, but also plays a vital role in training future citizens and building more inclusive, more equitable societies. The efforts of the last 20 years to increase enrolment in education and improve its quality at all stages should therefore continue. The number of years of schooling in Latin America remains below the level seen in developed economies. The lower quality and performance in Latin American education further widens the gap. Women as well as people from poorer socio-economic backgrounds and rural areas face even greater challenges.

Solutions must be accompanied by a firm commitment to innovation. Only in an innovation-friendly environment can it be ensured that a better education and more suitable job skills will strengthen the region's competitiveness, raise productivity and promote the diversification of production to bring about the much-needed structural transformation.

This edition of the *Latin American Economic Outlook* sets out the current challenges faced by the region in all these areas. It also makes specific recommendations to promote a more dynamic, more inclusive growth through education, skills and innovation.

The report presents valuable experiences and best practices in these areas, both in Latin America and in OECD countries, thus proposing policies and strategies to remove the bottlenecks and structural restrictions that are holding back Latin America's economic and social development. We hope this joint effort by CAF – development

bank of Latin America, the Economic Commission for Latin America and the Caribbean (ECLAC) and the Development Centre of the Organisation for Economic Co-operation and Development (OECD), presented at the 24th Ibero-American Summit of Heads of State and Government in Veracruz (Mexico) in December 2014, will contribute to policy discussions on improving education, skills and innovation in Latin America and Caribbean economies and consolidating a more socially inclusive development strategy in the region.

Alicia Bárcena Executive Secretary ECLAC	Enrique García Executive Chairman CAF – development bank of Latin America	Angel Gurría Secretary-General OECD

Executive summary

The pace of Latin American economic growth will be the slowest in the past five years. According to forecasts, the region's economy will grow by 1-1.5% in 2014 (compared with 2.5% in 2013 and 2.9% in 2012), before recovering slightly in 2015 to 2-2.5%. External factors contribute to this slowdown, including lower commodity prices, mainly due to the economic slowdown in the People's Republic of China, as well as the rising cost of external financing and more restrained capital inflow prospects. Although growth levels vary from one country to another, partly because of different economic management strategies, these projections signal the end of a ten-year period during which Latin America has seen higher growth than the OECD average.

Structural reforms must continue in order to boost potential output and equity. Productivity growth remains modest compared to that of the OECD countries and other emerging economies and, despite recent improvements, Latin America remains the world's most unequal region. Most significantly, commodity booms and short-term capital flow booms have not raised the region's growth potential. **Reforms to strengthen education, skills and innovation must foster higher growth potential and higher productivity by improving workers' skills.** They must also ensure equal opportunities in access to high-quality training. The current political context presents an excellent window of opportunity, with 14 presidential elections having been held in Latin America in the three years from 2012 to 2014. The region's well-being, especially in the long run, will depend on whether governments make the most of this opportunity.

These reforms are essential to escape the *middle-income trap* and better position the region within the shifting wealth process towards the emerging countries. Unlike certain European and Asian countries that have achieved high incomes in recent decades, the countries in the region have not made considerable progress in closing the income gap with the advanced economies, with the exception of Chile, Uruguay and some Caribbean economies. For the region to integrate better into the shifting wealth process, it will need more skills, including soft skills, so it can adapt better and find competitive niches more efficiently in the changing economic environment. Currently, Latin American firms in the formal economy are 3 times more likely than South Asian firms and 13 times more likely than Pacific-Asian firms to face serious operational problems due to a shortage of human capital. This problem is compounded by the high informality among workers and in the business community.

Various courses of action are needed in both mainstream education and technical training in order to improve job skills. In addition to the high proportion of low-skilled workers in jobs requiring basic skills, returns to education have been in decline for more than ten years. Investment must be made in improving education programmes and technical and professional training. Courses related to general or soft skills are particularly important, since they assist in labour-market access at the end of the training period and allow current workers to adapt to a changing labour market by updating their skills. National and regional qualifications frameworks are needed for the recognition and transferability of skills acquired in formal and informal settings. Co-ordinated public-private sector co-operation is essential to achieve these goals.

Education should be seen as a driver of economic growth, but also of social inclusion and greater equality. Latin America needs to understand education as a vector for greater

social cohesion and more inclusive growth, because the region's development will be shaped largely by the policies it adopts in this area. Greater and better investment in education is therefore a priority for the countries in the region to continue to drive up enrolment and boost quality.

Latin America has taken great strides in education investment, but is still faced with the big challenges of increasing the provision of good-quality education at most levels. Public investment in education in the region has risen considerably in recent years and now accounts for more than 5% of GDP on average (vs. 5.6% average for the OECD countries). As a result, there is now almost universal access to primary education. However, enrolment remains low in pre-primary education (66% of the pre-primary aged population in Latin America in 2012, compared with 83% in the OECD countries), as well as in secondary education (74% vs. 91% in the OECD countries) and tertiary education (42% vs. 71% in the OECD countries). The quality of education is also poorer. In secondary education, the gulf between the performance of Latin American students and that of students in the OECD countries is equivalent to more than two years of schooling according to the 2012 PISA tests.

A combination of policies could improve the quality of education for all students. Early education must continue to expand its coverage, thus fostering the development of soft skills such as interpersonal skills and perseverance, which are central to the future labour market. Governments should bolster policies that provide incentives to retain and motivate high-quality educators by introducing stringent recruitment procedures. School policies, which do not necessarily require large-scale resources, have proved to be effective, so it is important to promote a learner-friendly disciplinary environment and provide opportunities for all students through pedagogical factors such as classroom hours and teachers' expectations of students' performance. Education resources must foster better performance by students from poorer socio-economic backgrounds. Finally, it is essential to improve schools' evaluation and accreditation systems.

Efforts to improve education and job skills must be accompanied by greater innovation. The stock of innovation capital – an additional measure of skills – is far lower in Latin America (13% of GDP) than in OECD countries (30% of GDP). Furthermore, in Latin America it consists mainly of the stock of tertiary education, whereas in the OECD countries it consists mainly of R&D expenditure. R&D expenditure is generally much lower in Latin America than in the OECD countries, with little support from the business sector. It is of paramount importance to strengthen developments in governance for science and technology institutions so that an efficient, comprehensive institutional framework can be developed to disseminate technology and innovation. To promote additional resources, attracting foreign direct investment would provide an opportunity to develop skills and innovation in Latin America, but only if the investment flows are more closely tied to policies on innovation and structural change.

Chapter 1

Education, skills and innovation for a more dynamic, inclusive Latin America

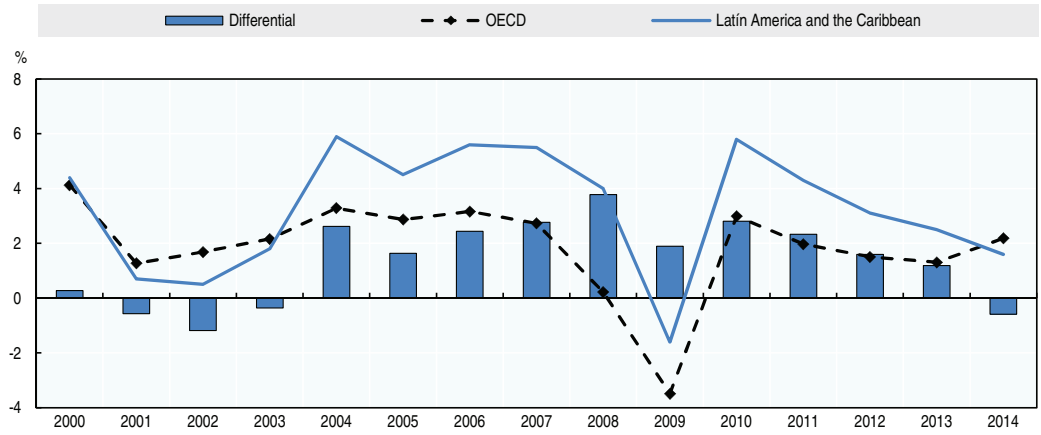
This chapter provides an overview of macroeconomic trends in Latin America and analyses the role of education, skills and innovation for development by looking at the current situation in the region and identifying the main challenges and opportunities in those areas.

From a short-term economic slowdown to reforms in the long run?

The economic slowdown that began in Latin America in 2010 is continuing

The region will continue to grow, casting aside fears of a crisis that arose in the second half of 2013 and early 2014. The pace of growth, however, will be the slowest in the past five years (Figure 1.1). According to forecasts, the region's economy will grow by 1-1.5% in 2014 (compared with 2.5% in 2013 and 2.9% in 2012), less than the OECD average for the first time in ten years. In 2015, growth is expected to pick up slightly, reaching 2-2.5%. These developments will be driven by the less favourable international climate of the past five years, due to lower commodity prices (especially for metals and minerals), and the economic slowdown in the People's Republic of China (hereafter "China"). Also of note is the rising cost of external financing and more restrained capital inflow prospects due to the tightening of US monetary policy.

Figure 1.1. **GDP growth in Latin America and the Caribbean and the OECD**
(annual %)



Source: OECD (2014), *OECD Economic Outlook*, Vol. 2014/1, OECD Publishing. http://dx.doi.org/10.1787/eco_outlook-v2014-1-en; ECLAC (2014), Economic Survey of Latin America and the Caribbean 2014: Challenges to Sustainable Growth in a New External Context, Economic Commission for Latin America and the Caribbean, Santiago, Chile; and projections by the Economic Commission for Latin America and the Caribbean (ECLAC) and CAF – Development Bank of Latin America.
StatLink http://dx.doi.org/10.1787/888933174156

The differences in economic growth among countries in the region could increase due to the uneven impact of the external context as well as domestic factors. In 2014, the fastest growing economies in Latin America are expected to be the Plurinational State of Bolivia, Colombia, Costa Rica, Ecuador, Panama, Peru and the Dominican Republic, which will grow by between 4% and 7% according to projections. Much slower growth is projected for the region's two biggest economies: Mexican growth will rebound to around 2.5% (similar to the figure for Chile) and Brazilian growth will be less than 1%. Finally, Argentina and the Bolivarian Republic of Venezuela are projected to record negative growth. These differences in growth rates among the region's countries are explained by both the varying impact of the international climate (especially the different changes in commodity prices) and internal factors such as those related to economic management.

Economic growth in Latin America could be lower if the Chinese slowdown worsens and, to a lesser extent, if financial conditions tighten more rapidly in the United States.

In the baseline scenario, the Chinese economy is slowing, but will continue to grow in the coming years. However, although the measures available to China (credit and investment projects) seem to be sufficient to maintain the country's economic dynamism, they would reverse the rebalancing of growth towards higher consumption, thus increasing the medium-term risks to global demand. Recent monetary-stimulus policies adopted in Europe seem to have reduced the impact of international financial conditions. In the United States, this process is probably the result of a more dynamic economic recovery, which will drive up external demand for Latin America. The situations in Eastern Europe and the Middle East have generated an additional geopolitical risk that could affect international trade and, in the longer term, the energy supply.

The frequent short-term commodity and capital booms have made economic activity in Latin America more volatile without increasing trend growth.

Almost all Latin American and Caribbean countries have experienced periods with large inflows of foreign currency in the form of exports of natural resources (food, minerals and fuels), remittances, short-term capital flows or foreign direct investment (FDI). Referred to hereafter as "commodity booms" when the inflows are significantly higher than the historical average for at least three years, these periods have been particularly frequent in South America. Since the mid-1960s there have been 3.3 booms per country in South America, 1.5 per country in high-income countries and 1.4 per country in Central America and the Caribbean. Each boom contributed 6 percentage points to GDP over the course of nearly three years.

Over the past five decades, the output gap increased during the booms and turned negative afterwards, thus increasing the volatility of economic growth. This was particularly true of booms in short-term capital flows, food and minerals, which have shaped the external environments during the past decade. Moreover, in the countries that experienced the booms, no positive impact on the growth trend was observed either during or after them.

The main concern is that the low growth rates of around 3% for Latin America over the next few years are not indicative of a temporary slowdown but rather of lower potential growth.

Potential growth in Latin America has been estimated at between 3% and 4% a year over the past ten years, which is slightly below the growth recorded during the most recent period of expansion, from 2004 to 2008. However, the slowdown has continued since 2010 as the international situation, which undoubtedly boosted economic activity in the past, has worsened, so the "new normal" for the region may well be lower than previously expected.

In the short run, all Latin American countries should rebuild their monetary and fiscal response capacities to counter the more adverse economic scenario.

The countries in the region need to strengthen their financial and fiscal framework – some more than others – by expanding their fiscal space. They also need to maintain the credibility of their central banks in running a countercyclical monetary policy, which has tended to be accommodative in the face of weak growth. The measures required to expand their fiscal space will vary from country to country. Some, such as the Central American and Andean countries and Mexico, will need to expand their tax bases, while others, especially in South America, will need to change the composition of their public

spending. In the Caribbean, meanwhile, governments need to continue their efforts to ensure that fiscal policy remains sustainable, especially government debt. It is important that all countries set up automatic stabilisers (especially for their expenditure, but also for their revenues) and have access to macroprudential frameworks and stabilising tools, with the conditions for their use clearly defined.

In the long term, this modest outlook is a reminder of the need to move forward in implementing structural reforms to boost potential growth and equality. Key reforms include strengthening education, skills and innovation.

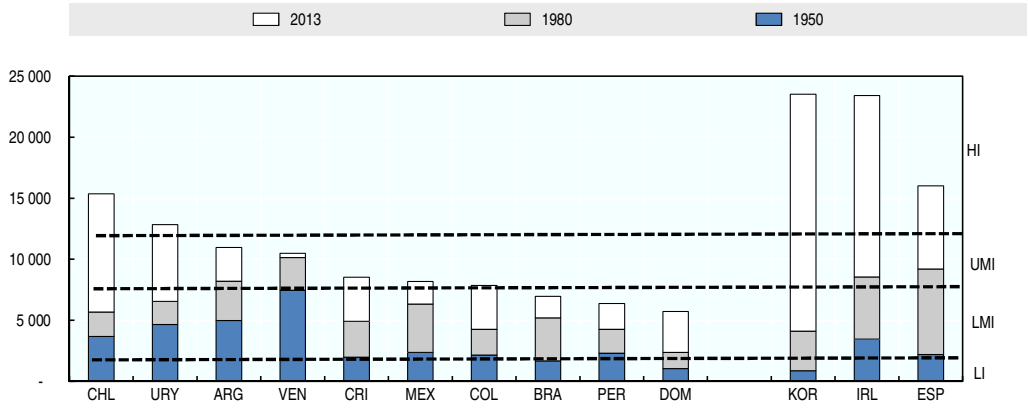
Latin America's productivity in recent years has been disappointing compared with that of both OECD countries and emerging economies. Stronger productivity would lead to more inclusive growth and would reduce the already high inequality and poverty rates. Education and innovation reforms must ensure equal opportunities for access to a complete, high-quality cycle of education and a workforce with better skills thanks to better matches with the labour market. There must also be measures to promote formal employment. The current political context presents an excellent window of opportunity, with 14 presidential elections having been held in Latin America in the three years from 2012 to 2014. The region's well-being, especially in the long run, will depend on whether governments make the most of this opportunity.

Education, skills and innovation are key factors in achieving more dynamic and inclusive growth

The *middle-income trap*, whereby GDP growth slows down once an intermediate level of development has been reached, is particularly persistent in Latin America.

Although income in the region was relatively high in the mid-20th century, the countries have made no considerable progress in closing the income gap with advanced economies, unlike certain European and Asian countries that have achieved high-income country status (Figure 1.2). In Latin America and the Caribbean, only Chile, Uruguay and a few Caribbean countries are high-income countries.

Figure 1.2. **The *middle-income trap* in Latin America and the Caribbean**
(GDP per capita, USD PPP 1990)



Note: GDP per capita at PPP in USD at constant 1990 prices. LI refers to low income, LMI to lower-middle income, UMI to upper-middle income and HI to high income.

Source: Authors' calculations based on World Bank (2014), *World Development Indicators* (database), Washington, DC, http://data.worldbank.org based on the methodology designed by Felipe, Abdon and Kumar (2012): "Tracking the middle-income trap: what is it, who is in it, and why?", *Working Paper*, No. 715, Levy Economics Institute, April.

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Education, skills and innovation are key areas to enable more Latin American countries to escape the middle-income trap and strengthen the region's *emerging middle class*.

Improvements to the stock and quality of education and skills, together with a stable macroeconomic context and an innovation-friendly environment, determine countries' capacity to direct their growth models towards higher value-added activities. Investment in human capital drives long-term economic growth and is an essential part of any inclusive-growth strategy. It is therefore necessary to improve equality of opportunity and social mobility by limiting the effect of people's socio-economic background and informal employment on their access to high-quality education at all levels.

Improving labour skills to adapt to and benefit from *shifting wealth*

***Shifting wealth* towards emerging countries has a strong impact on the supply and demand of labour skills.**

The integration of China and India alone into the global economy provided 1.2 billion new workers. Initially they had only basic skills, but both countries have vastly increased the percentage of the population with secondary or tertiary education. Thus the percentage of working-age people with secondary or tertiary education in emerging countries rose from 36% in 1980 to 56% in 2010. Meanwhile, this larger stock of skills is allowing some emerging countries to rapidly accumulate technology. This situation makes it more difficult for countries that are competitors and trading partners to define their skills-training strategies, especially in Latin America. On the one hand, demand for commodities discourages the development of knowledge-intensive activities, while on the other, China is competing as the "global factory" (a label that refers to the country's capacity to develop comparable advantages among a range of manufacturing industries). Moreover, the shifting wealth process has increased demand not only for better skills but also for soft skills, which allow greater adaptability and a more efficient search for competitive niches in a changing environment.

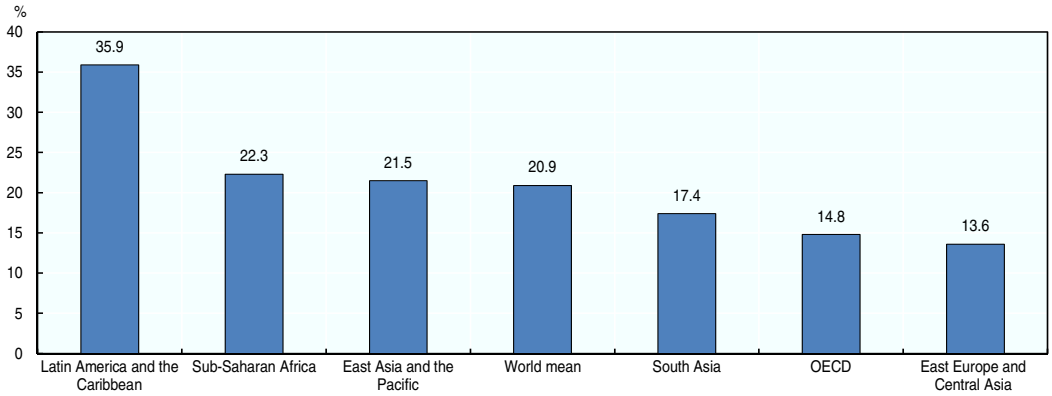
Latin America is the region with the widest gap between skills supply and demand, which adds to a high labour informality.

In Latin America and the Caribbean, 36% of companies operating in the formal economy struggle to find a properly trained workforce, compared to a global average of 21% per country and an OECD average of 15% (Figure 1.3). The analysis in this publication shows that Latin American firms are 3 times more likely than South Asian firms and 13 times more likely than Pacific-Asian firms to face serious operational problems due to a shortage of human capital.

The automotive and machinery sectors struggle the most to find the skills they need in Latin America. The challenge for those sectors is particularly steep, because they tend to be more sophisticated sectors, with greater connectivity and complexity. They could therefore support the region's structural change and transformation towards a knowledge-intensive and technology-intensive development model.

Figure 1.3. **Share of firms identifying an inadequately educated workforce as a major constraint to their operations**

(% of formal companies, circa 2010)



Source: World Bank, *Enterprise Surveys*, Washington, DC, data extracted in August 2014.

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In addition to the high proportion of low-skilled workers in jobs requiring basic skills, returns to education have been declining. In Latin America, the skills of workers by level of education (primary vs. secondary vs. tertiary) and by job position based on the tasks required (from machine operations to executive roles in companies) are both far lower than in the OECD countries. Furthermore, since 2000 there has been a fall in the returns on education in the region, as measured by the salary premium paid to a worker with a certain level of education compared with a worker with no education (especially the return to tertiary over secondary, and to secondary over primary education). These returns are being driven down mainly by temporary factors such as the recent expansion of tertiary education. More permanent factors may also be at work, however, such as the mismatch between the skills offered by the education system and those in demand in the labour markets.

High labour informality affecting workers and the business community, is another factor. More than half the Latin American workforce, including middle-income workers (the "emerging middle class" or "middle sectors") work in the informal sector, making them vulnerable to drops in income, unemployment caused by lower economic growth, and the risks posed by illness and old age. Indeed, there is some evidence that workers in the informal economy are paid less than workers in the formal economy with comparable jobs and the same level of education.

Various courses of action are needed in the education system and in technical training programmes to improve job skills. Public–private sector co-operation is essential.

In the short term, investment must be made to improve education programmes and vocational education and training. General or soft skills are particularly important, since they provide labour market access at the end of the training period and allow current workers to adapt to a changing labour market by updating their skills and favouring their mobility. Participation and co-ordination with the private sector is very important, since it can offer guidance on current and future business demands and provide training directly in the workplace. Finally, it is important to establish national and regional qualifications frameworks for the recognition and transferability of skills acquired in formal and informal settings.

Educating citizens for inclusive growth

Education leads to economic growth, social inclusion and greater equality.

A good education and training system can develop the population's skills and create greater equality of opportunity. Latin America needs to understand education as a vector for greater social cohesion and more inclusive growth, since the region's development will be shaped largely by the policies it adopts in this area.

Latin America has taken great strides in education investment and coverage, but challenges remain, especially in increasing pre-primary education coverage and reducing the drop-out and repetition rates.

Total public investment in education has risen considerably in recent years and now accounts for more than 5% of GDP (vs. 5.6% average for OECD countries in 2012). As a result, there is now almost universal access to primary education (91% of the region's potential population, compared with 97% in the OECD countries). There has been a marked increase in school life expectancy, from 8 years in 1971 to 13 years in 2012 (in the OECD it increased from 11 to 17 years during the same period). However, coverage remains low in pre-primary education (66% of the pre-primary aged population in Latin America in 2012, compared with 83% in the OECD). This figure is particularly important, because pre-primary education is beneficial for the rest of one's education cycle: secondary-school performance improves by the equivalent of almost a full school year among those who attended pre-primary education. Similarly, enrolment remains low at higher levels of education: 74% in secondary education (vs. 91% in the OECD countries) and 42% in tertiary education (vs. 71% in the OECD countries). Progress in increasing enrolment in the region has been slow compared with that of some Asian countries. China, for instance, had slightly higher secondary-education enrolment rates than Latin America in 2012 thanks to a 140% increase since 1990, compared with a 50% increase in Latin America over the same period.

Furthermore, government expenditure per student in Latin America remains below the average for the OECD countries. Expenditure on secondary education, for instance, represents 18% of GDP per capita in Latin American countries, compared with 26% in the OECD countries. However, a substantial proportion of financing for education in the region is private (40% in Chile and 35% in Colombia, vs. 16% in OECD countries). Policies to reduce the drop-out and repetition rates in secondary and tertiary education are a priority for a region where a fifth of students do not continue past primary school, compared with only a tenth of students in other emerging regions.

One of the major unresolved problems is the need to increase the impact of education investment on quality and performance.

Brazil and Mexico sit alongside Tunisia and Turkey as the countries that have made the most progress in secondary-education performance (15-16 year-olds), increasing their scores in the OECD's PISA tests (Programme for International Student Assessment) by between three and four points a year since 2003. Nevertheless, there is still a huge gulf between the performances of Latin American students and those in OECD countries, amounting to almost two years of schooling according to the 2012 PISA tests. The region's modest results are caused not only by the students' socio-economic background, but also by factors related to school activities, such as classroom hours and teachers' expectations of students' performance. These factors are less relevant in OECD countries, where the quality of teachers has a greater impact on results.

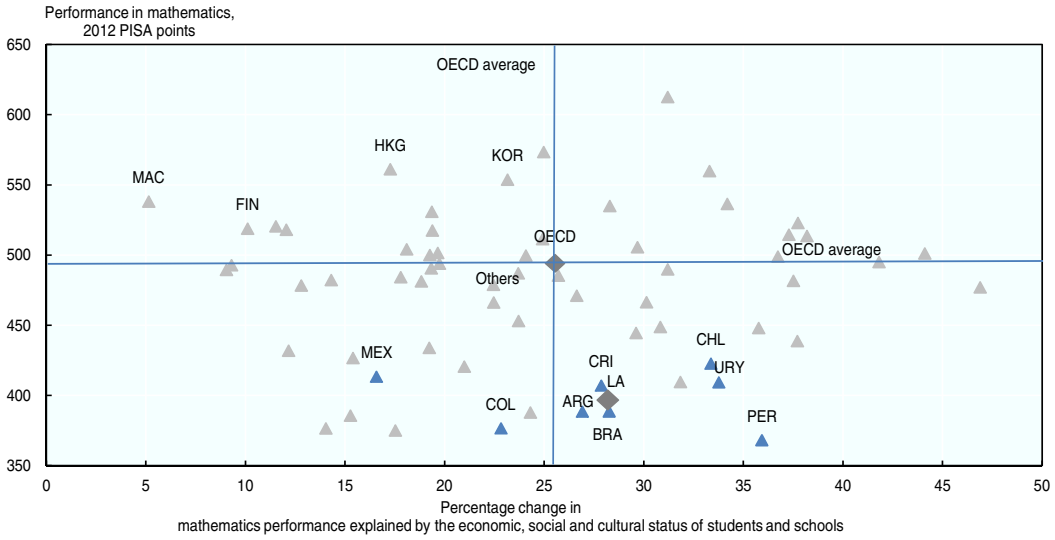
A second major challenge is the need to reduce socio-economic, gender and urban/rural inequalities in the provision of and access to education.

In Latin America, the socio-economic background of students and of the school have a marked influence on access to education, performance and completion. Only 56% of those in the lowest income quintile attend secondary school and only 9% continue into tertiary education, compared with 87% and 46%, respectively, for those in the highest income quintile. In the PISA 2012 tests, in Latin America almost 30% of the variation in students' results in secondary education was associated with socio-economic factors, compared with an average of 26% in OECD countries (Figure 1.4). As a result of these performance differences associated with socio-economic and cultural factors, students in the lowest income quartile fall two years behind those in the highest income quartile.

The performance differences between public and private education are another reason why the objective of equity should be at the heart of countries' agendas. The experience of the OECD countries shows that providing equity is perfectly compatible with improving performance. Education policy makers should also address inequalities between rural and urban students. The consequences of those inequalities often extend beyond school performance and gender inequalities: drop-out rates are high among boys, while girls are less motivated and less confident in mathematics. According to the PISA 2012 results, the poorer performance by girls in mathematics is equal to half a year of schooling.

Figure 1.4. **High school student performance and equity**

(PISA 2012)



Note: Latin America ("LA") comprises Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. "Others" comprises Albania, Bulgaria, Croatia, Dubai, Hong Kong (China), Indonesia, Jordan, Kazakhstan, Latvia, Liechtenstein, Lithuania, Macao (China), Malaysia, Montenegro, Qatar, Romania, Russia, Serbia, Shanghai (China), Singapore, Chinese Taipei, Thailand, Tunisia and United Arab Emirates. 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.

Source: Authors' calculations based on data from OECD/PISA 2012.

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Education policies must continue to address the challenges of quality and equity at all stages of the education cycle, both in terms of coverage, and especially performance.

Governments should allocate more resources to early education to further broaden its coverage. They should also press on with reforming early childhood care systems, improving health centres and training for healthcare professionals. In these areas, developing soft skills such as interpersonal skills and perseverance from an early age is essential for integration into the labour market and society in general. In primary and secondary education, governments should bolster policies that provide incentives to retain and motivate high-quality teachers by introducing stringent new recruitment procedures, bringing continuity to teacher training and ensuring that remuneration matches teachers' training and experience. The experiences of OECD countries such as Korea and Japan show that policies focused on the quality of teachers have a greater impact than those focused on reducing class sizes. School policies that do not necessarily require large-scale resources, such as promoting a learner-friendly disciplinary environment and providing opportunities for all students, have proved to be effective, Among these policies, better mechanisms to identify struggling students who are more likely to drop out are vital.

Generally, educational resources need to be allocated for the purpose of reducing inequalities by targeting students from poorer socio-economic backgrounds. Latin American countries currently have better educational resources (books, instructional material and laboratories) in schools with students from wealthier socio-economic settings (Figure 1.5). Some of the best-performing OECD countries in the PISA tests, such as Estonia, Finland, Germany, Korea and Slovenia, tend to distribute educational resources more equitably. Successful school systems in the OECD have sought to balance the distribution of staff, ensuring that struggling schools have a sufficient number of highly qualified teachers.

Figure 1.5. **Correlation between the quality of schools' educational resources and students' socio-economic status in selected Latin American and OECD countries**

(values between 0 and 1 for 2012, where 0 = no impact and 1 = total impact)

Note: Latin America ("LA") comprises Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. "Schools' educational resources" refers to aspects such as scientific laboratory equipment, instructional material, computers, software, Internet connections and library material.

Source: Authors' work based on data fromOECD/PISA 2012.

StatLink http://dx.doi.org/10.1787/888933174195

OECD countries such as Norway and Portugal and also some from Latin America such as Chile and Uruguay have greatly improved their policies on internal and external school evaluation. These evaluations must involve both students and teachers and be

used for training purposes. These measures also need to be extended beyond the confines of the classrooms and systems need to be developed to measure skills of adults. Finally, in tertiary education it is crucial to improve assessment and accreditation systems to prevent fragmentation between universities in order to raise quality.

These changes will only be successful if they take into account the institutional structure and the stakeholders involved and provide a medium- and long-term scheme to measure their impact. Building leadership in schools around the head teacher or a critical mass of teachers is essential for successful implementation.

Innovation as an input of productive-development policies

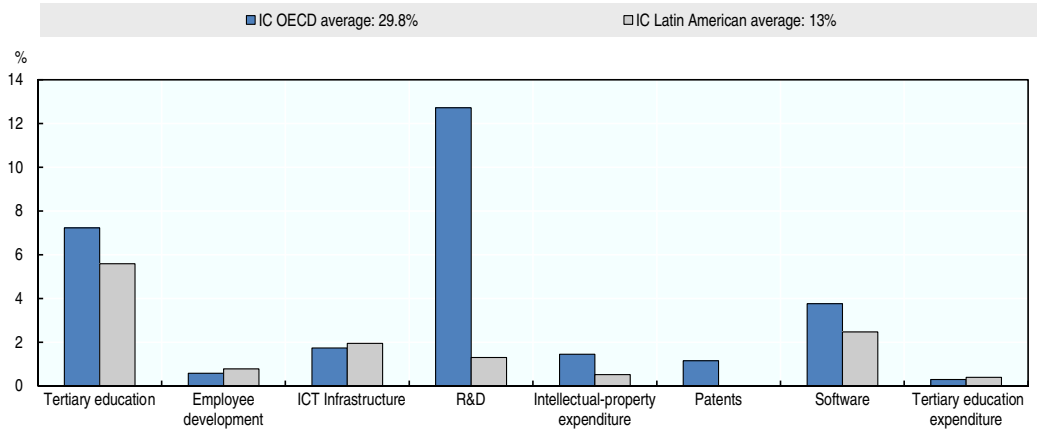
Efforts to improve education and skills will only raise labour productivity, create high-quality jobs and reduce the size of the informal economy if they are supported by greater innovation.

Development depends on each country's capacity to build the right skills to innovate and inject innovation into the productive system. This dependence is augmented by the fragmentation of production and the development of global value chains, making innovation a central factor in the development of competitiveness. Given the complementarity between innovation on the one hand and education and skills on the other, Latin American countries should update their policy agendas on science, technology and innovation, fostering regional co-operation to underpin national efforts.

Although investment in research and development (R&D) has increased, the stock of *innovation capital* – an additional measure of skills – is significantly lower in Latin America than in the OECD economies.

Inclusive growth requires more and better innovation. "Innovation capital" is an additional indicator of skills, measuring the capacity to innovate and disseminate innovation. The stock of innovation capital is far lower in Latin America (13% of GDP) than in OECD countries (30% of GDP). Furthermore, in Latin America it consists mainly of the stock of tertiary education, whereas in the OECD countries it consists mainly of R&D expenditure (Figure 1.6). These situations illustrate why it is important to strengthen ties between higher education institutions and the private sector in the field of science and technology to better steer and promote R&D activities. It is of paramount importance to strengthen developments in governance for science and technology institutions so that an efficient, comprehensive institutional framework can be developed to disseminate technology and innovation. More attention needs to be devoted to the complementarity between Latin America's education system and innovation capacity.

Figure 1.6. **Level and composition of innovation capital, Latin America vs. OECD countries (% GDP)**



Source: Authors' work based on De Groot (forthcoming), "Innovation capital in Latin America: A first attempt at analyzing the region's competitive strengths in innovative capacity", *Working Paper,* ECLAC Division on Production, Productivity and Management.

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R&D investment in Latin America remains significantly lower than in the OECD economies, and a large share of the investment is by the state, as shown by the OECD studies on innovation policies in Latin America (Colombia, 2014; Peru, 2011; Mexico, 2009; and Chile, 2007). Businesses in the region spend little on R&D, mainly because of conditions that limit the profitability of such investment. In particular, total R&D expenditure in Latin America stood at around 0.4% of GDP in 2010, with private R&D representing around a quarter of the total. Attracting FDI provides an opportunity to develop skills and innovation in Latin America, but only if the investment flows are more closely tied to policies on innovation and structural change. FDI can be understood as a vehicle for innovation, since it enables the introduction of new technologies and potential technology spillovers. Moreover, FDI creates ties with external markets that can promote the adoption of technology, since those markets have more stringent competitiveness requirements in terms of price and quality. However, for these positive effects to become a reality, investment needs to be channelled towards the most technology-intensive sectors, and beneficiary countries need an environment that is conducive to positive externalities. Greater efforts must therefore be invested in designing strategies to attract more R&D-intensive FDI and build upon some of the recent positive trends. Currently, R&D projects receive only 2% of investment in new facilities (greenfield investment) in the region, compared with an average of 4% in OECD countries. Furthermore, the institutional environment and policies must prevent new technologies from becoming an enclave with scant linkages to the rest of the production system.

Industrial and production development policies should focus on the acquisition of skills in new technologies and on innovation in order to achieve economic, social and environmental sustainability.

Case studies in Argentina and Brazil show the need to develop policies that allow greater co-operative efforts between small and medium-sized enterprises (SMEs) and larger firms, fostering greater access to technology and major markets. Sustainability-related innovations are desirable because of their positive externalities on the environment and because they offer competitive advantages for international integration.

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Chapter 2

Latin American macroeconomic outlook

Latin America has moved away from the high rates of economic growth seen during the 2000s and towards more moderate rates of a range of 1.5-3%. Clearly it is good news that the region was able to deal with deteriorating external conditions without experiencing any crises. However, continuous downward revisions to medium-term growth projections could be a symptom of potential output growth being less robust than expected, which could present a risk to recent social achievements. This chapter assesses Latin America's growth prospects in a more challenging international environment and explores how vulnerable the region is to further blows to the international environment in the short term. It also analyses the historical impact of resource booms (from commodities and capital flows) on the trend and cyclical components of economic performance. The chapter ends with some proposals on economic policy in the short term, and especially in the long term. The region must take ambitious strides to raise productivity and continue to bring down inequality and poverty. To do so, it must improve the skills of current and future workers through traditional education and technical and vocational education and training, a subject that ties in with the rest of this report.

The fall in global demand has hurt Latin America's economic development. The region seems to have left behind the high rates of economic growth seen during the 2000s and moved towards more moderate rates. Clearly it is good news that the region was able to avoid being hit by the deterioration of external conditions. Unlike in the past, there were no dramatic adjustments or crisis episodes in the region. The bad news is that projections are still being revised downwards, and the region could be converging towards a lower potential output than previously forecast.

This scenario is not without risk. First, output could increase as the recovery in the United States grows stronger. This would particularly benefit manufacturing exporters in Mexico and Central America. However, in this case, interest rates would rise sooner and more sharply than expected, which would be a downside risk due to its potential impact on capital flows to the region and on volatility. Another downside risk would be a more pronounced slowdown in Chinese growth than expected, which could have a negative impact on the price and quantity of Latin American commodity exports to the People's Republic of China (hereafter "China").[1]

This chapter therefore not only assesses Latin America's growth prospects, but also explores the region's vulnerability to further blows to the international environment in the short term and discusses policies to counter these challenges. Last year's *Latin American Economic Outlook 2014* (OECD/ECLAC/CAF, 2013) focused on how less foreign trade and lower commodity prices might impact the region (see Box 2.1).

Box 2.1. **Macroeconomic outlook and developments in 2013: Forecasts and observed developments**

Latin American Economic Outlook 2014 (LEO 2014) forecast a less benign external scenario than that which actually occurred. This box looks back at last year's growth, trade and debt forecasts and compares them with how the economy actually performed in those areas.

External growth projections for the OECD region were 1.7% for 2013 and 2.8% for 2014, whereas actual growth was 1.3% in 2013 and is now forecast at 2.2% for 2014 (OECD, 2014a). However, the euro area, with growth of -0.4% in 2013, performed close to projected (-0.6%).

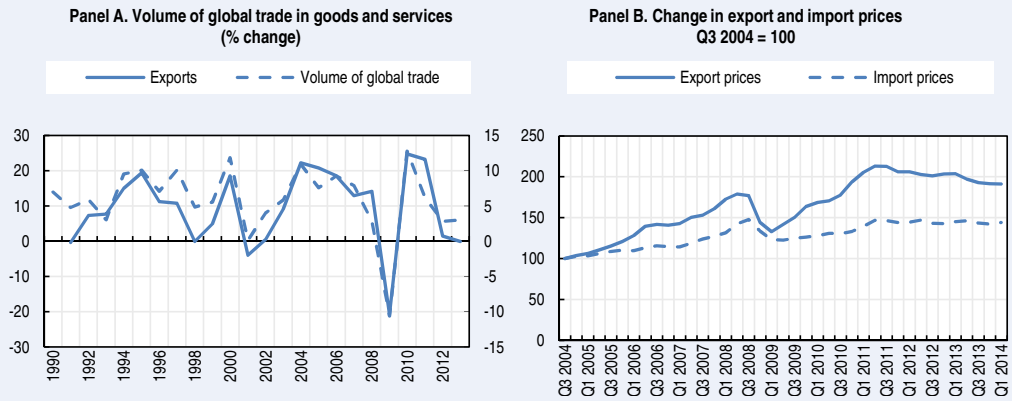
Three main channels should affect Latin American economies under this scenario: a decrease in the volume of foreign trade, a possible fall in commodity prices, and the normalisation of financial conditions for obtaining credit.

The volume of global trade recovered slightly in 2013 from the severe declines in 2010 and 2011 (Figure 2.1, Panel A, left axis). In 2014, exports are expected to grow by just 0.8% from the stable USD 1.3 trillion in 2013 (Figure 2.1, Panel A, right axis), while imports will contract by an estimated 0.6% (ECLAC, 2014a). Although the volume of global trade has improved since then, it is not expected to grow substantially. The strong correlation between GDP growth in the region and world trade led to growth of 2.5% in 2013.

The prices of some commodities fell, as forecast in LEO 2014. Although no major corrections are expected, the equilibrium price is falling below where it stood during the previous decade. Export prices fell slightly in 2013 (Figure 2.1, Panel B), but import prices remained stable for the second consecutive year. As a result, the current account deficit over GDP widened from 1.9% to 2.6%.

Box 2.1. **Macroeconomic outlook and developments in 2013: Forecasts and observed developments** *(cont.)*

Figure 2.1. **Volume of global trade in goods and services and changes in export and import prices**



Notes: a) Exports in millions of USD according to CEPALSTAT; *b)* Prices of exports and imports calculated as an average of the export and import price index for Argentina, Brazil, Chile, Mexico and Peru.

Source: CEPALSTAT, IMF *World Economic Outlook* and Thomson Datastream.

StatLink http://dx.doi.org/10.1787/888933174219

Finally, the anticipated normalisation of credit conditions, with a progressive rise in the cost of financing and a fall in capital flows, materialised. In October 2013, the US Federal Reserve began reducing its asset purchases, which are expected to stop altogether by the end of 2014. Private capital inflows, however, remained stable, at around 5% of GDP (IIF, 2014).

The first section of this chapter focuses on the global outlook and its impact on the region. The second section looks at the central scenario for Latin America in the next two years and the impact of external conditions on growth, analysing the historic impact of resource booms on economic performance (trend and cycle) and identifying which countries are most vulnerable and what policy options are available in the current situation, in which output gaps have closed. Finally, the third section reflects upon the challenges that the region faces in the short and long term, and considers what policy options are available in the area of education and skills, which ties this section in with the rest of the report.

The challenging global environment is having a marked impact on Latin America

The global slowdown continued in 2013, with growth struggling to reach 3%, well below the 5.2% mark recorded when the global recession ended in 2010. According to International Monetary Fund (IMF) estimates published in October, the global economy will grow by 3.3% in 2014 and 3.8% in 2015 (IMF, 2014). However, since then, forecasts have been revised downwards several times, and they now predict that world growth will not exceed 4% in any of the next five years. The global environment is characterised by an economic recovery in most developed economies, a weakening of emerging economies, a gradual fall in the prices of certain commodities and a normalisation of monetary conditions in the United States. The main advanced economies are expected

to record stronger growth over the next two years, especially the United States. Emerging economies look set to continue growing, but at a slower pace. The recovery in advanced economies will probably be accompanied by a normalisation of monetary conditions, starting with the United States. Commodity prices are set to continue falling slightly, but will remain high.

Growth is slowing in emerging economies, while advanced economies, especially the United States, are experiencing a modest recovery

Although emerging economies will still be the main contributors to world growth, over the next two years some of the momentum will shift towards advanced economies, especially the United States. Forecasts for the OECD economies as a whole predict slower growth (1.8% in 2014 and 2.3% in 2015) than for the world economy (OECD, November).

The United States is showing the clearest signs of a recovery, leading the growth among advanced economies thanks to a gradual boost to domestic demand and exports since mid-2013. Unemployment continues to fall – albeit partly due to a reduction in labour force participation – and has reached the same level as before the financial crisis broke out in 2008. Consumption has been aided by a better labour market, credit growth and the wealth effect resulting from rising stock and house prices. Investment has been underpinned by greater investor optimism and the credit recovery. According to OECD projections, growth is expected to reach 2.1% this year, before rising further to 3.1% in 2015 (OECD, 2014b).

The balance of risks for this global scenario in the short term remains tilted to the downside. The risks include a greater deterioration than expected in external conditions (more sluggish growth in Europe or the main emerging economies) and episodes of financial stress during the normalisation of monetary policy. Nevertheless, certain risks may increase if the US labour market recovers more quickly than expected and there is a greater impetus resulting from new developments in the energy sector. In the medium term, growth is expected to stabilise at around 3%, provided that fiscal consolidation continues in spite of political pressures.

The euro area finally emerged from recession in 2014, thanks to a slight improvement in external demand and a lightening of the fiscal adjustment burden. However, the OECD is projecting that euro countries will record sluggish growth of 0.8% in 2014 and 1.1% in 2015 due to limited credit growth, private-sector deleveraging and weak employment figures. Gaps between countries persist, with the peripheral economies growing at a slower pace, although growth in the central countries has slowed.

The risks of this scenario to the euro area are also tilted to the downside, especially if deflationary expectations affect the price formation process and discourage activity over a sustained period. In June, the European Central Bank (ECB) responded with a series of measures to reduce the risks of deflation, including interest-rate cuts and charges for banks that hold cash (negative interest rates), as well as new liquidity injections through targeted long-term refinancing operations (TLTROs). In October 2014, the ECB also launched a programme to purchase directly asset-backed securities consisting of loans to non-financial companies and mortgages in the euro area. Finally, various geopolitical risks (Middle East, Ukraine) also threaten the region's development because of the possible effects on trade and energy security.

Japanese growth rebounded to 1.6% in 2013, driven by consumption and net exports and fostered by fiscal and monetary stimuli in the Abenomics Plan to exit negative inflation. The plan boosted economic activity and prices began to rise. Inflation for the year was 1.5% and the wage decline halted. In the third quarter, however, the economy

began to contract due to a fall in exports and rising energy imports. Meanwhile, consumption's contribution to growth weakened as consumption taxes were raised in April 2014 as part of the government's fiscal-consolidation measures. This will partly offset the effects of the fiscal and monetary stimuli. Growth is expected to slow to around 0.9% in 2014. The balance of risks for this scenario is also tilted to the downside, especially in the medium term, if structural reforms to ensure debt sustainability and greater labour-market flexibility are not introduced.

Among the emerging economies the so-called BRICS economies (Brazil, Russia, India, China and South Africa) are experiencing the most pronounced slowdown, due to structural factors, so the high growth rates seen in previous years are unlikely to return. The most important of those economies to Latin America is China. The rebalancing of the Asian country's economic model requires a gradual withdrawal of investment in favour of consumption, as well as tighter credit conditions. These measures will serve to contain the expansion of domestic demand. Following GDP growth of 7.7% in 2013, the authorities aim to achieve 7.5% growth in 2014 and 7.3% in 2015.

Data on industrial production and foreign trade in the first quarter of 2014 indicate that the Chinese economy is weakening more than expected, although it did begin to stabilise in the second quarter. From a structural perspective, although the authorities can take steps to shore up economic activity, the stimuli proposed – easing credit conditions and accelerating investment projects – are contrary to the rebalancing towards higher consumption. They would lead to medium-term risks due to the accumulation of excess capacity and housing inventory. In turn, these excesses could affect the solvency of the financial system, since many of the projects are financed by domestic credit to businesses and local government (see Box 2.2). However, most of the banking system is composed of public banks, which have the capacity to assist struggling banks, redirect credit through the more solid banks and prevent credit rationing, albeit at great cost to the public sector.

Box 2.2. **Chinese banks in Latin America**

In the 1990s, the major Chinese state banks, especially the China Development Bank (CDB) and the Export-Import Bank of China (China Exim Bank), began to support the country's macroeconomic development model. These banks have played a central role in China's "*zou chuqu*" ("going out") strategy to expand abroad. The strategy promotes the international expansion of Chinese companies to ensure access to natural resources and energy, strengthen "national champions" and acquire advanced technologies. To support these activities, Chinese banks have issued hundreds of billions of US dollars of financing for foreign governments, often in the form of commodity-backed loans.

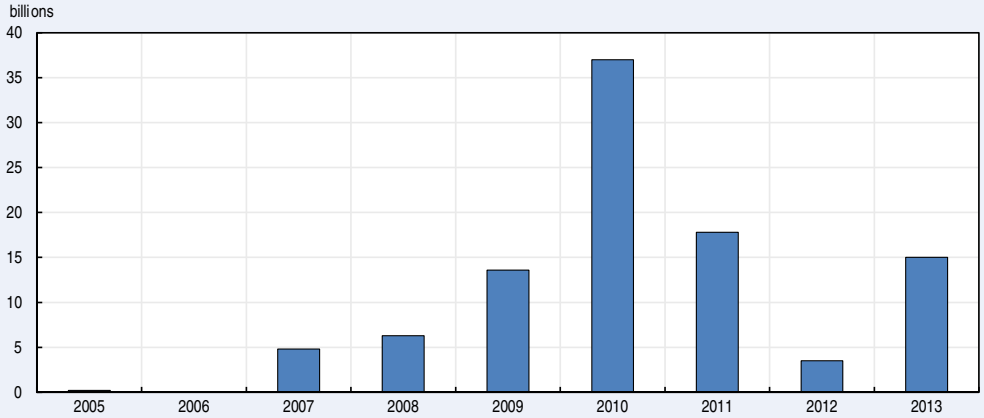
From 2005 until the end of 2013, total financing to Latin America by leading Chinese public banks was USD 102.2 billion according to the China-Latin America Finance Database, a joint initiative between Inter-American Dialogue and Boston University's Global Economic Governance Initiative (GEGI).

Chinese banks finance a very different group of countries than other international financial institutions (IFIs) such as the World Bank and the Inter-American Development Bank (IDB). Since 2005, most Chinese loans to Latin America have been to the Bolivarian Republic of Venezuela (hereafter "Venezuela"), Brazil, Argentina and Ecuador, and have been directed towards infrastructure and heavy industry. Loans from IFIs and "western" development banks to Latin America, however, are mainly for governmental, social and environmental projects. The Chinese loans have similar interest rates to those issued by the IFIs. In fact, the non-concessional rates offered by China Exim Bank, CDB and Bank of China are often higher.

Box 2.2. **Chinese banks in Latin America** *(cont.)*

Chinese financing to Latin America dropped significantly in 2012, with banks issuing only USD 3.5 billion in new loans, the lowest amount since 2006, when China began to step up its activities in the region. In 2013, however, there was a strong recovery, with Chinese loans to Latin American governments and companies totalling USD 20.1 billion. This figure was only surpassed in 2010, when Chinese banks lent USD 37 billion to the region (Figure 2.2). In 2013, CDB provided 79% and China Exim Bank 9% of the total financing.

Figure 2.2. **Chinese loans to Latin American governments and firms (2005-13)**



Source: China and Latin America Finance Database, Inter-American Dialogue, 2014.
StatLink http://dx.doi.org/10.1787/888933174228

Also in 2013, China's central bank (the PBoC) issued its first loan to the region, supporting the creation of a new financial initiative with the IDB. CDB and China Exim Bank continued to focus their financing on higher-risk countries, as measured by international capital markets. The Argentinian and Venezuelan governments were the main recipients of Chinese loans in 2013. The governments of Ecuador and Jamaica also received more than USD 500 million in loans.

In the future, China will remain a major source of financing for Latin America, and their lending in 2014 is expected to be high. A study conducted by CDB in 2013 (http://finance.eastmoney.com/news/1377,20131022331007572.html) recognises the political and economic risk among China's preferred partners in Latin America, but indicates continued interest in investment and lending to 10 major industries in the region: oil and gas, minerals, agro-processed products, cars, telecommunications and infrastructure. The recently created BRICS Development Bank is another indication of China's commitment to external financing.

Commodity prices continue to decline, especially minerals and metals

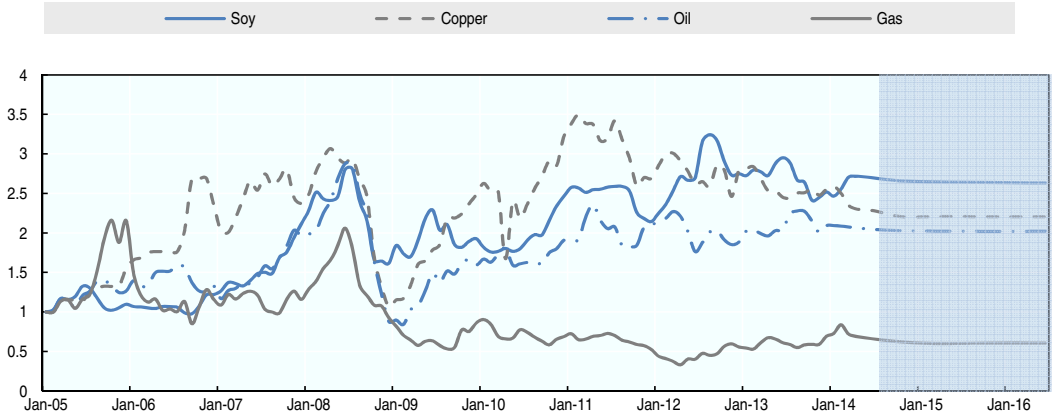
Commodity prices are decreasing, but are not expected to crash. In 2013, weak global demand and supply shocks caused most commodity prices to decline. China's performance has a particularly strong impact on commodity prices (OECD/ECLAC/CAF, 2013). Commodity prices are expected to stabilise somewhat this year, but there may be some small corrections, especially in metal prices, in line with a drop in demand from emerging economies,[2] and in crude oil prices, due to an increase in market supply.

Brent oil prices closed 2013 at USD 111 a barrel, down 1% year on year due to global uncertainty, increased production in Saudi Arabia and a high US crude-oil inventory. In early 2014, the price of Brent oil fell by around 3%, but this trend was reversed and prices rose amid tensions between Russia and Ukraine. However, since August prices have once again been in decline, despite geopolitical risks in the Middle East, as some producers' supply has recovered (e.g. Libya) and US oil shale production has grown, reducing the need to import energy. CAF – Development Bank of Latin America predicted that crude oil prices would continue to slide, but that 2014 Brent prices will average around USD 105 a barrel.

Industrial metal prices fell by 9% on average in 2013. CAF predicts that copper prices will fall by an additional 12% in 2014. The prices of precious metals have also slid, partly due to weak demand from Asian countries, the main importers of these metals. With the Federal Reserve expected to reduce its monetary stimuli, the price of gold fell by around 28% in 2013 and stood at around USD 1 200 an ounce in late December of that year. Gold prices rebounded during the first six months of 2014, averaging USD 1 290 an ounce for the first three months of the year, because the metal is considered a safe haven during times of instability. However, it began to decline again in the second half of the year. For the entire year the price of gold is expected to average USD 1 280 an ounce.

Finally, food prices slipped by 2% in 2013, but remain high. Prices of sugar and cereals (except rice) fell due to bumper crops in Brazil, China, Thailand and other countries, while dairy and meat prices surpassed expectations thanks to a rise in Chinese and Japanese demand. These trends look set to continue, with some agricultural commodities presenting upside price risks associated with El Niño. In short, base metal and fuel prices are expected to decline more sharply than agricultural and fuel prices, which look as though they will remain stable (Figure 2.3).

Figure 2.3. **Selected commodity prices**



Note: Base 100: 2005.

Source: Authors' work, based on Bloomberg and OECD (2005=1).

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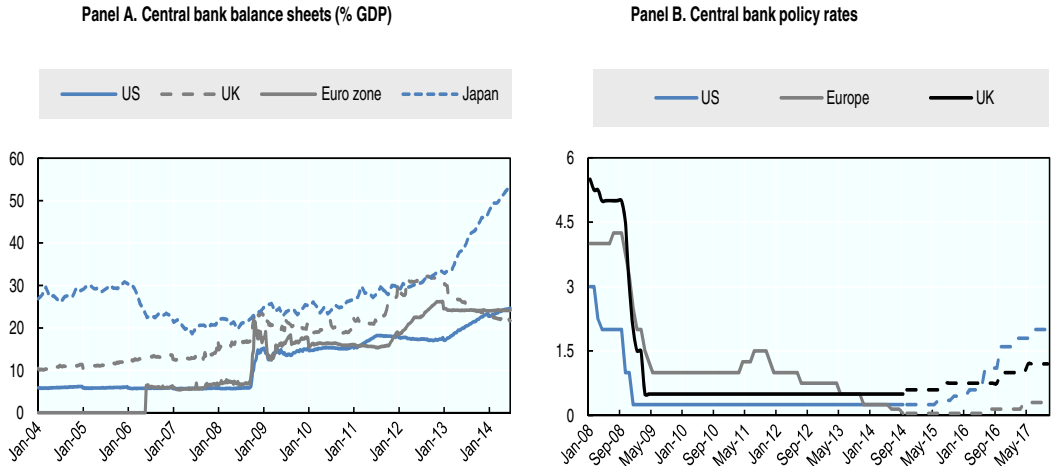
The impact of tighter monetary conditions in the United States is one of the major risk factors

The third trend is the tightening of monetary conditions in the United States, which will increase financing costs and make capital flows to emerging economies – especially portfolio investments – less attractive. Since October 2013, the United States Federal Reserve (Fed) has been reducing its asset purchases so that, as the economic recovery

allows, it can inject liquidity into the financial system (Figure 2.4, Panel A). The Fed has reduced the pace at which it is expanding its balance sheet by gradually cutting down its asset purchases until they ceased altogether in October 2014. The mere announcement of this reduction in purchases rocked the markets, and may continue to generate episodes of volatility.

However, global liquidity conditions are expected to remain lax, since US interest rate increases will not be as abrupt as in previous cycles (Figure 2.4, Panel B) and the Bank of Japan still has an expansionary monetary policy. Moreover, as mentioned above, the European Central Bank cut rates to record lows in September 2014 and announced the injection of liquidity into the economy through purchases of asset-backed securities from the private sector. The ECB's cycle of interest rate increases is therefore unlikely to be entirely synchronised with that of the Fed, since the US economy is showing more signs of recovery (Figure 2.4, Panel B).

Figure 2.4. **Monetary policy in the industrialised economies**



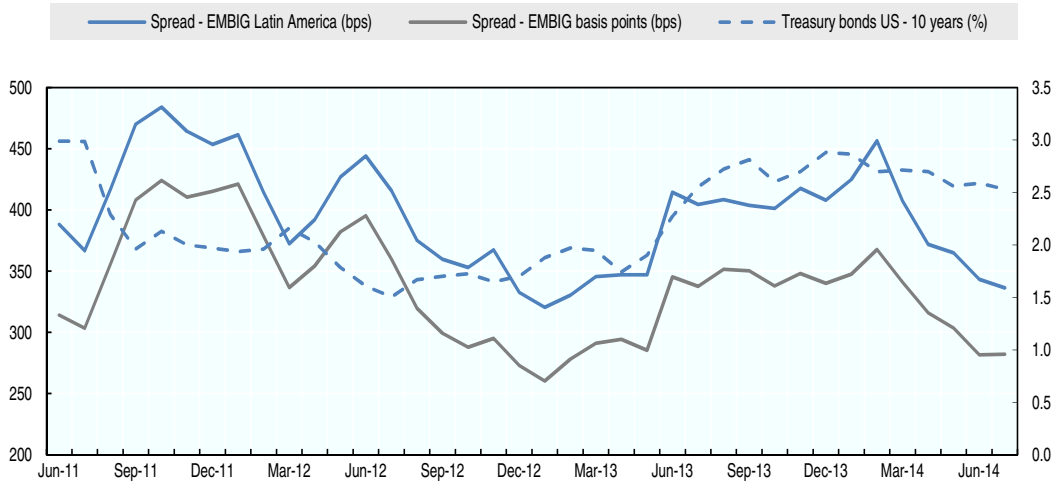
Source: Thomsom Reuters Datastream (Panel A). IMF, CAF and Thomsom Reuters Datastream (Panel B).
StatLink http://dx.doi.org/10.1787/888933174245

Recent evidence suggests that the Fed's quantitative easing programmes have had a big impact both on purchases and on asset prices in emerging markets (Fratzscher et al., 2011). The programmes have also impacted gross capital flows to emerging markets (World Bank, 2014; Olaberria, 2014)[3] and have turned many capital flows into portfolio flows (Ahmed and Zlate, 2013). The scaling back of quantitative easing should therefore slow portfolio flows to emerging countries.

Along with the quantitative adjustment, the change in the expected interest rates influences the performance of long-term bonds in the United States, which affects non-resident capital inflows to emerging markets (Koepke, 2013; IDB, 2014). Changes in long-term US bond yields, especially 10-year bonds, alter the cost of capital financing and the attractiveness of emerging economies' assets, and therefore their prices.

Moreover, the impact appears to be asymmetrical: portfolio flows (especially fixed-income instruments) decline further when market forecasts predict US interest-rate rises than when they predict US interest-rate cuts (Koepke, 2014). There is a correlation between long-term bond yields and the sovereign-debt spreads of emerging economies (Figure 2.5).

Figure 2.5. **Ten-year US treasury bond yields and sovereign spreads of emerging countries and Latin America**



Source: Bloomberg.

StatLink http://dx.doi.org/10.1787/888933174252

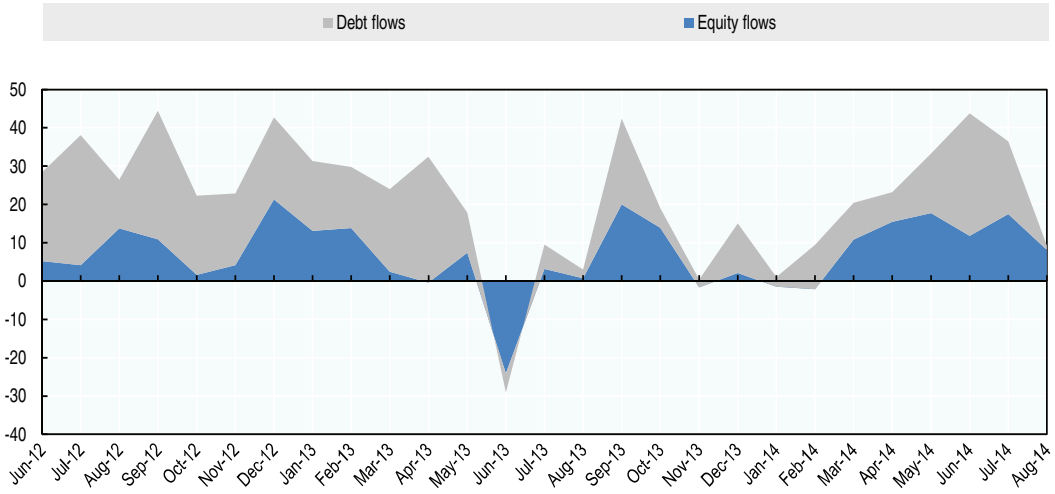
Once again, the impact of monetary normalisation on capital flows varies greatly from one country to another in the region. The mid-2013 episode[4] suggests that changes in global financial conditions or "push effects" (borrowing costs in advanced economies and risk appetite) may prevail. But domestic fundamentals, or "pull effects", such as growth expectations and payment capacity, are also relevant (Csonto and Ivaschenko, 2013; IIF, 2014), as was the case during the January 2014 episode.[5] Markets actually seem to be discriminating among countries, depending on their fundamentals.

The emerging economies with stronger fundamentals recorded fewer depreciations and sovereign-spread rises in the financial volatility episodes between January 2013 and January 2014 (Mishra et al., 2014; OECD/ECLAC/CAF, 2013). In particular, the most important specific characteristics for determining market reactions to Fed announcements are the international reserves-to-GDP ratio, the current-account balance, growth prospects, external debt (including corporate debt), inflation rates, stock market capitalisation and macroprudential measures.

Also, growth expectations are positively associated with the value of assets. Stock markets have performed better in economies with good growth prospects for 2014 (including Mexico, the Philippines and Thailand) than in economies like Brazil, where growth prospects have deteriorated (IIF, 2014).

In short, as the normalisation of monetary policy in the US progresses, adjustments to interest rate expectations could generate new episodes of volatility. During those episodes, the markets would probably distinguish between different types of assets and discriminate against emerging economies with weaker fundamentals. For example, as US interest-rate expectations have stabilised since the second quarter of 2014, there has been a resurgence of risk appetite. Consequently, portfolio flows to emerging economies have begun to recover (Figure 2.6). However, those economies' fundamentals have changed very little, and in August portfolio flows began to decline once again and then in October there was another episode of volatility. These events serve as a warning of the impact of periodic changes in attitudes towards risk as the monetary normalisation process moves forward. Economies with greater external financing needs that have witnessed an increase in private-sector leverage in recent years could see their financing disrupted by heavy capital outflows.

Figure 2.6. **Portfolio flows to emerging economies**
(billions of USD)



Source: IIF, estimates for 30 emerging economies.
StatLink http://dx.doi.org/10.1787/888933174265

Situation and outlook in Latin America

The slowdown is continuing in Latin America, albeit with heterogenity

In 2013, the region grew by 2.5%, down from 2.9% growth in 2012. This slowdown was due to lower export and lower domestic demand growth and some supply bottlenecks. Exports were hit by a downturn in global demand and commodity prices. Meanwhile, the slowdown in domestic demand was caused by the weakening of gross capital formation due to more pessimistic investor expectations and a loss of momentum for domestic credit. Private consumption continued to show solid growth, albeit at a slower pace due to the slight deterioration of labour market conditions and the slowdown in consumer credit.

The region's economy is projected to grow by 1.2% according to CAF[6] and 1.1% according to the Economic Commission for Latin America and the Caribbean (ECLAC) in 2014. Growth in 2014 will be hit by weak investment in most economies, modest US demand and the economic slowdown in China. Although the US recovery is expected to drive growth in exports over the next few quarters, Central America and Mexico could benefit more than South America, which will continue to be weighed down by the slowdown in Chinese demand and the decline of commodity prices.

Nevertheless, the phase of the business cycle and growth prospects vary greatly from one country to another in the region. Peru and Chile, for instance, are experiencing a sharp economic slowdown due to deteriorating terms of trade and weaker investment. Estimates project a slight acceleration in the second half of 2014, but only to around 3% for Peru and 2% for Chile. Economic growth also slowed in Panama, due to weaker external demand, and is expected to reach only around 6% due to a slowdown in investment growth after major infrastructure projects have reached maturity. Growth in the Plurinational State of Bolivia (hereafter "Bolivia") looks set to slip slightly to 5.5% after accelerating rapidly in 2013. It will continue to be underpinned by fuel exports to Brazil and Argentina and public investment.

Brazilian growth has continued to slow and is unlikely to reach 0.5% in 2014 due to infrastructure bottlenecks and delays to pro-competitiveness reforms. According to

projections, Uruguayan growth will slow to 3% in 2014 and, as in Brazil, the economy will be affected by persistent inflationary pressures. Finally, the Argentinian and Venezuelan economies will contract in 2014 due to growing economic imbalances and double-digit inflation.

The Colombian economy is recovering thanks to a monetary and fiscal stimulus and greater consumer optimism, and projections for 2014 predict growth of almost 5%, enabling the output gap to close. In Mexico, fiscal stimuli and the US recovery are expected to lift growth to 2.5% in 2014. Structural reforms recently passed, especially in energy, telecommunications, tax and education, could promote investment and raise growth potential in the coming years. Secondary legislation, which has not yet been drafted, will be vital to drive this process.

Central American countries will also benefit from renewed demand from the US and additional tourism inflows. Costa Rica, Nicaragua and the Dominican Republic will grow by 4% to 4.5%, and Guatemala and Honduras will grow at slightly lower rates of 3% to 3.5%. Finally, growth in the Caribbean economies is expected to accelerate from 1.2% in 2013 to 2% in 2014, bolstered by additional tourism thanks to the economic recovery in the United Kingdom and several countries in the euro area.

In 2015, GDP growth is expected to rebound slightly in nearly all countries in the region, to around 2.5% on average. This growth will be supported by a recovery in global demand, thanks in particular to a shift to a more favourable phase of the business cycle in the United States and expansionary fiscal and monetary policies in countries that have the space to adopt them (Peru and Chile, for instance). The balance of risks for this outlook remains tilted to the downside, mainly by worsening external conditions. There is no perceived risk of adjustments to demand due to internal imbalances, except in a few South American economies. Nevertheless, the need for such adjustments would be precipitated by a further deterioration of external conditions.

How will the international environment affect Latin America's performance?

The economic impact of temporary resource booms can be analysed by looking at their history.

When advanced economies are returning to growth, Latin America seems able to cope with gradual interest rate increases and slight declines in commodity prices. Such a scenario is potentially risky, however. Perhaps the most obvious risk is that, if interest rates increase faster than expected, capital markets will become more volatile and capital flows will reverse once again. There is also the risk of a greater fall in commodity prices due to a sharper Chinese slowdown.

In the past, countries in Latin America and the Caribbean have experienced numerous temporary resource booms, which have strongly impacted economic cycles. Resource booms refer to inflows of foreign currency for commodity exports (food, minerals and fuels), remittances, short-term capital flows and foreign direct investment (FDI), the value of which is at least one median deviation above the series median of the GDP trend.[7]

All countries in Latin America have had commodity booms during the last half century. There was an average of 3.3 booms per country in South America and 1.4 per country in Central America and the Caribbean (Table 2.A1.1), compared to only 1.5 per country among high-income economies and 1.6 per country globally (Table 2.A1.1 in Annex 2.A1).

Moreover, 15 of the 16 countries in Central America and the Caribbean included in this analysis recorded short-term and long-term capital-flow booms or remittance booms in the last five decades, with an average of 2.0 episodes per country. In South

America, eleven of the twelve countries experienced booms (all except Suriname) with an average of 1.8 episodes per country. Again, in both cases, this frequency is above the average for high-income countries (1.3 booms) and above the average for any other group of emerging countries.

Table 2.1 shows the nature of the booms in several countries. Chile and Peru experienced mineral booms; Ecuador, Colombia and Venezuela oil booms; Colombia and Costa Rica coffee booms in the 1970s; and Argentina, Uruguay and Paraguay cereal booms. Bolivia and Chile are the countries that experienced most booms in South America. Bolivia is currently experiencing a boom from minerals and gas exports to neighbouring countries. Chile is notable because commodity booms have been bolstered by capital-flow and investment booms.

In Brazil, there have been fewer commodity booms because of a more diversified economy and a low trade openness, with these exports representing only a small portion of GDP. Commodity shocks therefore seem to be less of a blow to Brazil than to the other South American economies, although Brazil has had capital-flow booms.

Table 2.1. **Temporary booms in Latin America (selected countries)**

	Food		Minerals		Fuels		Remittances		Short-term capital flows		Foreign direct investment	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
Argentina	1977	1983							1993	1994	1999	2000
	2007	2012							1997	1998		
Bolivia	1994	1998	1977	1981	1981	1986	2006	2010			1995	2002
			2008	2012	2005	2008						
					2011	2012						
Brazil	1964	1965							1994	1996		
Chile	1994	1998	1979	1981					1992	1994	1996	1999
			1988	1989					1996	1997		
			2006	2008								
Colombia	1964	1965			2008	2012			1981	1982		
	1977	1980							1994	1996		
Costa Rica	1976	1981									2006	2008
	1993	1998										
Ecuador	1964	1965			1980	1985	2005	2008	1990	1992		
	1994	1998			2005	2008						
	2011	2012			2011	2012						
Mexico					1980	1985			1991	1993		
					2006	2008						
Paraguay	1989	1990			2010	2012	1995	1997	1981	1982		
	2001	2003										
	2007	2008										
Peru	1964	1966	1979	1983							1994	1997
	1994	1997	2005	2011								
	2008	2012										
Uruguay	1980	1983									2006	2010
	1996	1998										
Venezuela, Bol. Rep.	2008	2012										
					1979	1984					1997	1998
					1996	1997						
					2005	2008						

Note: The fuel boom in Paraguay was driven by oil and gas re-exports from Bolivia.
Source: Authors' work based on *World Development Indicators*, World Bank and official sources.

About half the food booms have taken place in Central America and half in South America. Fuel and mineral booms, meanwhile, have mainly been in South America and Mexico. Capital-flow booms have been distributed evenly between South and Central America. Finally, two-thirds of direct-investment and remittance booms have been in Central America (see Table 2.2 and Figure 2.7 for a selection of countries).

On average, Latin American booms last 3.7 years and account for 5.6% of GDP (measured as the value of exports as a fraction of long-term GDP in a boom year minus the series median in a 25-year window). The largest booms are in investment flows and short-term capital (7.1% and 6.9% of GDP, respectively), followed by fuel (6.1% of GDP), minerals (5.6% of GDP) and food (4.8% of GDP). The results are similar for South America.[8]

Table 2.2. **Temporary booms and output gap in Latin America**

LAC	Booms	Duration (in years)	Size (% GDP)	Average output gap before the boom	Average output gap during the boom	Average output gap after the boom	Change in output gap during the boom	Change in output gap after the boom	Change in output gap before and after the boom
Agricultural products	36	3.9	4.8	-0.2	2.0	-2.1	2.9***	-4.5***	-2.2
Minerals	9	4.2	5.6	-1.8	1.1	-3.2	3.9**	-4.7*	-1.1
Fuels	15	4.0	6.1	0.0	0.7	-2.5	0.7	-4.1***	-3.5
Natural resources	60	4.0	5.2	-0.4	1.5	-2.4	2.5	-4.4	-2.3
Remittances	15	4.6	3.2	-0.4	0.8	-2.1	0.9	-2.9***	-2.1
Short-term capital flows	17	2.4	6.9	0.4	3.5	0.7	2.6**	-2.9**	0.7
Foreign direct investment	25	3.3	7.1	-0.8	2.7	0.1	3.6***	-3.3***	-0.2
Remittances	57	3.4	6.0	-0.3	2.4	-0.3	2.6	-3.1	-0.5
Total temporary booms	**117**	**3.7**	**5.6**	**-0.4**	**2.0**	**-1.4**	**2.5**	**-3.7**	**-1.4**
South America	**Booms**	**Duration (in years)**	**Size (% GDP)**	**Average output gap before the boom**	**Average output gap during the boom**	**Average output gap after the boom**	**Change in output gap during the boom**	**Change in output gap after the boom**	**Change in output gap before and after the boom**
Agricultural products	20	3.8	3.2	3.5	4.1	4.0	3.7	-4.6	-1.0
Minerals	8	4.3	6.0	3.9	3.7	3.6	3.9	-5.4	-1.1
Fuels	12	3.8	6.4	3.5	3.4	2.8	0.5	-3.4	-3.1
Natural resources	40	3.9	4.7	3.6	3.8	3.6	2.8	-4.4	-1.7
Remittances	4	4.3	3.5	3.3	3.4	3.5	0.9	-2.9	-2.0
Short-term capital flows	9	2.4	6.3	3.7	3.9	3.7	4.3	-3.0	2.6
Foreign direct investment	8	3.9	6.4	3.0	3.3	3.5	3.0	-4.2	-4.6
Remittances	21	3.3	5.8	3.4	3.5	3.6	3.2	-3.4	-1.0
Total temporary booms	**61**	**3.7**	**5.1**	**3.5**	**3.7**	**3.6**	**2.9**	**-4.0**	**-1.4**

Note: * significant at the 10% significance level. ** Significant at the 5% significance level. *** Significant at the 1% significance level. For South America there are too few data to appropriately infer anything in terms of the significance level. Changes in the average gap are not the same as the differences between gaps because they only take into account observations for which data exist for the minuend and subtrahend.

Source: Authors' work based on *World Development Indicators*, World Bank and official sources.

Historically, these resource booms have been related to the cyclical dynamics of outputs, thus contributing to accelerated growth during booms and marked slowdowns afterwards. On average, output seems to be close to or below its potential during the two years prior to each boom, then rises above potential output during the boom, before finally falling back below potential two years after the end of the boom. Moreover, the results suggest that the positive output gap during booms tends to be greater during short-term capital-flow booms. The output gap seems to close more quickly after commodity booms, especially mineral booms.

Capital-flow and direct-investment booms cause the output gap to rise furthest above its pre-boom level, followed by food booms. For booms of other commodities and remittances, the difference in the output gap is not significant. In South American countries, the dynamic is fairly similar, but since there are far fewer episodes, it is not possible to establish whether the differences in the output gap are statistically significant. In all cases the average output gap for the two years following the end of the boom is lower than the average gap during the boom. This suggests that growth slips below its potential once a boom has ended. Furthermore, commodity booms tend to have a stronger negative cyclical effect than capital booms (see Figure 2.7, which shows the results for a selected group of Latin American countries).

Irrespective of their nature, these resource booms do not seem to have raised growth potential in Latin America. Empirical analysis suggests that resource booms do not significantly increase the economies' trend growth (Table 2.3). This is true even of direct-investment booms. Nevertheless, this does not disprove that direct investment may help to raise growth potential, but it does show that increases above historical levels are not associated with higher growth potential.

Table 2.3. **Resource booms and the trend output growth**

LAC	Change in the trend output growth during the boom	Change in the trend output growth after the boom	Change in the trend output growth before and after the boom
Agricultural products	-0.2*	-0.2***	-0.4
Minerals	0.0	0.2*	-0.1
Fuels	-0.2	-0.1***	-0.4
Remittances	-0.1	-0.2**	-0.2
FDKCP	-0.1*	-0.2**	-0.3
FDI	-0.1**	-0.2*	-0.3
Sum of temporary booms	-0.1**	-0.1	-0.3

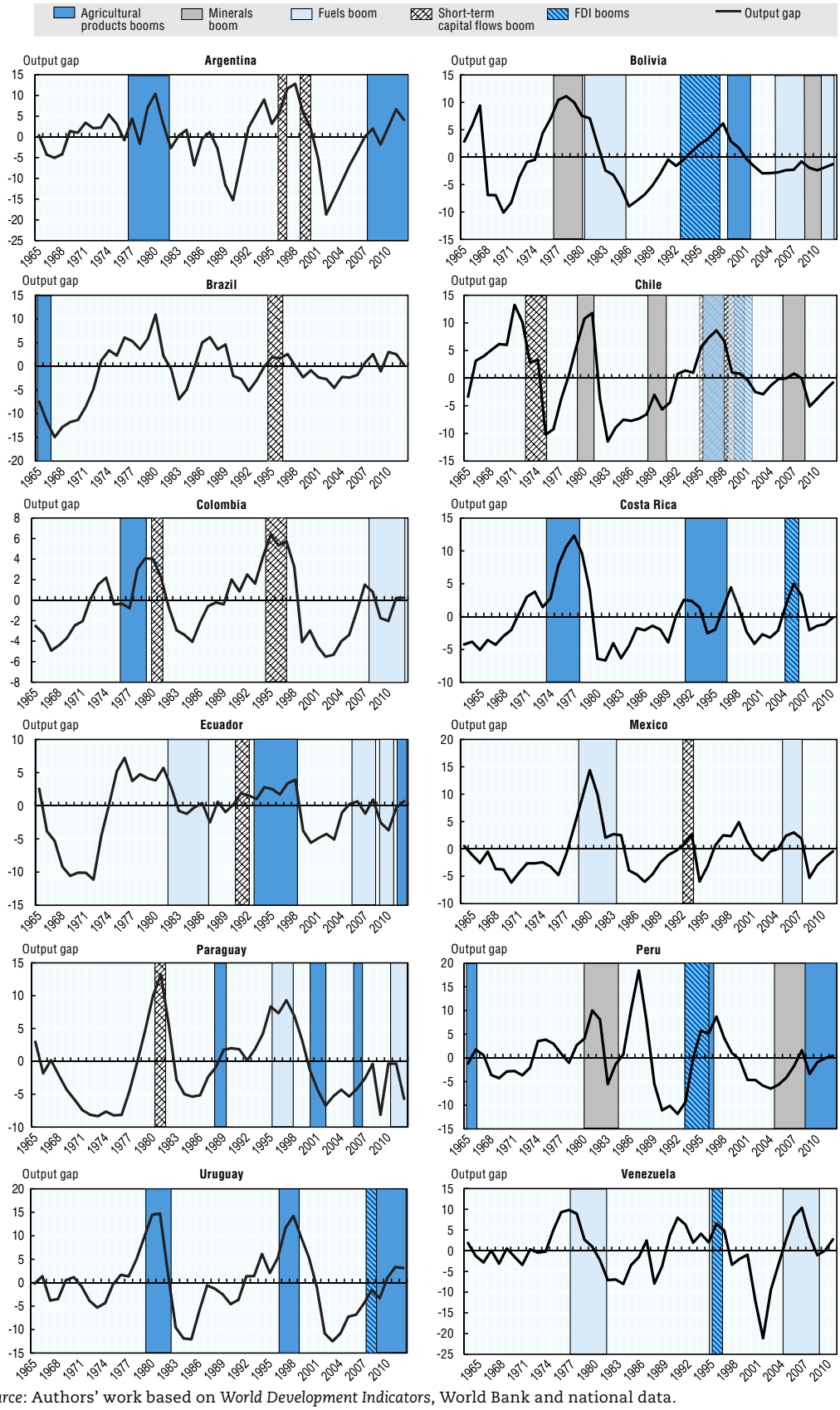
Note: * significant at the 10% significance level; ** significant at the 5% significance level; *** significant at the 1% significance level. For South America there are too few data to appropriately infer anything in terms of the significance level.

Source: Authors' work based on *World Development Indicators*, World Bank and national data.

Commodity booms are often supported by capital booms and FDI booms. As evidenced during the food booms in Chile, Bolivia and Uruguay and the mineral booms in Bolivia and Chile (based on data for 1980-2011, the period for which capital-flow data are available).[9] If direct investment in commodities has only limited spillover effects on other sectors, its capacity to raise the economy's potential output may also be limited, which would be consistent with previous findings.

Different methodologies lead to the same findings concerning the impact of commodity booms on the business cycle in Latin America. The previous analysis is revealing since it presents overall trends and country trends, as well as suggesting correlations. However, it has limitations in establishing the effect of booms on the output gap. For instance, capital flows can be attracted by countries' high growth rates.

Figure 2.7. **Resource booms and the output gap**



Source: Authors' work based on *World Development Indicators*, World Bank and national data.

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To solve this difficulty, two panel vector autoregression (VAR) were estimated[10] to evaluate what impact shocks to the interest variables have on the output gap. Although the variables included in the model may be endogenous, exogenous shocks can be isolated by making certain identification assumptions (Box 2.3). The results are consistent with those previously found. Changes in the availability of external resources have significant effects on Latin America's output gap. If we define these effects as a shock of one standard deviation either to commodity exports and capital flows or to the terms of trade and the long-term interest rate in the United States, we find that they last for two years.

Box 2.3. **Estimated impact of resource booms on the output gap using panel VAR**

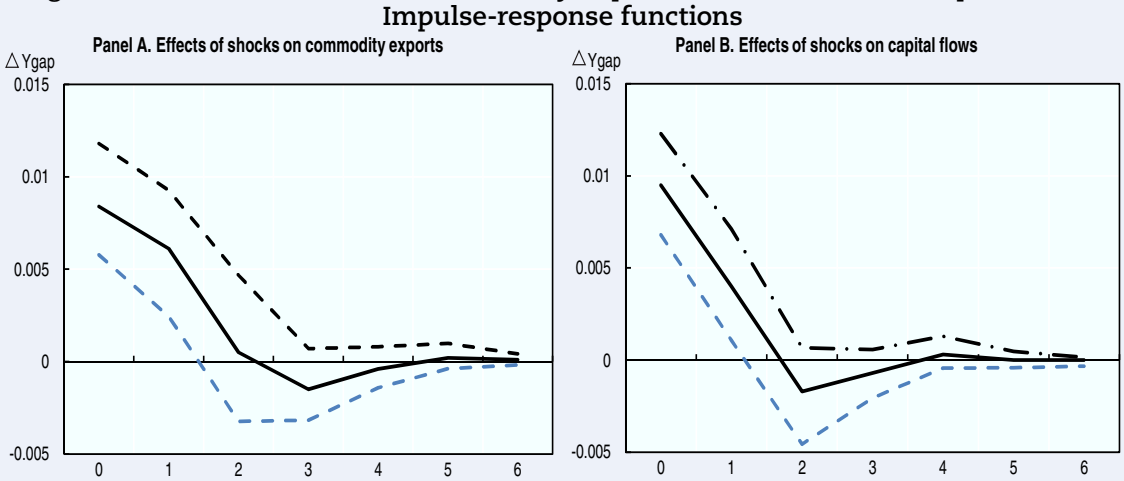
Data were taken from the annual *World Development Indicators* published by the World Bank for the period 1980-2012 for 12 Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Paraguay, Peru, Uruguay and Venezuela. The output gap is calculated from the GDP series in local currency at constant prices, as in the previous procedures. Income from commodity exports and capital flows is calculated as a proportion of the trend GDP in USD.

The analysis focuses on the impulse responses that measure what effect a single standard deviation shock to one variable has on the other variables. The results show orthogonalised impulse responses using Cholesky decomposition. The level of exogeneity is given by commodities, capital flows and the output gap (YGAP). The commodities series is the most exogenous, as evidenced by the fact that shocks to the other variables have no contemporary impact on commodities. From Graph 2.8 one can deduce that commodity shocks and capital-flow shocks have a positive effect on the output gap.

The model was estimated using two lagged values for each variable, and the first differences were used according to the results of the unit root test designed by Pesaran (2007). The fixed-effect estimators are inconsistent, so, because the lags of the variables are correlated with the error, deviations were taken from the mean value of each variable for each country. The estimate was made using the generalised method of moments (GMM) using lagged values of the variables as tools. These lagged variables thus become workable tools to estimate the model using GMM. Each graph analyses the effect over the other variables over a period of six years.

The effects of shocks on commodity exports and capital flows are positive and have a stable dynamic that converges towards zero (Figure 2.8).

Figure 2.8. **Effects of shocks on commodity exports and on short-term capital flows: Impulse-response functions**



Note: YGAP refers to the output gap.

Source: Authors' work based on *World Development Indicators*, World Bank and national data.

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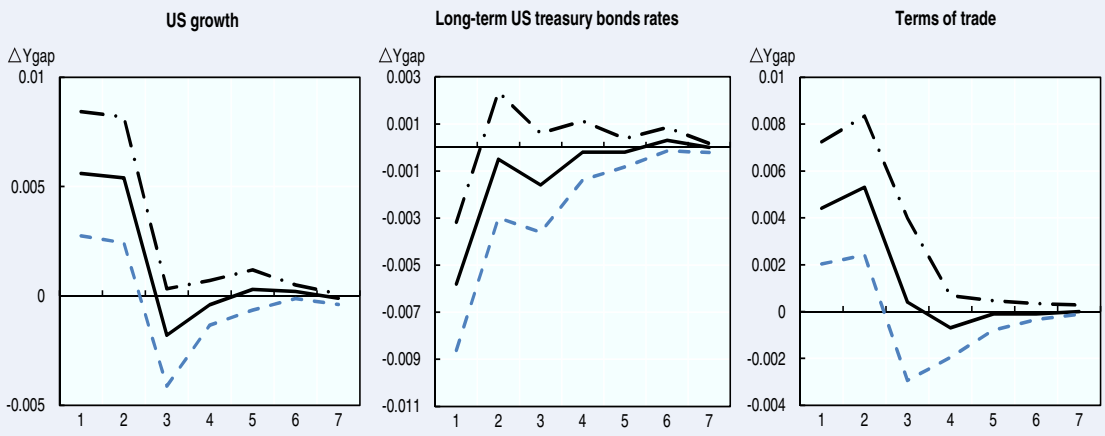
Box 2.3. **Estimated impact of resource booms on the output gap using panel VAR** *(cont.)*

A similar procedure was used with the output gap, but replacing commodity exports by terms of trade, and capital flows by long-term US treasury bond rates. These new variables are even more exogenous. Furthermore, the procedure controlled for US growth, which is believed to be inversely correlated with US interest rates via countercyclical monetary policy. In this new model, the US growth rate was considered the most exogenous variable, followed by long-term US treasury bond rates, then terms of trade, and finally the output gap.

External shocks also affect cyclical output fluctuations in Latin America (see Figure 2.9). The effects of three external shocks were analysed: US GDP growth, long-term US treasury bond rates and terms of trade. Terms-of-trade shocks were found to have a statistically significant positive effect lasting two years, whereas long-term US treasury bond rates were found to have a negative effect on the gap that lasted a much shorter period of time. On the other hand, a shock to US growth has a positive effect in Latin America. This result is not incompatible with the fact that the effect of a recovery in US growth partly offsets the rise in medium-turn interest rates, as per the findings of the IDB (2014).

Figure 2.9. **The effects of shocks to US growth, long-term US interest rates and terms of trade: Impulse-response functions**



Note: YGAP refers to the output gap. The terms of trade figures were taken from the World Bank's net barter terms of trade index.

Source: Authors' work based on World Bank and official sources.

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In short, business cycles in Latin America – unlike growth potential – are heavily influenced by fluctuations in external resources, whether capital inflows or commodity exports. Food booms are common throughout the region, whereas mineral and fuel booms are more typical of South America. FDI and remittance booms are more influential in Central America and the Caribbean, as are short-term capital flows in South America. Temporary resource booms, especially of minerals, fuels and short-term flows, tend to have a procyclical influence on the GDP gap. When the booms finish, countries seem to return to the pre-boom stage of the business cycle, which means they failed to use the booms to boost the region's long-term growth.

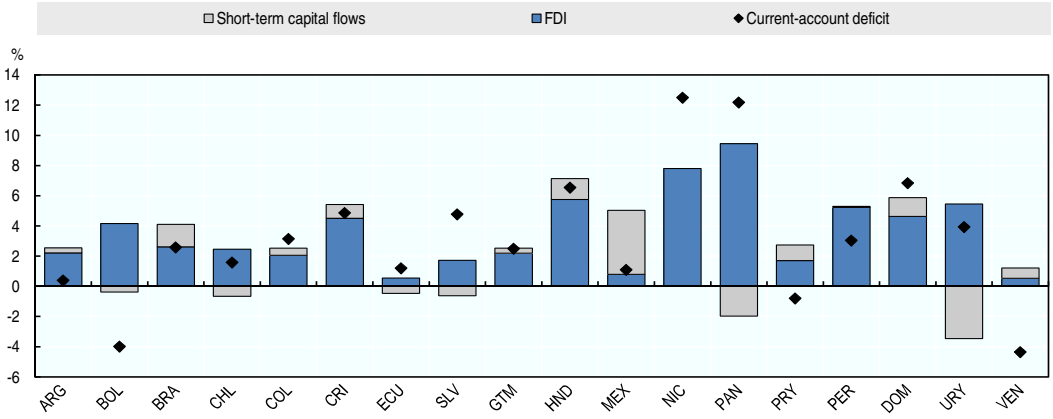
The importance of external financing is a reminder that there are various *Latin Americas*.

Although the region as a whole will see its external conditions deteriorate, neither the impact nor the ability to cushion the impact of that deterioration will be spread evenly across the region. Most at risk will be those countries that have greater external financing needs (a large current-account deficit), those that acquire a larger proportion of their financing from portfolio capital (which is more prone to being reversed if there is a change to the external conditions), and those that have most external liquid liabilities and least external liquid assets. Furthermore, in all countries, the fiscal and monetary space to counteract external shocks has contracted in recent years, though some countries have more leeway than others. Other important factors are the exchange-rate regime and the currency mismatch of economic operators.

Latin America's current account deficit has deteriorated since 2010, making the region more vulnerable to a decline in external financing. Growth in exports has generally slowed owing to weak external demand and less competitive non-primary goods exports (except in Mexico), combined with imports that have continued to grow at the same pace as domestic demand. South America's net commodity exporters have seen their terms of trade deteriorate, especially the two base-metal exporters, Chile and Peru. In Brazil, manufacturing exports have also been affected. In Central America, a moderate decline in energy prices strengthened the countries' external accounts, but was partly offset by the poor performance of worker remittances and US demand in recent years. In Argentina and Venezuela, current flows have plummeted, largely due to the sharp appreciation of their currencies as a result of the exchange rate systems.[11]

The deterioration of external flows needs to be addressed, especially by countries that already had a large current account deficit, which is why several countries have resorted to FDI, multilateral agencies and bank financing.[12] This is the case of some Central American countries, including Nicaragua and Panama (more than 10% of GDP in 2013), the Dominican Republic and Honduras (about 7% of GDP), and Costa Rica and El Salvador (about 5%) (Figure 2.10). South American net commodity exporters have seen their current-account balances deteriorate quickly, including some with surplus balances (Argentina, Bolivia, Paraguay and Venezuela), but the balances seem to be still manageable.

Figure 2.10. **Current account deficit and capital flows**
(% GDP, 2013)



Sources: Authors' work based on central bank, CAF and ECLAC data.
StatLink http://dx.doi.org/10.1787/888933174303

Most countries' current accounts are financed by direct investment, giving them some stability, at least in the short term. Metal producers Chile and Peru could suffer the worst deteriorations to their current accounts, although foreign investment is more than sufficient to finance their deficits.[13] However, the expected decline in commodity prices could increase reliance on short-term flows. This happened in Brazil in 2013, when, for the first time this decade, direct investment did not cover the current-account deficit. Ecuador's current-account deficit remains low, but its sources of external financing are also limited, with low foreign investment and very little access to the financial markets. The country has therefore recently acquired bilateral financing, mainly from China.

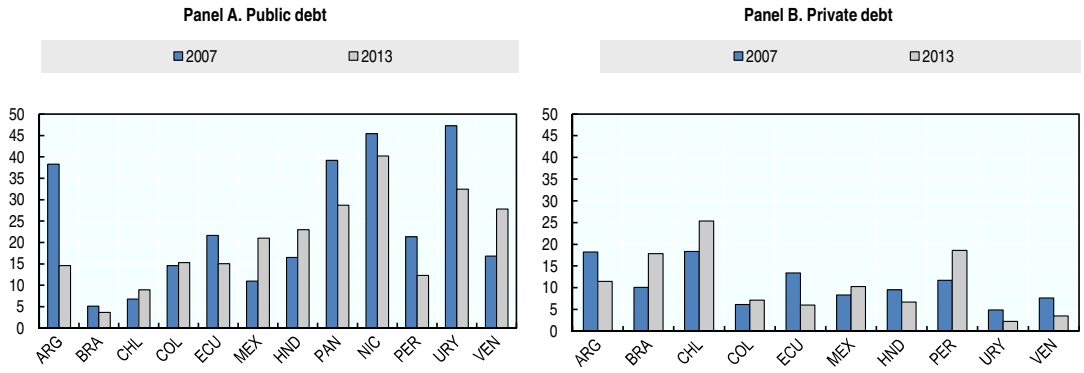
The external positions of some other South American economies are somewhat more vulnerable to a further deterioration in commodity prices. These include Argentina and Venezuela, where the amortisation of external debt commitments and net capital outflows from the private sector have turned the balance of external flows negative as the current-account balance has deteriorated. This has led to a sharp fall in foreign assets in both countries in recent years, especially in Argentina, which does not have access to finance from international markets.[14]

In Central America, some countries are compromised by high external deficits and will struggle to finance them if credit conditions become tighter than expected. Nicaragua boasts the highest current account deficit in the region not covered by foreign investment. El Salvador has a smaller deficit, but less than half of it is financed by foreign investment. Direct investment covers almost 80% of Panama's current-account deficit, but the remaining 20% is dependent on bank financing that is susceptible to changes in direction, as occurred during the 2008 crisis. The Dominican Republic's deficit is not covered by direct investment or portfolio flows either, but the size of the deficit is rather more manageable. Managing external financing also depends on borrowing capacity and access to markets.

Public debt levels improved, albeit asymmetrically across the region. Countries reduced their external sovereign debt from an average of 24% of GDP in 2007 to 20% in 2013, although these figures varied greatly from one country to another (Figure 2.11, Panel A). Uruguay, for instance, reduced its debt from almost 50% of GDP to little over 30% during the same period, while Mexico's increased from 10% of GDP to a still manageable level of 21%. Nicaragua reduced its external debt by around 5 percentage points of GDP. It still remains at a lofty 40%, however, and is even higher as a percentage of tax revenue, which limits the country's scope to obtain additional external financing.

Some economies with low debt levels are also vulnerable to a deterioration of the current account because they do not have access to markets. Argentina and Ecuador are cases in point. Argentina has utilised its stock of reserves to provide for its growing external financing needs, while Ecuador has acquired bilateral financing, mainly from China. Extra borrowing costs would make it difficult for either country to return to the markets and would make bilateral loans more expensive. Another country more exposed in 2013 than in 2007 was Venezuela. Although it has access to markets, its debt increased from 17% to 28% of GDP during the 6-year period and became significantly more expensive, with a spread of more than 1 000 basis points, limiting the country's opportunities to obtain additional financing at a reasonable price.

Figure 2.11. **Latin America: External debt**
(% GDP)



Sources: Central banks.
StatLink http://dx.doi.org/10.1787/888933174315

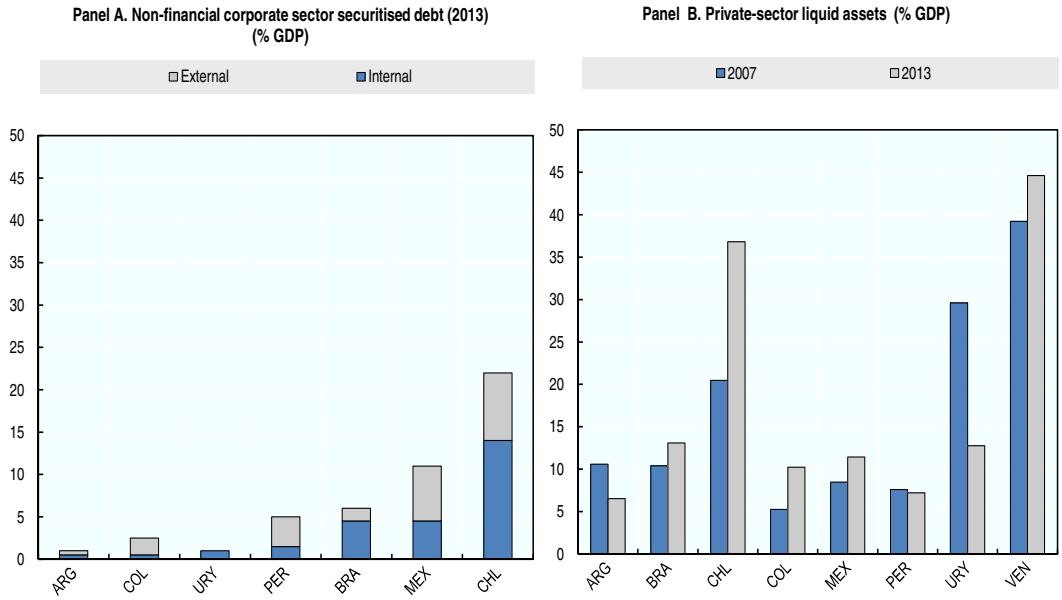
Average private sector debt in the region was relatively stable, but trends vary greatly from one country to another. Economies without access to finance or with access at very high interest rates reduced their external debt. In financially integrated economies, corporate debt surged thanks to the good financing conditions that prevailed over the last three years, especially in Brazil, Chile and Peru, where the ratio of external debt to GDP grew by more than six points between 2007 and 2013. Unlike elsewhere in the region, in these three economies, private debt is more than twice as high as sovereign debt, although government debt is low.

In Chile, for example, private external debt stands at 25% of GDP, but government debt is less than a tenth of GDP (see Figure 2.11, Panel B). So, although improvements to sovereign-debt ratings and spreads fostered cheaper and larger private debt, firms' debt capacity and the market's perceptions of businesses could severely affect borrowing costs, mainly because of the underwriting fee (Avendaño and Nieto Parra, forthcoming). For example, primary corporate bond emissions rose from USD 112 billion in 2012 to USD 130 billion in 2013 in the financially integrated economies.

Although private debt levels remain relatively low, the pace at which they have risen in some economies is a cause for concern, due to the risks that could be accumulating. Some of these companies may, for instance, struggle to access finance if credit conditions tighten, which could generate balance-sheet risks if currency depreciation takes place, especially for companies without currency hedging arrangements. Despite efforts to establish more precisely the level and source of the debt, it is not yet clear whether firms that have increased their debt have the additional coverage they will need, whether explicitly, or naturally because they produce and export tradeable goods (IDB, 2014). This is undoubtedly a source of vulnerability for those economies (Figure 2.12, Panel A).

One factor that could mitigate these risks is the accumulation of foreign assets. In fact, some economies that increased their external liabilities have also increased their external assets, as occurred in Chile, Colombia, Mexico and Peru (Figure 2.12, Panel B). However, it is not clear what proportion of the additional assets is accumulated by firms to hedge for the additional liabilities they have taken on. Brazil has introduced macroprudential measures to reduce private-sector exposure to currency derivatives to mitigate these risks.

Figure 2.12. **Private sector accumulation of foreign assets and liabilities (% GDP)**



Source: Authors' work based on central bank figures.
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Corporate debt issues in local currency have also been expanded. The presence of domestic capital markets that are more developed in the financially integrated economies served to mitigate the impact of the reversal of capital flows in 2009 (Jara, Moreno and Tovar, 2009). However, although the domestic corporate-debt market includes local investors, there are also non-residents interested in these assets. The market is therefore vulnerable to a change in the sentiment of external markets too, especially carry-trade activity. Companies' access to local bond markets varies greatly across the region (CAF, 2011). Relative to GDP, Chile has the largest bond market (15% of GDP), followed by Brazil and Mexico (both representing 5% of GDP); other countries in the region have much smaller bond markets.

However, initiatives such as the Integrated Latin American Market (MILA) formed by Colombia, Chile and Peru could help to expand the markets by reducing access costs for a wider range of issuers and investors and expanding diversification options. MILA enables stocks and bonds from the three countries' stock markets to be traded through local intermediaries and in local currency, facilitating international transactions. When Mexico joins in late 2014, MILA will overtake the Brazilian stock exchange as the largest stock exchange in the region, with a market capitalisation of more than USD 1 trillion and more than 700 issuers.

In short, although most countries in the region have the scope to obtain external financing, the rapid expansion of corporate leverage in some of the financially integrated economies poses incalculable risks. On the other hand, economies without access – or with limited access – to international capital markets are vulnerable to a further deterioration of their current account and a tightening of financial conditions, which in turn would make it more difficult for them to return to the markets and would increase the cost of other forms of financing.

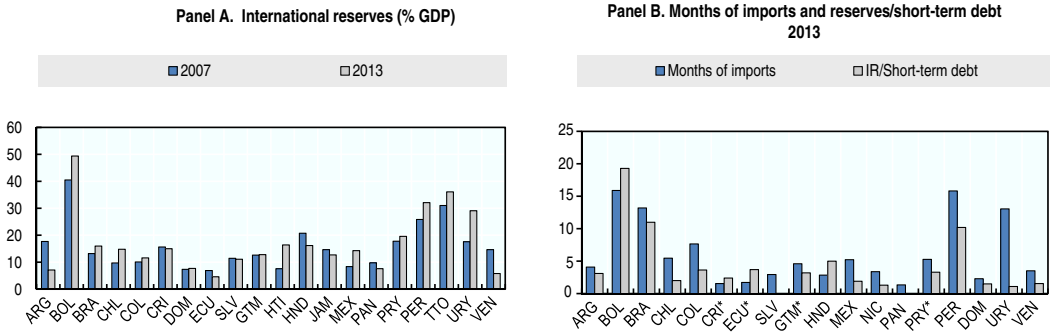
The accumulation of reserves provides a good cushion to meet import requirements and short-term debt commitments. The accumulation of reserve assets between 2007 and 2013 increased from 15% to 17% of GDP in the region. However, once again these

overall figures conceal vast differences from one country to another. For example, Bolivian reserves grew by 10 percentage points of GDP to 50% during the period, giving the economy ample scope, especially considering that it still has a current-account surplus (Figure 2.13, Panel A).

The financially integrated countries are in an intermediate position. Their current-account deficits have widened, but their reserves have increased enough to meet their external liquidity needs. Peru and Uruguay have reserves of more than 30% of GDP, while Chile, Colombia and Mexico have reserves of close to 15%. Chile's external liquidity is also underpinned by its sovereign wealth funds, while Colombia's and Mexico's are covered by special credit facilities with the IMF. Several Central American countries have seen their reserves decline. They remain at around 10%, but given their large current-account deficits this gives them little leeway, and leaves them in a relatively exposed position.

Also vulnerable are Argentina, Ecuador and Venezuela, which have seen their reserves halve to 7%, 6% and 8% of GDP respectively, among the lowest levels in the region.[15] In the absence of more extensive exchange-rate adjustments,[16] there will be no current-account correction, which could cause reserves to fall to critical levels, given the limited access to capital. In Central American countries, the situation is also tight in terms of months of imports covered by reserves. Although all countries have enough reserves to cover short-term debt maturities (with a reserves-to-debt ratio of more than 1), for some countries the ratio is more than 10 (Bolivia and Peru), whereas some countries' ratios (Central American countries', Uruguay's and Venezuela's) are much closer to 1 (Figure 2.13, Panel B).[17]

Figure 2.13. **International reserves in Latin America**



Note: *International reserves data are for 2012.
Source: Authors' work based on central bank data.
StatLink http://dx.doi.org/10.1787/888933174336

Exchange-rate flexibility gives economies additional scope to react to external shocks by adjusting prices rather than absorption levels. The currency depreciation that would result from the deterioration of external flows is a matter for concern, since it might drive up inflation. However, except in rare cases where there were already inflationary pressures (either because the economy was very close to full employment and had wage indexation, as in Brazil and Uruguay, or because there were supply bottlenecks and excess liquidity, as in Argentina and Venezuela), exchange-rate movements seem to have contributed little to inflation. This was perhaps because the movements occurred concurrently with a drop in certain commodity prices (food and energy), which offset the effects of weaker exchange rates. Central banks' greater credibility also helped. Indeed, in this region, most countries' inflation expectations remain firmly anchored around the targets set by the central banks, bringing stability to prices.

Core inflation has also been contained. Economies with inflexible systems, such as those that are dollarised (Ecuador, El Salvador and Panama) and those with managed exchange rates (Argentina and Venezuela), do not have this adjustment mechanism at their disposal. These economies will have to respond to the deterioration of their external accounts by using external assets. Moreover, their capacity to absorb exchange-rate shocks could be hurt by high balance-sheet risks caused by currency mismatches.

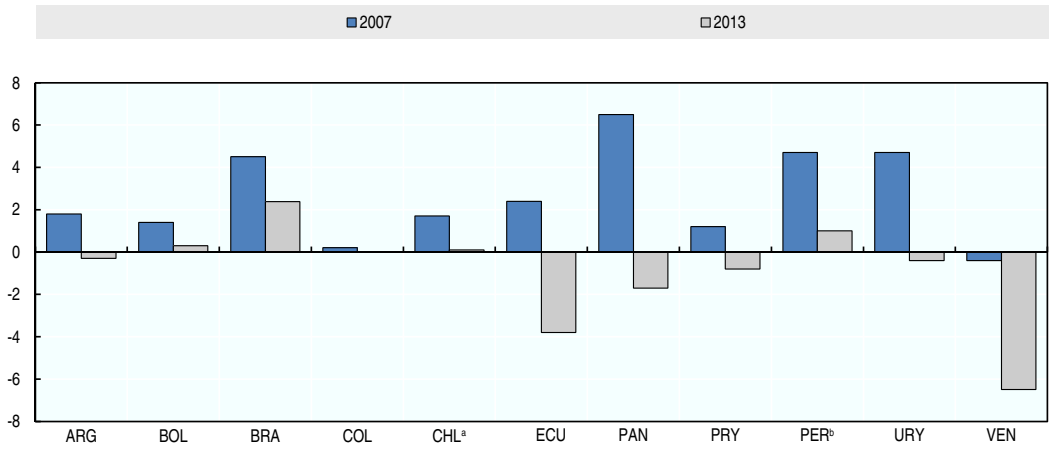
The role of countercyclical policies: Pursue or rebuild?

In addition to the first lines of defence against external shocks (availability of foreign assets and exchange-rate flexibility), fiscal and monetary policies are also crucial to counteract adverse situations. This was evident during the 2008-09 crisis. However, the region's room for manoeuvre has contracted, especially its scope for fiscal policy.

The fiscal balance remains highly correlated with the external balance. The twin surpluses of the 2000s have been replaced with twin deficits. Fiscal revenue rose on the back of continuous rises in the value of commodity exports in the 2000s, which generated additional income tax, royalties, excise taxes and direct transfers by public enterprises. Since 2011, however, declining commodity prices and the trend of currency appreciation have turned surpluses into deficits as spending has increased. The region's structural balances have also deteriorated as a result (Figure 2.14).

This represents a financial constraint and a macroeconomic risk for the region. Albeit to varying degrees, 15 Latin American countries and 10 Caribbean countries (including Belize, Guyana and Suriname) are faced with the simultaneous deterioration of their fiscal and external balances (ECLAC, 2014b). The Central American countries' current accounts averaged a deficit of nearly 6% of GDP in 2013, while their fiscal deficits averaged 3% of GDP. The Caribbean countries averaged wider deficits: 10% of GDP for current accounts and 5% of GDP for fiscal deficits. These two subregions are therefore the most vulnerable.

Figure 2.14. **Structural primary fiscal balance (% GDP)**



Notes: Latest figure for Ecuador is from 2012.

a) Includes public enterprises and social welfare.

b) The Ministry of Economy and Finance, in its latest macroeconomic framework, recorded a structural primary balance of 2.9% of GDP for 2007 and 0.7% of GDP for 2013. These figures are different because of the methodology used.

Source: Authors' work, based on central government data.

StatLink http://dx.doi.org/10.1787/888933174341

The average fiscal deficit of Latin American countries looks set to widen by 0.1 points to 2.6% of GDP in 2014 (ECLAC, 2014b). The region's deficit figures suggest a structural deterioration of public finances, which is particularly challenging when there are also long-term fiscal and external imbalances. Public spending is increasing while the tax revenue-to-GDP ratio is flatlining, which does not represent a systemic macroeconomic risk, but does form opposing trends in the medium term. In the Caribbean countries, the fiscal deficit rose to 3.6% in 2013, and is expected to narrow to 3.2% in 2014. Public debt – mainly external debts – remained at around 77% of GDP.

During slowdowns, as during the post-crisis years of strong growth, Latin American governments have generally adopted lax fiscal policies within new or reformed fiscal institutions. Colombia, Mexico and Peru, for instance, have tax rules that align their medium-term goals with business cycles and relevant commodity prices. They apply the structural fiscal balance calculation methodologies that were introduced when Chile adopted a structural balance target in 2001. Brazil, meanwhile, has relaxed its primary surplus targets, allowing more public spending during slowdowns, which has affected the credibility of the policy.

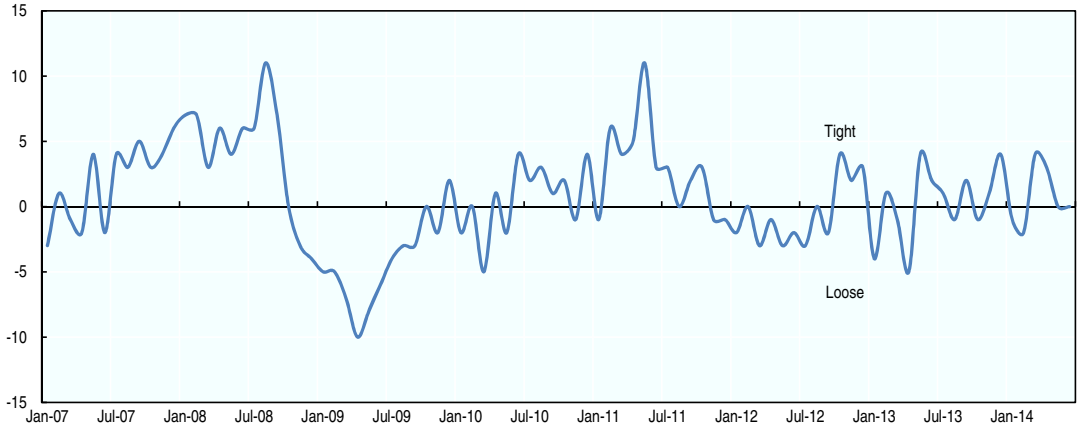
This lax fiscal policy bias was made possible by unusual conditions for accessing finance, especially historically low interest rates. The average public debt per country in Latin America remains stable, although it did rise slightly in 2013, from 31.5% to 32.4% of GDP (ECLAC, 2014b). In terms of its composition, external public debt amounted to only 15% of GDP, compared with 17% for domestic debt.

Bolivia, Chile, Ecuador, Guatemala, Haiti, Paraguay and Peru had below-average debt levels; Colombia, Nicaragua and Venezuela had close to average debt; and Argentina, Brazil, Costa Rica, the Dominican Republic, El Salvador, Honduras, Mexico, Panama and Uruguay had higher debt levels. The differences in debt levels are even greater in the Caribbean, where the national average stood at 76% of GDP in 2012, with Jamaica reaching debt levels above 100% of GDP. Interest repayments have fallen significantly in most countries. This trend is particularly relevant with regard to the outlook for the composition of spending and management of public finances, since it provides space for heavier investment and social spending.

Government budgets for 2014 and recent figures suggest that the upward trend in central government spending in the region in recent years has continued. Data for the first half of the year, even accounting for seasonal variation, warn of a spending surge in some countries, especially in government consumption. The most pronounced surges have been in Argentina, Costa Rica, the Dominican Republic, Ecuador, Guatemala, Nicaragua and Peru (ECLAC, 2014b). According to 2014 budget data, current expenditure by Latin American central governments will rise relative to GDP, at the expense of capital expenditure. Nevertheless, some countries have announced large-scale infrastructure programmes for the coming years, and public-private partnerships are on the rise. In other countries, public investment has focused on public enterprises (which are not usually recorded in central government budgets).

In short, vulnerabilities can thus be observed in the fiscal policies of Latin American and Caribbean governments, limiting their scope for stability efforts. However, on the monetary side, the region's central banks do have some scope to stimulate activity. In recent months, monetary conditions have remained on neutral ground in much of the region (Figure 2.15), albeit with some variation depending on the phase of the business cycle and the presence of inflationary pressures.

Figure 2.15. **Monetary policy indicator in Latin America**



Note: The countries included are: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Peru, Uruguay and Venezuela. The indicator is the sum of the number of countries that increased their interest rates in a month minus the number of countries that reduced their rates.

Source: Authors' work based on *Capital Economics*, ECLAC and central bank data.

StatLink http://dx.doi.org/10.1787/888933174352

Brazil and Uruguay, for instance, have applied restrictive policies to counter cumulative inflationary pressures. (Brazil raised interest rates, while Uruguay managed its aggregates.) However, credit issued by Brazilian public banks has accelerated, limiting the impact of the government's policies. The central bank actually put the measures on hold midway through the year, reduced reserve requirements and relaxed certain prudential rules to accelerate credit.[18] Colombia started to raise its rates this year to keep inflationary expectations anchored as economic activity improved and the output gap closed. Argentina also allowed rates to rise to prevent a further weakening of its currency, which could have knock-on effects on inflation, since the exchange rate is an important benchmark in forming expectations. Chile and Peru, on the other hand, have cut their interest rates to counter the rapid economic slowdown.

In addition to their response to the domestic business cycle, the region's central banks ought to react to Fed and possibly Bank of England interest-rate rises expected next year. In the financially integrated economies with inflation-targeting systems, central banks should be willing to tolerate a greater currency depreciation, with interventions designed to control volatility. However, to the extent that economies face greater inflationary pressures or are exposed to risks from currency mismatches, central banks may need to raise interest rates to curb the inflationary and financial risks brought by further depreciations. It would also be important to continue strengthening macroprudential regulations and the communication of those regulations in countries where private-sector debt has grown rapidly. This would avoid the accumulation of rate risks and currency mismatches.

Countries with less flexible exchange rates and with capital mobility are likely to be forced to approve increases in domestic rates in response to increases in foreign rates. In countries where inflationary pressures are building, monetary policy needs to be supported by actions to promote the conditions for savings and investments in the economies. Expanding the fiscal space and improving credibility would help to ease any dilemmas that the monetary authority might face and curtail the economy's reliance on external financing to tackle its deteriorating external balances.

Although monetary policy plays a key role in stabilising the output gap, the region's problem reaches far beyond business-cycle management. Countries seem to be fairly well

prepared for this, but the level of vulnerability and scope for action vary greatly among the region's economies. The region must address the causes of low growth potential. As we will see in the rest of the report, a fundamental component of the problem is education and the development of skills for innovation.

Conclusions and policy recommendations

In the short term, the region will record more modest rates of growth than in the 2000s, but is unlikely to be plunged into a crisis. Governments must focus on ensuring their economies are able to respond to more adverse conditions. The region needs to rebuild its financial shield by expanding its fiscal space. It must also maintain and increase the credibility of central banks for applying countercyclical management of monetary policy in just as exemplary a fashion as they did before the outbreak of the crisis.

The measures required to expand the fiscal space will depend on each country's initial conditions. In some countries, including some Central American countries, the Andean region and Mexico, the authorities should focus their efforts on strengthening their tax burdens (OECD/ECLAC/CIAT, 2014). Some South American governments with more consolidated income structures should focus on curbing increases in current public spending and developing automatic stabilisers. The Caribbean countries, meanwhile, will need to deal with the recurring problem of public-debt sustainability before they can expand their fiscal space. They also need to better communicate under what conditions they will use their macroprudential frameworks and stabilisers.

The main challenges, however, are in the long term. Is the current economic slowdown temporary, or will growth soon return to the potential rate, traditionally estimated to be in the 3-4% range? If modest growth continues, it will be difficult to close the income gap with the OECD economies or to continue reducing poverty and inequality at the current rate.

Faced with this uncertainty, it is time for the region to embark on a series of ambitious, bold reforms. The diagnosis is the same for all countries in the region – still the most unequal region in the world – and all are aware of it. Institutions are needed with the capacity to implement public policies that create and strengthen social systems built on the principle of equal rights for all. Yet, social policies alone are not sufficient to bring sustained, equitable growth in revenues.

Productivity and innovation improvements, production diversification, policies to reduce infrastructure gaps, investment in human capital, and formal job creation are all vital. Latin America's productivity in recent years has been disappointing compared with that of both OECD countries and emerging economies. Stronger productivity should lead to more inclusive growth and enable inequality and poverty to be reduced further, with 28% of the population (164 million Latin Americans) living below the poverty threshold in 2013 (ECLAC, 2013).

Each government should draw up its own reforms programme, taking into account that it is often difficult to improve productivity and reduce inequalities simultaneously. These reforms must ensure the improvement of workers' skills, For example by improving the connection between education and the labour market, providing better technical training outside universities, and upgrading infrastructure (especially energy and transport) and logistics (OECD/ECLAC/CAF, 2013), as well as by promoting formal employment. With 14 presidential elections having been held between 2012 and 2014, the political context provides an excellent window of opportunity. The region's well-being, especially in the long run, will depend on whether governments make the most of this opportunity. The rest of the report looks at many of these challenges.

Annex 2.A1. Methodology for identifying temporary resource booms

The World Bank's *World Development Indicators* (WDI, 1962-2012) for 144 countries were used to identify resource booms. Exports-to-GDP ratio series were used for three commodity groups: agricultural products (food and raw materials), minerals and fuels. The following criteria were applied:

- The value of commodity exports for each group must be more than 4 points higher than the trend GDP (see Sachs and Warner, 1999). This means that only booms that are significant to the country's economy are selected.
- The ratio of exports to trend GDP for a commodity group must be at least one median absolute deviation above the median for a 25-year series. This criterion excludes observations in countries that are traditional producers of natural resources and excludes structural changes to a certain export that do not entail temporary changes in the resources they receive for that export.
- Booms must last for at least three consecutive years, or two consecutive years if the boom is larger than the median boom in the sector.

This methodology is a new version of that described by Fernández and Villar (2013), except that a 25-year series is used and the calculation is based on exports as a ratio of trend GDP, thus preventing the inclusion of prolonged output declines as booms. The trend is calculated using an HP filter in which lambda = 400. To prevent distortions at the beginning and end of the series, the series is completed with IMF projections, and the first three observations are removed.

The same calculation was made for remittances, short-term capital flows and investment flows. The databases used were the *World Development Indicators* for personal remittances and Bluedorn et al. (2013) for short-term capital flows. For most countries, the data only go back as far as 1980.

One advantage of this method over methods used in other recent publications, such as Céspedes and Velasco (2011) and Adler and Magud (2013), is that in addition to identifying booms driven by price rises, it also identifies booms driven by increases in export volumes. This might occur when a new natural resource is discovered or when production expands rapidly thanks to investment in exploration, such as for fuels.

The following tables present the results for booms in commodities, capital flows and remittances (Table 2.A1.1).

Table 2.A1.1. **Temporary resource booms**

	Natural Resources			Remittances and capital flows		
	Number of countries included in the sample	Countries with booms	Number of booms per country (average)	Number of countries included in the sample	Countries with booms	Number of booms per country (average)
World	144	97	1.6	144	120	1.6
LAC	26	22	2.3	28	27	2.0
South America	12	11	3.3	12	11	1.8
Central America	14	11	1.4	16	16	2.3
Sub-Saharan Africa	34	23	1.4	34	25	1.3
South Asia	6	2	0.7	6	5	1.7
East Asia and the Pacific	11	8	2.0	15	11	1.4
Europe and Central Asia	17	10	1.1	18	14	1.7
Middle East and North Africa	8	5	2.0	10	7	1.9
High-income countries	42	27	1.5	38	31	1.3

Source: Authors' work based on *World Development Indicators*, World Bank and official sources.

Notes

1. Additional risks include the recovery in US shale production, which could reduce the country's reliance on certain fuel imports from Latin America, such as Colombian coal.
2. The increase in US interest rates could also help bring down commodity prices by making investments in commodities less attractive, but it is unclear how much influence interest rates would have.
3. Based on data from a sample of emerging countries between 1990 and 2012, this study argues that a rise in US interest rates affects gross flows but not net capital inflows. It also argues that a greater perception of global and domestic risk would have a greater impact.
4. In mid-2013, when the markets anticipated that US interest rates might start increasing earlier than expected, the rise in the price of 10-year treasury bonds was accompanied by a widening of the sovereign risk premium of emerging economies and of all Latin American sovereign issuers.
5. In this episode, the markets reacted adversely to news from emerging economies, such as the downturn in China's economic activity and the crashes in the Argentinian and Turkish currencies.
6. ECLAC projections were published in July 2014 and CAF projections in September 2014.
7. This analysis is based on Fernández and Villar (2013). See Annex 2.A1 of this chapter for more details on these definitions and the calculation method.
8. This chapter will now use the methodology developed by Céspedes and Velasco (2011) to examine how temporary resource booms steer the business cycle, using the full sample of countries. The mean output gap is calculated at two years before each boom, during the boom and two years after the end of the boom. The output gap is calculated as a ratio of the cycle and trend output in constant terms in the local currency of each country. Trend and cycle output were calculated using the Hodrick-Prescott filter, with a smoothing parameter of 400, according to the method described by Correia, Neves and Rebelo (1992) and by Cooley and Ohanian (1991). The initial four and final four observations are removed to prevent distortions at the ends.
9. Openness to foreign investment in hydrocarbons usually goes against the price cycle because, when prices rise, many countries tend to raise taxes or modify contracts to acquire a larger fraction of income, which makes investment less attractive. Conversely, when prices fall, countries tend to open up to foreign capital as they have fewer resources to meet the investment needs of the sector (see CAF, 2012). Perhaps one notable exception was the opening of the hydrocarbons sector during the 2000s. More recently, Mexico also opened up its economy, having previously been closed to any kind of foreign investment.
10. Vector autoregression (VAR) is an econometric model used to evaluate the relationships among a set of variables over time without assuming any causal relationships among them. Panel VAR is an extension of this methodology that includes cross-sectional data. In this chapter, it is used to analyse the relationships among data for various countries across time.
11. Venezuela's current flows have also been hit by the fall in the volume of crude oil and derivatives exports in recent years, since these represent 96% of total exports. Thus, the continued currency appreciation has had an even greater impact by encouraging rapid growth of imports. Argentina's current flows have also been hit by the country's growing energy deficit.
12. Bank financing has grown over the last five years, especially in Costa Rica, Guatemala and the Dominican Republic.
13. In Peru, declining prices over the next few years could be partly offset by an increase in the volume of metal exports once new mining projects commence operations. These additional exports would also offset any decline in foreign-investment flows, thanks to the maturity reached by several mining projects.
14. This is evidenced in Argentina by a rapid fall in reserves and in Venezuela by a decline in reserves and a fall in assets in sovereign wealth funds. However, if Argentina were able to resolve the selective default it fell into after failing to reach an agreement with bondholders on 30 July, the country would regain access to the markets and would be able to contain the decline in reserves while meeting its external commitments.
15. Ecuador has imposed some import barriers to mitigate the deterioration of flows and reserves.
16. In Argentina and Venezuela, adjustments would also involve reducing foreign-exchange restrictions.

17. Venezuela also has external-assets funds other than reserves, but there is little transparency on the size of these funds and on what proportion is freely available to cover liquidity needs.
18. The Central Bank of Brazil halved its risk weighting factor for credit operations for vehicles, increased the maximum amount that can be lent to small and medium-sized enterprises, approved the risk weighting factor for all retail lending operations in line with international guidelines, and cut collateral requirements for large companies.

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Chapter 3

Skills in Latin America and the Caribbean amid shifting wealth

This chapter analyses the influence of shifting wealth on skills and production development in Latin America. It proposes that an inadequate supply of skills (in terms of quantity and quality) explains their limited role in the Latin American development model. This situation has left the vast majority of countries in the region caught in the middle-income trap, which is particularly difficult to escape in the current context, in which shifting wealth is making it difficult to identify and acquire the necessary skills. More than in any other emerging region, Latin American companies are not seeing their demand for skills being met. This contrasts with the drop in returns to education in the region, reflecting the complexity of acquiring the skills needed in such a dynamic economic environment. The chapter also analyses the distribution of workers according to their level of skills and highlights the potential role of technical and vocational training in increasing the impact of training on employment.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Shifting wealth[1] directly influences skills[2] and production development in Latin America. Skills play a limited role in Latin America's growth model, which is one of the reasons why Latin America remains in the so-called "middle income trap".[3] The shift in global wealth towards emerging countries is causing major changes in the supply and demand for skills, both worldwide and specifically in Latin America.

The first section of this chapter describes the relationship between skills and the middle-income trap, with a special focus on Latin America. The next section provides a detailed explanation of how shifting wealth affects that relationship through major changes in the supply and demand for skills. The third section explores the demand for skills in Latin America, and uses an empirical analysis to conclude that there is an unmet demand for skills, more so than in other emerging regions. Consequently, the fourth section examines how the relationship between supply and demand for skills has evolved, analysing the decisive factors behind the recent decline in the returns to education and the importance of technical and vocational education and training (TVET) in forging linkages between the education system and the production sector. The fifth and final section summarises the main conclusions drawn in the chapter and makes some policy recommendations.

The limited role of skills in Latin America explains why the region remains in the middle-income trap

Economic-development literature has recently suggested the existence of a "middle-income trap".[4] Its most obvious sign is a prolonged slowdown in economic growth after a country reaches the middle-income range. However, there are various methods for identifying the middle-income trap and different income ranges used to define when a country is in the trap.

A fundamental cause of the middle-income trap is the inability to move towards a more knowledge-based and skills-based economic model. Economic development in its early stages is marked by a reassignment of production factors among activities that generate major productivity gains (Kuznets, 1955). Because of the almost endless supply of labour, the additional productivity does not translate entirely into higher salaries, so the economy maintains its price competitiveness. This generates a favourable environment for a reallocation of factors accompanied by greater specialisation in cost-sensitive, unskilled activities, usually with strong support from foreign technology (Agénor, Canuto and Jelenic, 2012).

However, once a country reaches middle-income levels, the continuity of this development model is jeopardised. On the one hand, the first signs of pressure on the labour markets emerge. These pressures are countered with wage increases with no corresponding productivity gains, because the sectors that experienced productivity gains during the initial development phase tend to exhaust them (Agénor, Canuto and Jelenic, 2012). As labour costs increase and price competitiveness falls, new forms of competitiveness are required, with output that is of better quality or more suited to consumer preferences (Kharas and Kohli, 2011). The production structure must be geared towards more knowledge-intensive and technology-intensive sectors with higher value added (Spence, 2011; Foxley and Sossdorf, 2011; OECD, 2014). This transition is particularly difficult for middle-income economies, but is necessary to prevent the structural transformation from stagnating.

Skills are one of the main inputs for escaping the middle-income trap

A country's ability to steer its growth model towards high value-added, technology-intensive and knowledge-intensive activities depends on a broad set of complementary variables, ranging from a stable macroeconomic environment to an innovation-friendly business environment (World Bank, 2010).

Repeatedly, the literature that discusses these factors mentions skills among the most important requirements. In part, this is because skills are closely connected to the knowledge-intensive and innovation-intensive activities and industries (see Chapter 5), which drive economic development once middle-income levels have been reached. Furthermore, a larger stock of skills raises efficiency, which becomes the main driver of growth as other factors see their contribution to growth decrease (Kharas and Kohli, 2011). The quality and complexity of the skills must gradually increase and include both cognitive and social skills, especially those related to science and creativity in the production environment. In short, those countries that are able to accumulate a larger stock of high-quality human capital are more likely to avoid the middle-income trap (Eichengreen, Park and Shin, 2013).

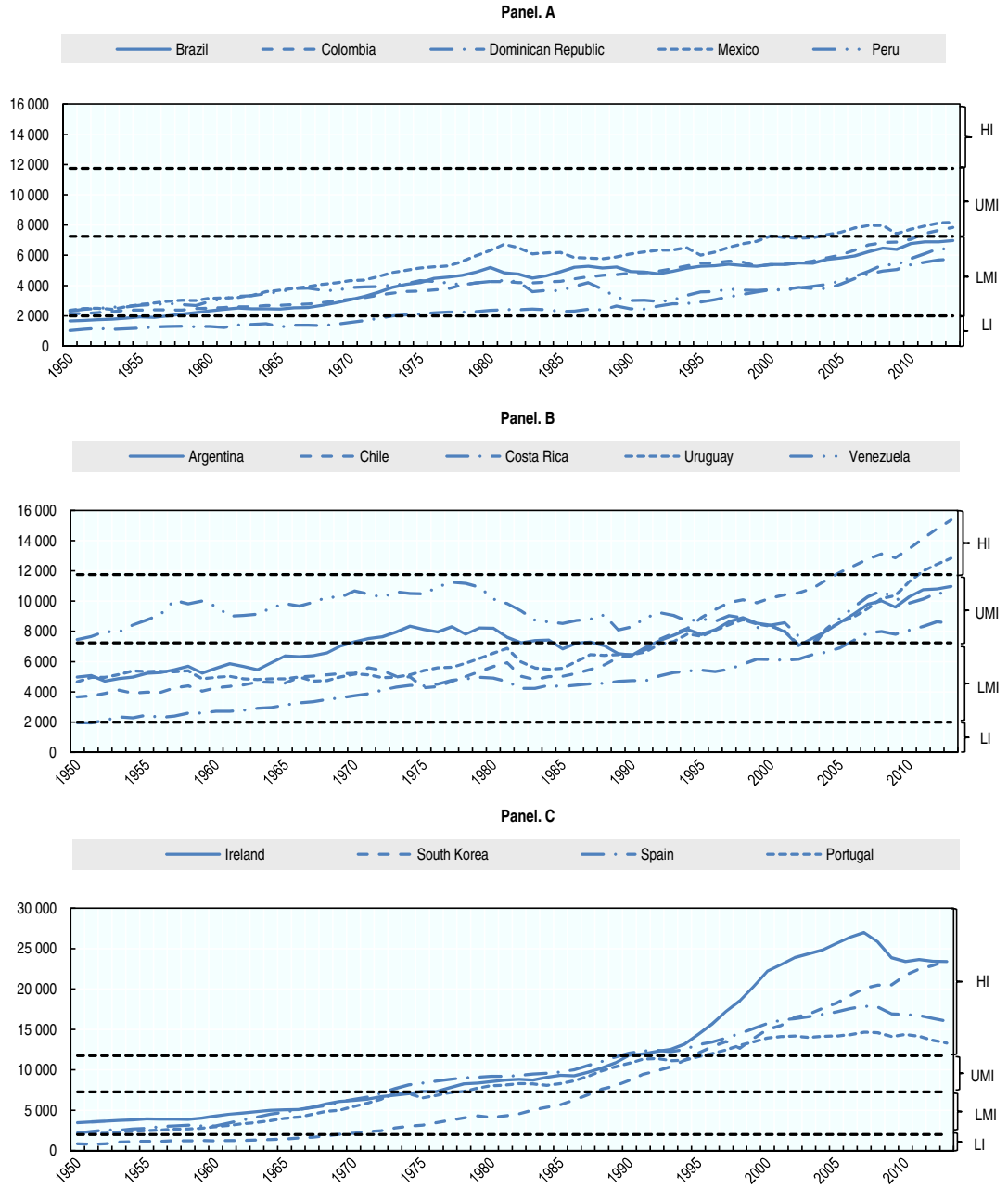
The middle-income trap is a persistent problem in Latin America and the Caribbean, which has been surpassed only by Trinidad and Tobago, and in more recent times Chile and Uruguay

Latin America and the Caribbean is particularly badly affected by the middle-income trap. Although income in the region was relatively high in the mid-20th century, the countries have made no considerable progress in closing the income gap with advanced economies. Over the last six decades most countries that have transitioned from middle-income to high-income levels have been in Europe and Asia. Only Chile, Uruguay, Trinidad and Tobago, and some other Caribbean economies are part of the group of high-income economies in the region (as classified by the World Bank for 2015).[5]

This middle-income trap is particularly persistent in the region. Some studies have found that Brazil, Colombia, Peru and the Bolivarian Republic of Venezuela (hereafter "Venezuela") have been caught in the trap for over 60 years (Felipe, Abdon and Kumar, 2012). Using the same series and the same levels to define income groups,[6] Figure 3.1 (Panels A and B) shows the middle-income trap's influence on Latin America over time.

In most countries the upward trend in per capita gross domestic product (GDP) ended in the late 1970s, when income levels in several countries became more erratic and began to stagnate or fall. This situation was exacerbated by the 1980s debt crisis and started to correct only with the expansionary phase of the 2000s. This pattern was most prominent in Argentina and Venezuela, both of which had a relatively high GDP per capita in 1950, but it also occurred in countries that initially were lower-middle income (Colombia, Mexico and Peru). The pattern is in sharp contrast to what happened in Asia and Europe, where some countries not only avoided the middle-income trap, but continued on a path of continuous growth for several decades (see Figure 3.1 Panel C for a selection of these countries).

Figure 3.1. **Middle-income trap in selected Latin American and OECD countries**
(constant 1990 USD, PPP, 1950-2012)



Note: The horizontal lines mark the thresholds between the low-income (LI), lower-middle income (UMI) and high-income (HI) groups.

Source: Authors' work based on the Conference Board Total Economy Database™, accessed in January, *www.conference-board.org/data/economydatabase/*.

StatLink http://dx.doi.org/10.1787/888933174361

Countries in the middle-income trap struggle to redirect their growth strategy once they reach middle-income levels (Kharas and Kohli, 2011). In Latin America, structural transformation has not been directed towards knowledge-intensive activities. This is related to education indicators, which, as shown in this chapter and in Chapter 4, reveal a substantial, persistent gap with countries that were able to escape the middle-income trap, particularly in the area of quality of education. This gap is compounded

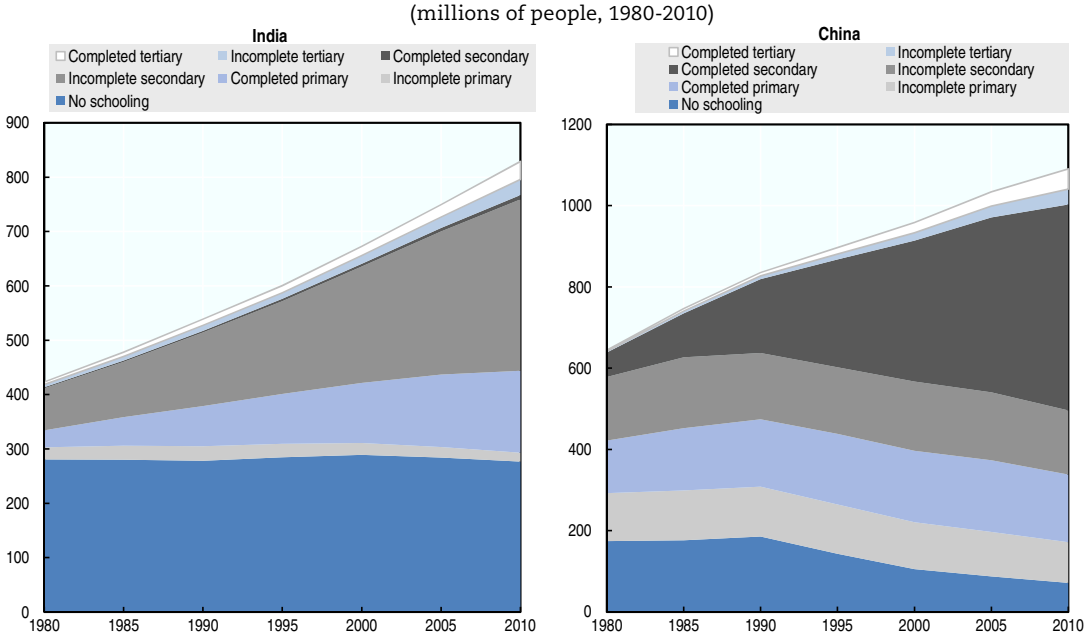
by an inefficient allocation of resources, resulting in much lower productivity than in advanced economies (Busso, Madrigal and Pagés, 2013; Loser, 2013). This productivity gap is one of the main symptoms of the middle-income trap in the region (OECD, 2014).

Shifting wealth impacts supply and demand for skills in various ways

The shift in global wealth towards emerging countries vastly transforms the stock and make-up of production skills. One of the most significant changes is the positive supply shock generated by the large emerging countries' entry into the global economy. China and India brought 1.2 billion new workers into the global economy, most of whom had only basic skills (OECD, 2010a).

Over time, some of these emerging economies have begun to steadily increase their stock of skills. There is a growing consensus that they need to improve the skills of their workforce to meet the needs of the new global economy and to deepen structural transformation. According to some estimates, the number of university graduates in emerging countries has more than doubled since 1980 (McKinsey Global Institute, 2012). A major factor that shaped changes in the distribution of skills in Asia's two largest developing economies, People's Republic of China (hereafter China) and India, is the large upsurge in the number of people with secondary education qualifications. A relatively similar upsurge has been seen in the number of people who have complete or incomplete tertiary education, albeit from a much lower starting point (Figure 3.2).

Figure 3.2. **Population by education level**
(millions of people, 1980-2010)



Source: World Bank (2014), *World Development Indicators*, World Bank, Washington, DC.
StatLink http://dx.doi.org/10.1787/888933174374

Latin America too has increased its supply of skills, especially the percentage of the population with secondary or tertiary education (see Chapter 4). As a result, the region has considerably narrowed the gap in education coverage with the OECD economies. Moreover, the recent growth in the middle classes in the region provides another foothold for skills acquisition, as the middle classes are more likely to demand education services (BBVA, 2013). However, these trends should be treated with caution, since the main comparative tests for education systems find that the gap in educational quality with advanced economies remains.

On the demand side, shifting wealth and the associated demand for commodities frequently appear as one of the factors that led Latin America and the Caribbean to less complex skill requirements. China's and other emerging economies' demand for commodities has driven countries with abundant natural resources to move away from knowledge-intensive activities, relatively speaking, and towards the provision of commodities. This shift has increased demand for skills related to natural resources (Aedo and Walker, 2012). The situation is also challenging for countries that do not specialise in commodities, since they struggle to maintain or develop comparative advantages in manufacturing because of China's position as "global factory".

Latin America therefore appears to have experienced an incomplete structural transformation with a non-skill-intensive production model. The region's commodity sector, operating as an enclave with little capacity to create jobs or production linkages, coexists with a limited manufacturing sector exposed to strong competition from abroad and a highly informal services sector whose human capital is poorly qualified (McMillan and Rodrik, 2011; Cimoli and Correa, 2002).

Globally, however, technological change is driving demand for skills acquired through higher qualifications. The wave of technological innovations over the past few decades has fostered an increase in the relative demand for skilled workers for two reasons. First, absolute demand for qualified workers has increased because of the complementarity between skilled workers and new technologies, since they are the ones who can use them. Second, relative demand for less-skilled workers has decreased because some of these technological innovations are taking over routine tasks that they previously carried out (Acemoglu and Zilibotti, 2001; Autor, Katz and Krueger, 1998).[7]

Globalisation is another driver of demand for skills. Trade liberalisation and capital liberalisation in recent decades have strengthened the role of skills as a source of economic competitiveness (Lall, 2000). This same liberalisation process has facilitated new business structures, especially businesses whose production stages are spread across various geographic areas. These new structures have given rise to a new labour structure based on a horizontal, flexible approach with adaptability. These attributes generate additional demand for a wide array of skills, ranging from technical knowledge of the digital world to "soft skills" such as agile thinking, interpersonal communication and the ability to operate in multicultural, geographically dispersed environments (Oxford Economics, 2012).

Global value chains are a prime example of this new production structure. Global value chains define much more specific competitiveness niches that are directly related to a particular activity in the production chain. Identifying and correcting skills mismatches therefore becomes a much more arduous task, since there is no longer such a direct link with the sector, but rather with a particular segment in the production process. Likewise, changes to the distribution of value in the chain suggest that skills have become a more important factor in generating value added, because knowledge-intensive activities in the production chain (research and development [R&D], design, marketing, etc.) tend to increase their relative contribution to value added (OECD, 2013c).

In conclusion, several counteracting factors are determining the balance between supply and demand for skills. The entry of some large emerging countries into the global economy is having a crucial influence, increasing the global labour supply. In addition, measures for the provision of education in some of these countries are significantly affecting the supply of skills worldwide. On the demand side, technological and structural changes are affecting demand for skills, which is becoming more complex and segmented.

As a result, the interaction between supply and demand in national labour markets is becoming more complex because the global supply of skills is growing and demand is

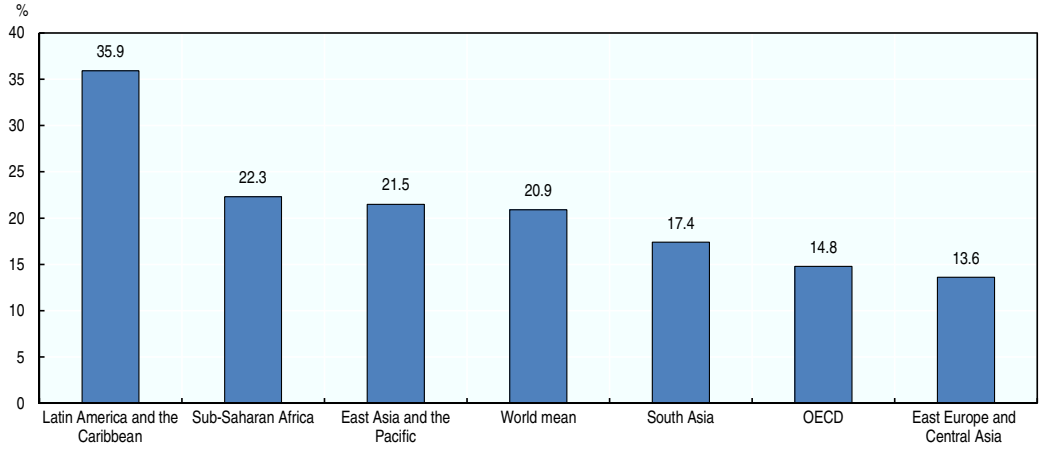
being shaped by increasingly more specific know-how, the balance between technical and soft skills, the need for continuing education and retraining, and the fragmentation of production.

Latin America is struggling more than other emerging regions to meet demand for skills

Latin America is one of the regions where the gap between supply and demand for skills seems to be having the greatest impact. There is a wide gap between the training that the education system provides and the skills that the production sector demands. Furthermore, according to the World Bank Enterprise Surveys,[8] Latin America's production sector struggles more than that of any other region to find the skills that are in demand. Specifically, 35.9% of firms say they struggle to find an adequately educated workforce (Figure 3.3).

Globally, it seems to be mainly the middle-income countries that struggle to meet demand for skills. An "inverted U" trend is observed, with firms in low-income and high-income countries having the least difficulty in finding an adequately trained workforce, and firms in middle-income countries, especially in upper-middle income countries, and more so in Latin America, having the most difficulty finding the skills they need. The difficulty in finding skills acts as a barrier to development (Figure 3.4).

Figure 3.3. **Percentage of firms that believe an inadequately educated workforce is a major constraint on their operations, by region**

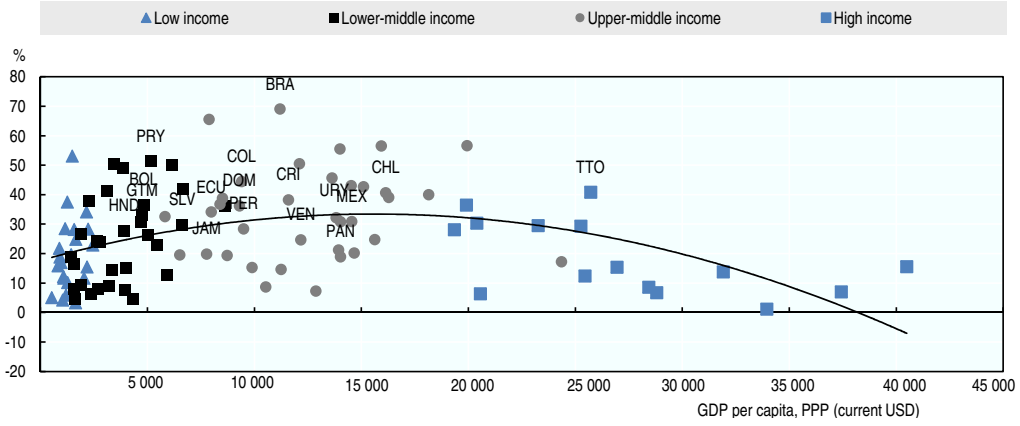


Note: Data are taken from the last survey available for each country. The countries included in the sample, by region, are: Sub-Saharan Africa: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Côte d'Ivoire, Cabo Verde, Chad, Congo, Democratic Republic of Congo, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Lesotho, Madagascar, Mali, Mauritania, Mauritius, Malawi, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia and Zimbabwe. Latin America and the Caribbean: Argentina, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Lucia, Suriname, Trinidad and Tobago, Uruguay and Venezuela. East Asia and Pacific: Cambodia, China, Fiji, Indonesia, Laos, Malaysia, Micronesia, Myanmar, Mongolia, Philippines, Samoa, Thailand, Timor-Leste, Tonga, Vanuatu and Viet Nam. South Asia: Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka. Eastern Europe and Central Asia: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Georgia, Hungary, Kazakhstan, Kosovo, Kyrgyzstan, Macedonia, Moldova, Montenegro, Romania, Serbia, Tajikistan, Turkey, Ukraine and Uzbekistan. OECD: Chile, Estonia, Germany, Greece, Ireland, Israel, Korea, Poland, Portugal, Slovak Republic, Slovenia, Spain.

Source: *Enterprise Surveys* (2012), World Bank, Washington, DC.

StatLink http://dx.doi.org/10.1787/888933174385

Figure 3.4. **Percentage of firms that believe an inadequately educated workforce is a major constraint on its operations, by country and income per capita**



Source: Authors' work based on data from *Enterprise Surveys* (2012), World Bank, Washington, DC and World Bank (2014), *World Development Indicators*, World Bank, Washington, DC.
StatLink http://dx.doi.org/10.1787/888933174397

Explaining demand for skills in Latin America vs. other emerging regions through empirical analysis[9]

This section analyses whether there is more trouble for firms to meet their human capital needs in Latin America than in other emerging regions. It looks at the intensity of skills required by the production process in the regions' economies, the level of development and the sector in which the company operates.

A variable was used to analyse the difficulty posed by the lack of adequately educated workers to operate a company (based on the World Bank's *Enterprise Surveys* database). The variable is an integer from 0 to 4, where 0 means the company faces no obstacles and 4 means the company faces "very severe" obstacles. A sampling of emerging and developing economies was used, with data from 2006 to 2010. Econometric analysis was applied to the sample, with two types of ordered logit specifications. First, collapsed values of the dependent variable were taken, with those firms reporting least difficulties (0 and 1) placed in one group and those encountering most difficulties (3 and 4) in the other.[10] Second, a generalised ordered logit model was used to enable all the levels described to be included.[11]

Latin America was the region with the highest percentage of formal firms reporting greater operating difficulties due to the skills shortages.[12] Based on the collapsed values of the dependent variable, 53% of the Latin American firms[13] in the sample reported facing major operating difficulties because they struggled to find adequately educated human capital, while 47% reported facing limited difficulties. Only Europe and Central Asia used to have results close to these a few years ago, while in the other regions a much smaller proportion of companies face such difficulties.[14]

To evaluate properly these difficulties, it is important to consider the intensity with which firms use skills (measured as the ratio of non-production workers to production workers), the level of development of the country in which the firm is based (measured as GDP in US dollars at purchasing power parity), and the firm's region and sector (identified using dummy variables). Thus, some of the specifications included interaction terms between the region dummy and the skill-intensity variable.

The empirical analysis confirms that Latin American firms are more likely to encounter difficulties in finding skills than firms in other regions. The odds ratios show that Latin American firms are 2.9 times more likely to encounter major difficulties in meeting their demand for skills than firms in South Asia, and around 13 times more likely than in Pacific Asia. Furthermore, in Latin America, firms with a skill-intensive production process are more likely to face major difficulties in finding the skills they require.

In terms of production sectors, the automotive and machinery industries have greater difficulties meeting their demand for skills. To enable analysis by sector, 12 category variables were included to represent 12 industries. These sector dummy variables do not affect the above conclusions drawn from the geographical variables, with Latin America remaining the region with the greatest difficulties. The machinery and automotive industries have greater difficulties meeting their human-capital needs. The chemicals and services industries, on the other hand, have statistically significant negative ratios, while industries involved in exploiting raw materials do not have significant skills deficits. The results hold true both for the sample of all emerging regions and for a sample containing only Latin American firms.

The greater difficulty encountered by the automotive and machinery industries is especially challenging, since those industries could be vital to the region's structural transformation. These sectors tend to show a greater degree of sophistication, connectivity and complexity than most tradeable industries. To analyse this, an empirical analysis compared the two sectors with all the other industries using three "product space" variables (Hausmann, Hwang and Rodrik, 2007; Hidalgo et al., 2007). Some of these variables were built using trade data from the United Nations' COMTRADE database and the product-complexity index designed by Hausmann et al. (2011).

The main benefit of this methodology is that it can evaluate an economy's structural transformation based on certain features of the tradeable industries in the export basket. In particular, these features include the industry's sophistication and its similarity or "closeness" to other industries (see Box 3.1). The automotive and machinery industries have higher average values for all the product-space variables. This is true not only compared with all the other sectors combined but also compared with the individual sectors most closely involved with raw materials (foodstuffs and basic metals).[15]

Nevertheless, product-space analysis has certain limitations: because it uses final transaction values, the above conclusions should be treated with caution. First, trade specialisation is a less accurate proxy for an economy's production structure than other indicators such as sector contributions to GDP. The use of final transaction values can create a false picture of the value added generated by an economy, especially in sectors in which there is a strong presence of global value chains (OECD, 2013c). Finally, the database used in the analysis does not cover the services sectors, which can be an essential pillar in emerging economies' development strategies, including those of Latin America (OECD, 2013a).

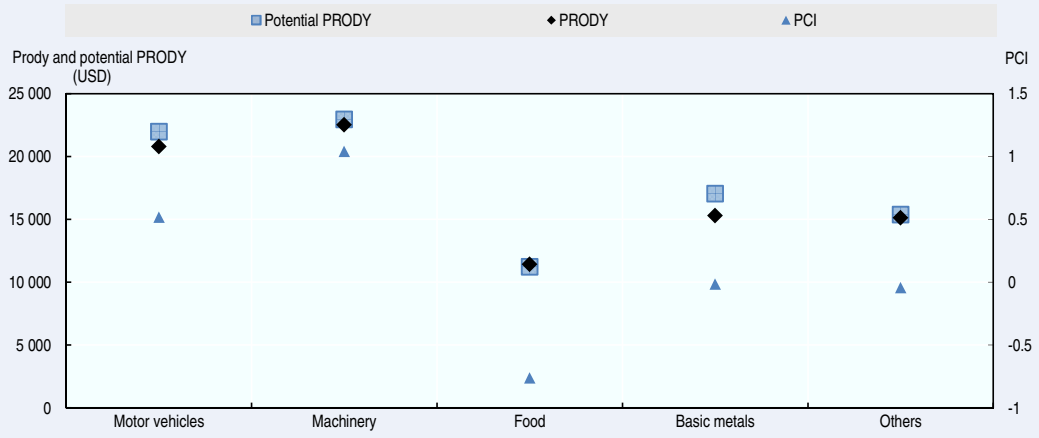
Box 3.1. **Sectors with unmet demand for skills: Fundamental for structural transformation?**

This box presents the findings of the sectoral analysis using the product-space variables. The prior econometric analysis identified the automotive and machinery sectors as those with the most human-capital problems. We must therefore now determine whether this situation is related to Latin America's difficulty in implementing a more profound structural transformation.

The analysis is based on comparisons of the medians of three variables (PRODY, potential PRODY and product complexity index; see the note to Figure 3.5) derived from the product-space methodology.

These comparisons are made for five sectors: motor vehicles, machinery, foodstuffs, basic metals, and the entire sample except automobiles and machinery (referred to as "other"). The sectors with the most acute problems meeting their workforce needs in Latin America (motor vehicles and machinery) are therefore compared against the other sectors ("other") and against the food and basic metals sectors, which act as proxies for commodity sectors, therefore linked to the "reprimarisation" of the region's economy resulting from shifting wealth.

Figure 3.5. **Median of product-space variables**



Notes: PRODY: a product-sophistication index calculated as a weighted average of GDP per capita of countries that export a product with a revealed comparative advantage (RCA>1), where the weights reflect the RCA. The PRODY index is thus an approximation of a product's sophistication, with higher indices representing products that are exported by countries with a higher GDP per capita (Hausmann, Hwang and Rodrik, 2007). The median was taken for the years 2000-05, which is the interval that covers the largest number of industries.

Product complexity index (PCI): an index created by Hausmann et al. (2011) using the "method of reflections". This method uses information on a country's diversification of exports and the ubiquity of the products it exports to build an index that evaluates the skills used to produce a good. The PCI is calculated using the average diversification of countries that export a given product with RCA and the average degree of ubiquity of other goods exported by those countries. Higher indices are associated with products requiring a greater number of production capacities, or capacities that are more complex. Potential PRODY: the PRODY index and the variable for proximity among sectors (Hidalgo et al., 2007) are used to build the potential PRODY variable, which measures a product's connectivity with the rest of the product space. It is calculated as a weighted average of the PRODY values of the sectors to which the sector is connected, where the weights reflect the distance (measured as probability) between the two products. High potential PRODY values therefore indicate goods that are situated better in the product space, which is determined by the product's proximity to a wide range of sectors or to highly sophisticated sectors (PRODY).

Source: Authors' work based on United Nations Statistical Division (2013) (http://comtrade.un.org/) and Hausmann et al. (2011), *The Atlas of Economic Complexity*, Puritan Press, accessed in May 2014.

StatLink http://dx.doi.org/10.1787/888933174406

Box 3.1. **Sectors with unmet demand for skills: Fundamental for structural transformation?** *(cont.)*

Under these parameters, the median values for the product sophistication (PRODY), connectivity in the product space (potential PRODY) and product-complexity index (PCI) variables are compared (Figure 3.5). This comparison confirms that the automotive and machinery sectors have higher PRODY, potential PRODY and PCI values. This holds true in comparisons with the other sectors in the product space and comparisons with sectors more closely involved with raw materials. The tradeable industries with particular difficulties finding the skills they need are therefore also some of the industries that would be better able to underpin structural change and the region's transition to a knowledge-intensive and technology-intensive development model

The relationship between supply and demand for skills in the labour markets can be analysed by the distribution of workers and by the returns to education

Recent studies all confirm that there is unmet demand for skills in Latin America. In 2014, 56% of employers in the region reported that they had difficulties finding the workforce they needed (Manpower, 2014), compared with only 42% in 2010. These difficulties were particularly prominent in Peru (67%), Brazil (63%) and Argentina (63%). The same survey found that employers had more difficulties finding technical skills than other skills.

Latin American firms are seeking a series of "soft skills" that are particularly scant in the region. In addition to cognitive skills, a number of non-cognitive skills related to aspects such as critical thinking, responsibility in the workplace, teamwork, dealing with complex situations, and oral and written communication can be very important to the performance of a profession. Usually known as "soft skills", these skills are in high demand among the region's employers, who say they struggle to find workers that have them (IDB, 2012).

The interaction between supply and demand in the Latin American labour market shows that there is a high concentration of low-skilled workers and jobs

The relationship between supply and demand for skills can be analysed in the labour market. To this end, supply and demand for lower, medium and higher skills are compared. The supply of skills is measured as the percentage of people with different levels of education employed in an economy. Those with only primary education are classed as low-skilled, those with secondary education as middle-skilled, and those with tertiary education as high-skilled. Demand, meanwhile, is measured using the proxy of the percentage of employment in a particular occupation, and each occupation is associated with a certain skill level (Box 3.2). Figure 3.6 (panels A, B and C) shows the results of these skills' supply and demand proxies for low, medium and high skills in a wide range of countries.

Box 3.2. **Demand for skills: Classification of employment by occupation and skill level**

To determine demand for skills in the labour market, the percentage of employment in a particular occupation is taken, and that occupation is associated with a certain skill level. Demand for skills can thus be compared against supply, which is approximated using workers' level of education, as shown on the horizontal axis in Figure 3.6.

Skill levels were assigned to each occupation based on the ISCO-88 classification (see Table 3.1). Each of the ten major groups of occupations in the classification was associated with one of three skill levels: low-skilled, medium-skilled and high-skilled.

Low-skilled workers (skill level 1) included unskilled workers and members of the armed forces. Medium-skilled workers (skill level 2) included clerks; service workers and shop and market sales workers; skilled agricultural and fishery workers; craft and related trades workers; and plant and machine operators and assemblers. Finally, high-skilled workers (skill levels 3 and 4) included legislators, senior officials and managers; professionals; and technicians and associate professionals.

Table 3.1. **Classification of employment by occupation (ISCO-88)**

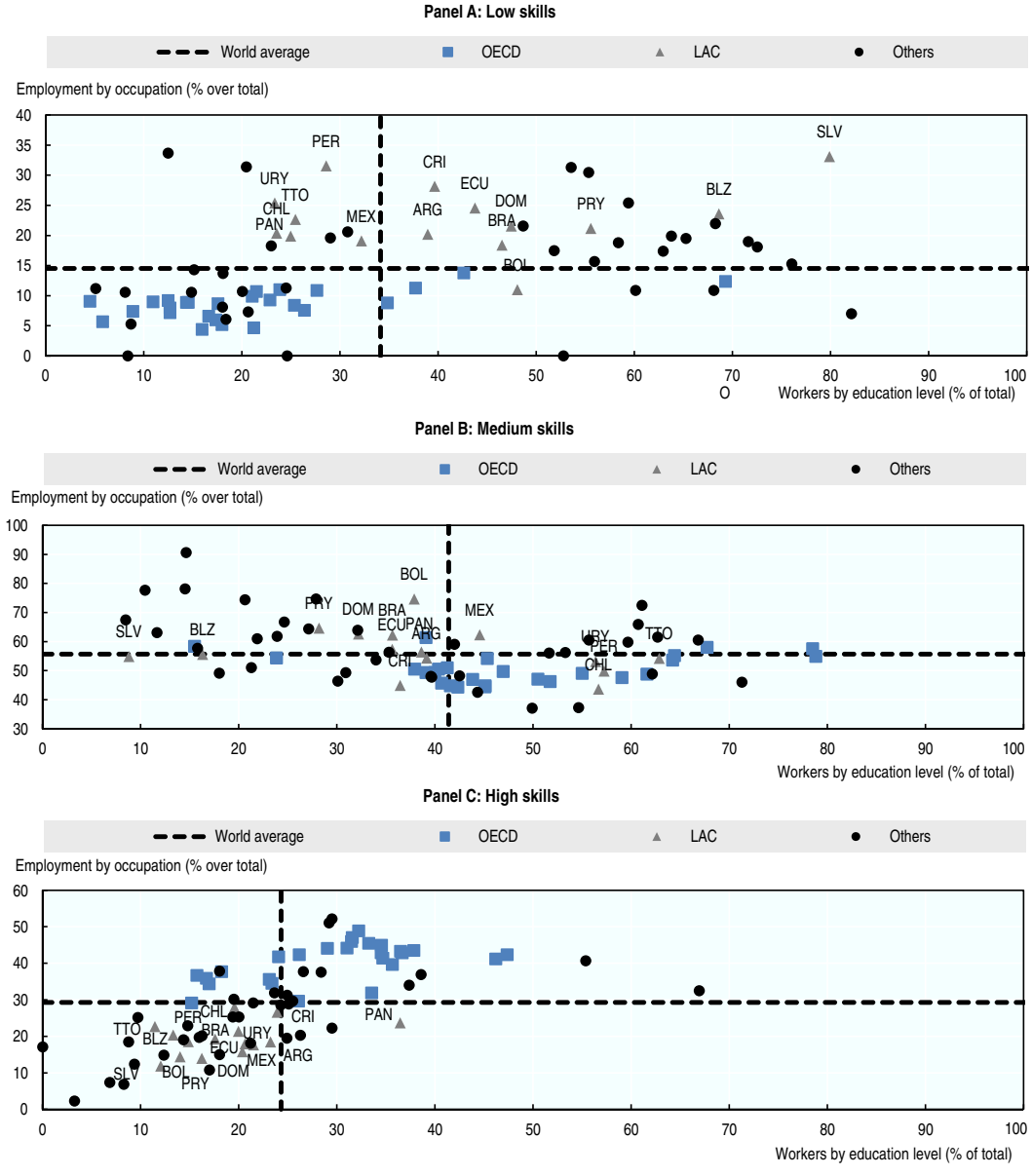
	Employment by occupation (ISCO-88)	ISCO skill level
1	Legislators, senior officials and managers	-
2	Professionals	4
3	Technicians and associate professionals	3
4	Clerks	2
5	Service workers and shop and market sales workers	2
6	Skilled agricultural and fishery workers	2
7	Craft and related trade workers	2
8	Plant and machine operators and assemblers	2
9	Elementary occupations	1
0	Armed forces	-

Note: The first level of ISCO skills was based on category 1 of the ISCED classification, in which primary education starts at the age of 5, 6 or 7 and lasts about five years. The second level of ISCO skills was based on categories 2 and 3 of the ISCED classification, which includes the first and second parts of secondary education. The first part begins at the age of 11 or 12 and the second part at 14 or 15, both lasting three years.

Latin American countries tend to have a high proportion of low-skilled workers in low-skilled jobs, in stark contrast to the situation in the OECD countries. Supply better matches demand for medium-skilled jobs in both Latin America and the OECD countries (Panel B, Figure 3.6). Finally, supply and demand are similar in both the OECD countries and Latin America for high-skilled jobs (Panel C, Figure 3.6), But while in the OECD countries supply and demand are high, in Latin America they are both low.

Figure 3.6. **Workers by education level and occupation, according to skill level**

(percentage of the total, most recent year)



Note: In most cases, the data refer to the period between 2008 and 2012.

Source: Authors' work based on data from ILO (2014), *Key Indicators of the Labour Market*, eighth edition, International Labour Organization.

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Technical and vocational education and training are essential to ensure that education is geared towards employment

In regions with poor skill levels like Latin America, technical and vocational education and training (TVET) is particularly important. TVET is usually related to the knowledge and skills linked to the workplace. It can therefore play a very important role in connecting, complementing and even updating the training offered by the education system to ensure that it meets labour market demands.

TVET covers different learning experiences that furnish job-related knowledge and skills and are acquired through various means throughout a person's career. TVET generally includes learning experiences that can be acquired through: *i)* formal channels, i.e. the education system and/or diplomas; *ii)* non-formal channels, such as uncertified in-house training, that does not lead to any formal credential that would let the learner move up the educational system; and *iii)* informal channels, i.e. largely skills acquired naturally in the course of life in one's interactions with others or in contexts in which a person's personality develops (UNESCO, 2013a). An important characteristic of TVET is that it includes career-long training. It prepares learners for the workplace, thus playing an important role both at the start of a person's working life and during it (UNESCO, 2013b).

The focus of this analysis will now turn to formal education, including both the education system and certified in-house training (see Box 3.3 for more information on on-the-job training in certain countries of Latin America and the Caribbean). However, two observations are particularly relevant to Latin America and should be included in a general analysis of TVET. First, many workers and businesses operate in the informal economy, so some professional skills are acquired in informal contexts, which means they have no subsequent recognition. Second, skills acquired in non-formal contexts, especially informal contexts, are more closely tied to the person's socio-economic setting, gender and geographic location, all three of which are the basis for inequalities.

Box 3.3. **Latest developments in on-the-job training in Latin America and the Caribbean**

One of the big challenges shared by Latin American economies today is to raise the productivity of their workforces. Training provided by the employer in relevant, up-to-date skills can play a substantial role in achieving this objective.

Flores et al. (forthcoming) analyse the impact of on-the-job training on productivity based on data from the only two surveys in Latin America and the Caribbean conducted among formal companies that provide data on on-the-job training in different countries. The first is the Enterprise Surveys, which contain data on on-the-job training in 12 countries in the region, with a large subset containing longitudinal data. The second is the Surveys of Human Resource Productivity and Education (EPF), which are carried out in several countries in the region with support from the Inter-American Development Bank (IDB). This cross-sectional survey includes detailed questions on on-the-job training not included in the Enterprise Surveys or in other traditional surveys, such as the skill level of those who receive on-the-job training, the skills prioritised by employers, decisions on hiring, and sources of funding for training.

The surveys conducted from 2011 to 2013 provide cross-sectional data for the Bahamas, Colombia, Honduras, Panama and Uruguay. Except for the Colombian survey, each survey is representative of the entire economy across the country. In Colombia, the sample is representative at the sector level for manufacturing, trade and services.

In most countries in the region, 30%-50% of firms offer usually brief training programmes to their employees. However, most firms in Latin America and the Caribbean are small and medium-sized enterprises, and these are less likely to offer such programmes. Training is by and large in specific skills for the job given that firms themselves foot most of the cost of the training.

The training is geared primarily towards high-skilled workers, suggesting that the skills gap among workers could be accentuated by employers' investments in human capital. These results highlight the importance of improving the quality of the region's education systems and developing permanent vocational training systems to reduce the skills gap among members of the workforce.

Box 3.3. **Latest developments in on-the-job training in Latin America and the Caribbean** *(cont.)*

In analysing the role of public initiatives to promote on-the-job training, the study shows that Latin American and Caribbean firms rarely obtain subsidies or use public suppliers to support their investment in vocational training. The use of public funds seems to be proportional to company size, even though smaller firms are faced with greater constraints if they want to invest in training.

The results show that, in Latin America and the Caribbean, the coverage of public subsidies for on-the-job training should be reviewed, as should the way the subsidies are targeted. Research is needed to identify market constraints and failures that impact how on-the-job training resources are allocated and to enable the adoption of suitable public policies.

On-the-job training seems to raise labour productivity, but only in larger firms. Using a fixed effects model to compensate for the wide range of business types excluded from the control variables, combined with a set of variable-time controls, shows that a 1 percentage point increase in the proportion of workers with access to training would raise productivity by 0.8% in firms with more than 100 employees. For small businesses, however, there is no significant impact. Therefore, on-the-job training can only raise productivity if some of the characteristics of larger firms are present. More efforts are needed to identify what additional investments are required to make vocational training efficient. These might include, for instance, personnel management.

In conclusion, a company's decision on whether to provide training depends heavily on the skills it requires, which in turn are linked to innovation and the adoption of production technologies that are more advanced. These findings reinforce the need to design integrated interventions in which instruments to promote on-the-job training are part of a broader set of policies to promote technological change and innovation.

TVET systems can play a very important role in the region, but still lack the necessary prestige and recognition.

The large informal economy, unemployment (which particularly affects young people), and the mismatch between the demands of the production sector and the training offered by the education system form a complex panorama in Latin America. The education system must become a more relevant mechanism for providing access to employment, and TVET systems can play a central role in this (OECD, 2013d). However, the vocational pathway is often ignored in the region. This is because it is judged inferior to academic education and because the two education pathways offer different returns. Vocational training has also lost prestige, having become outdated and disconnected from the reality of the workplace (OECD, 2010b). In reality, however, there is no clear evidence that the returns to technical education in developing countries are smaller than the returns to mainstream education. The large variation in results from one country to another and from one period to another suggests that the returns to TVET depend directly on each country's institutional framework, the capacity to adapt TVET to changes in labour demand, and the private sector's willingness to invest in worker training (Eichhorst et al., 2012).

TVET has not expanded enough in Latin America in recent years, and there are a number of challenges that it must still tackle. In the last decade, TVET enrolment in secondary schools increased by an average of 18% in the region, about the same as for secondary education as a whole. Therefore, proportional to mainstream secondary education, the weight of TVET remained practically the same. Efforts to respond to the growing demand for education in the region focused not so much on TVET as on mainstream secondary education as a route to tertiary education. Very often specific knowledge was incorporated into mainstream secondary-education programmes, but not into expanding TVET (UNESCO, 2013a). At the tertiary level, enrolment in TVET rose

significantly over the last ten years, from 15% to 19% of the total number of people enrolled in tertiary education. However, because the duration and nature of TVET programmes vary from country to country, it is difficult to compare results between one country and another in the region (UNESCO, 2013a).

The TVET system has been expanded, often by adding programmes somewhat disconnected from the formal TVET system. As a result, its structure now varies greatly from one country to another, and even within countries. These additional programmes do not count towards completion of any formal education level and provide no credentials valid in the education system. However, because they are shorter and explicitly designed as employment-training programmes with a specific objective, they are more attractive than secondary or tertiary TVET (UNESCO, 2013a).

Although a number of technical and vocational education initiatives focus on the post-secondary level, vocational programmes at the secondary level can have a positive influence on labour-market entry. Vocational training starts in basic secondary education and continues until post-secondary and tertiary education, but most programmes and reforms have focused on advanced levels. A better understanding of the characteristics of schools with vocational programmes and of the students who attend them could help to explain their subsequent performance in the workplace and improve policies regarding such institutions.

In some Latin American countries, students at vocational schools may perform better than students at mainstream schools. International performance comparisons between the two types of programmes using microdata from the OECD's PISA (Programme for International Student Assessment) study find that the situation in Latin America is very different from that in other countries (Altinok, 2011; Avendaño et al., forthcoming). Students in vocational programmes in the region perform better than those in mainstream programmes. In a sample of almost 15 000 vocational students in Argentina, Colombia, Costa Rica, Chile and Mexico (almost 25% of all schools in those countries, compared with an average of 17% in the OECD countries), there is a performance gap of 15 points in favour of vocational students, equal to approximately four months of schooling; in the OECD countries, mainstream schools perform better by 61 points (Avendaño et al., forthcoming; see Box 3.4 for more details).

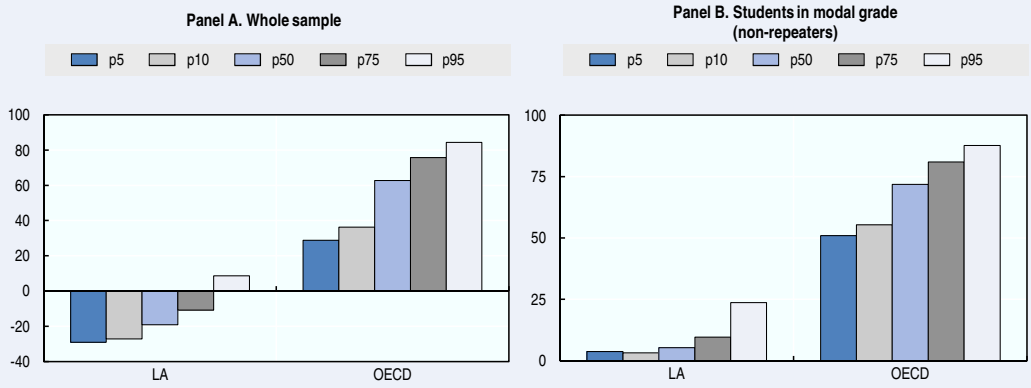
Box 3.4. **Factors behind the performance of skills in secondary education: Mainstream vs. vocational schools**

In Latin America, unlike in the OECD countries, students in vocational programmes perform better than those in mainstream programmes (Avendaño et al., forthcoming). A number of factors explain this difference.

First, the sample of vocational students contains a selection bias, which thus overestimates average performance. Except in Uruguay, students in Latin America choose between mainstream and vocational programmes when they are 15 or 16 years old (vs. 14 years old on average in the OECD countries). But the PISA sample is based on students aged 15.3 to 16.2 years, so most Latin American students who repeated a year will not be included in the results. This selection bias helps to explain why a third of the students in the sample in mainstream programmes have repeated a year at least once, compared to only a tenth of students in vocational programmes. For this reason the sample is divided into students who are in the modal grade (i.e. the grade a student should be in based on their age) and students who are below the modal grade (those who have repeated a year). When only modal-grade students are considered, the gap between vocational students and mainstream students narrows in Latin America (Figure 3.7), while in the OECD mainstream students still outperform vocational students (75 points on average for the 50th percentile).

Box 3.4. **Factors behind the performance of skills in secondary education: Mainstream vs. vocational schools** *(cont.)*

Figure 3.7. **Performance gap between mainstream and vocational schools**



Note: "Latin America" comprises Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. The percentiles refer to the performance distribution. For the entire sample and for the mainstream students in their modal grade, "Latin America" comprises Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. For modal-grade students in vocational schools, data are missing for Peru and Brazil. "OECD" comprises all 34 members except Canada for the entire sample. For the modal-group students, there are no data for Canada for the mainstream programmes and no data for Canada, Denmark, Estonia, Finland, Iceland, New Zealand, Norway, Poland, Spain and the United States for vocational programmes.

Source: Avendaño et al. (forthcoming), "Vocational education in Latin America: Is the story different?", *Working papers*, OECD Development Centre.

StatLink http://dx.doi.org/10.1787/888933174427

Second, the performance gap between vocational and general programmes is greater in rural areas than in urban areas. Analysis of the almost 1 000 rural vocational schools in Argentina, Colombia, Costa Rica, Chile and Mexico, which represent 7% of all vocational schools, shows the stronger performance by vocational schools is more marked in rural areas than in urban environments. Regional inequality can explain this trend.

For rural students (and low-income students), mainstream education is of little practical use and of little interest, since they have few opportunities for social mobility. Vocational education is better adapted to their social and work environments, so the students are more committed to their studies. This could explain why, relatively speaking, rural (and poorer) students perform better in vocational programmes in Latin America. For regional policies, vocational education can be an effective means of improving the performance of rural students and facilitating a smoother transition into the labour market.

Third, students in Latin America who are socio-economically disadvantaged perform better in vocational programmes than in mainstream programmes, but among students with higher incomes there is no such performance gap. By contrast, in the OECD countries, mainstream students outperform vocational students irrespective of their socio-economic status.

Finally, vocational students seem to be more motivated, which can lead to a better relative performance. Although the added value of vocational schools reduces considerably when results are controlled for modal grade, the impact of attending a vocational school remains greater in Latin America than in the OECD countries. An additional explanation is that students in vocational schools are more satisfied with their learning outcome in general, and in terms of the preparation it gives them for their working life.

Regarding motivation for learning mathematics, PISA data show that vocational students are more aware of career and higher-education opportunities than mainstream students. This trend may reflect vocational programmes' ability to relate the education system to the production system, allowing a more efficient transition into the labour market.

Countries in Latin America and the Caribbean and in the OECD have tried some interesting approaches to improve the impact of TVET.

Even though less attention is afforded to TVET in Latin America and the Caribbean, some countries, such as Chile and Mexico, have used interesting approaches in recent years. During the current decade, TVET has gained presence in the region's education policy agenda as a means to improve the link between education and employment (OEI, 2010). National governments have also made efforts to strengthen TVET and give it a more central role in the education system.

Chile, for instance, set up the National Innovation Council for Competitiveness (Consejo Nacional de Innovación para la Competitividad) in 2005 and the Technical and Vocational Training Commission (Comisión para la Formación Técnico-Profesional) in 2009. The latter's contributions have included proposing and implementing a national qualifications framework (OECD, 2009; OECD, 2010b). Mexico, meanwhile, has a Labour Observatory (Observatorio Laboral) with detailed data on the performance of TVET graduates in the labour market. The country has adopted various measures to foster mobility in the education system and encourage dialogue between TVET institutions and employers. It has also taken measures to allow TVET teachers to have professional experience in the field that they teach by continuing to work part-time in the sector, which enables them to keep their skills up to date (OECD, 2009). Most OECD countries have also had interesting experiences with TVET (Box 3.5).

Box 3.5. **Keys to success: Ingredients for relevant, high-quality vocational training systems**

Many factors determine whether training systems for work are successful, relevant and of high quality. Korea, Chile, Germany and the United Kingdom are particularly renowned for having incorporated practices into their work-training systems that have markedly improved the skills of their workforce.

Korea, for instance, aligned its skills-development system with its economic-growth agenda over a series of decades. It did so by developing a technical-education and training system that focused efforts on sectors and occupations that were prioritised by each development plan. This brought the skills developed in line with labour-market demands, and businesses were able to increase their capacity to export increasingly sophisticated products, since they were able to find the necessary skilled labour. Meanwhile, the government also adopted policies to support training for active workers, introducing a training tax and then a grant programme for training, with particular emphasis on small and medium enterprises in certain strategic sectors. The Korean programme drew its inspiration from Mexico's successful CIMO training programme (Capacitación Integral de la Mano de Obra).

Some countries, meanwhile, such as Chile, have institutionalised the role of the production sector in their training system for sectors that are strategic to the economy. For instance, Chile's Framework for Mining Qualifications (Marco de Cualificaciones para la Minería) states the skills requirements for the different occupations in the country's mining sector, allowing the educational supply to be adapted to the production sector's demand for skills. This experience shows that private-sector involvement can serve to: *i)* send signals to the education sector to align technical courses with the areas of industry most in demand based on the production dynamic; *ii)* make those industries more attractive to workers and attract students into related courses; *iii)* reduce transaction costs in the sector thanks to useful standards for human resource management; *iv)* offer a solution to a government that is seeking relevant alternatives to integrate workers into the market; and *v)* co-ordinate labour supply and demand through co-ordinated policies to support skills development.

Box 3.5. **Keys to success: Ingredients for relevant, high-quality vocational training systems** *(cont.)*

Finally, countries such as Germany and the UK have focused on developing dual training systems or systems with a strong emphasis on apprenticeship programmes, which provide training opportunities in the workplace and ensure that education is highly relevant. Both countries have achieved strong involvement from the production sector through co-financing mechanisms, ensuring that training is more relevant and that more of the students can find jobs.

In the British model, for instance, the government bears the full cost of training in the workplace: in full for 16-18 year-old apprentices, up to half the cost for 19-23 year-olds, and 40% for apprentices aged over 24 years. The employer pays the remaining training costs and provides the apprentice with a salary. The German government finances technical schools, research in skills development and training programmes. Firms assume the costs related with the training: apprentice salaries and the cost of trainers and material.

Some countries, including Korea and the United Kingdom, also periodically inspect their skills-development institutions to evaluate their performance, co-ordination with other institutions, and incentives to fulfil the growth vision drawn up by the government, as well as to identify good practices and introduce improvements.

In short, countries have enjoyed a more productive workforce and a more developed economy when they have: *i)* adopted human-capital development strategies that are in line with their economic-growth strategy; *ii)* actively involved the production sector in the training system; *iii)* offered opportunities for continuing learning in the workplace; and *iv)* introduced review and assessment mechanisms to ensure that the measures are improving constantly.

The decline in returns to education is in marked contrast to the unmet demand for skills

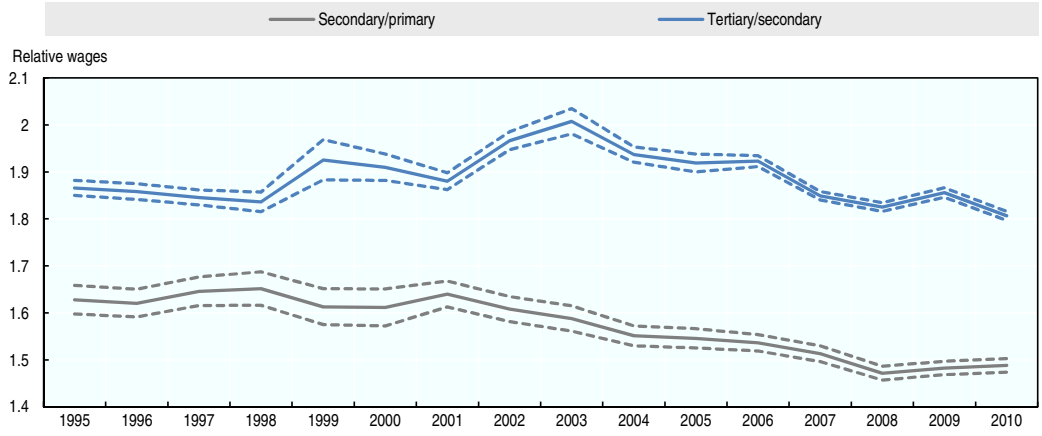
In developed countries and many developing countries, wage premiums have risen continuously in recent decades (Anderson, 2005; Goldberg and Pavcnik, 2007). The wage premium refers to the additional wages earned by workers with a certain level of education compared with the wages of a worker with a lower level of education (tertiary vs. secondary, and secondary vs. primary).

In Latin America, meanwhile, wage premiums have been narrowing since 2000. Several recent studies (Aedo and Walker, 2012; López-Calva and Lustig, 2010, among others) have shown that the wage premiums are falling for all levels of education (Figure 3.8), affecting incentives for lower-skilled young people and workers in Latin America to study.

This fall in education-based wage premiums comes despite the unmet demand for skills in Latin America. To attempt to better understand how these two trends can coexist, we must consider several possible explanations put forward in recent literature.

On the supply side, access to the education system in the region has increased significantly, as has the supply of better-educated workers as a result. The larger labour supply is believed to have sparked a drop in performances associated with education (López-Calva and Lustig, 2010; Azevedo et al., 2013; De la Torre, Levy Yeyati and Pienkgnamura, 2013; Cornia, 2014). This trend is compatible with the fall in returns to education first at the secondary level (in the 1990s), then at the tertiary level (in the 2000s), which would be consistent with the gradual entry of lower-income students into the education system.

Figure 3.8. **Wage premiums in Latin America, 1995-2010**



Note: The dashed lines show confidence intervals. Latin America shows the average for Argentina, Brazil, Chile, Colombia, Mexico, Peru and Uruguay.

Source: De la Torre, Levy Yeyati and Pienknagura (2013), "Latin America and the Caribbean as tailwinds recede: In search of higher growth", *LAC Semiannual Report*, World Bank, Washington, DC, based on *Socio-Economic Database for Latin America and the Caribbean* (SEDLAC and World Bank, 2014).

StatLink http://dx.doi.org/10.1787/888933174439

The supply may have changed not only in terms of quantity, but also in terms of quality. Lower quality could be due to the change in the composition of the labour supply. People from socio-economic settings with less social and cultural capital have entered the education system, which, some have argued, has lowered the average skill level at each level of education. Other authors blame outdated teaching methods and an outdated curriculum, or an education system that does not offer the skills demanded by the labour market.

On the demand side, many believe the fall in returns to education in the last decade could be due to employers requiring lower-quality, less sophisticated skills as global wealth has shifted. They argue that, either because the commodity-exports sector has grown in response to additional demand from emerging economies (Gasparini et al., 2011) or because of the tertiarisation of the region's economies (De la Torre, Levy Yeyati and Pienkgnamura, 2013), high-skilled jobs have been replaced by less-skilled jobs, causing demand for skills to fall.

From the point of view of labour economics, changes in wage premiums and the salary gap may have been caused by the functioning of the labour markets and reforms to their institutions. The narrowing of the salary gap may be thanks to additional formal employment and stronger labour institutions, especially a higher and more stringently enforced minimum wage and more effective collective bargaining (Casanova and Alejo, 2014; Maurizio, 2014).

It would be interesting to analyse wage premiums by sectors. Differences in demand for skills among sectors may explain the apparent contradiction between unmet demand for skills and lower returns to education. The previous empirical analysis confirms that the automotive and machinery sectors struggle to meet demand for skills. These difficulties may increasingly reward skills, but wage increases in the sector may have been eclipsed by the widespread fall in wages in recent years in other, more buoyant sectors. In short, demand for skills may vary greatly from one sector to another, depending on each sector's needs. This is made clear in Chapter 5, which shows that Latin America's economies are not very diversified.

Finally, we must bear in mind that the data on wage premiums were extracted from household surveys, which include the informal economy. The World Bank and Manpower surveys, on the other hand, collect their data only from formal, often large private enterprises operating in manufacturing industries, thus ignoring a large chunk of the business sector, especially in emerging economies like those of Latin America. Indeed, some studies conducted in Colombia show evidence that workers in the informal economy are paid less than workers in the formal economy with the same level of education (Herrera-Idárraga, P., E. López-Bazo and E. Motellón, 2013).

Conclusions and policy recommendations

Skills are decisive in determining an economy's capacity to escape the middle-income trap since, as confirmed by a review of the economic literature, they are a key input in structural transformation. This is especially important given some of the components of shifting wealth, such as integration of new emerging economies into the global economy, international trade liberalisation and new forms of organisation of production. This scenario hinders the capacity of middle-income economies to identify and acquire the necessary skills to make the transition to a growth model based on knowledge and technology.

Latin America is the emerging region that has the most difficulty meeting demand for skills. In the formal sector of the economy, 36% of companies in Latin America report that they struggle to meet demand, compared with 22% of companies in sub-Saharan Africa and in East Asia and the Pacific, 17% in South Asia, 15% in the OECD and 14% in Eastern Europe and Central Asia. Technical skills and soft skills seem to be particularly difficult for Latin American firms to find.

The empirical analysis conducted confirms that there is unmet demand for skills in Latin America, particularly in certain key sectors such as machinery and the automotive industry. It is a particularly tough challenge for firms with a skill-intensive production process and for some of the tradeable industries that would be most likely to bring about a more profound structural change, such as machinery and the automotive industry. Empirical evidence therefore undermines the idea that shifting wealth is reducing demand for skills in Latin America by increasing the region's specialisation in raw materials.

Regarding the match between supply and demand for skills by level of education and occupation, Latin America performs poorly in both categories, in contrast with the OECD countries. TVET could therefore play a key role in rapidly and flexibly increasing training in workplace-related skills. However, such a policy has not been prioritised in the region, because academic training is somewhat overvalued and TVET is perceived to bring lower returns and to be out of touch with the labour market's current needs. Furthermore, technical and vocational training institutions in the region often have a limited capacity to provide the type and level of skills required by the jobs market. In several countries in the region, technical training is provided by public institutions created many decades ago that have not always adapted to changes in the skills required (CAF, 2014). This would explain why, according to the database used in this study, businesses tend to provide their own training for their staff.

Contrary to what is happening in the OECD countries, returns to education are also declining in the region, perhaps because the rapid expansion of education is harming the quality of training, or perhaps because the supply of skills in some sectors of the economy is excessive. Perhaps, then, the skills being provided are not suitable, leading some firms not to reach optimum performance, with poor remuneration for skills.

Various policy recommendations can be made based on these conclusions. First, since the region does not have the level or type of skills needed to compete in a changing global economic environment with increasingly more complex demands, it should invest in more general skills that can be adapted to the changing labour-market conditions. Education systems need to incorporate these skills into their curriculums to improve the employability of those who move from the education system to the labour market, and make it easier for workers to update their skills, thus strengthening lifelong learning.

Throughout this process, the education system must provide qualifications frameworks that enable the recognition and portability of skills acquired in both formal and informal education. Of particular importance are skills acquired through training that is more directly linked to specific tasks in the workplace, such as TVET.

Second, this chapter underlines the need to adapt the supply of skills to the production structure. The unmet demand for skills identified by the agents of production in Latin America contrasts with the major efforts undertaken by the region in recent decades to provide education. Investment in skills needs to become more relevant for the region's efforts to produce better quality and employability.

To achieve this, it is essential to correctly identify which skills are needed, a task made particularly difficult by the emergence of new competitors in the global economy and the fragmentation of the production chain. It is therefore vital that governments and educators work in partnership with the private sector to identify the skills that are currently needed and that will be needed in the future, as well as to train their own staff in the workplace, possibly using co-financing mechanisms to pay for the training.

Third, there must be a more solid diagnosis of existing training programmes and their effectiveness. Most surveys cover only the formal economy, which in Latin America accounts for only around half the businesses and half the workforce. It is essential to compile statistics that show the reality of technical training programmes in the workplace and for informal workers. More importantly, the number of thorough assessments of the impact of these training programmes needs to be increased. There are currently too few assessments, and those that do exist often involve a descriptive analysis, making them difficult to compare or to apply to different contexts (Aedo and Walker, 2012). It is essential for these assessments to cover a wide range of criteria, including employability and wages, but also including productivity and even equity.

Notes

1. Shifting wealth refers to the process by which emerging economies are increasing their relative contribution to the global economy. This shift began when large emerging countries (China, India and Russia) began to open up their economies in the 1990s, and has gathered steam since the turn of the century. The size of these economies, in conjunction with their rapid, sustained growth and their strong demand for natural resources, has supported growth in many emerging and developing economies. As a result, we are witnessing a clear shift in the gravity centre of the global economy towards emerging economies, especially Asia (OECD, 2010a; OECD, 2013a; Quah, 2011).
2. In accordance with the OECD Skills Strategy (OECD, 2013b), skills are "the bundle of knowledge, attributes and capacities that can be learned and that enable individuals to successfully and consistently perform an activity or task and can be built upon and extended through learning. The sum of all skills available to the economy at a given point in time forms the human capital of a country."
3. Simply put, the middle-income trap refers to a secular slowdown in growth as a country becomes a middle-income economy.
4. Im and Rosenblatt (2013) offer a review of the middle-income trap literature.
5. This classification establishes income groups based on national per capita income calculated using the Atlas method. For 2015, the list distinguishes between low-income economies (per capita income of USD 1 045 or less), middle-income economies (from USD 1 045 to USD 12 745) and high-income economies (USD 12 746 and above). The middle-income bracket is divided into lower-middle income and upper-middle income, with the cut-off point at USD 4 125. See http://data.worldbank.org/about/country-and-lending-groups.
6. Felipe et al. (2012) use per capita GDP series measured in 1990 PPP US dollars, allowing them to define groups according to constant income levels over time. They define middle-income countries as those in which per capita GDP is between USD 2 000 and USD 11 750 (1990 US dollars), with USD 7 250 as the cut-off point between upper-middle and lower-middle income.
7. The literature on "job polarisation" deals with the replacement of workers in the middle of the skill distribution (Acemoglu, 1999; Autor, Katz and Kearney, 2006). Employment thus becomes concentrated at the high and low ends of the skill spectrum, reducing the relative weight of jobs with average skills. Such jobs, requiring routine tasks, are more likely to be replaced by better technologies, and therefore disappear (Jaimovich and Siu, 2012).
8. Compiled by the World Bank, this database consists of various topics related to the business environment, including access to credit, corruption, infrastructure, crime, competition and business performance. The results are taken from surveys sent to 130 000 formal businesses in 135 countries since 2002. See www.enterprisesurveys.org/.
9. This section is based on Melguizo and Perea (forthcoming).
10. Responses with the integer number 2, representing moderate obstacles, were eliminated so that all responses would fall into one of the two new combined values.
11. The main advantage of this method is that it relaxes some of the assumptions of standard ordered logit so that all the information included in the original dependent variable can be used.
12. In this study a lack of adequately trained workers is referred to as a skills shortage.
13. The results for Latin America are from companies in Argentina, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay and Venezuela.
14. The database also included results for companies in the Middle East, but these were eliminated from the sample because their results included fewer responses (878) and fewer countries than the other regions.
15. The Enterprise Surveys sample fails to include some of the region's key raw-material sectors, such as hydrocarbons, so a more profound analysis is not possible.

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Chapter 4

Education and skills for inclusive growth in Latin America

This chapter offers a recent overview of education systems in Latin America and their capacity to achieve inclusive growth. It begins by describing the achievements made in investment and enrolment rates at the various levels of education and identifying some of the challenges that lie ahead for the region. It then looks at changes in performance, especially in secondary education, and the school-related and social factors behind those changes. The chapter looks at inequality patterns in the education systems related to socio-economic income, geographical location and gender. There is also a discussion of recent changes to education policies in the region, with an overview of the experiences of OECD countries in implementing such policies. The chapter concludes by making policy recommendations based on this analysis.

Education can drive growth and social inclusion, develop the population's skills and create greater equality of opportunities. This chapter analyses the education and skills landscape in Latin America. It presents the policies that have been adopted and those that should be implemented to have a greater impact on inclusive growth. In particular, it analyses aspects related to investment, enrolment rates, performance and equity throughout the education cycle.

Although strides have been made in investment, major challenges still lie ahead in all areas. Investment in education has risen, but is still insufficient in areas such as early education that have a strong influence on children's future development. The different dimensions of inequality (individual and regional) require the objective of equity to be placed at the centre of the agenda.

It is essential to identify specific interventions that should be made in traditional areas of education policy, such as accreditation, policies on teaching, working conditions, the school system and school autonomy (see the discussion in the country notes at the end of this report).

The first part of this chapter emphasises the importance of education and skills for economic development. The second section compares Latin America's key indicators with those of other emerging economies and the OECD countries. These indicators include education enrolment rates and performance in cognitive and non-cognitive skills. The third section analyses the considerable socio-economic, gender and geographical inequalities in the region compared with inequality levels in other countries. The fourth section focuses on education policies, describing the recent educational agendas implemented in Latin America as well as the experience of OECD countries with both reforms and policies and their implementation. The chapter concludes by presenting a series of policy recommendations to improve performance and make education more relevant in an equitable manner.

Education and skills have a considerable impact on the population's economic and social well-being

Education and skills play a key role in a country's development. They can improve well-being, social inclusion and economic progress, as long as the government introduces the necessary reforms. Capacity building should take into account and promote the link between education and the jobs market (Chapter 3) and lead to better social inclusion in participatory democratic societies. Education should promote a person's integral development for his or her productive and social inclusion, developing both cognitive skills and soft skills. Soft or non-cognitive skills cover areas related to personality traits (conscientiousness, emotional stability, agreeableness, extroversion, openness to experience), goals, motivations and preferences that are valued in areas of life and situations that go beyond school and the workplace (Heckman and Kautz, 2012).[1]

Education is a fundamental part of well-being in OECD countries.

Various aspects highlight the importance of education, knowledge and skills for welfare. In addition to its intrinsic value, education has a positive effect on people's material conditions, their physical and mental health, their civic engagement and their capacity to participate in society (OECD, 2011). A good education improves a person's chances of finding a job, which means that those who are better educated are less vulnerable to unemployment and informal employment. Education is one of the eleven dimensions of well-being measured by the OECD. These dimensions analyse the stock and quality of human capital.[2] In Latin America, performance in education and the

distribution of educational results by socio-economic income, geographical location and gender remain less equal than in the OECD countries, which has an impact on the population's well-being (OECD/ECLAC, 2014).

Education's impact on economic development depends mainly on educational quality and performance. Inputs such as average years of schooling and enrolment rates may differ from one country to another, and only reflect the amount of education, without necessarily having direct effects on economic growth (Pritchett, 2006). Recent studies emphasise the importance of the quality of education and the development of skills as factors that drive economic development. For example, a 25-point improvement in PISA test results in the 2000s (slightly less than the improvement by Poland, the country that most improved its performance during that decade) gives the OECD economies a cumulative gain of USD 115 trillion during the life cycle of the generation born in 2010, about 2.4 times the countries' total GDP (OECD, 2010a).

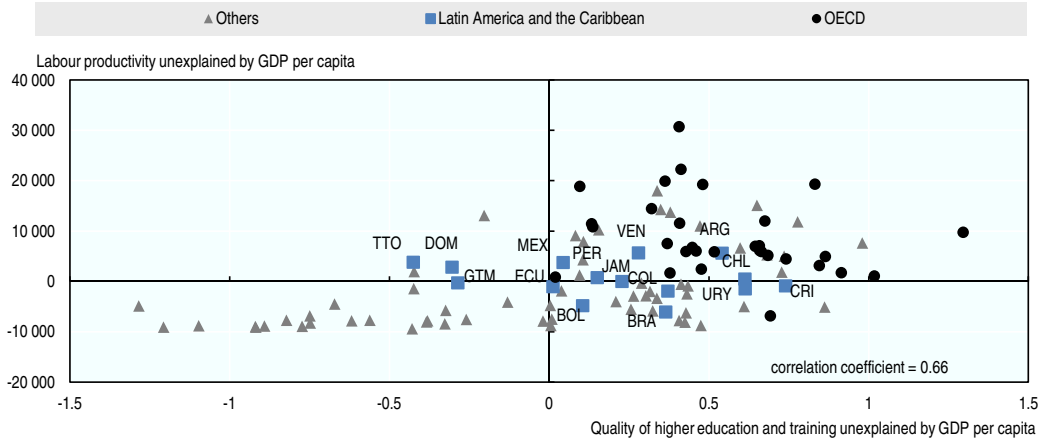
Improvements to education can bring major economic gains to the region.

Skills-intensive industries grow faster in countries with a more skilled workforce (Ciccone and Papaioannou, 2009), which also adopt new technologies and production processes more quickly. An increase of one standard deviation in cognitive skills (measured using PISA-type exams) is associated with approximately a 2% increase in annual growth of per capita GDP (Hanushek and Woessmann, 2012a).

Better-quality education would bring substantial economic gains to Latin America. Although enrolment rates are similar to those of other emerging economies, poor performance in skills is a major factor behind Latin America's sluggish growth in GDP per capita compared to that of other economies, especially those in Asia. Although years of schooling explains 28% of the difference in GDP per capita between Latin American and OECD countries, when the performance factor is included, human capital explains almost 60% of that difference (Hanushek and Woessmann, 2012b). Better-quality education is linked to higher labour productivity, even when controlling for per capita income (Figure 4.1). When controlling for key development factors – the quality of institutions, the macroeconomic environment, the development of financial markets, market efficiency, innovation and sophistication – as well as for logistics and infrastructure, a one-point increase in a country's quality of training and higher education (on a scale of 1 to 7) results in a labour-productivity gain of 32%. A one-point increase would require considerable efforts in education, with Colombia and Brazil achieving the OECD average and Chile catching up with the United States. However, the economic benefits would be substantial and direct.

Figure 4.1. **Quality of education and labour productivity: Partial correlations**

(2012, values)



Note: Partial correlations used GDP per capita as a control variable. Labour productivity is defined as GDP per employed person in 2012 US dollars, adjusted for purchasing power parity (PPP). The quality of education and training is part of the fifth pillar of the World Economic Forum's *Global Competitiveness Index*. The index is on a scale of 1 to 7, with 7 representing the highest quality of education. Chile and Mexico are labelled as Latin America and the Caribbean (LAC) rather than as OECD.

Source: Authors' calculations based on OECD/PISA 2012 database.

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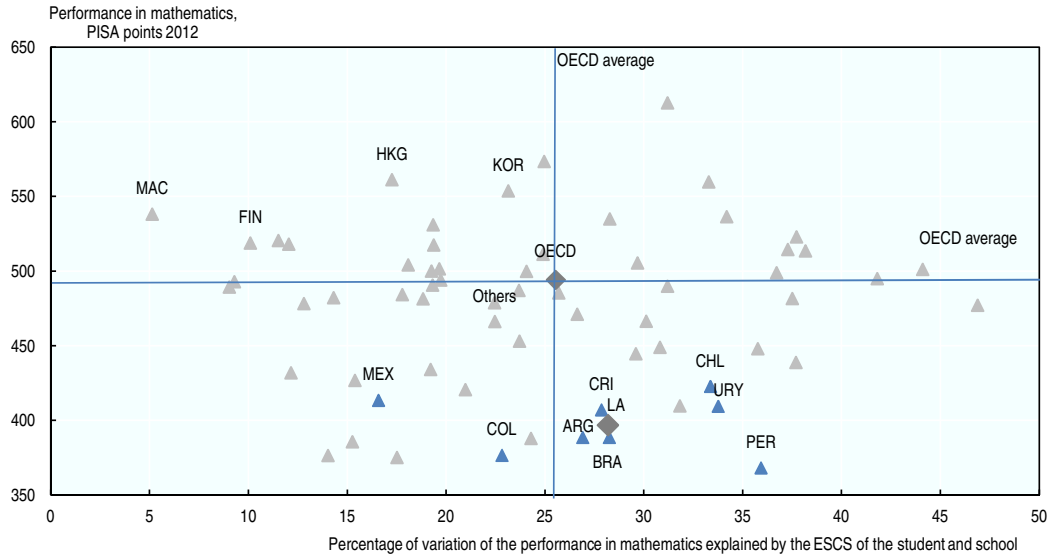
Quality and equity are compatible goals.

More equitable participation in education could drive inclusive growth in the region. The right to education implies aspiring towards high-quality, compulsory education to guarantee student equality and inclusion (UNESCO, 2005). All Latin American countries that participated in PISA 2012 except Colombia and Mexico had lower equal opportunities than the OECD average. Performance in mathematics was also below the OECD average (Figure 4.2).[3] According to household surveys conducted in 2012-13 (Gallup Organization, 2014), 80% of the population in OECD countries believe that children have the opportunity to learn and grow each day. By contrast, in Latin America only 60% of the population believe so. In Argentina, Brazil, Colombia, Paraguay and Peru, less than half the population believe that children have this opportunity.

Quality and equity in education are compatible goals. This is the case of Hong Kong (China), Macao (China) and OECD economies like Korea and Finland. In Latin America, Mexico has improved its performance and considerably reduced inequalities in recent years. In general, the highest-performing countries in secondary education are those that allocate educational resources more equitably among socio-economically advantaged and disadvantaged schools (OECD, 2013a). Socio-economic background and social environments are key markers of performance in Latin America. The socio-economic status of the student and the school account for around 30% of the performance variation of secondary-school students in the region. To foster further inclusive growth in the Latin American economies, school-performance improvements must be accompanied by greater inclusion.

Figure 4.2. **Secondary-school performance and equity in education**
(PISA 2012)



Note: Latin America ("LA") comprises Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. "Others" comprises Albania, Bulgaria, Croatia, Dubai, Hong Kong (China), Indonesia, Jordan, Kazakhstan, Latvia, Liechtenstein, Lithuania, Macao (China), Malaysia, Montenegro, Qatar, Romania, Russia, Serbia, Shanghai (China), Singapore, Chinese Taipei, Thailand, Tunisia and United Arab Emirates. 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.

Source: Authors' calculations based on OECD/PISA 2012 database.

StatLink http://dx.doi.org/10.1787/888933174453

Economic development and social inclusion also depends on other factors, not just on cognitive skills. Human development, and economic and social integration in general, depends on factors not necessarily linked to knowledge acquisition. In the United States, for instance, studies conducted on the General Educational Development Testing service (GED Testing), which seeks to assess general knowledge and provide certification for high-school dropouts, found that young people with GED certification do not have the same level of labour-market integration as high-school graduates. High-school graduates had better salaries, better job types, higher labour-market integration and higher social integration than GED recipients. This is largely because the GED recipients do not acquire soft (or non-cognitive) skills related to openness to experience, conscientiousness, extroversion, agreeableness and emotional stability (Heckman, Humphries and Kautz, 2014). As discussed in the next section, these skills can be developed from a young age, and an education that fosters their development provides good results in areas such as higher education, health, the labour market and social integration.

Towards more effective investment in education to boost enrolment rates and quality

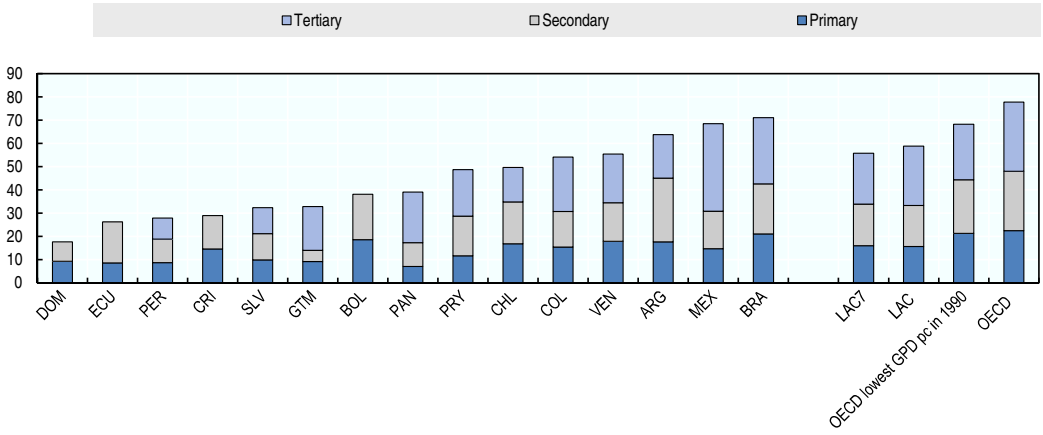
Although public investment in education has increased in recent decades in Latin America, it remains relatively low in primary and secondary education in most countries. In the 2000s, some countries' investment levels were close to the OECD average, but most were not. As a percentage of GDP, total government spending in 2012 was slightly over 5% in Latin America, compared with 5.6% for the OECD countries (see country notes). Government spending per student in secondary education was 18% of GDP per capita

in Latin America, compared with 26% for the OECD countries. This percentage is lower than that observed in 1990 in the lower-income OECD countries, whose progress has been similar to that of Latin America (Figure 4.3).

However, since these figures only consider public investment in education, they ignore the fact that a substantial proportion of financing in education in Latin America comes from the private sector. Having grown rapidly in the region during the 1990s, private-sector funding now accounts for 40% of education spending in Chile and 35% in Colombia, more than double the OECD rate (16%) (OECD, 2014a). Private enrolment ratios are also higher in Latin America. According to figures for 2012, the ratios were 44% for pre-primary education (31% in the OECD countries), 25% for primary education (10% in the OECD countries),[4] and 50% for tertiary education (29% in the OECD countries). The tertiary-education figure is very high in Belize (96%), Brazil (71%), Chile (84%) and El Salvador (68%).[5]

Public investment in primary education is low throughout the region except in the Plurinational State of Bolivia (hereafter "Bolivia") and Brazil, and in secondary education is low throughout the region except in Argentina. The spending gap between the region and the OECD countries is lower in tertiary education, but some countries still have challenges they must deal with, including Argentina, Chile, El Salvador, Guatemala and Peru.

Figure 4.3. **Government expenditure per student as % of GDP per capita, circa 2012**



Note: The Latin American and Caribbean countries included are the fifteen with the highest GDP in current dollars among the countries for which data are available, as of 2011. "LAC7" refers to the seven largest Latin American and Caribbean economies. No tertiary-education data are available for Bolivia, Costa Rica, the Dominican Republic and Ecuador. The OECD countries with the lowest GDP per capita (pc) in 1990 were Chile, the Czech Republic, Estonia, Hungary, Korea, Mexico, Poland, the Slovak Republic, Slovenia and Turkey.

Source: UNESCO Institute for Statistics (UIS) database.

StatLink http://dx.doi.org/10.1787/888933174466

These modest levels of investment in education partly explain poor student performance, highlighting weaknesses in the quality of the education system. Consequently, some countries in the region still need to step up public investment in education to improve enrolment rates and performance quality. Higher tax revenue is needed to achieve this and ensure the sustainability of public debt (see Chapter 2). In pre-primary education, except in rare cases like Chile (0.6% of GDP) and Cuba (0.9% of GDP) and the Bolivarian Republic of Venezuela (hereafter "Venezuela") (0.8% of GDP), public investment in the countries of the region as a percentage of GDP remains low, 40% below the OECD average.[6] Spending on pre-primary education usually provides higher returns than spending on higher levels of education, which suggests that pre-primary education should be made a priority for educational resources (as analysed later in this chapter).

A greater focus on quality of investment to ensure it is effective.

The effectiveness and proper implementation of investment in education are just as important as the amount. Education spending needs to be efficient, especially during periods in which the fiscal space is limited. The efficiency of spending on both primary and secondary education varies greatly across the region. Even without increasing the teacher-student ratio, the least efficient countries could improve results in primary and secondary education by 3-4% and 9-11% respectively (Salazar Cuéllar, 2014). In tertiary education, although countries such as Honduras and Mexico invest heavily, enrolment rates remain low.

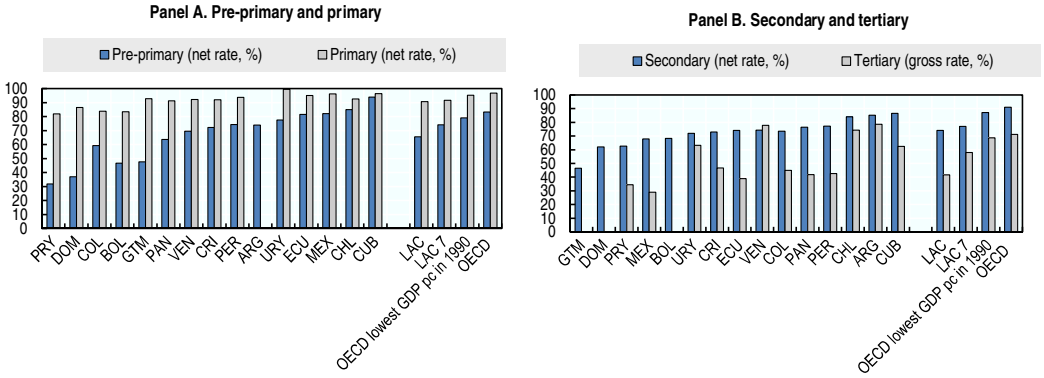
Efficiency and equality objectives could be reached through optimal distribution and use of resources, ensuring that resources are channelled to where they are most needed. The OECD has identified four key policy areas to ensure that school resources are used more efficiently to improve student performance (OECD, 2013b). These four areas are: governance of resource use in schools (resource levels, sources of revenue, and planning of resource use); resource distribution (by education level and sector, across specific student groups, and for facilities and materials); resource utilisation (according to student needs, learning time, and teaching and learning environments); and resource management (transparency, reporting, and incentives for effective use and assessment of use). These four aspects can make the same level of investment in education more effective. The following section describes recent enrolment trends, particularly in early education, and performance achievements and challenges in secondary education.

Enrolment must continue to grow, especially in pre-primary education

Efforts in recent decades to increase enrolment rates have raised school life expectancy considerably, although dropout rates need to be cut. In the early 1970s, Latin America and the Caribbean had a school life expectancy of less than eight years, thus ranking below Central Asia, East Asia and the Pacific, and Central and Eastern Europe. By 2012, Latin America and the Caribbean had increased its school life expectancy to 13 years, ranking only behind Western Europe and North America (approximately 17 years for the OECD countries).[7] Nevertheless, around a fifth of students in the region drop out before the end of primary school, compared to less than a tenth of students in Central and Eastern Europe, Central Asia, and East Asia and the Pacific (UNESCO-UIS, 2012). Reducing the number of younger students who leave school remains a challenge in the region.

Although considerable efforts have been made to increase enrolment, it remains low in some areas of education, especially the lowest and highest levels. The policies introduced in recent decades to increase enrolment in education have been successful in most Latin American countries. Enrolment in primary schools is close to the OECD average in most countries in the region. In secondary education, the difference between the region's enrolment rate and that of the OECD countries has narrowed, but the region has not made as much progress as the Asian countries. In China, enrolment in secondary education has risen by almost 140% since 1990, compared to only 50% in Latin America. Work still needs to be done at the lowest and highest levels of education. Bolivia, the Dominican Republic, Guatemala and Paraguay have low net enrolment rates (less than 50%) in pre-primary education, while Ecuador, Mexico, Panama and Peru have low rates in tertiary education (Figure 4.4). Even in countries that have increased enrolment in secondary education, two- and even three-shift schools are common, as is teacher absenteeism, resulting in fewer schooling hours than in the OECD countries.[8]

Figure 4.4. **Enrolment rates as % by level of education**
(circa 2012)



Note: The Latin American and Caribbean countries included are the 15 countries that had the highest GDP in current dollars in 2011 among the countries for which data are available. "LAC7" refers to the seven largest Latin American and Caribbean economies (no data for Brazil and no primary-education data for Argentina are available). The net enrolment rate refers to the total number of students in the theoretical age group for a given level of education enrolled in that level, expressed as a percentage of the total population in that age group. The gross enrolment ratio refers to the number of students enrolled in a given level of education, regardless of age, expressed as a percentage of the official school-age population corresponding to the same level of education. See the country notes for the definitions of the different education levels.

Source: UNESCO Institute for Statistics (UIS) database.

StatLink http://dx.doi.org/10.1787/888933174477

Furthermore, the early stages of education are still affected by exclusion, which can either be effective (students outside education) or potential (students in education with a high risk of leaving) (UNESCO-UIS/UNICEF 2014). An estimated 21.6 million children of preschool, primary-school or secondary-school age are effectively or potentially excluded. The lack of household financial resources affects school dropout rates. According to 2012-13 household surveys (Gallup Organization, 2014), around 55% of households in Latin America are concerned about not being able to pay for the education of their children.

Effective exclusion levels are most critical in early education, with 14% of children not having access to the final year of preschool or to primary school. Similarly, potential critical exclusion among male students (leading to a higher risk of leaving) in primary school (15%) and secondary schools (25%) is also considerable. These indicators show an upward trend in preschool and primary-school exclusion between 2008 and 2011 and a slight decline in secondary-school effective and potential exclusion.

Early education can affect adult life significantly, so it requires additional support.

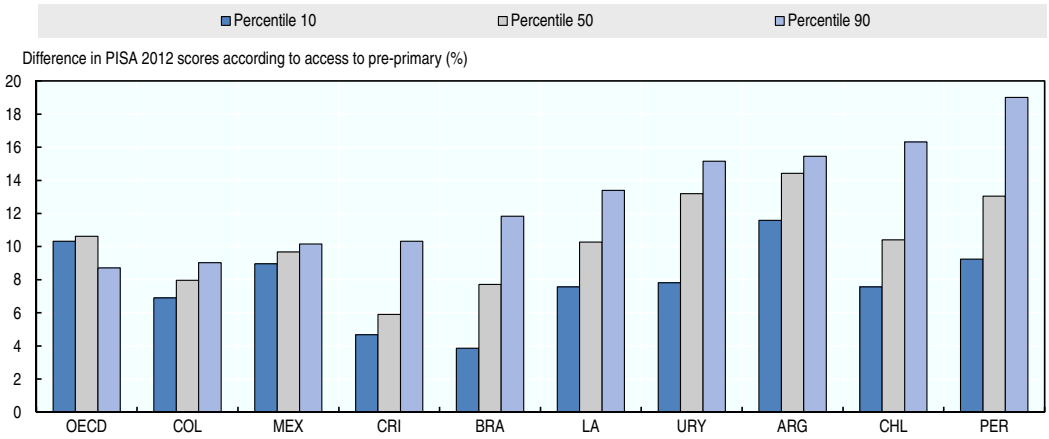
More enrolment in early education is essential, because it offers greater returns than other education levels. Compared to other stages of education, attending pre-primary school offers a very low opportunity cost and a very high potential performance boost. Experiences in developed economies, such as the Abecedarian early-childhood programme and Perry Preschool Program in the United States, have shown positive results in skills development, leading to better labour-market integration in the future (Heckman, 2006). Policies aimed at extending pre-primary enrolment in emerging economies are essential in countries with low enrolment rates at higher education levels and relatively low levels of quality.

The experiences in Latin America reveal that pre-primary education has major positive effects, even after controlling for household socio-economic status. Pre-primary education raises PISA scores by 41 points, reflecting knowledge equivalent to one

additional year of secondary education.[9] In Uruguay, pre-primary attendance provides an average performance gain of 13% in secondary school (Figure 4.5). Furthermore, the rate of return of investment in pre-primary education is 14% (Berlinski, Galiani and Manacorda, 2008). In Argentina, the results of higher enrolment rates in pre-primary schools are clear even in primary education, in which performance already improves (Berlinski, Galiani and Gertler, 2009). Positive effects have also been observed in other countries in the region. Analysis of Bolivia's PIDI early-childhood development programme (*Proyecto Integral de Desarrollo Infantil*) suggests that it results in better cognitive skills, better physical characteristics and a higher school completion rate, which leads to higher income in the future and provides a highly efficient cost-benefit ratio (Behrman, Cheng and Todd, 2004). Early-childhood intervention programmes therefore substantially improve cognitive and non-cognitive skills (such as motivation, perseverance and tenacity), which are undoubtedly essential for a person's development in society.

Figure 4.5. **Effects of pre-primary education on secondary education**

(%) 2012 Latin American vs. OECD countries



Note: Latin America ("LA") comprises Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. The percentiles refer to the performance distribution (in PISA scores).

Source: Authors' calculations based on OECD/PISA 2012 database.

StatLink http://dx.doi.org/10.1787/888933174480

To maximise the benefits of early-childhood education, policies need to extend beyond enrolment rates. The results of programmes that seek to increase enrolment, and especially those that seek to support families with a low socio-economic status, could provide greater benefits. More and better infrastructure is needed for childcare centres, children need to spend more time in those centres, and staff need better training (Noboa and Urzúa, 2012; Bernal et al., 2009). The benefits should not be measured only in terms of nutritional development and better cognitive performance. From early childhood, efforts should seek to develop non-cognitive factors such as conscientiousness, emotional stability, extroversion, openness to experience and agreeableness (Heckman, Humphries and Kautz, 2014). The repercussions of these elements reach beyond the classroom to the labour market and other areas.

Providing support in planning, implementing and reviewing tasks, as well as fostering interactions with others in problem-solving, has lasting benefits. Perry preschools in the United States and specific interventions in Jamaica illustrate how early-child stimulation in children from a low socio-economic setting has long-term effects (Heckman, 2006; Gertler et al, 2013.). These initial efforts should be backed up throughout the person's life cycle, with subsequent investments in high-quality learning and skills.

Improving the quality and performance of skills are the main challenges in education

Latin America has major problems developing skills in primary education. Skills development begins in early childhood and has fundamental repercussions throughout one's studies and working life. Exam results show that primary-school children have a poor understanding of concepts and domain-specific knowledge and have poorly developed cognitive processes, that is, the operations to establish relationships with and between objects, situations and events. For example, in the SERCE study (*Segundo Estudio Regional Comparativo y Explicativo*), only 11% of Latin American third-grade students who took the study's mathematics test in 2006 could recognise a number sequence rule. Similarly, only 11% of sixth-grade students who took the same test were able to find averages and do calculations using the four basic operations in the field of natural numbers. There were huge performance differences among countries in the region. In Cuba, more than half the students were able to solve the above problems, but in the Dominican Republic, fewerthan 1% could do so (UNESCO/LLECE, 2008). These results underline the need to continue assessing the quality of primary education in a manner that allows comparisons among countries in the region and analysis of the policies needed to boost the quality of education and reduce inequalities in primary-education learning.

Skills performance by Latin American secondary-school students were analysed based on the results of the 2012 PISA test, which was taken by around half a million students from 65 countries, including 31 non-OECD economies. Eight Latin American countries took part: Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay (see Box 4.1 on PISA and Latin America). The 2012 test focused on mathematics, a fundamental field for development, given its importance for describing, explaining and predicting phenomena and for enabling informed decisions in the workplace and in everyday life.

The purpose of the exam is not only to offer a picture of mathematics knowledge, but also to analyse whether students can extrapolate and apply their mathematics knowledge to real life. The implications of good performance in this test are considerable, since it would imply better use of skills by individuals in the labour market, predicting good mathematical reasoning in a multitude of situations. This would strengthen skills in various sectors in which the region continues to lag behind other emerging economies (see Chapter 3 for a comparison of labour-market skills).

Box 4.1. **PISA and Latin America**

The PISA tests are conducted every three years among 15-16 year-old students, with each test focusing on a different domain. The 2000 and 2009 tests focused on reading, the 2003 and 2012 tests on mathematics and the 2006 and 2015 tests on science. Although each test has a specific focus, with many of the questions on that year's field, students are tested in three areas, allowing comparisons to be drawn between each year's results.

Eight Latin American countries participated in the 2012 PISA test: Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. Only two countries (Brazil and Mexico) have taken part in every PISA test since its inception in 2000. Argentina and Chile participated in 2000, 2006, 2009 and 2012; Peru in 2000, 2009 and 2012; Uruguay in every test since 2003; Colombia in every test since 2006; and Costa Rica participated for the first time in 2009.

PISA compares results by calculating performance trends between two assessments focused on the same domain. For mathematics, comparisons are between the 2003 and 2012 results. The 2015 PISA test will focus on science, so results will be comparable with those of 2006.

To provide a concrete idea of what the scores represent, they are also expressed in terms of years of schooling, with 41 points representing one year. Thus the 101-point performance gap between Latin America's results and those of the OECD countries is equivalent to a gap of more than two years of schooling.

The results are classed into six proficiency levels. Students at Proficiency Level 1 (358-420 points in mathematics) can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and to carry out routine procedures according to direct instructions in explicit situations. All Latin American countries that participated in PISA 2012 except Chile were at this level. Chile scored 423 points, slightly above the threshold.

Latin American secondary schools are performing better but still have considerable room for improvement.

Most Latin American countries' improvements in secondary-school skills have been greater than the average performance improvement of the OECD countries. Brazil and Mexico sit alongside Tunisia and Turkey as the countries that improved their performance by most points per year (up 3 to 4 points per year) between their first participation in the PISA survey (2003 for Brazil and Mexico) and their 2012 participation.[10] Argentina, Chile, Colombia and Peru improved at a slower rate of between 1 and 2 points per year since 2006 (2009 for Peru). The performance of Costa Rica (since 2009) and Uruguay (since 2003) declined by 1 and 2 points per year respectively, which is of some concern given that OECD countries' performances declined by less than 1 point per year on average.

Similarly, many of the countries in the region have managed to reduce their performance gaps among students. Brazil and Mexico were able to improve their performance in mathematics between 2003 and 2012 by narrowing the gap between the best and worst students. By 2012 they were among the ten PISA-participating countries with the least variance in results, as were Argentina, Colombia and Costa Rica. As in Tunisia and Turkey, most of the performance improvements in Brazil and Mexico were among those students requiring most support, largely because they are from lower socio-economic backgrounds. The improvements were achieved by reducing the number of students with the lowest proficiency level by between 8 and 11 percentage points.[11]

However, not all countries in the region reduced the variance among students. In Uruguay, the decline in the average performance was concentrated in students with the lowest scores, which grew by 8 percentage points, while the proportion with the highest scores shrank by 1.4 percentage points, thus increasing the variance between students in Uruguay.

Despite these improvements in the main countries in the region, Latin American secondary schools still perform poorly. In all three subjects tested (mathematics, science and reading), the eight PISA-participating countries were in the bottom third of the 65-country ranking. In mathematics, even Chile, the best-performing Latin American participating country, was ranked among the bottom 15 participating countries in the world, and Peru finished at the very bottom of the ranking.[12] The results are even more worrying given that the test does not take into account the young people who do not attend school. Education enrolment rates are lower in Latin America, meaning there were fewer potential participants than in other OECD countries (see Figure 4.4 on enrolment). Despite the significant improvement in Brazil and Mexico, two-thirds of Brazilian students and half of Mexican students are below level 2 (basic skills) in mathematics.[13]

By comparing the relative rankings of Latin American countries in the 2012 PISA tests with their relative rankings in similar tests conducted in previous decades (1960-2003 average), we see that Peru has been overtaken by other countries in the region. Some countries – notably Colombia and Uruguay – have been overtaken by other emerging economies and other countries in the region (Hanushek and Woessmann, 2012a). For example, Turkey's average score in tests between 1964 and 2003 was lower than Colombia's and Uruguay's, but its 2012 PISA test score was higher than that of any Latin American country.

Tangible and intangible factors that can improve educational quality need to be explored.

A better understanding of factors affecting student performance is essential for education policy makers seeking to improve educational quality. Factors affecting educational performance vary depending on the grade, so policy solutions must be different for each level of education.

In primary education, student performance is strongly correlated with educational infrastructure and access to basic services. Learning is enhanced in particular by the presence of areas to support teaching (libraries, science labs and computer rooms), but also by access to basic public services such as electricity, telephones, drinking water, wastewater services and a sufficient number of toilets (Duarte, Gargiulo and Moreno, 2011).

In secondary education, other factors seem to come into play. Performance seems also to be affected by students' socio-economic background and the way the school operates. The PISA assessment includes information on students' family and educational background, the characteristics of schools, and other performance-related factors, enabling a detailed microdata analysis of these factors' effects.

Student-specific factors such as gender, socio-economic status and social environments are key elements in explaining school performance and are correlated with school infrastructure in Latin America. School-specific factors include those resulting from pedagogical variables such as extra classes taken by students, feedback from the school principals to teachers, and weekly classroom time.

Regarding the latter, the quality of student learning is related not only to the number of classroom hours but also to the use of classroom time. Minimising time spent on disciplinary matters is essential to improve learning in the classroom. In PISA 2012, in most participating countries, the best-performing schools tend to have a better disciplinary climate, even after controlling for the students' and the schools' socio-economic statuses (OECD, 2013a).

Where the quality of teachers is concerned, intangible variables and variables related to soft skills interact most with performance in both Latin America and the OECD countries. These include teachers' expectations of their students' futures, and to a lesser extent the type and level of teacher certification (see Box 4.2). These factors may require less spending than certain "traditional" policies such as higher teacher-student ratios, better physical infrastructure and teachers who are more qualified. In secondary education, access to a variety of schools and educational models, especially technical and vocational options, is also a key factor that boosts the quality of learning (Cullen et al., 2013).

Box 4.2. **Traditional and pedagogical factors associated with student performance**

Physical infrastructure or staff numbers alone do not seem to be associated with student performance in the OECD countries (OECD, 2013d). Other factors, however, such as the quality of teaching staff, organisational structures with professional leadership capacities, active parental involvement and the stimulation of high expectations among students, have been recognised as essential for effective performance in schools (Loeb, Beteille and Kalogrides, 2012; Sammons, Hillman and Mortimore, 1995). To study the impact of these factors in Latin America, Avendaño, Barrera, Nieto-Parra and Vever (forthcoming) use a method similar to that adopted by Dobbie and Fryer (2011) to analyse mathematics skills using student-level PISA 2012 data (around 510 000 observations in total).

First, they defined a base model to analyse mathematics performance (using PISA 2012 scores) using four variables related to students and their social environment: age, sex, student socio-economic status and school socio-economic status. Five traditional variables related to performance variation were later added to this model: class sizes, percentage of certified teachers, proportion of teachers with an ISCED 5A[14] diploma, and whether a school is public or private. Finally, they measured how performance variation is associated with pedagogical variables, referring to educational actions in each school: classroom time, use of assessment data, tutorial groups, additional classes, feedback from the school principal to teachers, and teacher expectations of student performance.

The results for the 34 OECD countries and 8 Latin American countries included in PISA 2012 indicate that the four student-related variables have a statistically significant positive impact on student performance. This base model explains 30% of performance variation in Latin American secondary schools, against 26% in the OECD countries.

Among the traditional variables, only larger class sizes are associated with better student performance, especially for very small classes, which lack sufficient interaction among students. As illustrated in Figure 4.6, some studies suggest the same result due to the effect of peers or because better-performing countries have larger class sizes. This has traditionally been observed in Asian countries (Pong and Pallas, 2001). Furthermore, this positive relationship can be explained by the fact that urban classes, which perform better, are relatively larger.

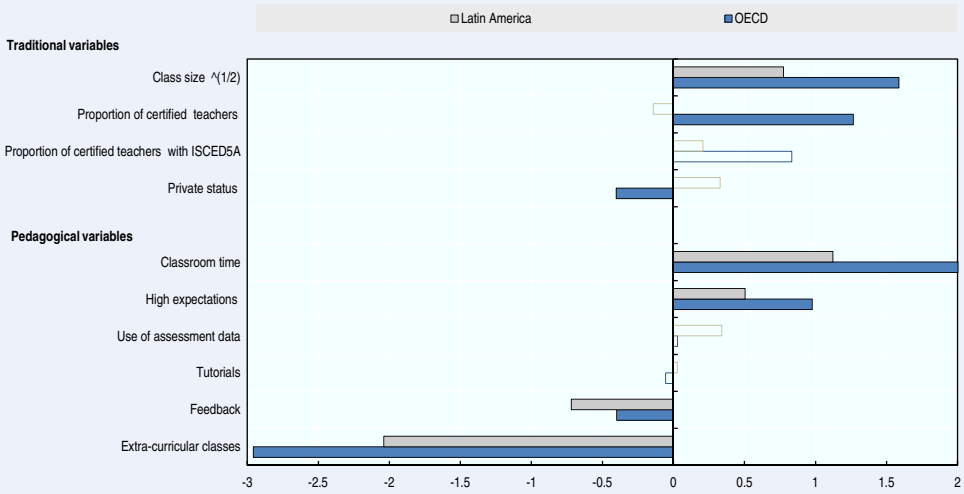
In Latin America, the proportion of teachers who are certified or who took tertiary education (ISCED 5A) has no significant relationship with performance, suggesting that the level of certification or qualifications currently in place does not guarantee a higher-quality education. The opposite results were found in the OECD countries. Additionally, after controlling for the base model, private schools were found to perform worse than public schools in the OECD countries. In Latin America there is no significant performance gap between private and public schools. Finally, the quality of educational resources and physical infrastructure has no statistically significant relationship with performance.

Box 4.2. **Traditional and pedagogical factors associated with student performance** (*cont.*)

The results for the variables associated with pedagogical actions in school indicate that in both the OECD and Latin America, high teacher expectations of students help boost performance. Similarly, classroom time is associated with better results. However, extra-curricular classes and feedback from the school principal to teachers are both negatively associated with performance in mathematics. This could be linked to the fact that it is normally students who are struggling the most who take additional classes and because principals normally give feedback in lower-performing schools.

With the usual caveats, the analysis shows that a student's socio-economic setting substantially affects his or her performance, and more so in Latin America than in the OECD countries. Additionally, the expected mean effect of traditional factors on performance in Latin America is relatively low, while the combination of other pedagogical factors can boost the quality of the education system. The results suggest that some educational actions that are not necessarily resource-intensive could improve Latin America's education systems.

Figure 4.6. **Effect on performance in mathematics**
(in months of schooling)



Note: "Latin America" comprises Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. "OECD" comprises 34 countries. The size of the bars indicates the effect on performance (in months of schooling) of a change of one standard deviation in each of the independent variables. The bars are for the variables that are statistically significant at the 1%, 5% or 10% level. Dependent variable: individual score in mathematics. Other independent variables used in both methods (traditional and pedagogical) not included in the graphic are those that form the base model: gender, age, student socio-economic status and school socio-economic status. ISCED 5A: in the International Standard Classification of Education, ISCED 5A refers to tertiary-type programmes that lead to an advanced research qualification.

Source: Avendaño et al. (forthcoming), based on the OECD/PISA 2012 database.

StatLink http://dx.doi.org/10.1787/888933174492

New technologies can supplement education policies and provide a solid foundation for educational support.

The role of information and communication technologies (ICTs) in education has grown rapidly in recent years. The region's education systems have considerably reduced

inequalities in access to ICTs in the home and at school. Although the percentage of PISA students with access to a computer at school remains higher in the OECD countries (93%) than in Latin America (71%), the gap has narrowed. Nevertheless, among the few assessments that have been conducted on the effective use of ICTs for learning, some found no significant effect on cognitive skills and student performance (Cristia et al., 2012). The evidence suggests that there is a basis for using ICTs to support education and boost the school's educational role (Claro et al., 2011; Espejo, Sunkel and Trucco, 2013).

Tertiary education is a key factor for developing and improving available skills.

Tertiary education stands out as a driver of development, strengthening a country's competitiveness in the global economy and generating personal and social benefits. In the knowledge-based global economy, the potential to innovate and boost competitiveness levels is closely linked to the higher-education system's capacity to increase the quantity and quality of skills available to a country's economy.

Higher levels of higher education improve social cohesion and mobility and provide personal benefits. Graduates have more chance of finding a high-quality, well-paid job, have better consumption and saving patterns and higher life expectancy, among other benefits (Brunner, 2013).

Quality remains one of the main challenges of tertiary education in Latin America, with access and enrolment having improved in recent years. According to the 2012-13 household surveys (Gallup Organization, 2014), around 40% of households in Latin America believe that university students in their country receive a lower quality of education than those in other parts of the world. This figure rises to 60% among Brazilian households and 77% among those in Peru. Latin American institutions also rank poorly in international university rankings. The Times Higher Education University Ranking for 2013/14 listed no Latin American or Caribbean university among the world's top 100 and only three among the top 400.

However, these rankings consider only a few aspects of higher education, so instruments to enable a better understanding of the quality of universities and skills are of special relevance. In this regard, in 2013 the OECD presented the first results of its Programme for the International Assessment of Adult Competencies (PIAAC), which, though not directly related to higher education, identifies the skills of a country's adult population and what they can do with them.

The programme analyses similar skills to the PISA tests, but with a focus on how adults acquire, use, develop and benefit from their skills. Countries could find the results very useful for developing educational, economic and social policies to improve their skills. A central message of the first PIAAC report is that what people know and what they can do with it have a major impact on their life chances (OECD, 2013e). For example, the median hourly wage for individuals with high skill levels is 60% higher than for individuals with low skill levels, who are also twice as likely to be unemployed.

The expansion of tertiary education in the region has not always been accompanied by improvements in quality.

Various factors explain the low quality of tertiary education, some of which are results of its rapid recent expansion. The factors include more students with a lower economic, social and cultural status; a shift towards a more teaching-based, rather than research-based, model; the emergence and rapid expansion of higher-education institutions (HEIs) that have lowered quality requirements and often hired poorly trained teachers; a certain commercialisation of tertiary education, with some universities

admitting students purely based on their capacity to pay (Brunner and Ferrada, 2011; Aedo and Walker, 2012).

Evaluation and accreditation systems are therefore essential to guarantee the quality of higher-education systems. Quality levels depend strongly on quality measurement, evaluation and accreditation capacities. Although the number of evaluation agencies has grown in the region, there is still plenty of room for improvement. Accreditation models must be broadened to cover the wide range of HEIs and institutional models, improve the qualifications of assessors and strengthen quality-control procedures.

Better quality will require better accreditation and follow-up procedures.

Given the internationalisation of higher education, accreditation is particularly important to ensure the quality and equivalence of diplomas. Regional co-operation in this area is particularly important, and the RIACES initiative (Ibero-American Network for Quality Accreditation in Higher Education) is an interesting example. A good example of the region's limitations in the area of accreditation systems can be found in Colombia, where quality requirements are low and where only 7% of universities were accredited by the country's excellent accreditation system in 2012 (OECD/IBRD/World Bank, 2012).

Other aspects that determine quality are related to the governance and university-management models and the quality of teachers. University governance models often reinforce endogamy and decisions based on vested interests, significant factors behind the poor quality of higher education in Latin America (Bernasconi, 2013). Several countries have more flexible university-management models, with regulatory frameworks that encourage dynamism and innovation (Salmi, 2013).

Another key aspect is related to teacher training. The teaching profession shows some limitations and shortcomings. Many teachers do not have postgraduate training, have little pedagogical training or earn low wages with poorly designed incentive schemes (Brunner and Ferrada, 2011). In the Dominican Republic, for example, quality has been identified as a central challenge for higher education. Efforts to improve teacher training must be a priority, with tougher selection criteria for the teaching profession, updated training procedures and incentives to make the profession more attractive for talented individuals (OECD, 2012a).

Dropout rates are an additional challenge for tertiary education. The region has low gross graduation ratios from first degrees: 12% in Argentina, 14% in Colombia, 18% in Venezuela, and 19% in Chile and Mexico. Costa Rica (37%) and Cuba (51%) have much higher rates.[15] These ratios underline the education system's weaknesses in training and retaining higher education students. Tertiary education enrolment is affected by the opportunity cost of work income and low household savings. Furthermore, the poor quality of some institutions means that students are not of a high enough standard to remain in tertiary education. Finally, the limited visibility or poor reputation of other types of education (technical and vocational) may increase the mismatch between students and programme type, raising dropout levels.[16]

Three inequality factors persist in education and in labour-market access: socio-economic background, gender, and rural vs. urban areas

Three main inequality factors affect educational access and performance among society's most vulnerable sectors, and later affect their labour-market integration: inequalities due to socio-economic status, gender, and rural vs. urban areas.

Socio-economic inequalities affect student access and performance

Not all students have the same opportunities in education, especially those with a lower socio-economic status. Education spending affects the various socio-economic groups differently and can have a highly significant distributional impact. Education services are in strong demand from the region's new emerging "middle classes", on whom education spending has a particularly large impact, given their size and the fact that many of their members are still relatively vulnerable (Box 4.3).

Box 4.3. **What impact does public spending on education have on Latin America's middle class?**

We often hear that Latin America is now a *middle-class region*. Although definitions of the term vary (see a comparison of the terms "middle class" and "middle sectors" in OECD, 2010b; and more recently in Ferreira et al., 2013), the drastic reduction in poverty and inequality is undoubtedly creating socio-economic groups with higher demand, more sophisticated consumer preferences and new social aspirations.

However, the social transformation driven by the rise of these new middle classes is exposed to risks. There is growing evidence that many individuals who escape poverty remain far from the definition of middle class as someone who has a stable, formal job (Banerjee and Duflo, 2008). On the contrary, they are often highly vulnerable to the effects of job loss, illness or old age, among other risks. Education is one of the main aspirations of this new middle class, not only because education is associated with more stable income but also because it increases people's social mobility.

This box presents some of the results of the Commitment to Equity (CEQ) project. Headed by Nora Lustig, the CEQ is an initiative organised by Tulane University, the Center for Global Development and the Inter-American Dialogue, With the help of local researchers, the project seeks to analyse the impact of taxes, transfers and public services (especially healthcare and education) on inequality and poverty in emerging economies (Lustig and Higgins, 2013).[17]

This box presents the results of the trials by Lustig, Pessino and Scott (2014) and other working papers by CEQ and an extension of the CEQ project supported by the Labor Markets and Social Security Unit of the IDB and the OECD Development Centre. The project classifies households into socio-economic groups, as defined by Ferreira et al. (2013): poor (daily income of less than USD 4 per capita), vulnerable (USD 4 to USD 10), middle-class (USD 10 to USD 50) and upper-income (more than USD 50). The analysis specifically focuses on those who form the middle sectors of the population, i.e. the vulnerable and middle class in the above classification. The results are summarised using two indicators: the distribution of total spending on education broken down by socio-economic group, and the redistributive impact of this spending for each group, measured as a proportion of their market income.

Box 4.3. **What impact does public spending on education have on Latin America's middle class?** (*cont.*)

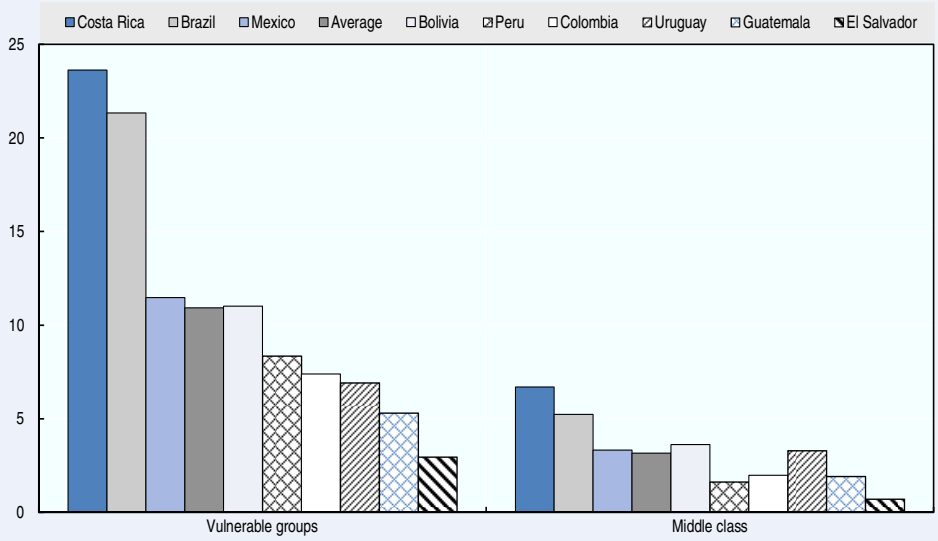
There are marked differences from one country to another in the distribution of educational spending among the middle sectors. In El Salvador, Mexico, Bolivia and Peru, the vulnerable group receives more than 40% of education spending, above the regional average of 36%. At the other extreme is Uruguay where the vulnerable group receives only 22%, less than in any other country in the region. This contrasts with education spending for the middle class, where Uruguay comes out on top (63%), well ahead of Costa Rica (51%); the middle class receives the lowest share in Guatemala (11%) and El Salvador (14%), well below the regional average of 29%. This variation among the countries is greater for the middle-class share than for the vulnerable-group share, largely because the relative size of the middle-class varies greatly from one country to another in Latin America.

Regarding the distributional impact, which takes into account both the distribution and size of the socio-economic groups, as well as their income, education spending raises the income of the vulnerable group by 11% on average and that of the middle classes by 3% on average. The countries in Latin America fall into four groups (Figure 4.7) based on the impact of education spending on the middle statuses: the high-impact group, formed by Costa Rica and Brazil, in which the increase exceeds 20% of income; the average-impact group, formed by Bolivia and Mexico; the medium-low impact group, formed by Peru, Colombia and Uruguay; and the low-impact group, formed by El Salvador and Guatemala. For the middle class only, Brazil and Costa Rica are still the countries where education spending has the highest distributional impact. The impact on the middle class is average in Bolivia, Mexico and Uruguay, while it amounts to less than 3% of income in the remaining countries.

This significant distributional impact of government education spending is mainly thanks to primary education in the vulnerable group and tertiary education in the middle class (which accounts for almost half of the distributional impact). Secondary education also has a significant distributional impact on both groups, but not to the same extent as primary and tertiary education.

Figure 4.7. **Distributive impact of public spending on education on Latin America's middle statuses**

(% market income)



Source: Authors' work, based on the extension of the CEQ project.

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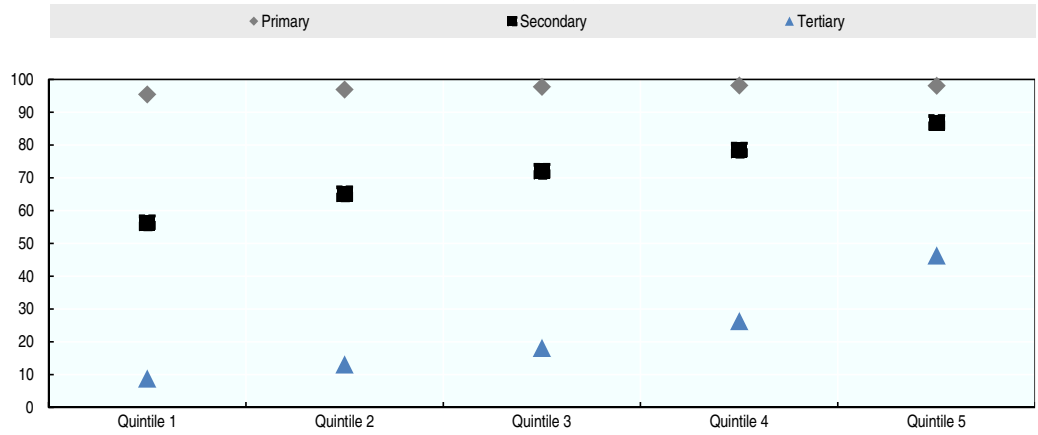
There are major disparities in enrolment rates, which become greater at higher levels of education and vary according to income and sociocultural aspects such as the indigenous and Afro-descendant population. Although income distribution has little effect on enrolment in primary education, it has a substantial effect on enrolment in secondary and tertiary education. In Latin America, nearly half of students in the fifth income quintile continue into university, but in the first quintile only one in ten students does so (Figure 4.8).

Access to education varies by income in all countries in the region, but access by type of school (public vs. private) and level of education (see Rossetti, 2014 for a summary comparing the figures among the countries) vary greatly according to income. Furthermore, income-based segregation between public and private schools has been growing since the 1990s (Arcidiácono et al., 2014).

Figure 4.8. **Net enrolment rates by income quintile in Latin America (%), 2011**



Note: Fifteen Latin American countries included, which vary for each level of education. For the seven largest Latin American economies, no data is used for primary education in Brazil or any level of education in Venezuela.
Source: SEDLAC (SEDLAC and World Bank), 2014.
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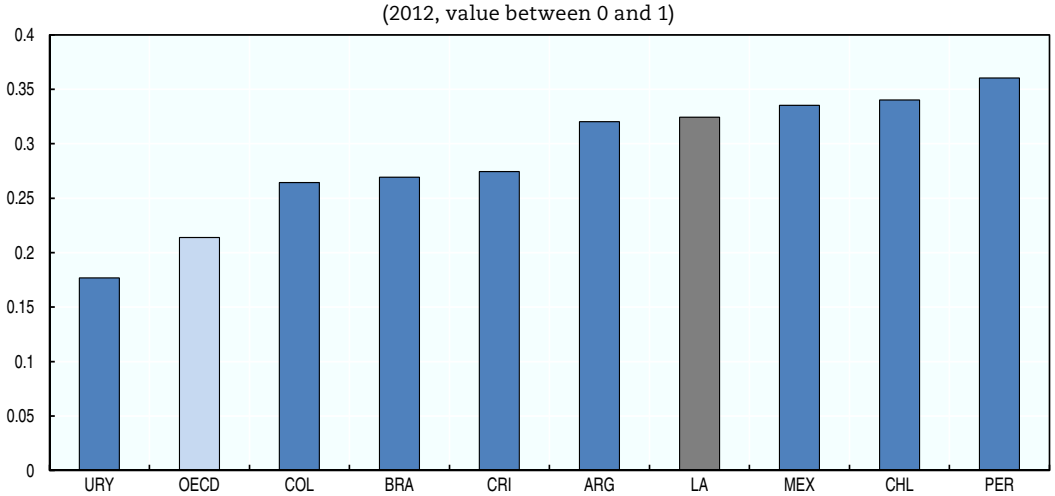
Economic disadvantages not only affect access but also student performance. As mentioned at the beginning of this chapter, the socio-economic status of the student and the school account for around 30% of the performance variation of secondary-school students in Latin America. Educational infrastructure levels and access to basic public services are strongly correlated with the socio-economic level of students and schools. The correlation between a student's socio-economic status and the educational resources of his or her school is much stronger in Latin America than in the OECD economies (Figure 4.9). The most disadvantaged schools have severe shortages of basic services such as access to drinking water, electricity and toilets, which diminishes the quality of learning (Duarte, Gargiulo and Coreno, 2011).

Another aspect linked to a school's socio-economics status is the school climate. A friendly climate among classmates and mutual respect between teachers and students are associated with higher achievement in Latin America (Treviño, 2010). Therefore, instead of creating a more equitable distribution of learning opportunities and more favourable educational results, schools tend to reproduce existing socio-economic inequality patterns.

Figure 4.9. **Correlation between the quality of schools' educational resources and students' socio-economic status**

(2012, value between 0 and 1)



Note: Latin America ("LA") comprises Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. "Schools' educational resources" refers to aspects such as scientific laboratory equipment, instructional material, computers, software, Internet connections and library material.

Source: Authors' work based on OECD/PISA 2012 database.

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Another crucial aspect affecting performance and equal access is Latin America's cultural and linguistic diversity. These cultural differences may put some students at a disadvantage, increasing their likelihood of not enrolling, repeating grades or dropping out. Peru, for instance, has a mathematics performance gap equivalent to more than two years of schooling, between students who report speaking Spanish at home and students who report speaking Quechua. This negative impact remains significant even after controlling for the economic, social and cultural status of the student and the school.[18] The development of intercultural and bilingual education programmes is vital in the region to combat this type of inequality and raise the performance of the most disadvantaged students.

The experience of OECD countries shows that quality and equity are not mutually exclusive.

The PISA 2012 results corroborate that better quality can accompany greater equity. The results show that some OECD countries and some emerging economies improved mathematics performance without increasing inequities. Moreover, in Mexico, performance improved between 2003 and 2012, as did equity as per both PISA definitions: the performance gap between the two ends of the socio-economic spectrum decreased (from 60 to 38 points, which is equal to less than one year of schooling) and the proportion of the variation explained by students' socio-economic status (down from 17% to 10%).[19] During the earlier 2000-09 period,[20] Chile also improved both its performance (by three points per year) and its equity (performance gap down almost 10 points).

However, not all countries in the region were able to improve both performance and equity. Argentina, Brazil and Peru improved their average performance but failed to reduce socio-economic inequalities. In Uruguay, meanwhile, both performance and equity deteriorated, with the performance variation explained by students' socio-economics status increasing from 16% to 23%. Finally, in Argentina, Colombia and Peru, 25% of students in the lowest socio-economic category failed to achieve the minimum

skill level, defined as the ability to answer questions involving familiar contexts or carry out routine procedures according to direct instructions.

Latin America still has one of the lowest levels of social inclusion in the world, defined as the proportion of students of different economic, social and cultural statuses enrolled at the same school. Raising the level of social inclusion is one of the most efficient ways of boosting equity, because the classroom climate can be a key source of motivation and engagement (OECD, 2012b). The level of social inclusion worsened in Mexico and Uruguay between 2003 and 2012. They join Brazil as the three countries in the region with the lowest levels of social inclusion among participating countries. These results confirm that economic, social and cultural status still plays a major role in determining the type of school in which students enrol.

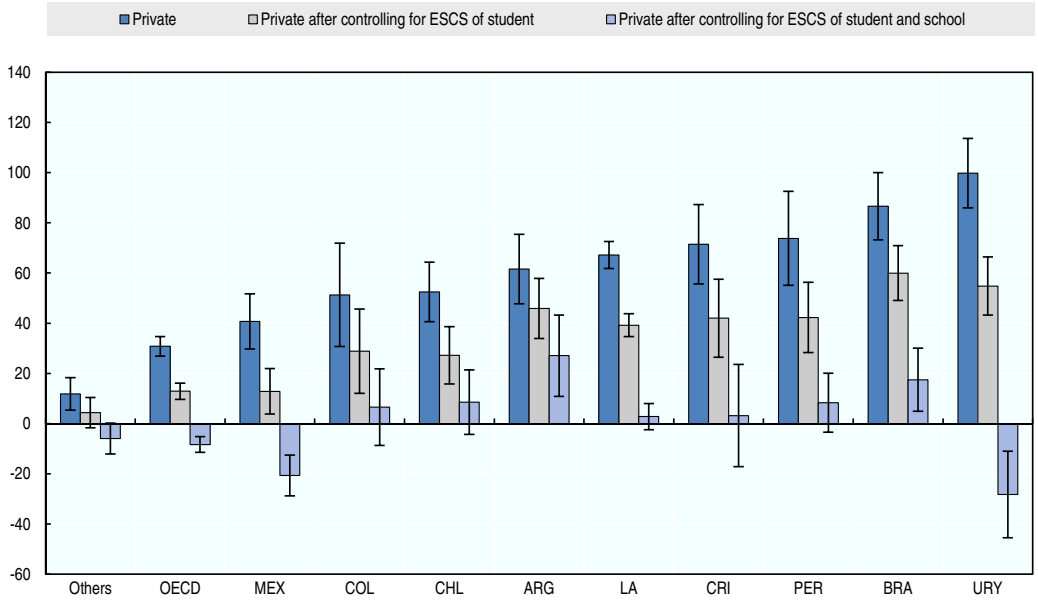
Students' economic, social and cultural status largely explains the performance gaps between public and private schools.

It is these socio-economic disadvantages that explain why private schools perform better. After adjusting for the economic, social and cultural status of parents and schools, private schools performed no better than public schools (Figure 4.10). In fact, in two countries in the region – Mexico and Uruguay – public schools offer greater net value added than private schools. In addition, in Brazil and Mexico the performance gap between private and public schools narrowed between 2003 and 2012, both before and after controlling for the student's socio-economic status. In the OECD countries, however, the net value added of private schools increased.

Another analysis confirmed that the poorer performance of public schools is due to students' socio-economic statuses and schools' limited resources. However, efficiency frontier analysis suggests there may be some differences among countries (CAF, 2012). For example, Chilean public educational institutions can operate efficiently, but there is still an equality gap associated primarily with insufficient resources and students' socio-economic background. In Peru, although resource shortages and students with adverse socio-economic conditions partly explain the poor performance of public schools, there are other aspects related to efficiency (Álvarez-Parra, 2012). As in other emerging economies, better performance by private schools does not necessarily mean that those schools function efficiently (Banerjee and Duflo, 2011).

Policies to enable public schools to attract students from a more diverse range of socio-economic backgrounds and policies to provide public schools with more resources could improve equity and performance. Because of the socio-economic disparity between public and private schools and its effects on performance, public schools need greater attention. More students from different socio-economic backgrounds – a goal for various countries in the region – would help public schools to improve their performance, and could have positive externalities thanks to peer effects (Llaudet and Peterson, 2013).

Figure 4.10. **Performance differences between private and public schools**
(PISA points in mathematics, before and after controlling for the socio-economic status of students and schools)



Note: Latin America ("LA") comprises Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. "Others" comprises Albania, Bulgaria, Croatia, Dubai, Hong Kong (China), Indonesia, Jordan, Kazakhstan, Latvia, Liechtenstein, Lithuania, Macao (China), Malaysia, Montenegro, Qatar, Romania, Russia, Serbia, Shanghai (China), Singapore, Chinese Taipei, Thailand, Tunisia and United Arab Emirates. The intervals show 95% confidence intervals. The dependent variable in the regression is student performance in the PISA test, and the explanatory variables are: a dummy variable equal to 1 if the school is private, the child's economic, social and cultural status (ESCS) and the school's ESCS.

Source: Authors' calculations based on OECD/PISA 2012 database.

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In tertiary education, disparities remain large despite significant recent progress in access. Additional access has not affected all economic groups equally, with performance in universities still strongly associated with factors such as income, family and educational setting, geographical location and ethnic group (ECLAC, 2011).

Tertiary enrolment rates for different income levels reveal the major inequalities that still exist. The poorest income quintile's enrolment rate remains below 10% in several countries, whereas the richest income quintile's rate is above 40% in most countries and above 50% in some.

Although university access has expanded in recent years, gaps remain, partly because the university system is split between a few elite universities and the rest, with the latter accounting for most of the increased access to higher education. In addition to access, there are also inequalities in graduation rates in tertiary education. The net graduation rate is 8.9% for 25-29 year-olds, but this figure rises to 27% for the richest income quintile and falls to 1% for the poorest. The latter often have to drop out because they need to work (SEDLAC, 2014). In terms of performance, the PIAAC test provides the first conclusions on inequality and skills in the OECD countries (see Box 4.4).

Box 4.4. **The impact of the socio-economic background on skills in non-Latin American OECD countries**

Skills in a range of fields such as mathematics, reading and problem-solving are essential for people to enter and successfully participate in the labour market. However, as acknowledged by most of the literature on the subject, including the PIAAC report (Programme for the International Assessment of Adult Competencies, OECD, 2013c), the skills that people acquire are conditioned by their socio-economic background. The PIAAC report looked at 16-64 year-olds in 24 countries and found that people from more advantaged socio-economic backgrounds perform better in tests than those from more disadvantaged backgrounds. The results showed that in countries like the United States, the United Kingdom, France and Germany, where socio-economic inequalities are greatest, there is a stronger relationship between socio-economic setting and skills. Conversely, where policies were introduced to improve access and quality in the education system, such as in the Nordic countries, this relationship has weakened, meaning that those from disadvantaged backgrounds are not predestined to low skill levels and to difficulties entering and participating in the labour market.

The OECD analysis does not yet include results for Latin America, but Round 2 will include Chile, with the results published in 2016, and Round 3 will include Argentina, Colombia, Costa Rica, Ecuador, Mexico and Peru, with results published in 2018.

Source: OECD (2013e).

The incorporation of ICTs into education brings new opportunities to promote equity, but also new risks. ICTs are playing an ever greater role in the education system, and in recent years they have been introduced into tertiary education and into the teaching and learning processes. They provide new opportunities in terms of access to education. However, because access to ICTs varies among different socio-economic groups (the "digital divide"), many are alienated from the opportunities they bring and denied the benefits of higher education, and so the existing inequalities grow. In 2008, 25.2% of households in the region's richest income quintile had Internet access, compared to 1.2% of households in the poorest income quintile (Kaztman, 2010).

Furthermore, the incorporation of ICTs into higher education has not yet become widespread. Where they have been used, it has been to improve management mechanisms, and they have done little to transform teaching methods (OECD, 2014b).

However, greater social inclusion outside school requires solutions that are more complex and that affect the social and cultural behaviour of societies. Increased performance in education for all is not enough to ensure equal employment conditions in the labour market. Belonging to a certain social network has a significant impact on labour-market integration and salaries. In Chile, for example, business and economics students who graduate from the same university with similar grades will earn salaries that differ by 25% to 35%, depending on the graduate's socio-economic background (Núñez and Gutiérrez, 2004). Although there does not appear to be any discrimination associated with people's names and places of residence during the initial hiring stages (Bravo, Sanhueza and Urzúa, 2008), there may be discrimination in subsequent stages or in wage setting.

Inequalities between rural and urban areas are due to countries' socio-economic factors

In Latin America there are vast inequalities in education skills between urban and rural areas. There are inequalities in enrolment rates between socio-economically advantaged and disadvantaged regions within a single country. This mismatch between schools and students is compounded by the smaller number of schools and less diverse programmes in rural areas. The performance gap between urban and rural schools is twice as wide in Latin America as it is in the OECD countries (Figure 4.11). Brazil, Chile, Peru and Uruguay have performance gaps of more than 70 PISA points, the equivalent of almost two years of schooling. These rural-urban comparisons reveal major differences between Latin American and OECD countries.[21] The infrastructure gap between rural schools (defined as those in areas with less than 3 000 inhabitants) and urban schools is 12 times greater in Latin America than in the OECD countries.

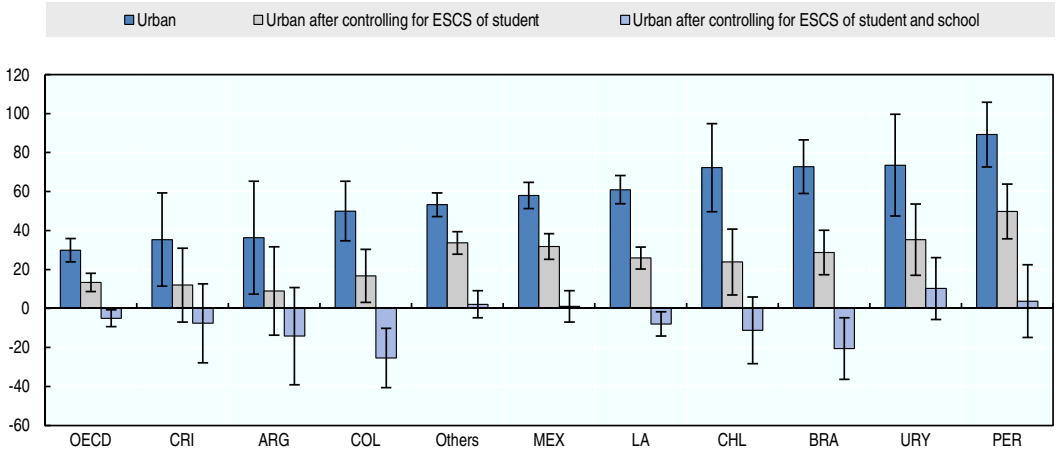
Similarly, the quality of educational resources (computers, laboratories, books and technologies) is six times greater in urban areas than in rural areas in Latin America.[22] Rural schools suffer from serious shortcomings, in both school infrastructure and access to basic public services. This suggests the need for targeted public interventions to improve student conditions in more remote areas and ensure equitable access to good-quality education (Duarte, Gargiulo and Moreno, 2011). Rural schools are considerably less well equipped than urban schools, harming their performance.

Performance differences are also visible within towns and cities. The large income inequalities in Latin America's urban areas are reflected in the substantial performance gaps of students within the same town or city. There are vast performance differences between schools that are located very close together, so instead of tackling inequality, education actually contributes to it. For instance, at schools within a kilometre of San Borja Sur metro station in Lima, 70% of students in the second grade of primary school can understand what they read, but at schools near Parque Industrial station – a 20-minute metro ride away – the figure falls to 30%. Moreover, these differences grew between 2007 and 2012 (Ñopo, 2014). Similar results can be observed if we ride the Santiago Metro, confirming a high intergenerational transmission of poverty and inequality (Echenique and Urzúa, 2013). The high correlation between household income and student performance in urban areas – with large performance gaps between schools that are close together – underlines the need for more inclusive policies.

Reducing the contribution that geographical location makes to student performance requires a series of measures that go beyond dealing with the quality of schools. After controlling for the socio-economic background of students' parents and schools, rural schools actually perform better in some countries in the region, even outperforming the OECD average (Figure 4.11). So, much of the better performance by urban schools is explained by the better socio-economic situations in certain regions due to wealth inequalities.

Indeed, the Gini coefficients in GDP per capita are much higher for Latin American countries than for the OECD countries. The Gini index for the OECD is 16%, well below the indices for Brazil (29%), Colombia (31%), Chile (35%) and Mexico (35%) (OECD, 2013f). Socio-economic differences due to geographical location are also reflected in the education system. In Latin America, 78% of students in rural areas are enrolled in socio-economically disadvantaged schools, compared with 41% in the OECD countries. Furthermore, 45% of students in urban areas (municipalities with more than 100 000 inhabitants) in Latin America come from socio-economically advantaged settings, compared with only 38% in the OECD countries.[23] Regional disparities must therefore be addressed by integral policies and education policies that boost regional development and reduce geographical disparities.

Figure 4.11. **Performance differences between urban and rural schools**
(PISA points in mathematics, before and after controlling for the socio-economic status of students and schools)



Note: Latin America ("LA") comprises Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. "Others" comprises Albania, Bulgaria, Croatia, Dubai, Hong Kong (China), Indonesia, Jordan, Kazakhstan, Latvia, Liechtenstein, Lithuania, Macao (China), Malaysia, Montenegro, Qatar, Romania, Russia, Serbia, Shanghai (China), Singapore, Chinese Taipei, Thailand, Tunisia and United Arab Emirates. The intervals show 95% confidence intervals. The dependent variable in the regression is student performance in the PISA test, and the explanatory variables are: a dummy variable equal to 1 if the school is located in an urban area with a population of more than 100 000 and 0 if the school is located in a rural area with a population of less than 3 000; and the economic, social and cultural status (ESCS) of the student and that of the school.

Source: Authors' calculations based on the OECD/PISA 2012 database.

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Gender inequalities persist at all levels of education and in the workplace

Despite recent progress, gender inequalities in education remain a challenge for the region. Universal coverage for primary education has brought gender parity. In general, there is equal enrolment of girls and boys in primary schools, unlike in other emerging regions such as sub-Saharan Africa, the Arab States, South and West Asia and East Asia and the Pacific, where there is higher enrolment among boys than girls. The only exception is the Dominican Republic, one of only 15 countries in the world where boys are at least 10% more likely to be enrolled in the first grade of primary education (UNESCO-UIS, 2011).

In Latin America, boys still drop out of school or repeat grades far more often than girls. Primary- and secondary-school boys are both more likely to repeat a year than girls. In primary education especially, the difference between male and female dropout rates is far greater in Latin America and the Caribbean than in the OECD countries. In 2012, in the OECD countries there was hardly any difference between the repetition rates for boys and girls in primary education, but in Latin America and the Caribbean the rates for boys are more than 45% higher.[24]

Unlike in other developing countries, in secondary and tertiary education there is a lower enrolment rate for males than for females, confirming a reversal of the trend in primary education. This trend has been increasing in the region in recent decades, with the gap between female and male enrolment rates reaching more than five percentage points in secondary education and more than 16 percentage points in tertiary education by the end of the 2000s (UNESCO-UIS, 2012). In Argentina, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Honduras, Nicaragua, Panama and Venezuela, the gender gap for completion of secondary education is more than 10 percentage points (Rico and Trucco, 2014).

The performance gap between boys and girls in Latin America is greater than in the OECD countries. In PISA 2012, boys outperformed girls in mathematics by an average of more than 19 points – equal to half a year of schooling – compared with 11 points in the OECD countries. This performance gap in favour of boys has increased over the past ten years in Brazil and Mexico, but remained the same in Uruguay, as well as in the OECD countries.

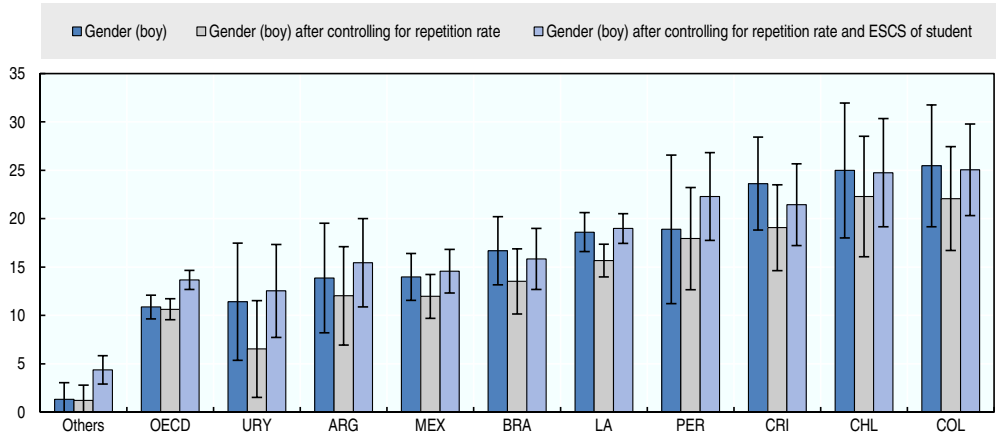
When socio-economic variables are included for the student or the school, gender differences remain significant, implying an association between gender and performance irrespective of the socio-economic level of the parents or the school. These differences increase when controlling for student repetition rates (Figure 4.12).

The lower dropout rate for girls explains the better performance by boys.

Similarly, in the reading test, girls outperformed boys by 27 points in Latin America (equal to almost eight months of schooling) and 38 points in the OECD countries. Extensive literature stresses that key factors behind these gender-based performance differences in mathematics and reading are people's different beliefs in the children's abilities in the respective subjects and the children's own self-belief. It is therefore essential to develop teaching strategies that seek to reverse gender-based inequalities (Bellei et al., 2013 and OECD, 2012c).

Figure 4.12. **Performance differences between boys and girls**

(PISA points in mathematics, before and after controlling for repetition and the socio-economic status of students)



Note: Latin America ("LA") comprises Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. "Others" comprises Albania, Bulgaria, Croatia, Dubai, Hong Kong (China), Indonesia, Jordan, Kazakhstan, Latvia, Liechtenstein, Lithuania, Macao (China), Malaysia, Montenegro, Qatar, Romania, Russia, Serbia, Shanghai (China), Singapore, Chinese Taipei, Thailand, Tunisia and United Arab Emirates. The intervals show 95% confidence intervals. The dependent variable in the regression is student performance in the PISA test, and the explanatory variables are: a dummy variable equal to 1 if the child is a boy, the number of repeated years and the child's economic, social and cultural status (ESCS).

Source: Authors' calculations based on the OECD/PISA 2012 database

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The better performance by boys is partly explained by the high dropout rate among boys from poorer socio-economic backgrounds. These students also tend to be the poorer performers, so when they drop out it introduces a selection bias in the boys that sit the exams. In some countries, the differences in dropout rates by socio-economic status are greater than in others. In Chile, for instance, 65% of boys in the lowest income quintile complete secondary school (compared with 95% of their male

peers in the highest income quintile), but in Guatemala, only 10% of boys in the lowest income quintile complete secondary school (compared with 60% of their male peers in the highest income quintile).[25] Colombia's 2012 PISA results are noteworthy in that it has the largest performance gap between boys and girls in mathematics and one of the smallest performance gaps between girls and boys in reading. However, the seemingly better performance by boys vanishes when the performance of those who dropped out of school is taken into consideration (Muñoz, 2014).

Similarly, in some countries in the region the gender performance gap can also be explained by the fact that violence is much more prominent among boys, especially the poorest teenagers living in urban areas. Youth violence and homicide rates in Latin America and the Caribbean are higher than in all other regions (Muggah and Aguirre, 2013). In South and Central America, the homicide rate for male victims aged 15-29 is more than four times the global average for that age group (UNODC, 2013). In Colombia, where the school performance gap between boys and girls is the highest, violence is associated with male school dropout (Gerardino, 2014).

This violence harms incentives to invest in education through various channels. First, it increases the opportunity cost of education, because violence involves men more than women, and second, it reduces life expectancy and perceived safety among men. In addition, the violence can indirectly affect all students, making them afraid to attend classes when violence is present even in school. In some countries, this factor can affect dropout rates and educational quality.

Even when girls perform as well as boys in mathematics, they report less motivation to learn the subject and less belief in their own skills. The gender gap in favour of boys is even greater among the highest-performing students. This has serious implications for higher education: young women are already under-represented in science, technology, engineering and mathematics degrees, as well as after graduation, when they enter the labour market. These identified factors thus create and expand the gender gap in education, employment and entrepreneurship. Positive attitudes to support girls and investment in mathematics learning could help to close this gap (OECD, 2012c).

Although integration of women has improved, gender inequalities extend into the labour market.

Because more women now enrol in secondary and tertiary education than before, there are more women in the workplace, especially women with higher socio-economic statuses. Globally, the female labour-force participation rate dropped from 57% to 55% between 1990 and 2012, while in Latin America and the Caribbean it steadily grew from 43% to 60% during the same period. In addition, regulation has encouraged female participation in the labour market, halving the number of discriminatory restrictions in the last four decades (World Bank, 2014). However, this positive trend has primarily been in the upper socio-economic levels. At the lower levels, various restrictions and conflicts remain.

Some key challenges remain to improve the position of young women in the labour market. First, the proportion of 20-29 year-old women in low-productivity sectors is greater than 70% (vs. 56% for men of the same age), which shows that labour-market integration for women needs to improve (Rico and Trucco, 2014). Second, the total number of hours worked by women is far greater than the number worked by men, mainly because of the high proportion of hours worked by employed women in unpaid domestic work (ECLAC, 2013). Third, youth unemployment for 15-24 year-olds is still around six percentage points higher among women than among men, whereas in the OECD there is no significant difference. Women's wages, meanwhile, have improved in

recent years, and in some countries they represent a higher proportion of men's wages than the OECD average. However, they remain at only 90% of men's wages, a figure that cannot necessarily be explained by fundamentals such as work experience and level of education (World Bank, 2014).

Education policies in Latin America must deal with major challenges

Recent education policies have addressed school autonomy, changes in the management model, the strengthening of evaluation and the professionalisation of teachers.

Educational reforms have sought to respond to traditional challenges related to enrolment rates as well as new challenges related to relevance and adaptability. Previous *Latin American Economic Outlook* reports have described some of the major education reforms introduced in the region in recent decades (OECD, 2011). First, education systems have been decentralised to improve performance, giving schools, local authorities and regions greater autonomy in areas such as hiring teaching staff, financing, scheduling school hours and setting targets. Second, changes have been made to the management of tertiary education, leading to greater private funding and new quality criteria, which has resulted in greater differences among universities. Third, evaluation systems have been introduced and strengthened, providing better insight into the dynamics of education systems and improving how student performance and teaching practices are measured. Fourth, changes have been introduced to the hiring, management and professional development of schoolteachers and principals.

In recent years, education reforms have sought to respond to both "traditional" challenges and "new" challenges that have emerged. Most countries in the region are still conducting reforms in the four traditional areas: enrolment rates, quality, equity and relevance. However, recent policies have also dealt with new challenges in areas such as early education, the relevance of education programmes and adaptability to labour-market needs.

Significant long-term challenges lie ahead for education policy, but the current climate of fiscal tightening requires short-term solutions that make better use of existing resources to deal with the most immediate challenges. These policies include, as discussed below, support programmes to reduce repetition and dropout, school tutoring programmes, some incentives for the teaching profession, and the strengthening of soft skills in school curricula and of information systems in tertiary education.

Although Latin America's long-term challenges will not lead to immediate results, they must be an essential part of education programmes. These challenges include policies for early education, including increasing the enrolment rate and creating programmes to train up skilled staff. They also include priority policies in several countries, such as full-time schools, teacher training systems and the introduction of evaluation systems.

The region's traditional education challenges are therefore accompanied by new areas of action that must structure the new education policy agenda. The next section presents the main areas that form this new agenda. It describes some of the recent reforms introduced by countries in the region and the experience of the OECD countries, and it makes recommendations. Annex 4.A1 presents a summary of the main policy recommendations in this chapter.

The new agenda for education policies should focus on quality and equity

Although OECD member countries do not share a single educational model, there is now a certain consensus regarding the most effective education policies. International experience points to a set of policies that affect quality and equity and contribute to defining a new agenda for Latin America: *i)* early-education policies, which cover challenges such as improving enrolment rates, training professionals for early education, and placing a greater emphasis on the development of non-cognitive skills in the curriculum, among others; *ii)* equity-focused policies such as programmes to support struggling students, new technologies, and new partnerships with the private sector; *iii)* classroom policies that seek to develop a disciplinary framework for training and encourage qualities such as motivation and perseverance; *iv)* strengthening the teaching profession, which is still a priority for the region and includes continuing training policies, teacher development and peer learning; and *v)* the development of internal, national and international evaluation and monitoring systems.

Early-education policies require medium- and long-term measures.

Essential for people's development and labour-market integration, early-education policies are now a priority. As explained in this chapter, several studies have highlighted the fact that people who receive early education perform better in the future, are less likely to drop out of school, and tend to have better cognitive skills. Early education therefore contributes to a more integral human capital (Cunha et al., 2005). Policies to increase enrolment in early education should therefore be strengthened, including aspects such as developing schools' and institutions' infrastructure. Other short- and medium-term measures are also important. The policies implemented in the region in recent years, which must remain a priority, include facilitating flexible childcare options so that more children have access to early education and more women can work. These policies also aim to increase the time people spend in education and improve staff training schemes in early-education centres.

Policies for equity and inclusion

Vast inequalities still remain in education, as seen throughout this chapter. Policies to address this have been stepped up and must remain a central part of education policy. Success stories in the region abound. In Brazil, the *Alvorada* project (initiated in 2001), the *Bolsa Escola* school-allowance programme and the National Partnership to Strengthen Secondary Education (*Pacto Nacional pelo Fortalecimento do Ensino Médio*) focus on reducing regional inequalities. The *Brasil sem Miséria* anti-poverty programme, launched in 2011, focuses on access to public services such as education and technical and vocational training. In Colombia, conditional cash transfer programmes such as *Familias en Acción and Estrategia de Cero a Siempre* seek to improve the quality of early-childhood programmes. The use of technology has made an important contribution to equity in some countries. In Argentina, the *Conectar Igualdad* programme has distributed computers among secondary-school students and teachers and provided teacher training. In Uruguay, the *Plan Ceibal* has made access to computers in public primary schools almost universal. In Mexico, two distance-learning schemes for undergraduate degrees – *Telebachilleratos Comunitarios and Bachillerato en Línea* – seek to improve inclusion among sectors of society with less access to education (e.g. adults, rural areas) by forming virtual learning communities.

Progress in the area of equity depends largely on the coherence and consistency among different education policies.

Education policies for equitable access and performance in the school systems need to be more coherent. The performance equity issues in school systems have been raised repeatedly in reference to Latin America, where socio-economic background, geographical location, ethnicity and gender significantly affect performance. In some countries, measures to improve performance have actually exacerbated inequalities, as shown by experiences in which different curricula are used for students with different ability levels, origins or motivation levels (Cox and Schwartzman, 2009). Curriculum differentiation between academic education on the one hand and vocational and technical education on the other (see Box 3.4, Chapter 3) has sometimes had an adverse effect in some countries, given vocational schools' poor reputation in the region. Coherent education policies also depend on better monitoring and follow-up.

Partnerships with the private sector, particularly with philanthropists, have improved educational access and equity. In Brazil, the experience of the *Instituto Ayrton Senna* (IAS), which benefits almost 2 million disadvantaged children and young people in 1 200 municipalities throughout the country, is an example of successful collaboration between the public sector and philanthropy to promote equal opportunities (OECD netFWD, 2014). The organisation's *SuperAção* programme seeks to develop soft skills (communication, trust, teamwork) and cognitive skills among secondary-school children to improve their integration into the labour market and society (OECD, 2013i). The training provided to teachers through the programme benefits the schoolchildren, who improve their skills in mathematics, literature and logical reasoning for problem-solving. According to impact evaluations, the improvements in student success rates in Brazilian schools between 1996 and 2006 were almost 3 percentage points greater in municipalities participating in at least one IAS programme than in the country as a whole.

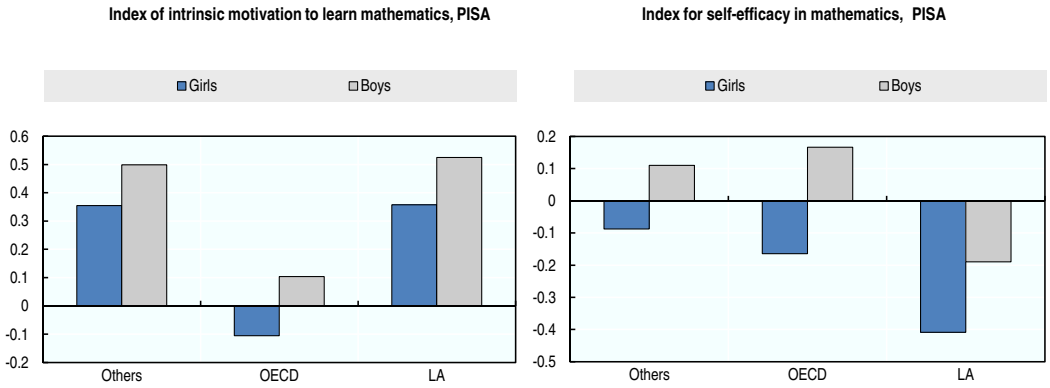
Classroom policies are highly effective and promote values such as motivation and perseverance.

Classroom policies have become more important in recent years because they are highly effective, with observable impacts in various contexts. They foster a solid learning environment and are essential not only to implement policies that provide support to struggling students and self-evaluation mechanisms, but also to boost qualities such as motivation among students. However, classroom policies in Latin America must strike a better balance between motivation and performance. Although indices for happiness at school, perseverance, openness to problem-solving and intrinsic motivation to learn mathematics are higher among Latin American students than among OECD students, Latin American students have a lower capacity to solve specific problems, as indicated in the index for self-efficacy in mathematics in the PISA test (Figure 4.13). The students' motivation, perseverance and happiness could therefore be better utilised through more stringent and more demanding classroom policies that convert these qualities into better performance (see Box 4.5).

It is also important to continue developing policies to reduce violence in schools, which would boost students' learning capacity and their integration into society. Proactive mechanisms like dialogue and participation in social relations support the psychosocial and human development of children and young people (Krauskopf, 2006). The *Paz nas Escolas* programme in Brazil and the *Habilidades para la Vida* programme in Colombia already reduced student violence in schools in their respective countries. Adapting prevention programmes from OECD countries to countries in Latin America and the

Caribbean could be helpful. For instance, the Bullying Prevention Program in the United States and the *Sevilla Anti-Violencia Escolar* programme in Spain have changed students' interpersonal relationships in order to foster co-operation and solidarity. Similarly, programmes to develop upper-secondary school students' socio-emotional skills such as *Construye T* in Mexico have sought to train teachers to understand the importance of identifying their own emotions, empathising with others and strengthening decision making.

Figure 4.13. **Student motivation and problem-solving effectiveness**



Note: Latin America ("LA") comprises Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. "Others" comprises Albania, Bulgaria, Croatia, Dubai, Hong Kong (China), Indonesia, Jordan, Kazakhstan, Latvia, Liechtenstein, Lithuania, Macao (China), Malaysia, Montenegro, Qatar, Romania, Russia, Serbia, Shanghai (China), Singapore, Chinese Taipei, Thailand, Tunisia and United Arab Emirates. The INTMAT index measures students' intrinsic motivation for learning mathematics based on student responses to questions about their enjoyment of, motivation for, and interest in reading about, learning and doing mathematics. The mathematics self-efficacy index (MATHEFF) measures students' belief in their ability to resolve certain specific tasks, such as calculating a car's fuel consumption or the saving on a television with a 30% discount.

Source: Authors' work based on the OECD/PISA 2012 database

StatLink http://dx.doi.org/10.1787/888933174562

A set of education policies to improve the conditions of the profession and guarantee the quality of teaching is essential.

Although policies for teachers have led to significant achievements in the region, there is still ample space for improvement. Policies for teachers have intensified in recent years in the region, and policy examples are plentiful. In Argentina, the National Teacher Training Institute (*Instituto Nacional de Formación Docente*) was created in 2007 for the institutional development of the training system and initial and continuing training for teachers. Brazil has implemented various training programmes for education staff, including the *Profuncionario* programme, which provides technical training, *Fundescola*, a maintenance and development fund for primary education, and the National Education Development Fund (*Fundo Nacional de Desenvolvimento da Educação*). Colombia's efforts have centred on mentor programmes for teachers. In Uruguay, discussions are currently under way to create a teacher-training university to address the dearth of teachers available in public education. Panama created the National Innovation and Curricular Update Team (*Equipo Nacional de Innovación y Actualización Curricular*, ENIAC) to keep the educational content up to date and implemented the *Entre Pares* programme (meaning "Between Peers") to train teachers in technology use. The Dominican Republic adopted a programme of full grants for future teachers studying programmes that focus on knowledge of the curriculum, innovative teaching practices, foreign languages and technology.

The professionalisation of the teaching profession should offer suitable incentives to have a significant impact on educational outcomes. An illustrative example is that of teacher certification, which does not always result in better student performance (see Box 4.2). To promote teacher certification systems that will boost the quality of education, it is essential to improve evaluation and design incentives for teachers. Although salaries remain an important factor, other incentives exist to improve teaching practice, such as time to prepare classes and interact with other teachers, professional development, support for non-certified teachers and flexibility. The experience in the OECD countries is a good example of certain teaching incentives that help the professionalisation of teaching to have a significant impact on performance (see Box 4.5).

Efforts to improve the quality of information and the monitoring of education systems must continue.

Better information systems have enabled better-targeted education policies. Academic performance indicators such as those developed in national and international evaluations have revealed areas in which the quality of education can be improved. Self-evaluation of educational institutions for training purposes also represents progress. Additionally, it is essential to evaluate and monitor programmes, because doing so provides a better understanding of their scope and improves their impact. In several countries, policies such as conditional cash transfer programmes, which affect school attendance, progression and completion, were successful thanks in part to evaluation (Baez and Camacho, 2011; Behrman, Parker and Todd, 2011). This type of evaluation provides important lessons on policy monitoring to measure effectiveness. The experiences in the OECD countries have enabled major steps forward in this area (see Box 4.5).

Box 4.5. **Some recent lessons in education policy in the OECD countries**

The recent experience of OECD countries in education policy suggests several areas in which Latin America could make progress, especially in early education and secondary education. These areas include policies on teaching, evaluation and vocational training, as well as classroom policies.

Early education has become a priority in many OECD countries. Most governments of OECD countries provide the lion's share of investment in early education and have adopted mechanisms such as direct financing, subsidy schemes and tax breaks to increase enrolment rates. They have also sought to improve the quality of early education. Some countries have sought to improve early-education curricula, with greater involvement of families and the community.

In secondary education, where many of the region's efforts are concentrated, various policy experiences have improved resource distribution, school autonomy, teacher training, school policies and evaluation policies in the education system (OECD, 2013d).

Various successful systems in the OECD have adopted an equity policy whereby more educational resources are allocated to the most disadvantaged schools. The best-performing OECD countries in the PISA tests tend to distribute educational resources more equitably, including Estonia, Finland, Germany, Korea and Slovenia.

Similarly, at the administrative level several countries have sought to balance autonomy with collaboration among teachers. The experiences in the OECD countries show that greater school autonomy is beneficial in high-performance systems. Schools in top-performing education systems tend to have greater responsibility in designing the curriculum and in evaluation. However, whether autonomy is beneficial depends on the quality of the education system, its transparency, and collaboration at the administrative level. For this reason, the results of school autonomy cannot be extrapolated to all countries (Hanushek, Link and Woessmann, 2011).

Box 4.5. **Some recent lessons in education policy in the OECD countries** (*cont.*)

In terms of education policies, several OECD countries have invested vast efforts in designing suitable mechanisms and incentives to attract and retain good-quality teachers. They have sought to adopt stringent recruitment procedures, make training ongoing for professional teachers, offer remuneration that is in line with each teacher's training and experience, acknowledge the work of the best employees and support those who need to improve. Successful school systems in the OECD have sought to balance the distribution of teachers, ensuring that struggling schools have enough of the more highly qualified teachers.

Classroom policies are acknowledged as being most effective (OECD, 2013d). A positive disciplinary climate is one of the conditions for improving performance, which shows the importance of attracting the best teachers to struggling schools. Moreover, the best education systems in the OECD countries seek to provide opportunities for all students. In fact, splitting students into groups based on repetition or skill level is negatively associated with equity and performance. Students in highly stratified systems tend to be less motivated.

In terms of evaluation policies, the experiences of the OECD countries show that it is helpful to include students and teachers in external-evaluation and self-evaluation processes, and to use the information for training purposes (OECD, 2013h). These measures also need to be extended beyond the confines of the classroom, and systems need to be developed to measure skills and abilities for labour-market integration. One policy that has successfully reduced repetition and dropout rates has been to improve the information systems that already exist in many countries so that struggling students can be identified.

Finally, OECD policies geared towards technical and vocational training have sought to improve the quality and relevance of such training. Various policies have sought to provide students with better support and careers guidance that is relevant to what they are studying. Providing early access to work experience, which is important for the development of hard and soft skills, has been a successful policy in some countries. Similarly, measures have been taken to close the gap in curriculum development through more fluid, balanced communication among teachers, employers and unions. Attracting teachers who are familiar with the labour market has also been an important policy to improve the quality of the system (OECD, 2010c).

The institutional experiences of the OECD countries are useful for policy implementation in Latin America

The implementation of education policies must consider both the institutional structure and the stakeholders. There is ample evidence to show which factors contribute to good-quality education (Hattie, 2008; OECD, 2013g). The consensus is even stronger – if not unanimous – regarding the most effective policies: those related to good-quality teachers, high standards and expectations of students, information and monitoring systems, teacher training, school leadership, and support for disadvantaged students. What is less clear, however, is the best way to implement those reforms. The OECD uses the term "school improvement programmes", referring to three main areas of intervention: school practices, the school as an organisation and the external policy environment (OECD, 2014b).

Various types of education policies have long timeframes, with their effects only becoming visible in the long term. Such policies must take into account different interests and ability levels. Education policies must be aligned with the education system's governance structure. They must also take into account the responsibilities of the different stakeholders, including students, parents, teachers, employers and unions. The implementation process is as important as the policies themselves.

One of the most important factors for successful implementation is the practices of the individual schools themselves. The OECD experience shows that the most successful reforms are those aimed at teaching and learning, rather than those that focus on the system structure and the distribution of resources (Elmore, 1996; Datnow, 2005). Initiatives to improve school autonomy, for instance, tend lately to focus on improving school practices, rather than only on transforming decision-making structures. Experiences in the OECD countries also show that changes in teachers' behaviour and practices have major effects on the effectiveness and continuity of policies (see Box 4.5). Many of the policies designed to improve teachers' practices assume that teachers will automatically adopt them and do not consider the possibility of a more subtle, gradual change (Ng, 2008).

Proper training of teachers and administrative staff is needed to implement the education reforms.

Training for teachers and administrative staff is therefore essential for any education reform to be implemented successfully. The professional development of those involved in any kind of programme or reform to be implemented is essential. Teachers often request specific training for new programmes, and such training is more effective if it lasts longer. Ensuring the sustainability of training programmes can be expensive, but it ensures that new programmes are more thoroughly accepted and understood by teachers. The challenge for the region today is not only to provide better working conditions for teachers, but also to demand that they provide better quality.

Data and detailed information on students are essential to monitor achievements and policy implementation. The various national and international evaluation systems could provide solid information that could greatly help to improve the quality of certain policies and strengthen the system's accountability. Proper use of internal school data could encourage a culture of self-evaluation and better organisation and planning in schools (Earl, Watson and Katz, 2003).

Improvements in the management and communication of education policies could make them more successful.

It is important to improve organisation and management capacity at the school level for the implementation of policies. Context is critical to the application of education reforms, which is why it is important to develop a community of experts and a suitable climate. Effective implementation depends on the involvement of all stakeholders and coherent alignment of policies. Effective communication with the various stakeholders and the school leadership are important components for the adoption of education policies. Leadership may centre around the school principal as the driver of reform at the school, especially at poorly performing schools (Mujis et al., 2004). However, in some contexts it may be appropriate for leadership to be shared with a critical mass of teachers and administrative staff.

Another successful factor in the experiences of the OECD countries has been to generate a professional community in which all members of the school share the same objectives and understand the need to work together, in a school culture conducive to progress. One effective practice to generate a professional community has been to give teachers enough time in their workload to ask questions, share experiences and communicate among one another. Making the teachers feel they are part of the education policies is undoubtedly the most important challenge for the reforms to be successful.

Depending on the school's stage of development, parental and community support for the school can also be essential to help the implementation of education policies.

Establishing education policy priorities for the region and considering the timeframe needed are also fundamental.

Establishing education policy priorities will show which policies are necessary in the education system to achieve its objectives. Although there is no single criterion for establishing education policy priorities, the United Nations National Development Strategies can provide a framework for identifying the most important policies. One example is the 2012 Pact for Mexico (*Pacto por México*), which identifies clear objectives, such as improving enrolment rates in upper-secondary and tertiary education, introducing full-time schools and making the national evaluation body (*Instituto Nacional para la Evaluación de la Educación*) independent. Experiences in the OECD countries show that a small, measurable number of education priorities have led to positive results, such as those seen in Japan and New Zealand, which draw up education plans every five years to establish policy priorities (OECD, 2014b).

Aligning specific education policies with a broader education agenda is an important factor for policy implementation (Earl, Watson and Katz, 2003; Reezigt and Creemers, 2005). It is not surprising that policies are more likely to survive if they are coherent with national, regional and local objectives. Colombia provides a good example of how allocating resources either directly to schools and institutions or through local government requires substantial co-ordination efforts. If such efforts are absent, policies and reforms may lead to overload and fatigue, reducing the schools' innovation capacity. Institutional alignment can also lead to better management models, especially in highly decentralised countries.

Conclusions and policy recommendations

Education policies are crucial to the role of education as a vector for social cohesion and inclusive growth in Latin America. The effectiveness of implementing those policies will largely determine the course of development in the region. Although several countries have dealt with the challenge of raising enrolment rates in primary and secondary education, they still need to improve quality and performance. Extra investment, though necessary, does not guarantee better quality. Inequalities of various kinds in Latin American education systems also remain a concern. In no other region covered by PISA does the socio-economic context play such a pivotal role in determining performance and the distribution of educational resources.

Policies need improving in order to achieve the goals of quality and equity in the education systems. A combination of different policies is needed to achieve these two objectives, as Mexico has in recent years. Short-term solutions that can be implemented with existing resources should meet the needs of the emerging middle class and prevent countries from falling into the middle-income trap, given the major fiscal constraints of most countries in the region. At the same time, there is also a need for long-term policies, which will not bear fruit immediately, but are essential for inclusive growth in the region.

Short-term policies are those that can make best use of existing resources, and cover several areas. Follow-up and support programmes for struggling students are vital to reduce repetition and dropout rates. It is important to improve tailored follow-up programmes, especially so that students who are more likely to drop out can be identified. In this area, support programmes for the transition between different

levels of education (primary to secondary and secondary to tertiary) have proven to be effective. It is also important to improve the available systems for obtaining information on students and their experience in the education system.

Teaching policies are a priority for the region. The status of the teaching profession and the commitment of teachers to the profession could both be improved by introducing better job conditions in exchange for better performance, continuing training, and opportunities for teachers and schools to learn from each other. For greater equity in education, teachers should be better distributed among schools, with struggling schools able to attract the best-qualified teachers.

Classroom policies have been effective at improving quality and equity in the education systems. It is important to create a learner-friendly environment. Performance and the school climate are closely associated, so it is essential to have an effective disciplinary framework at the school level.

Several countries should also improve the information mechanisms in schools. The experiences of the OECD countries show that it is helpful to include students and teachers in accountability processes, and to use the information for training purposes.

Long-term education policies, which require more investment and structural changes at the institutional level, remain essential for the region, and should be an integral part of education programmes. Greater efforts are needed in pre-primary education, which, despite leading to considerable skill gains for students at all stages of education, has received little attention in the region. Early education is still almost non-existent in many countries, and requires considerable investment in infrastructure and professional training, especially in the most socially disadvantaged schools. It is also important for curricular programmes to focus not only on developing cognitive skills, but also on communication, integration and other soft skills.

In addition to the aforementioned incentives, long-term education policies include a thorough professionalisation of the teaching profession. Stringent, transparent recruitment and evaluation procedures are therefore necessary, along with attractive career paths and teacher mobility mechanisms. Various policies can be successfully implemented only if teachers and administrative staff receive training and if school leadership is built around the school principal or a critical mass of teachers.

Finally, efforts to improve evaluation mechanisms should continue. Evaluations of students and teachers at different levels of education should be systematised and the skills of adults monitored when they enter the workforce. The different educational programmes introduced in recent years must also be evaluated and monitored in order to assess their impact properly.

Many valuable educational reforms and policies have been introduced in recent years, but it is important to ensure that they continue and to observe how they are implemented. For education policies to be successful, they must take into account the institutional structure and the stakeholders involved and provide a realistic medium- and long-term scheme to measure their impact. Educational and classroom policies must be clearly aligned with the broader education agenda to ensure that they are implemented coherently across the board.

Annex 4.A1. Summary of messages and policy recommendations

Section	Main message	Area	Secondary message	Level	Policy recommendations	Objective	Area of policy intervention
I. Overview: investment, enrolment and performance	Achievements have been made in education, but various challenges still remain	Investment in education	Investment in education (public and private) has increased but is still low compared with OECD levels	Pre-primary and primary	Invest in early-education centres	Enrolment	Governance
					Make childcare systems more flexible to expand access	Enrolment	Governance
				Secondary	Develop a realistic investment plan to increase the number of full-time schools	Enrolment	Governance
				Tertiary	Design mechanisms to drive the expansion of tertiary education	Quality	Governance
					Follow up tertiary education accreditation systems	Quality	Governance
			The quality of investment in education is just as important as the level of investment	Pre-primary and primary	Invest in training teachers specialised in early education and strengthen pre-school teaching	Enrolment	Teacher policies
				Secondary	Focus investment on aspects that have proven to have an impact on quality: teachers, full-time schools	Individualised instruction	School organisation
					Promote the use of internal evaluations for training purposes to improve and strengthen certain areas	Better identification systems	Assessment
					Create the conditions and encourage incentives for peer learning within and among secondary schools, and enable collaboration among teachers (TALIS 2013)	Better identification systems	Assessment
				Tertiary	Strengthen education councils that monitor programmes and institutions in tertiary education	Better coherence and co-ordination	Governance
					Expand systems for storing information such as repetition and dropout rates and job prospects to monitor effectiveness and linkages with the job market and improve early-warning mechanisms	Better identification systems	Assessment
		Education enrolment	School life expectancy has improved	Pre-primary and primary	Invest in teacher training for early-education centres	Enrolment	Governance
				Secondary	Use completion and well-being rates as a quality indicator	Better identification systems	Assessment
					Improve learning and teaching conditions by giving teachers more time with the same group of students	Individualised instruction	Teacher policies
					Develop a realistic investment plan in full-time schools	Enrolment	Governance
				Tertiary	Facilitate mobility between post-secondary and tertiary institutions through credit schemes and agreements among different universities	Mobility	Governance

Annex 4.A1. Summary of messages and policy recommendations *(cont.)*

Section	Main message	Area	Secondary message	Level	Policy recommendations	Objective	Area of policy intervention
I. Overview: investment, enrolment and performance	Achievements have been made in education, but various challenges still remain	Education enrolment	Enrolment remains low among various groups	Pre-primary and primary	Strengthen programmes that facilitate access to early education for disadvantaged groups	Enrolment	Governance
				Secondary	Make secondary education (upper and lower) compulsory	Enrolment	Governance
					Invest in full-time schools	Enrolment	Governance
				Tertiary	Create support programmes for students Extend loans for higher education	Funding	Governance
					Create flexible university-business programmes	Mobility	Governance
			Repetition and school dropout remain high	Secondary	Introduce policies focused on reducing repetition and dropout: focus on identifying and supporting struggling students and those at risk of dropping out, especially during the transitions between one level of education and another	Lower dropout rates	School organisation, governance
				Tertiary	Improve accreditation systems and management models	Monitoring	School organisation
					Provide programmes to link with the labour market without dropping out	Lower dropout rates	School organisation
	Despite improvements, performance remains lower than in the OECD countries	Quality of learning outcomes	Performance variation remains high, but has declined	Secondary	Introduce policies to reduce performance variation in several LAC countries in PISA: support programmes and tutorials, dropout reduction among children	Empowerment of teachers and principals	Teacher policies, School organisation
				Tertiary	Improve institutional co-ordination	Better coherence and co-ordination	Governance
			Various factors affect performance		The socio-economic context directly affects performance	Direct parental involvement in education	School organisation
				Pre-primary, primary and secondary	Encourage tutorial policies, extra teaching hours, and feedback to teachers to improve performance	Better performance	Teacher policies, working conditions
					Conduct impact evaluations on the effect of ICTs in the educational process	Monitoring	Assessment
				Tertiary	Improve student follow-up mechanisms (inter-university information systems)	Stronger student support	Assessment

Annex 4.A1. Summary of messages and policy recommendations *(cont.)*

Section	Main message	Area	Secondary message	Level	Policy recommendations	Objective	Area of policy intervention
II. Inequalities	The education system has many inequalities	Socio-economic inequalities	There are big performance differences between public and private institutions	Secondary	Increase the quality among schools with different socio-economic levels	Stronger student support	Governance
					Introduce a second language of instruction for some subjects for ethnic and linguistic minorities See examples from New Zealand and Australia	Stronger student support	School organisation
			Soft skills are lacking in the region		Reform curricula and strengthen the development of soft skills (communication, confidence, teamwork)	Empowerment of teachers and principals	School organisation, Teacher policies
		Geographical inequalities	There are strong inequalities between urban and rural areas	Secondary	Increase autonomy and the development of local skills	Empowerment of teachers and principals	Teacher policies
			Regional policies reach beyond schools		Strengthen regional co-operation in areas such as accreditation and teacher training	Better coherence and co-ordination	School organisation, Teacher policies
		Gender inequalities	High dropout rates among boys generate inequalities	Secondary	Introduce more follow-up programmes for boys that are most likely to drop out	Better identification systems	School organisation, governance
			Girls are less motivated and less confident		Select higher-skilled students (boys and girls) and provide support and follow-up during the transition to tertiary education	Better identification systems	School organisation, governance
III. Relevance	Students must receive training that makes them employable	Supply and demand of skills through technical training	There is a wide gulf between supply and demand for technical and vocational training	Technical and vocational training	Improve information on student vocational training (employment, wages, career paths).	Individualised instruction	School organisation
			It is important to foster labour-market linkages from primary and secondary education		Redesign incentives for vocational training: job opportunities, wage developments, mechanisms to support studying during employment	Stronger student support	Governance
IV. Policy implementation	Some policies are successful, and it is important for them to be implemented	Implementation lessons in OECD countries	Policies should take into account the institutional structure and stakeholders	Primary to tertiary	Encourage the development of a professional community with a common goal of improving through training	Empowerment of teachers and principals	School organisation, governance
			School policies are highly effective		Adopt consistent, complementary quality and equity policies and improve policy information systems	Better coherence and co-ordination	Governance

Notes

1. In this chapter, the word skills covers the concepts of "competencias" and "habilidades" used in the Spanish version.
2. The OECD has developed monetary estimates of the stock of human capital to complement existing indicators based on years of education or skill level. Such estimates allow comparisons using stocks of physical capital. They also make it possible to assess how changes in the stock of human capital are affected by various factors, including educational achievements, the labour market and demographic factors.
3. See Box 4.1 for more information on PISA and Latin America.
4. According to data in OECD (2014a), *Education at a Glance 2014*.
5. World Bank/World DataBank figures: http://databank.worldbank.org/data/databases.aspx
6. UNESCO/UIS figures www.uis.unesco.org/datacentre.
7. School life expectancy is defined as the number of years a person of a certain age can be expected to spend within the specified levels of education. The indicator shows the overall level of development of an educational system in terms of the average number of years of schooling that the eligible population achieves, including those who did not attend school. See UNESCO (2012) for more information.
8. See, for example, the situation in Colombia in OECD (2013c).
9. Attending pre-primary school still improves secondary-school performance even when controlling for the parents' socio-economic status.
10. The yearly performance change is calculated for the period for which data are available for each participating country.
11. Performance was measured on a scale of 1 to 6, with Proficiency Level 6 representing the highest performance. In the PISA terminology, "low performers" refers to students below Proficiency Level 2 and "top performers" refers to students with Proficiency Levels 5 and 6. Level 2 is considered the skill threshold in mathematics, i.e. the minimum level students should achieve to participate fully in modern society.
12. There is no statistically significant difference between Colombia and Peru in maths performance for 2012.
13. See Box 4.1 for a description of the skills of students with Proficiency Level 1 in mathematics.
14. ISCED 5A: In the International Standard Classification of Education, ISCED 5A refers to tertiary-type programmes that lead to an advanced research qualification.
15. UNESCO Institute for Statistics (UIS) database (circa 2012).
16. See Chapter 2 for a discussion of technical and vocational education and the functioning of labour markets.
17. The data were prepared by the following CEQ teams. Bolivia: Paz Arauco et al. (2014); Brazil: Higgins and Pereira (2014); Colombia: Lustig and Meléndez (2014); Costa Rica: Sauma and Trejos (2014); El Salvador: Beneke, Lustig and Oliva (2014); Guatemala: Cabrera, Lustig and Morán (2014); Mexico: Scott (2014); Peru: Jaramillo (2014); Uruguay: Bucheli et al. (2014). More information at www.commitmentoequity.org
18. Results extracted from the OECD-PISA 2012 database.
19. In PISA, equity is measured in two ways: the proportion of the performance variation explained by students' economic, social and cultural status, and the performance difference between socio-economically advantaged and disadvantaged students.
20. For each country, PISA calculates performance trends by comparing two PISA studies with the same focus (mathematics, reading or science). Brazil, Mexico and Uruguay participated in both mathematics-focused studies (2003 and 2012). Argentina, Chile and Peru participated in 2012 but not in 2003. For these three countries, the trend is calculated by comparing results from 2000 with those from 2009 (reading-focused). Colombia and Costa Rica have not yet participated in two studies with the same focus, so no trend can be analysed.
21. Several countries in the region (Argentina, Brazil, Colombia, Costa Rica, Mexico, Peru and Uruguay) reported a more severe lack of physical infrastructure and shortage of teachers in rural areas (OECD, 2013d).
22. Based on OECD/PISA 2012 figures.
23. Socio-economically disadvantaged (advantaged) schools are defined as schools in which the economic, social and cultural level is below (above) the national average. Based on PISA 2012 figures.
24. Based on UNESCO figures.
25. See Rico and Trucco (2014) for an analysis of developments in Latin America's secondary-education completion rate by gender.

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Chapter 5

Innovation for development in Latin America

Latin America has significantly improved its macroeconomic stability and some aspects of its population's well-being. However, greater efforts are needed to raise productivity levels, create good-quality jobs and reduce the size of the informal economy. Policies therefore need to be geared towards making the production system more diverse and more sophisticated. This chapter analyses the relationship between skills development and innovation processes in the production system, focusing on the impact of the stock of skills on long-term productivity and growth. Various indicators are used to measure the knowledge intensity of the production structure and to estimate the knowledge-based capital of the economy. The chapter also discusses certain indicators of the contribution made by foreign direct investment to skills development. Finally, looking at certain case studies, it discusses the relationship between skills, innovation and productivity increases at the firm level.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

National performance depends on each country's capacity to build the endogenous skills needed to innovate and to produce knowledge spillovers into its production system. This chapter focuses on analysing the impact of innovation processes on long-term productivity and growth.

People develop skills in specific activities, and the accumulation of skills leaves its hallmarks in the production structure.[1] The technology-intensity indicators used in this chapter seek to identify those hallmarks. The first section therefore discusses production diversification towards more technology-intensive sectors and its relationship with skills and growth. The second section presents knowledge-based capital as an additional indicator of skills at the aggregate level. This stock of skills is a part or segment of the variables usually included in "physical capital" and "human capital", which most directly affect innovation and the diffusion of technology.

The third section focuses on the role of foreign capital as a source of skills for innovation. This topic is analysed by observing general trends in foreign direct investment in the region, especially investment in research and development (R&D) projects. The fourth section deals with the relationship between productivity and innovation from the microeconomic perspective, using firm-level data. Finally, conclusions are drawn and public-policy recommendations are made based on the findings of the different sections.

The structural change in the production system is essential for Latin America to achieve sustainable, long-term growth

Diversified production is strongly linked to growth. A long-standing analytical tradition links growth closely to the production structure. The Italian Renaissance economist Antonio Serra said that he could deduce a society's wealth based on its number of professions (Reinert and Daastol, 2004). The more professions there were in a city (which could also be referred to as the level of "division of labour"), the more prosperous it would be. Today, indicators must be more sophisticated to measure an economy's diversification and technology intensity.

An economy's diversification and technology intensity levels affect growth on both, the demand and supply sides. On the demand side, if technology-intensive sectors grow, the country can access more dynamic markets (national and foreign) where demand is growing faster than average. On the supply side, if the weight of such sectors increases, productivity growth can accelerate, as can the economy as a whole (ECLAC, 2012).

This chapter includes an empirical analysis of the relationship between structural change and growth based on the joint ECLAC-UNIDO work developed by Fleitas (2012), which estimates growth models that include a structural-change indicator as an explanatory variable as well as other variables typically used in conditional-convergence models.

Challenges abound in choosing an indicator of structural change (which is synonymous with increased technology intensity of the production structure). International trade data are one of the main sources of information. One line of research was to study the composition of exports in terms of their technology intensity using various available classifications.[2] Another strategy was to use trade data to build specific indicators that combine diversification and technology intensity, such as the Economic Complexity Index (ECI) (Hausmann et al., 2011).

Indicators based on trade data have many advantages. For instance, they provide comparable data for many countries over long periods of time. However, one disadvantage

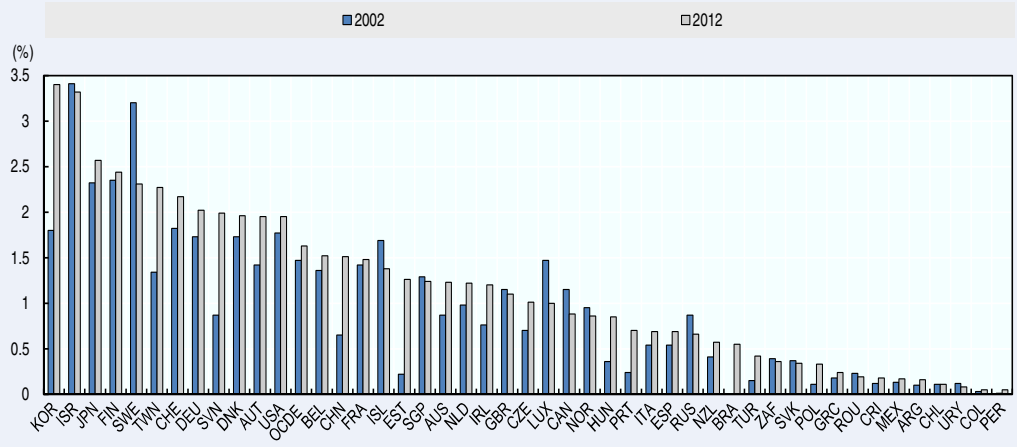
is that trade patterns do not always properly reflect local skills.[3] Some authors have therefore sought to complement trade-data indicators with indicators that measure the economy's innovation skills (Griffiths, Redding and Simpson, 2004). These indicators should be seen as useful but imperfect approximations. They include technology performance (patents and innovation), technology inputs (number of engineers, R&D), and indicators that express the relative contribution to value added made by sectors that are important for generating and spreading innovations (such as the relative weight of engineering-intensive sectors).

Box 5.1. **National Innovation Systems in Latin America: Lessons from OECD Innovation Policy Reviews**

The OECD Innovation Policy Reviews in Latin America – Colombia (2014), Peru (2011), Mexico (2009), and Chile (2007) – show that business sector participation in national systems of innovation is insufficient in each of the four analysed countries. The region's business expenditure on R&D (BERD) remains significantly below the OECD average. This is mainly due to framework conditions that do not make innovation a profitable type of business investment, including the market structures that firms are exposed to, their position along the value chain, the ability of firms to appropriate the returns of innovation efforts, the scarcity of qualified human resources, and the long-term inability of firms to accumulate in-house innovation capabilities (Figure 5.1).

Business is the principal source of dynamism in all high-performing innovation systems, helping to leverage the activities of universities and research institutes. Latin American countries need to make a concerted effort to develop a business-centred innovation system, just as successful emerging economies have done. To strengthen innovation across the business sector, support for firm-centred, effectively co-ordinated business innovation must be prioritised with the aim of building firms' in-house innovation capabilities, notably through investment in human resources.

Figure 5.1. **BERD intensity, selected countries: 2002 and 2012 (or nearest available years)**



Note: Australia: 2011, Brazil 2010, Iceland: 2011, Luxembourg: 2003, Mexico: 2011, New Zealand 2001 and 2011, South Africa: 2001 and 2011, Sweden: 2001, Switzerland: 2000.
Source: OECD (2013a), Main Science and Technology Indicators Database, www.oecd.org/sti/msti; and estimates from OECD based on RICYT.

StatLink http://dx.doi.org/10.1787/888933174574

Box 5.1. **National Innovation Systems in Latin America: Lessons from OECD Innovation Policy Reviews** *(cont.)*

In recent years, the four reviewed countries have taken measures to attract and increase private investment in R&D and innovation:

Chile: In March 2012, to further encourage private investment in R&D, the government modified its R&D tax credit framework. Both the eligibility requirements for collaboration with external research centres and the requirement to invest at least 15% of the company's gross annual revenue were abolished.

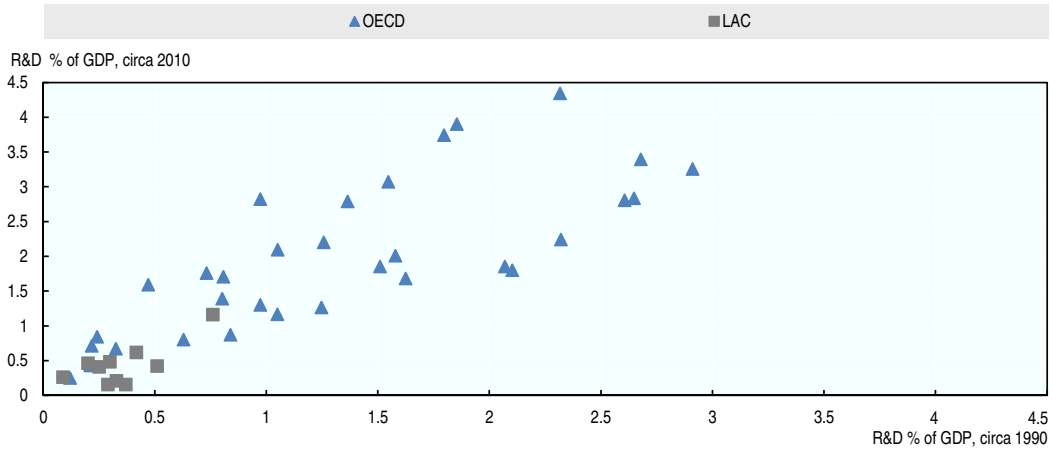
Colombia: The government uses three main mechanisms to support business R&D investments. First, at the guidance of Colciencias and other relevant government bodies, the National Development Bank provides preferential credits at below-market interest rates for innovation projects. Second, a tax incentive scheme offers tax exemptions of up to 175% of R&D investments made during the taxable period. Third, different government agencies provide subsidies for firms' STI activities.

Mexico: In Mexico, CONACYT, which manages around 40% of the public STI budget, seeks to encourage business R&D and innovation through its Innovation Incentives Programme, which has proved to be effective in stimulating business innovation, particularly in SMEs. The programme's overall budget increased from USD 223 million (MXP 1.66 billion) in 2009 to an estimated USD 500 million (MXP 4 billion) in 2014.

Peru: Since 2011, CONCYTEC, the agency responsible for promoting science, technology and innovation, has been directly linked to the Presidency of the Council of Ministers and its budget has increased from USD 5 million in 2012, to around USD 43 million in 2014. New instruments have been launched to reduce bottlenecks in the innovation system and increase business R&D, including a 30% tax deduction on activities and projects related to STI since 2013, and a fund to finance credit guarantees or risk-sharing mechanisms for business through the financial system.

Although Latin American countries have increased their investment in R&D, it remains well below the levels seen in the OECD countries. Figure 5.2 shows R&D spending as a percentage of GDP in 1990 and 2010. It shows that a strong majority of countries increased R&D spending as a percentage of GDP, with some doing so by more than average. Four groups of countries stand out. The first consists of those countries whose R&D investment was very low in 1990 and remained very low in 2010. All the Latin American countries are in this group, albeit with varying R&D spending levels (Brazil is unique in that it is the only Latin American country that invests more than 1% of GDP in R&D). A second group consists of those countries such as Italy and New Zealand whose R&D spending in 1990 was close to the average for developed countries, but has fallen behind since then. The third group is formed by a large number of developed countries whose R&D spending was high in both 1990 and 2010. Finally, the fourth group is formed by a small number of countries whose investment in technology was lagging behind in 1990, but which have made major efforts in innovation since then, investing more than the global average in R&D in 2010 (for example Iceland, Ireland and the People's Republic of China [hereafter "China"]). Another interesting factor is that, unlike in developed countries, in Latin America it is the state, and not the private sector, that invests most effort in R&D (OECD/ECLAC, 2012). Private sector investment in R&D has been closed to one quarter of total investment in R&D in the last decade.

Figure 5.2. **R&D spending as a percentage of GDP**
(1990 vs. 2010)

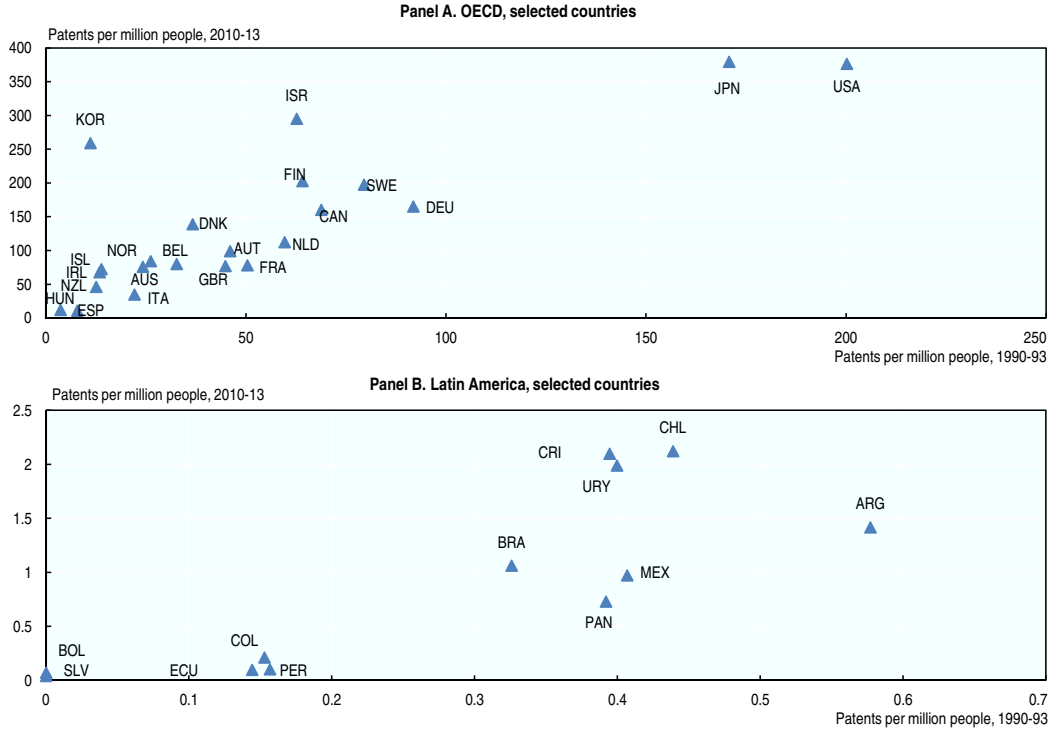


Source: Based on UNESCO (2014), "Science, technology and innovation" (database), data extracted in August 2014 from http://data.uis.unesco.org/.

StatLink http://dx.doi.org/10.1787/888933174588

Patent registrations are relatively low in the region. Another indicator for analysing innovation potential is the use of knowledge-protection mechanisms. In particular, countries in the region register very few patents with the United States Patent and Trademark Office (USPTO) compared to OECD countries (Figure 5.3). On average, OECD countries registered 50 patents per year per million inhabitants in the early 1990s; by the early 2010s this figure had risen to 132. This compares with respective figures of 0.3 and 0.9 patents per year per million inhabitants in the Latin American countries. A huge gulf therefore separates the two regions, signalling Latin America's weak innovation capacities.

Figure 5.3. **Number of patents per million people**
(selected countries, 1990-2013)



Source: Based on information in the United States Patent and Trademark Office database (2014), data extracted in August 2014 from www.uspto.gov.

StatLink http://dx.doi.org/10.1787/888933174595

No indicator of technology intensity reflects capabilities properly if it is used in isolation. Table 5.1 shows the correlation among different technology-intensity indicators for a sample of 66 countries analysed in 2007. Although the correlations are usually high, each correlation highlights a specific aspect of capabilities and ignores others, so they need to be considered together.

The importance of technological capabilities for growth can be tested by including an indicator of such capabilities in conditional convergence regressions. The Combined Technology Intensity Index (CTII) was selected to capture structural change, because it combines variables related to the specialisation pattern and endogenous skills.[4] Structural change is therefore defined by the CTII variation over time.[5]

Table 5.1. **Indicators of the production structure's technology intensity, 2007**

correlation matrix

	CTII	EIS	HTE	R&D	PAT	ECI
CTII	1					
EIS		1				
HTE		0.578	1			
R&D	0.612	0.699	0.275	1		
PAT	0.559	0.604	0.285	0.871	1	
ECI	0.799	0.828	0.474	0.803	0.708	1

Notes: The CTII is calculated by taking the arithmetic mean of high-technology exports (as a percentage of total exports) and the value added of engineering fields (as a percentage of the value added of manufacturing). EIS refers to the contribution of engineering-intensive sectors to manufacturing's total value added. HTE refers to high-technology exports. R&D refers to expenditure on research and development as a percentage of GDP. PAT is the number of patents registered with the United States Patent and Trademark Office (USPTO) per million population. The Economic Complexity Index (ECI) is defined by Hausmann et al. (2011).

The correlations of CTII with EIS and HTE are not reported, because CTII is calculated using the other two variables. In 2007, the HTE and EIS data needed to calculate the CTII were available for 44 of the 62 countries.

Source: United Nations Industrial Development Organization (2006), Industrial Statistics Databases (INDSTAT3), https://stats.ukdataservice.ac.uk/; United Nations Industrial Development Organization (2013), Industrial Statistics Databases (INDSTAT4), https://stats.ukdataservice.ac.uk/; World Bank (2014), *World Development Indicators* (database), data extracted in August 2014 from http://data.worldbank.org/; United Nations Statistical Division (2013). Data extracted in August 2014 from http://comtrade.un.org/; United States Patent and Trademark Office (2014), data extracted in August 2014 from www.uspto.gov/; The Observatory of Economic Complexity (2014), data extracted in 2014 from Simoes and Hidalgo (2011), "The Economic Complexity Observatory: An Analytical Tool for Understanding the Dynamics of Economic Development", Workshops at the Twenty-Fifth AAAI Conference on Artificial Intelligence, and Hausmann et al. (2011), *The Atlas of Economic Complexity*, Puritan Press, Cambridge, MA; and UNESCO (2014), Science, technology and innovation (database), data extracted in August 2014 from http://data.uis.unesco.org/.

Estimates made based on Fleitas (2012) suggest there is conditional convergence, with structural change playing an important role among the determinants of growth. The coefficient for the lagged per capita GDP variable was negative and significant, accounting for the conditional convergence component. The physical capital coefficient was consistently positive and significant, and the human capital coefficient was usually positive and significant.

The structural change component, meanwhile, had a positive and significant effect among the explanatory variables (CTII variation) for economic growth. This coefficient did not vary significantly, neither with different econometric model specifications nor with different estimation methods. Although such an exercise cannot accurately determine the direction of causality, it did confirm a close relationship between growth and structural change over the long term.[6]

The production structure does not depend only on technological capabilities. Other variables – outside the scope of this report – may help to compensate for productivity differences and sustain productive diversification, such as a competitive real exchange rate, even if there is a technological lag. In Latin America, exchange rate fluctuations have been intense, with pronounced appreciation peaks. Both these factors have harmed training and productive transformation. Empirical evidence suggests a positive relationship between growth, diversification and a competitive exchange rate (Freund and Pierola, 2008a and 2008b; Rapetti, Razmi and Scott, 2009; Baldwin and Krugman, 1989; Eichengreen, 2008).

In summary, it is suggested that structural change has contributed significantly to success stories in the processes of convergence in the international economy. In open economies it allows two variables to coevolve: acquisition of knowledge and skills. Structural change should be seen as a key to sustainable, long-term growth. It is partly because of a lack of structural change that Latin American countries have failed to experience sustained cycles of productivity gains in recent decades.

Latin America has a significantly smaller stock of knowledge-based capital than the OECD economies[7]

This section seeks to capture innovation skills more directly, using the concept of knowledge-based capital (McKinsey, 2013) rather than proxies based on the features of the production structure. Knowledge-based capital is part of physical capital and human capital, and is more directly linked to the generation and diffusion of innovations in the economy. The composition of this capital and the intensity with which it is accumulated are indicative of a country's innovation potential. Using the metaphor of the production function, one could say that this is the kind of capital that would be used in the argument of an innovation production function.

Measuring knowledge-based capital can be difficult, because it depends on intangible components alongside other assets. Some progress has been made in measuring it in OECD countries, but little has been done for Latin America. De Groot (forthcoming) shows preliminary results that help to identify the barriers to innovation in the region. In 2013, the OECD used the framework developed by Corrado, Hulten and Sichel (2005) and Corrado, Haltiwanger and Sichel (2009) to estimate knowledge-based capital. The framework proposes three categories to classify innovation expenditure: computerised information, innovative property and economic competencies. The framework estimates the monetary value of the resources that companies allocate each year to each of the assets in those three categories. The authors work on the assumption that annual investment supports production for a certain number of years and should therefore be capitalised, rather than considered an expense for one specific year. Finally, the data obtained are used in a growth accounting model to determine the effects of production factors on productivity and economic growth (OECD, 2013b).

Adjustments must be made to existing measuring systems due to the specificities of Latin America and the availability of information for the region. Table 5.2 compares the composition of the indicators designed by McKinsey (2013), De Groot (forthcoming), and Corrado, Hulten and Sichel (2005) and Corrado, Haltiwanger and Sichel (2009). The indicators only partly coincide, among other reasons because not all the indicators used by McKinsey can be obtained for the Latin American economies. Also, some indicators and factors are important in the Latin American economies, but less so in the OECD countries. It was therefore necessary to modify the composition of the innovation-capital indicator (see Box 5.2 for more detail).

Table 5.2. **Variables used to compile the knowledge-based capital estimation**

Category	McKinsey (2013)	De Groot (forthcoming)	Corrado, Hulten and Sichel (2005 and 2009)
Physical capital	ICT infrastructure	ICT hardware	
Knowledge capital	Software and databases	ICT software	Software and databases
	Scientific R&D	Scientific R&D	Science and engineering R&D
	Mineral exploration	Cross-border intellectual property	R&D in mining industries
	Creative and artistic originals	Patent	Licences and copyright (artistic originals)
	New architectural and engineering designs		Product development costs in the financial industry
	Product development costs in the financial industry		New architectural and engineering designs
	Advertising and market research		R&D in social sciences and humanities
	Venture capital		Firm-specific training
Human capital	Science, technology, engineering and mathematics higher-education costs	Higher-education costs	Organisational capital
	Employee development	Higher-education abroad costs	Brand equity
	Organisational development	Employee development	

Source: De Groot, O. (forthcoming), "Innovation capital in Latin America: A first attempt at analysing the region's competitive strengths in innovative capacity", Working paper, Division of Production, Productivity and Management, (DPPM-ECLAC). McKinsey (2013) *Innovation Matters: Reviving the Growth Engine*. McKinsey & Company, y OCDE (2013b), *Supporting Investment in Knowledge Capital, Growth and Innovation*, OECD Publishing, http://dx.doi.org/10.1787/9789264193307-en.

Knowledge-based capital is measured by combining different capital stocks: tangible and intangible. The proxy used for tangible knowledge-based capital was information and communication technologies (ICTs) infrastructure. The proxy used for intangible knowledge-based capital was R&D expenditure, patents, tertiary education and staff development.

Box 5.2. **Variables used to compile the knowledge-based capital estimation**

This box describes the variables used to compile the knowledge-based capital:

- ICT Hardware: these data are obtained from the LA-KLEMS database (ECLAC 2013a), which provides hardware investment data for Argentina, Brazil, Chile, Italy, Mexico, Spain and the United States since 1990.
- ICT Software: these data are obtained from the same LA-KLEM for the same countries since 1990.
- R&D: data on R&D expenditure is taken from a combination of databases. The main source is the World Bank's *World Development Indicators* (WDI), which provides the variable "research and development expenditure (% of GDP). The WDI are supplemented with the RICYT database (REDES, 2013).
- Charges for the use of intellectual property: this variable is derived from a WDI variable. It is based on charges for the use of intellectual property in current US dollars, which is converted to a percentage of GDP.
- Patents: this variable is taken from the United States Patent and Trademark Office (USPTO) database. The data are classified according to the inventor's country of origin.

Box 5.2. **Variables used to compile the knowledge-based capital estimation** *(cont.)*

- Expenditure on tertiary education: investments in the future stock of knowledge. McKinsey (2013) includes only spending on science, technology, engineering and mathematics, but this analysis uses a broader scope that covers tertiary education in its entirety. The main reason for this decision is the availability of data, but also the quality of data obtained using this broader measure.
- Expenditure on tertiary education abroad: not all education is received in one's country of residence.
- Expenditure on tertiary education abroad as a percentage of tertiary education in one's home country ($ForEd_i$) was calculated as follows:

$$ForEd_i = \frac{\sum_{j=1}^{J}\left(S_{ij} \cdot Exp_j \cdot PIB_j\right)}{PIB_i}$$

  where S_{ij} is the number of tertiary students from country *i* studying in country *j*, Exp_j is the expenditure per student as a percentage of GDP per capita, and PIB_i and PIB_j are the GDP levels in countries *i* and *j*.
- Employee development: based on "Firms offering formal training (% of firms)" in the WDI.

Source: De Groot (forthcoming).

It is impossible to imagine an innovation-friendly environment without the possibility of searching for, accessing, processing and disseminating information provided by the ICT infrastructure. By allowing mass access to data sources, scientific articles, knowledge and new production and management types and techniques, among others, ICTs open windows of opportunity for improving the productivity and competitiveness of businesses. ICT infrastructure is the backbone of the innovation system. ICT capital estimates performed by ECLAC through the KLEMS project were used in this attempt to measure knowledge-based capital (ECLAC, 2013a).

Intangible knowledge-based capital is essential in innovation processes

Economies accumulate a stock of intangible knowledge-based capital in addition to tangible knowledge-based capital. Various indicators were combined to show the importance of intangible capital and reveal its composition. R&D expenditure indicates the intensity of an economy's innovation efforts and the extent to which it is absorbing or spreading innovations. Buying or licensing intellectual property from abroad could be considered a type of skill import that contributes to local capacity-building. Another way of measuring intangible capital is by looking at its outcome, that is, the number of patents registered by the country's residents. This figure can be associated with the existence of a combination of tangible and intangible assets.

Diffusion is not a type of "contagion" that firms accept passively; it requires action by the firm to improve its existing innovation and adapt it to market specificities, the technological environment and the company's own organisational culture. However, innovation efforts and endogenous skills building are not always reflected in a formal R&D department or in patents, especially in developing countries. Other proxies are needed to capture what is referred to as informal R&D. Expenditure on tertiary education can be used to measure efforts to develop certain skills that contribute to this knowledge-based capital. This type of expenditure's impact is spread out more across the production system, but is no less important. For instance, a manufacturing plant

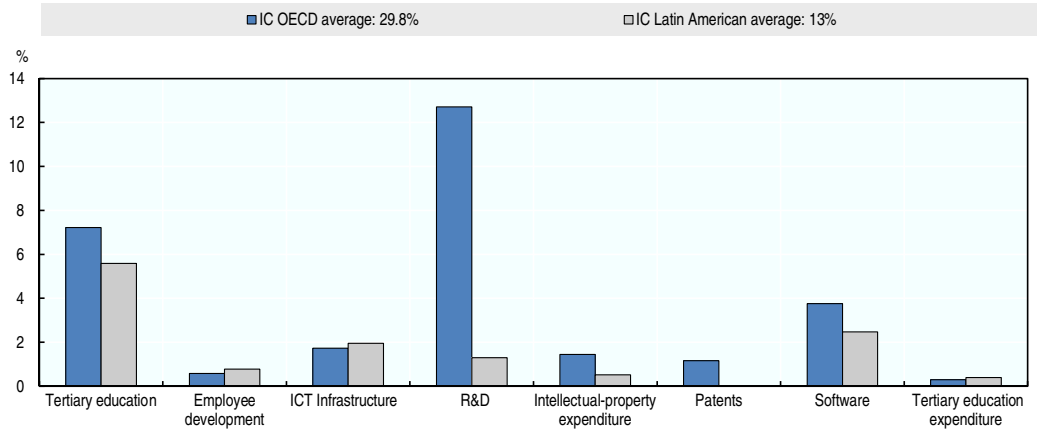
that has on-site engineers will have a high capacity to innovate or spread innovations, even if the firm has no formal R&D department. Additionally, the presence of qualified staff fulfils a role that transcends the individual firm, since it is positively correlated with co-operation among firms, and therefore with synergies in the learning process.

The proposed indicators of knowledge-based capital stock seek to reflect accumulated skills rather than effectively measure the value of that capital. Constructing these indicators involves combining multiple proxies, some with high degrees of overlap (such as the strong correlation between patents and R&D). They should therefore be interpreted with caution.

There are large differences between knowledge-based capital in Latin America and those of the OECD countries, in both the amount of stock and its composition. In Latin American countries, capital stock represents only 13% of the economy on average, less than half the OECD average of 29.8% (Figure 5.4). More than 40% of Latin American knowledge-based capital stock comes from tertiary education (5.6% of GDP), and only 10% (1.3% of GDP) is from R&D, the core driver of innovation.[8] The OECD countries, by contrast, invest much more in R&D (12.7% of GDP). This has obvious repercussions on the types of innovation that can be developed in one region or another, which in turn affects the dissemination and incorporation of technology.

Figure 5.4. **Composition of knowledge-based capital in Latin America and in the OECD countries**

(as a percentage of GDP)



Note: The variables used are: patents, ICT infrastructure (hardware), software and databases (software), R&D, tertiary education expenditure (tert. edu.), tertiary education expenditure abroad, intellectual-property expenditure (intel. prop) and employee development (empl. dev.).

Source: Based on De Groot (forthcoming), "Innovation capital in Latin America: A first attempt at analysing the region's competitive strengths in innovative capacity" *ECLAC Working Paper*, Division on Production, Productivity and Management.

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A more diversified structure amplifies the effects of innovation on economic performance, and requires greater investment in knowledge-based capital. There is undoubtedly a strong correlation between the type of production structure and the composition of knowledge-based capital. More diversified, knowledge-intensive production structures require more investment in knowledge-based capital and are expected to include a much larger R&D component than poorly diversified structures. Knowledge-based capital's role in productivity and growth should be considered in conjunction with the role of the production structure (discussed in the previous section).

The institutional environment plays a vital role in defining innovation potential in Latin America

Although it cannot be measured quantitatively, the institutional environment is another important factor in defining innovation potential in Latin America. It reflects the need to co-ordinate, manage and promote R&D activities. In the 2000s, Latin America undertook major reform and institution-building efforts in this area. Those efforts should be seen as an additional factor without which knowledge-based capital could not work. Measures have also been taken in Latin America to increase the political clout of science and technology institutions. Argentina, Brazil and Costa Rica created Ministries of Science, Technology and Innovation, Uruguay created the Ministerial Cabinet for Innovation (*Gabinete Ministerial de Innovación*), and some countries created special agencies, like Brazil's Centre for Strategic Studies and Management (*Centro de Gestão e Estudos Estratégicos*), combined with the development of national science and technology plans and periodic information-gathering efforts on innovation activities (Rivas and Rovira, 2014). The combination of these three areas seeks to bring greater coherence to policies. This represents a step towards a "whole-of-government" approach (OECD, 2007b) that recognises that innovation is the result of a set of conditions in various areas of public policy that must be articulated to produce the desired results.

Furthermore, selective pro-innovation interventions have been stepped up in the region. This is reflected in a number of areas: technology funds have been set up and are used in tenders in priority sectors, partnerships between firms and science and technology organisations have been promoted, Chile has introduced policies to support clusters and Brazil has created sector-specific funds. Chile's policies involved financing the forming of clusters in priority sectors by imposing compulsory royalty fees on all the country's mining operations (however, it ceased its cluster-forming programme in 2010). Brazil's sector funds became the largest source of federal financing for innovation. They enabled stakeholders to become more actively involved in policy execution and brought part of the science and technology system out of isolation and into contact with the production system (Rivas, Rovira and Scotto, 2014).

The region has thus moved towards stronger institutions with greater political clout, using new promotion tools that transcend the horizontal policies of the 1990s. Nevertheless, the region is still far from having an effective innovation and technology-dissemination system. Brazil has made the most progress towards an integrated public innovation policy by creating sector funds and linking industrial policy to its innovation objectives. In most of the region, however, interventions in the fields of development, science and technology skills and in industrial policy are limited and compartmentalised (Rivas, Rovira and Scotto, 2014).

In summary, although there are many challenges to measuring knowledge-based capital and results should be treated as approximations, vast differences were found between the OECD countries and Latin America in both the stock and composition of knowledge-based capital. In particular, the developed economies invest much more in R&D, which is the best possible form of investment in innovation. Moreover, the impact of knowledge-based capital should be considered alongside the institutionalism of science and technology policies. Major progress has been made in this field, especially in institution building and in co-ordination among agencies, as well as in the design and implementation of new instruments. Nevertheless, a long road still lies ahead to consolidate the progress that has been made.

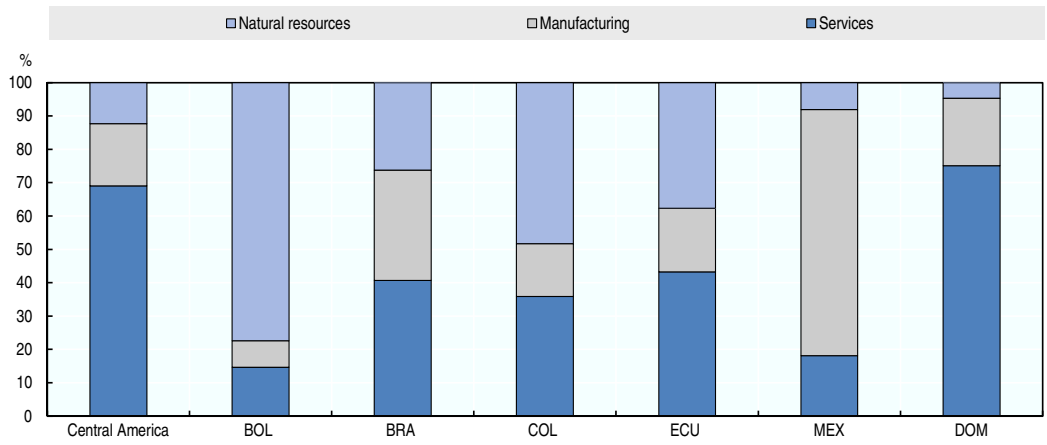
Foreign direct investment: An opportunity for innovation in the region[9]

Foreign direct investment (FDI) has often been viewed as a vehicle for innovation, since it brings in new technologies, with potential technology spillovers. FDI also creates ties with foreign markets, which can boost technology uptake because those markets have more stringent competitiveness demands (price and quality). Meanwhile, two conditions must be met for these positive effects to become a reality: investment must be channelled towards the most technology-intensive sectors or activities, and beneficiary countries need an environment that is conducive to spillovers and linkages with the rest of the economy. Both aspects require an institutional environment and policies that prevent new technologies from becoming an enclave with scant linkages to the rest of the production system.

Heterogeneous foreign-investment patterns in the region

Analysis of the sectoral distribution of FDI in Latin America reveals very distinct patterns. In Mexico, FDI mainly benefits manufacturing, thanks to the country's strong industrial tradition, large domestic market and flow of exports of labour-intensive goods to the United States. In Bolivia, the commodity sectors receive most investment, especially the mining industry. In Central America and the Dominican Republic, where non-renewable natural resources are scarce and investment in *maquiladoras* is not very capital-intensive, most investment goes to the services sector, which in the case of the Dominican Republic includes a solid tourism sector. Meanwhile, Ecuador, Colombia and especially Brazil have a more balanced distribution of investment (Figure 5.5).

Figure 5.5. **Foreign direct investment by sector: Selected countries**

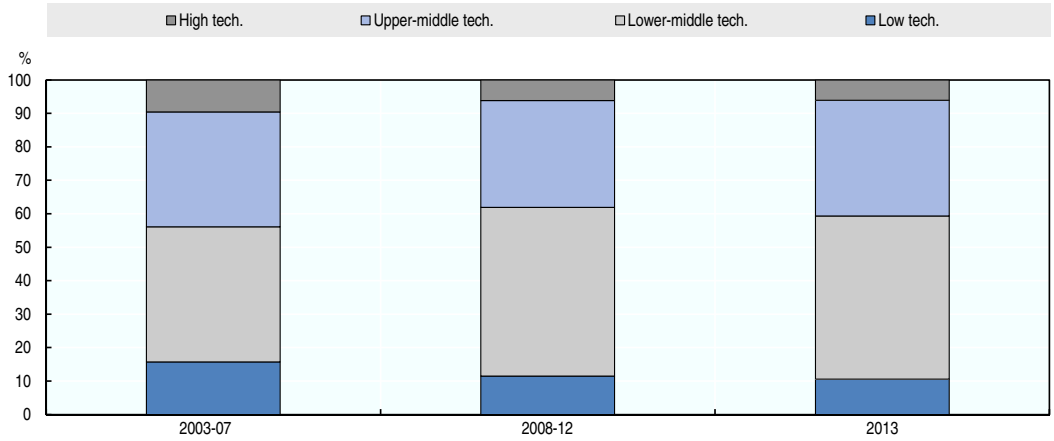


Source: Based on official government databases (data extracted in May 2014) and on ECLAC (2013b), Foreign Direct Investment in Latin America and the Caribbean, ECLAC, United Nations.

StatLink http://dx.doi.org/10.1787/888933174617

At this level of aggregation of the analysis, little can be said about the implications of the region's various FDI patterns in terms of skill building. Investment in export platforms for cheap-labour manufacturing does not necessarily generate more skills than, for instance, investment in mining. FDI in manufacturing was therefore broken down based on the technology intensity of each sector within manufacturing, as per the OECD's proposed classification: high, medium-high, medium-low and low technology (Figure 5.6).

Figure 5.6. **Technology intensity of FDI in the Latin American manufacturing industry**
(by periods)



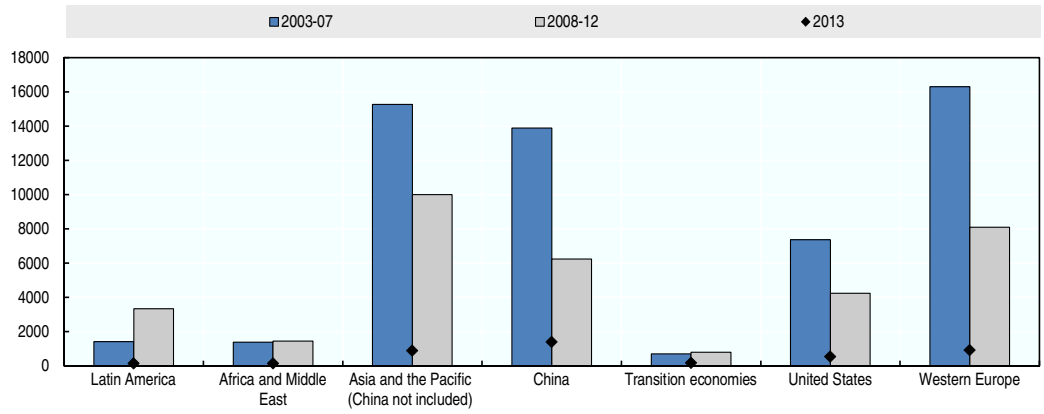
Source: Based on "FDI Markets" investment announcements, *Financial Times*, data extracted in May 2014.
StatLink http://dx.doi.org/10.1787/888933174628

A breakdown of FDI by industry reveals that since 2008 there has been a decline in the percentage of investment in low technology, a rise in investment in medium-technology sectors, and a relatively steady level of investment in high technology. Increased investment in the automotive industry in recent years, most prominently in Brazil and Mexico, has contributed to the good performance of investment in medium-high technology (see Box 5.3). As evidenced in the firm-level analysis in Chapter 3, these sectors generate the highest level of demand for skilled human capital, and may therefore be essential in transforming the region's production structure.

FDI needs to have a larger R&D component to promote innovation

R&D projects are another variable that offers an indication of the quality of technological FDI. Asia has performed far better than Latin America in this area, benefiting from a steep rise, specially from China, in the R&D investment it receives from multinationals. In Latin America, despite strong growth in R&D FDI during the five years from 2003-07, the upward trend seems to have ended in 2011. This form of investment recovered to its 2003-07 average level in 2013, but it is unclear whether the kind of upward trend previously seen will return (Figure 5.7).

Figure 5.7. **R&D projects announced, by period and region**



Source: Based on "FDI Markets" investment announcements, *Financial Times*, data extracted in May 2014.
StatLink http://dx.doi.org/10.1787/888933174639

Table 5.3. **R&D projects in the total reported greenfield foreign investment**
(average, 2003-13)

	Investment			Jobs created		
	R&D, engineering and design	Total	Percentage	R&D, engineering and design	Total	Percentage
Mexico	4 730	**196 454**	**2.4**	**21 267**	**860 638**	**2.5**
Central America	990	**63 944**	**1.5**	**4 832**	**289 097**	**1.7**
Costa Rica	516	13 675	3.8	2 581	71 363	3.6
El Salvador	23	5 290	0.4	41	33 235	0.1
Guatemala	61	6 936	0.9	369	25 023	1.5
Panama	198	16 477	1.2	1 012	54 316	1.9
Puerto Rico	192	12 061	1.6	829	42 519	1.9
Caribbean	298	**51 012**	**0.6**	**667**	**122 874**	**0.5**
Dominican Rep.	250	16 756	1.5	438	41 981	1.0
Haiti	23	827	2.8	41	3 918	1.0
Trinidad and Tobago	25	9 513	0.3	188	14 465	1.3
Brazil	8 688	**380 815**	**2.3**	**35 564**	**997 952**	**3.6**
South America	4 552	**414 097**	**1.1**	**22 999**	**908 765**	**2.5**
Argentina	1 100	71 761	1.5	7 039	238 553	3.0
Chile	747	101 619	0.7	3 045	167 736	1.8
Colombia	1 884	65 565	2.9	10 026	186 551	5.4
Ecuador	469	10 401	4.5	1 300	23 756	5.5
Paraguay	9	6 046	0.2	52	11 018	0.5
Peru	204	73 964	0.3	686	152 487	0.4
Uruguay	87	19 216	0.5	615	40 105	1.5
Venezuela	43	43 788	0.1	175	61 436	0.3
Total LAC	19 259	**1 106 322**	**1.7**	**85 329**	**3 179 326**	**2.7**
OECD average	109 466	2 671 018.10	4.1	326 898	5 946 187	5.5
Korea	3 795	86 340	4.4	21 789	209 503	10.4

Source: Based on "FDI Markets" investment announcements, *Financial Times*, data extracted in May 2014.

The situation varies from country to country in Latin America. R&D projects currently receive only a tiny share of greenfield[10] investment in the region, with countries in the region allocating less than 2% on average. Even the much higher figures for Costa Rica, Colombia and Ecuador (Table 5.3) fall well short of those achieved by the countries that have had most success in reducing technology gaps. Korea's percentage, for instance, stood at 4.4% for the period from 2003-13, and was particularly strong in the final five years, averaging 8%. There is a similar trend for the proportion of R&D jobs created by FDI. In Latin America, less than a niggardly 3% of jobs in greenfield projects are in R&D. Colombia and Ecuador have the highest figures in the region, around 5.5% of greenfield jobs, compared with 10.5% in Korea (average for 2003-13).

The above indicators suggest there is still a huge gulf that must be closed for FDI to provide more technology and more skills in Latin America. There are opportunities to be explored in the design of new strategies to attract FDI with a stronger R&D component and stronger knock-on effects on production and technology in the recipient economy.

Box 5.3. **Expansion of the automotive industry in Brazil: Market, industrial policy and the search for exports**

Brazil is an interesting example of where public policies, combined with traditional pull factors for FDI such as its domestic market, have had a positive impact on the volume and quality of investment in technology.

FDI in Brazil's automotive sector soared in 2013 to USD 2.6 million, the highest figure ever recorded and twice the average of the previous five years. Production of vehicles also hit a record high, with 3.7 million units produced in 2013, up almost 10% from the previous year, placing Brazil as the world's seventh largest vehicle producer and fourth largest market for cars, behind China, the United States and Japan. The automotive industry provides almost a quarter of industrial GDP and 5% of total GDP.

Several factors explain why the sector is booming. First, it has achieved a series of sale and production records driven by growth in disposable income and credit. Brazil has become a highly attractive market with a strong growth potential, yet the proportion of people with vehicles remains fairly low. There is also strong growth potential for luxury cars, the number of which may double over the next five years.

Second, the government's stimulus policies have not been limited to tax increases on imports. New measures were introduced in 2013 for the following five years, including *Plano Brasil Maior*, a programme to further industrialise the country through procompetitiveness policies to offset the market loss resulting from appreciation of Brazil's currency, the real. The aim is to transition from a manufacturer economy to a global hub for the development of new products. Three main pillars underpin the scheme:

- *Programa Inovar-Auto*, a programme to stimulate investment in the country's automotive industry by reducing the IPI sales tax (*imposto sobre produtos industrializados*) by 30 percentage points for cars produced and sold in the country, provided that companies commit to a series of targets for the period from 2013-17. These targets are related to the purchase of inputs, technological development and innovation, training for suppliers, and basic industrial engineering and technology. The ratio of local components will gradually rise from the current 45% to 70% by 2017.
- *Programa Inovar-Autopeças*, a programme to strengthen the local supply base and the production chain through measures to support traceability, financing conditions and the promotion of innovation and development.
- *Programa Exportar-Auto*, a programme to raise the competitiveness of the Brazilian automotive industry to increase exports to a million units by 2017 (up from 566 299 in 2013).

The most successful programme, *Plano Brasil Maior*, has attracted investors and reduced the technology gap of Brazilian-made vehicles, but it comes with a huge fiscal cost and increases the risk of excess production capacity at a time when demand for cars may decline.

Source: ECLAC (2013b).

Promoting innovation among small and medium-sized enterprises is key to improving productivity levels in the region

To understand the technological capabilities and production capacities of the economies, one must understand what goes on within companies. Current and historical capital stock levels give additional insight into the country's innovation capacities. Similarly, analysis of the production structure (the composition of production by sector), as examined in the first section, focuses on its effects on aggregate productivity and per capita GDP growth. These discussions take place at the macro level, or in the area between macro- and mesoeconomics. Meanwhile, continuous productivity gains make the waters look calm, but strong currents and fluctuations lurk beneath the surface

(Dosi et al., 2013; Bernard et al., 2012; Mayer, Melitz and Ottaviano, 2012). Some sectors emerge and expand while others shrink; some businesses are born while others die out; and some sectors increase while others decrease their market presence. We must therefore consider the microdynamics at work as a result of these imbalances, which lie in the relatively stable behaviour of aggregates.[11]

This section discusses innovation and its impacts on competitiveness at the micro level, without neglecting the interactions between the micro and macro levels in defining learning pathways. It is not possible to conduct a study of this kind for the entire region, so selected country-level case studies were used. The first subsection looks at productivity determinants in Brazilian manufacturing firms; the second discusses some of the challenges and opportunities associated with technical change, with a focus on environmental factors, analysing the case of the Argentinian plastics industry.

Productivity and innovation analysis in the Brazilian manufacturing industry

Measuring a firm's innovativeness and the quantitative impact of that innovation on productivity is a complex matter that is the subject of debate. An exercise conducted by the Institute of Applied Economic Research (IPEA) in Brazil for the manufacturing industry sheds some light on the subject and helps to quantify, albeit preliminarily, the impact of innovation-related variables.[12] The explanatory variables used were those suggested by microeconomic literature on innovation and dissemination of technology[13] (see Catela, Cimoli and Porcile [forthcoming] for details of the model).

Innovation and skills play an important role in supporting productivity gains. The probability of a company belonging to the higher-productivity groups (or of not belonging to the lower-productivity ones) increases as the number of product innovations and the various variables that reflect innovation skills increase. Workers' years of study and overall experience and the number of technicians and employees in R&D are positively correlated with a firm's productivity. The interaction between learning and productivity brings increasing returns. Moreover, if a firm does not have the skills to adapt or adjust new technology to a specific work environment, it cannot efficiently disseminate technology within the firm. Economies of scale and pressure from external markets also increase the likelihood of a company being part of the high or medium-high productivity group, rather than the low, medium-low or medium group. It is important to remember that causality can be bidirectional. Just as innovation boosts productivity, exports, and growth, these last two also generate new innovation incentives and resources to invest in innovation. The empirical exercise identifies interaction patterns without inferring the direction of causality.

Economies of scale are a factor that determines the likelihood of productivity improvements, so much so that there should perhaps be policies to encourage co-operation among small and medium-sized enterprises (SMEs) and better linkages between them and large firms, giving them better access to technologies and foreign markets.

Public policies had contrasting effects on results.[14] Support for R&D activities was usually helpful, reducing (increasing) the probability of a firm being among the least-productive (most-productive) productivity sectors. Policies fomenting direct financing of innovation, however, had the opposite effect. The probability of a firm being among the higher-productivity groups fell when they received this kind of public support. There is no clear explanation for this, but perhaps the causality runs in the opposite direction. Public financing prioritises struggling firms and those with a technological lag, so government financing is associated with lower productivity, while more buoyant firms do not request or need financing. These findings reinforce the need to make support for innovation activities conditional on the progression of the firm's performance variables, thus ensuring that it leads to greater future competitiveness.

Box 5.4. **Learning models and skills building in the Argentinian ICT sector**

The literature explains the major impacts of certain widespread technologies, especially ICTs, on an economy's productivity and competitiveness. The studies show that the technologies do not spread passively or automatically. They can move along very different innovation and productivity pathways – some virtuous, some less dynamic. Policies to strengthen local skills and boost productive complementarities are a very important part of technological dissemination.

In Argentina, the different skills within companies that adopt ICTs provide an example of the different pathways that can be forged. Three ICT dissemination models were identified in Argentina's production fabric. The first is induced modernisation, in which ICT providers control or define how firms that acquire ICTs adopt them. Skills remain asymmetrical throughout the process, with the purchasing companies in a subordinate position, without the complementary skills needed to spot problems or customise the technology. The selling companies, meanwhile, have no incentives to customise their package for each purchaser, which remains hostage to the seller's after-sales services. Learning processes are therefore limited and the potential impact of new technologies on company efficiency is reduced.

The second dissemination model identified was shared modernisation: change management is carried out with much greater involvement by the receiving company, which has its own technical teams or forms the teams during the adoption process. Internal skills ensure that interaction with suppliers is much more intensive, the purchaser is better able to exploit it, and the technology is better adapted to the purchaser's needs. Efficiency and productivity gains therefore become much greater.

Finally, the third dissemination model identified was managed modernisation, in which the firm's own ICT workers are heavily involved in the adoption process. This process was typical of large, multinational companies. Sometimes their subsidiaries played a very limited role, since technical change was implemented by external mobile technician teams. Other times, when the subsidiary was commissioned by the parent company to adapt the technology to the local context before taking it to subsidiaries elsewhere in the world, local skills were developed and the subsidiary was able to acquire the tacit knowledge. All subsidiaries felt the need to better master the technology in order to have a competitive advantage, even though it was the parent company that defined the skill-building strategies and decided how to disseminate them to its global operations.

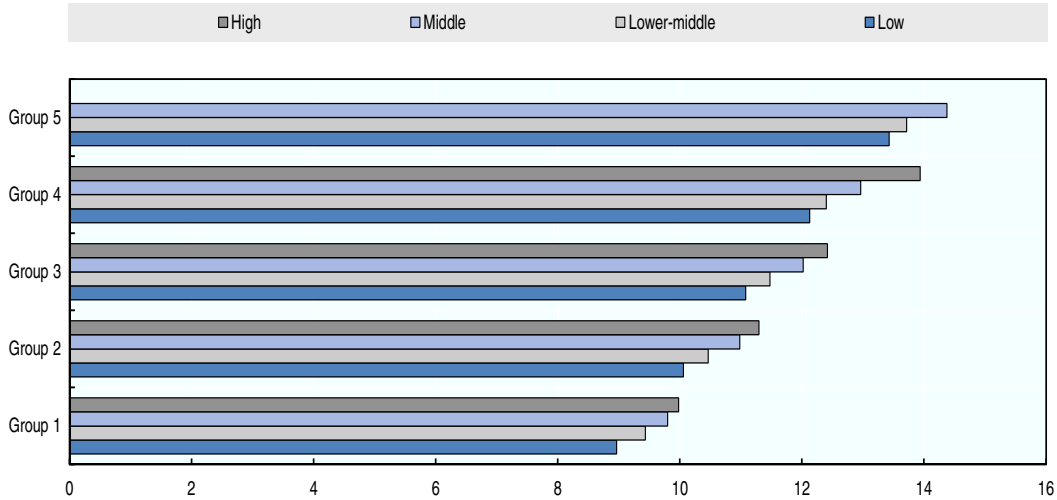
Because there were such different patterns (with very different impacts on productivity and competitiveness), there is an even greater need for policies to foster skills building in firms that incorporate new technologies. These skills are essential to make technology a competitive asset, whether in SMEs or in the subsidiaries of large, multinational companies. Firms that do not have the additional assets needed to interact with providers in finding technical solutions to their problems, and are therefore captive to off-the-shelf solutions that do not meet their specific needs, will be less competitive. Likewise, these policies are necessary so that the subsidiaries of multinationals can be more involved in the strategy of their parent company, strengthening the location advantages of their R&D activities.

Source: Authors' work based on Novick and Rotondo (2013).

Assessing sectors' productivity by technology intensity and innovation potential revealed major differences among the productivity groups (see Figure 5.8). The high-technology sectors achieved higher productivity levels for all productivity groups except group 5, in which medium-high technology sectors were more productive than high-technology sectors in group 4 (there were no high-technology sectors in productivity group 4). These results confirm the importance of the structural variable. Productivity is related to efficiency within sectors, especially the weight of low-productivity firms in each sector. It is also related to product composition and the weight of lower-technology sectors.[15]

Figure 5.8. **Average productivity by productivity group in sectors grouped by technology intensity, Brazil**

(2008, in logarithms)



Notes: Productivity groups were determined using the k-means clustering methodology: group 1 (very low productivity), group 2 (low productivity), group 3 (medium productivity), group 4 (medium-high productivity) and group 5 (high productivity).

Source: Catela, Cimoli and Porcile (forthcoming), "Productivity and structural heterogeneity in the Brazilian manufacturing sector: Trends and determinants", *Oxford Development Studies*.

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In the short term, there is much to gain from moving firms up from the lower to the upper levels of productivity within a sector. In the long term, however, the relative weight of each sector also needs to change, with high-technology sectors making a larger contribution to total output. The productivity gains resulting from better skills in low-technology firms are exhausted much faster than those resulting from better skills in high-technology and medium-high-technology firms. Policy for productivity must therefore not become disjointed from industrial policy for structural change.

New challenges and opportunities for firm-level productivity gains: Towards more sustainable innovation

One of the main challenges facing the planet today is environmental deterioration, especially the threat of widespread climate change resulting from increasing greenhouse emissions. One solution to environmental problems is innovation focused on the environmental sustainability of production processes, which currently pollute the land, water and air. This form of innovation must become widespread before we are faced with irreversible changes to the climate and to ecosystems that will allow human development on the planet.

Progress in this direction will require sustainable environmental, economic and social innovation. Such progress is tied to the search for new forms of production and management to improve productivity and the quality of jobs without compromising the development of future generations.

Although many businesses see reducing environmental impact as a logistical and financial burden, sustainable innovation can improve their innovative capacity and market competitiveness in the medium and long run. In terms of consumer behaviour, sustainability and low carbon footprints are changing market interactions between businesses and consumers. Competitiveness associated with better environmental protection is becoming increasingly important for large companies and SMEs alike (Box 5.5). Social trends show that consumers are increasingly concerned with the environment, so firms that innovate sustainably will have a better market position.

Box 5.5. **Eco-SMEs in the Pantanos de Villa wetlands, Peru**

In March 2013, the Metropolitan Municipality of Lima, in partnership with the Peruvian Ministry of Environment and the GEA Group, launched the Eco-SMEs III programme, the main objective of which is to protect the biodiversity of the Pantanos de Villa wetlands, with technical assistance from the Centre for Eco-efficiency and Social Responsibility (*Centro de Ecoeficiencia y Responsabilidad Social*). This project is a continuation of other programmes initiated in 2010 (Eco-SMEs I and II) to promote eco-efficient practices in local businesses, and involves SMEs in its efforts to reduce pollution of the wetlands. SMEs represent 43% of all firms located in the region. The programme offers technical consultancy in eco-efficiency and cleaner production to SMEs located within the protected area (*Zona de Reglamentación Especial*) of Pantanos de Vila. It is Lima's only environmental conservation area.

So far around 3 000 small and medium-sized enterprises in the Chorrillos, Villa El Salvador, San Juan de Miraflores and Santiago de Surco districts, most of them from the manufacturing and services sector, have participated in the Eco-SMEs programme. Together, they have developed more efficient industrial processes, reduced solid waste, introduced water recycling and improved energy efficiency, among other environmentally friendly practices. The institutional set-up is geared towards technical advice as well as support in the areas of competitiveness and financing. Co-ordination is by the Centre for Eco-efficiency and Social Responsibility, which is operated by the GEA Group, with support from the Swiss co-operation and development agency SECO. The project has allowed businesses in the area to make their products and services more distinct, raising their value added and thus generating major competitiveness gains.

Since sustainability encompasses all stages of a product or service cycle, from raw material extraction to final consumption, co-operative efforts or linkages among the various stakeholders (sectors, companies, consumers) are particularly relevant. When businesses co-operate in implementing innovation processes, they can combine their knowledge and experience to achieve their goals. They can also cut costs by avoiding duplication of R&D efforts and develop new knowledge across businesses and sectors, improving their capacities.

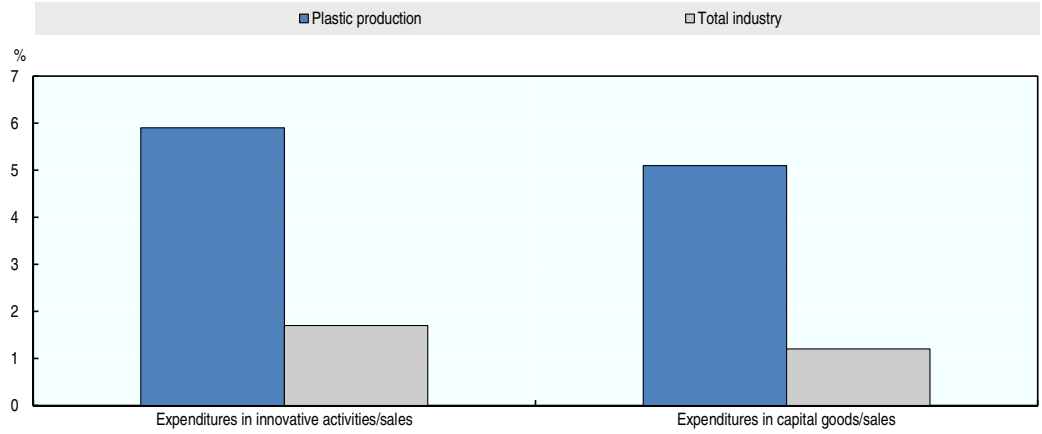
The increasing global commitment to the sustainability of production processes presents many challenges to businesses, especially small businesses. There are issues related to SMEs' perception of their own role in dealing with environmental and social problems. Poor access to finance and the difficulty of adapting human capital to new technologies are also obstacles to innovation. Another challenge for SMEs in this area is their limited access to information, knowledge and technology. Compliance with regulatory requirements is also an obstacle, especially for smaller firms, as is the difficulty of accessing green markets.

Because of these factors, targeted policies are needed that incorporate environmental issues into productivity and innovation problems. Environmental aspects should not be seen as a threat, but rather as an opportunity to create new business, make products and services more distinctive and give them greater value added.

One example of sustainable innovation opportunities is provided by the Argentinian plastics industry. The industry offers innovation opportunities with a significant environmental impact and has traditionally been more innovative than most industries: it invests around 6% of sales in R&D (compared to <2% for all industrial sectors in

Argentina), spends a higher proportion on imports of capital goods (another means by which new technology is adopted – see Figure 5.9), and has a higher proportion of innovative firms (48% of SMEs in the rubber and plastics sector, compared with 29% of all industrial SMEs – see Figure 5.10). Also, the plastics industry has important linkages with the entire industrial fabric, suggesting a significant multiplier effect economically and environmentally.

Figure 5.9. **Innovative effort of Argentinian industry and the plastics sector**
(1995, as percentages)



Source: Baruj (2014), "Oportunidades de mejora en la competitividad del sector transformador plástico argentino a través de la innovación sustentable", in Rovira and Hiriart (eds.), *Innovación Sustentable: Espacios para Mejorar la Competitividad de las Pymes Argentinas*, Economic Commission for Latin America and the Caribbean, United Nations.

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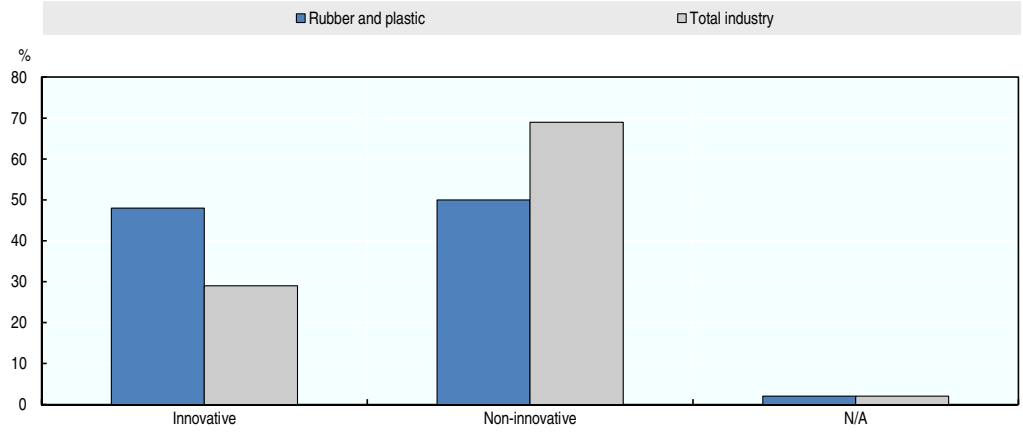
Figure 5.10. **Innovative industrial SMEs in the rubber and plastics sector**
(2006-08, as percentages)



Source: Baruj (2014), "Oportunidades de mejora en la competitividad del sector transformador plástico argentino a través de la innovación sustentable", in Rovira and Hiriart (eds.), *Innovación Sustentable: Espacios para Mejorar la Competitividad de las Pymes Argentinas*, Economic Commission for Latin America and the Caribbean, United Nations.

StatLink http://dx.doi.org/10.1787/888933174661

Future trends for the sector pose various major challenges related to environmental protection (BIOIS, 2011). Other factors will also have an impact in Argentina, including the continuous increase in demand for plastic products and in plastic waste, higher levels of recycling (mainly mechanical), and better energy-recovery rates (albeit lower than the rate achieved in recycling). Exports of plastic waste for recycling and recovery will grow alongside overall recycling rates and volumes, and production of plastics will be even more dominated by the Asian market, particularly China. Production of bioplastics will grow rapidly, but will remain only a small fraction of total plastics production for many years. Waste-to-energy conversion (incineration) will increase, thus reducing the percentage of waste dumped in landfills. The main source of raw materials will remain hydrocarbons (non-renewable), despite the increase in bioplastics mentioned above. Waste-management systems need to be expanded and improved to cope with increasing levels of plastic waste.

Local industry could exploit demand for sustainable innovations to strengthen its competitiveness. Given the challenges facing the sector, the major environmental impact of plastic waste is expected to grow in the next few years, despite the measures introduced to alleviate the problem by the industry and by regulations in developed countries.

Increased activity in sustainable innovation requires policies and an appropriate institutional framework for co-ordination among various actors. The *Plan Argentina Innovadora 2020* seeks to move in that direction by strengthening the country's scientific and technological base. The strategy focuses the exploitation of opportunities by production clusters on the country's "strategic socio-productive hubs", or NSPEs (*núcleos socio productivos estratégicos*), identified for their high economic, technological and social impact. The Ministry of Science and Technology (MINCyT) has implemented several science and technology policies to support these strategic groups (Baruj, 2014). For instance, one of the NSPEs being developed by the MINCyT is bio-refineries (bioenergy, polymers and chemical compounds). The measures taken have included installing four pilot plants under agreements between public research and education institutions in the production sector. The plants will house applied research and be used for training experts in the field. It is hoped that new processes will be developed for producing bioproducts or existing processes will be improved. Argentina has the necessary scientific and technological base to make progress in sustainable innovation in the near future (see Box 5.6).

Box 5.6. **An institutional framework for nanotechnology-based sustainable innovation in the plastics industry**

Argentina has groups conducting research into polymers, biopolymers and nanotechnology applied to these compounds (Vázquez, 2012). Around 26 R&D groups are conducting at least one line of research related to polymers and nanocomposites, including the following groups/institutes:

- Grupo (Nano)Materiales Poliméricos (INFTA, CCT CONICET La Plata, Universidad Nacional de La Plata): developing polymer nanomaterials for high-performance coatings.
- Grupo Polímeros y Materiales Compuestos (INTECIN, CONICET, Laboratorio de Materiales y Estructuras (Facultad de Ingeniería, Universidad de Buenos Aires): developing fibre-pultruded rods and nano-reinforced polymer matrices to replace metal bars and works with biodegradable polymers such as starch.
- Grupo Ecomateriales (INTEMA, Universidad Nacional de Mar del Plata, CONICET): developing bionanocomposites for biodegradable packaging.

Box 5.6. **An institutional framework for nanotechnology-based sustainable innovation in the plastics industry** *(cont.)*

- Área de Materiales Biomédicos (INTEMA, Universidad Nacional de Mar del Plata, CONICET): developing polymer and composite nanofibres with applications in tissue engineering and regenerative medicine, functional textiles and nanoencapsulation of drugs and active ingredients.
- Grupo Unidad de Investigación Aplicada y Transferencia de Tecnología (INTI Plásticos, Universidad Nacional de General San Martín): working with polymer nanocomposites. Its results include creating microfibrillated cellulose from natural fibres.
- Centro en Criotecnología de Alimentos (CIDCA) and Centro de Investigación en Tecnología de Pinturas (CIDEPINT) in La Plata: has developed biodegradable materials that are able to detect substances that indicate a deterioration in the quality of food, allowing the food's useful life to be extended.
- Planta Piloto de Ingeniería Química (PLAPIQUI) in Bahía Blanca: working with controlled-structure polymers and block copolymers.
- Instituto de Física de Buenos Aires (IFIBA): working on a project to develop a new biodegradable material made from fully renewable and environmentally friendly natural raw materials.
- Universidad Nacional de Rosario (UNR): working on the application of natural and synthetic flexible chain polymers to develop bioseparation technologies and the stabilisation of industrial enzymes.
- Instituto Multidisciplinario de Biología Vegetal (IMBIV): synthesising new nanostructured materials from polymers and dendrimers.
- Instituto de Química de Rosario (INQUIR): developing edible biopolymer films with antimicrobial properties for potential application as food coatings for controlling foodborne illnesses.
- There are other major research groups at the Instituto de Investigaciones en Físico-Química (INFIQC) in Córdoba, the Instituto de Investigaciones en Ciencia y Tecnología de Materiales (INTEMA) in Mar del Plata, the Centro de Investigación en Hidratos de Carbono (CIHIDEAR) and the Department of Physics at the UBA, the Faculty of Pharmacy and Biochemistry at the UBA, and the Instituto de Física Enrique Gaviola (IFIEG), among others.

Source: Baruj (2014).

Although some elements of policies, governance and production paths are helpful, there are significant obstacles to the gradual incorporation of these new technologies. Biopolymers, for instance, are still manufactured on a very small scale, making them very expensive, which means they are used only for a few very high value-added applications such as medicinal products (sutures and surgical packing) and products for which environmental marketing is important. Biodegradable polymers, meanwhile, are not produced by any firms based in Argentina, so if they are needed they have to be imported. Even if biodegradable polymers were manufactured locally on an industrial scale, composting plants would be needed so that the biodegradation could take place under controlled conditions. The entire life cycle of these new bioplastics must be catered for, from their manufacture to their use and final disposal. For nanotechnology, meanwhile, the skills exist for it to be developed, but the main problem is the lack of knowledge regarding its potential toxicity when used and handled and regarding post-consumption problems (nanotechnology waste). Finally, the Argentinian Plastics Industry Chamber

(*Cámara Argentina de la Industria Plástica*) begins its report on biodegradable plastic bags by stating that the main short-term problem related to their use is the poor management of municipal solid waste. The circuit from households to final disposal in composting plants still needs to be organised.

Conclusions and policy recommendations

It is essential that skills become more diverse and more sophisticated. Latin America still needs to develop skills at the firm level, create an institutional environment to co-ordinate and stimulate innovations and build the production structure. The region has made progress on many fronts over the past decade, creating greater macroeconomic stability and reducing poverty and inequalities. However, this progress in open economies will not be consolidated until it is accompanied by productivity gains, more good-quality jobs and a smaller informal sector.

Overall, the region still invests relatively little in innovation, although commitments to science, technology and innovation vary from country to country. One of Latin America's main problems, which is linked to the low productivity, is the lack of knowledge-based capital and composition which is composed by a small proportion of activities related to R&D. Furthermore, the region has weak institutions that have failed to significantly improve R&D expenditure, especially by the private sector.

Comparatively speaking, R&D has been much less dynamic in Latin America than in other regions like Asia. Nevertheless, FDI offers learning potential, if investment flows are linked with innovation policies and structural change. The data available suggest that, although foreign investment in R&D showed a positive trend during the 2000s, that trend has not been consolidated.

For best practices to become widespread, active policies must be introduced and institutions must be set up to co-ordinate science and technology in order to overcome the pitfalls of poor learning and low productivity. There are still strong productivity asymmetries among firms and among sectors, suggesting that SMEs need to improve their co-operation so that they can join large firms in driving innovation. Two microeconomic case studies have been published on firm-level innovation and skills. The first – an analysis of Brazil's manufacturing industry – showed the importance of increasing returns in innovation and technology dissemination. The second – a study of environmental technologies in Argentina's plastics industry – showed that innovations centred on sustainability benefit the environment and bring competitive advantages.

In the coming decades, industrial policy should focus on the acquisition of skills in new technologies and on innovation in order to achieve economic, social and environmental sustainability. Skills in new technologies will determine who will be competitive, in what fields, and who will secure a place in the future international division of labour. The direction taken by innovations is also important. Technological change can be hampered by stiffness and blockages, but it does not have a genetic code that predestines what use and impact it will have in society. Instead, the institutions must adopt policies and change social behaviour and norms to create incentives so that technical change begins to prioritise the environmental aspects and social inclusion, both of which are compatible with competitiveness gains. The necessary endogenous skills to equip competitiveness for a technology revolution need to be built. The revolution should lead not only to consumption but also production of green technologies. The risk of the region becoming a mere importer of more environmentally friendly technologies must be avoided.

The future development policy is therefore defined not only by its emphasis on new technologies but also by its content, which involves sustainability at all levels: environmental, economic and social. Institutions must define *ex ante* the incentives for innovation and competitiveness based on these objectives and must act *ex post* to correct market results that prevent society from achieving its objectives. The institutions responsible for innovation therefore need to draw up strategies and define fields of action based on technology exploration and a long-term vision.

The need to strengthen efforts to improve the skills and innovation capacities of Latin American and Caribbean countries provides an opportunity for a renewed regional co-operation agenda for science, technology and innovation. Science and technology development is a highly complex matter, full of uncertainties, requiring major, long-term risky investment. Countries in the region are often unable to deal with these factors on their own. One possible solution would be to create specific spaces for bilateral or multilateral technological and productive development, and the region's science, technology and innovation ministries are currently looking into them. For example, at the first session of the Conference on Science, Innovation and Information and Communications Technologies,[16] the Latin American and Caribbean countries agreed to move forward with productive integration through regional projects to enable greater social appropriation of knowledge. To achieve this, the countries are working to define specific projects in the areas of telemedicine, assistive technologies, additive manufacturing, reverse chain for electronic and electrical devices, and wind and photovoltaic solar energies in distributed generation.[17]

Notes

1. See Narula (2004) and ECLAC (2012).
2. See in particular those suggested by Lall (2000) and OECD (2011b).
3. For example, some goods exported by the electronics industry from developing countries are statistically classified as high technology, when in reality they reflect the fragmentation of value chains in segments with very different technology intensity levels. These countries export cheap labour and not the advanced skills required to produce the more sophisticated parts of the production chain (OECD/ECLAC/CAF, 2013).
4. This index is calculated by taking the simple mean of the contribution for each engineering sector to the value added of manufacturing and the contribution of high-technology exports to total exports. The purpose of this method is so that the biases of the indicator's two variables cancel each other out. The contribution of the engineering sectors to manufacturing's value added is biased because it only captures skills in a specific sector of the economy; the contribution of high-technology exports to total exports is biased due to the fragmentation of the value chains.
5. In other words, Arrow's "learning-by-doing" (productivity growth as a result of cumulative production experience) reflects the learning curve in the production of goods not only at the firm level. At the aggregate level, productivity growth is also the result of interaction between changes in the firm's productivity and changes in the composition of the product. In virtuous productivity gains, this interaction raises the production system's technology intensity, which leads to a higher CTII (see also Kirman, 2004; Saviotti and Pyka, 2011).
6. Previous results are consistent with shift-share analyses that compare the sources of productivity gains in different regions of the world. In Asian countries, the total productivity gain associated with structural change (a greater contribution by high-technology sectors to the production structure) has been higher than in Latin America (ECLAC, 2007; McMillan and Rodrik, 2011).
7. This section is based on the work conducted by De Groot (forthcoming) for ECLAC.
8. See Edquist (2009) and REDES (2013).
9. This section is based on an FDI report by ECLAC (2013b).
10. That is, projects or businesses set up "from scratch" by their direct investors.
11. Syversson (2011) and Pozzi and Schivardi (2012) provide a comprehensive review of the subject.
12. This subsection is based on Catela and Porcile (2013) and Catela, Cimoli and Porcile (forthcoming).
13. This empirical exercise uses 2000-08 data from a combination of sources in Brazil: the labour ministry's annual social report (*Relação Anual de Informações Sociais*); the development ministry's foreign-trade secretariat (SECEX); the annual industry survey (*Pesquisa Industrial Anual*) conducted by the Brazilian Institute of Geography and Statistics (IBGE); and the IBGE's innovation and technology surveys (*Pesquisa de Inovação*, PINTEC). The data have been made consistent with each other to form a database of 4 000 firms with more than 30 employees; those with fewer than 30 employees are not included because random samples are used, rather than censuses. Consistency of the cross-related data was ensured by using the same company ID number for any given firm in all the databases.
14. See also Ottaviano and Sousa (2007) and Nassif, Feijo and Araujo (2011). Santoleri and Stumpo (2011) look at the specific situation of SMEs and how policies influence their performance.
15. To better capture the influence of this aspect on productivity, the different manufacturing branches were divided into four groups according to their technology intensity, using the classification described by Lall (2000): high, medium-high, medium-low and low technology. The k-means clustering method was then applied to each technology group to find the optimum number of productivity groups. For all technology groups the optimum number of productivity groups was five, except for high technology, for which the optimum number was four. See Steingraber and Gonçalves (2011) for an analysis of the sectoral dimension of productivity in Brazilian manufacturing.
16. See www.cepal.org/socinfo/noticias/noticias/5/53095/Santiago_Declaration.pdf.
17. See ECLAC/CGEE/GIZ (2014).

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Country notes

ARGENTINA

Recent trends in education

Argentina ranks among the biggest investors in education in Latin America, allocating public funds equivalent to 6.3% of GDP to education, more than both the regional and OECD averages. The proportions of public (86.5%) and private (13.5%) investment in Argentina are similar to those found in the OECD countries (83.9% and 16.1% respectively).

Enrolment in Argentina is higher than the regional average at all levels of education. Enrolment is slightly lower than the OECD average in pre-primary and secondary education, but higher in primary education, and even more so in tertiary education, in which the gross enrolment ratio reaches 79% (71% for the OECD). The survival rate in primary education is similar to that of the OECD, while at the lower secondary level it is slightly below the regional average. The school life expectancy is close to the OECD average, and more than three years of schooling above the regional average.

In tertiary education, there is a notable difference in the number of female and male students, with an enrolment rate of 96% among women and 62% among men.

In terms of equality of access, Argentina has higher enrolment rates than the regional average for all income quintiles, especially for the lowest, in which the gross enrolment ratio in secondary education is 80%, 24 points above the regional average.

In terms of performance (mathematics score in PISA 2012), Argentina remains behind several countries in the region, including some with similar net enrolment rates in secondary education and some with lower rates (see the graphic). The gap between Argentina's 2012 PISA result and the OECD average is equivalent to more than 2.5 years of schooling.

Key education indicators

	Argentina	OECD	LAC
Govt. expenditure on pre-primary education as % of GDP, circa 2012	0.5	0.5	0.3
Govt. expenditure per primary student as % of GDP pc, circa 2012	18	22	16
Govt. expenditure per secondary student as % of GDP pc, circa 2012.	28	26	18
Govt. expenditure per tertiary student as % of GDP pc, circa 2012.	19	30	26
Total govt. expenditure on education as % of GDP, circa 2012	6.3	5.6	5.0
Net enrolment rate, pre-primary (%), circa 2012	74	83	66
Gross enrolment ratio, primary (%), circa 2012	118	102	105
Net enrolment rate, secondary (%), circa 2012	85	91	74
Gross enrolment ratio, tertiary (%), circa 2012	79	71	42
Survival rate to the last grade of primary education (%), circa 2011	93	98	85
Survival rate to the last grade of lower-secondary education (%), circa 2011	81	94	84
School life expectancy, circa 2012	16.7	16.9	13.4
PISA 2012 score in mathematics	388	494	397

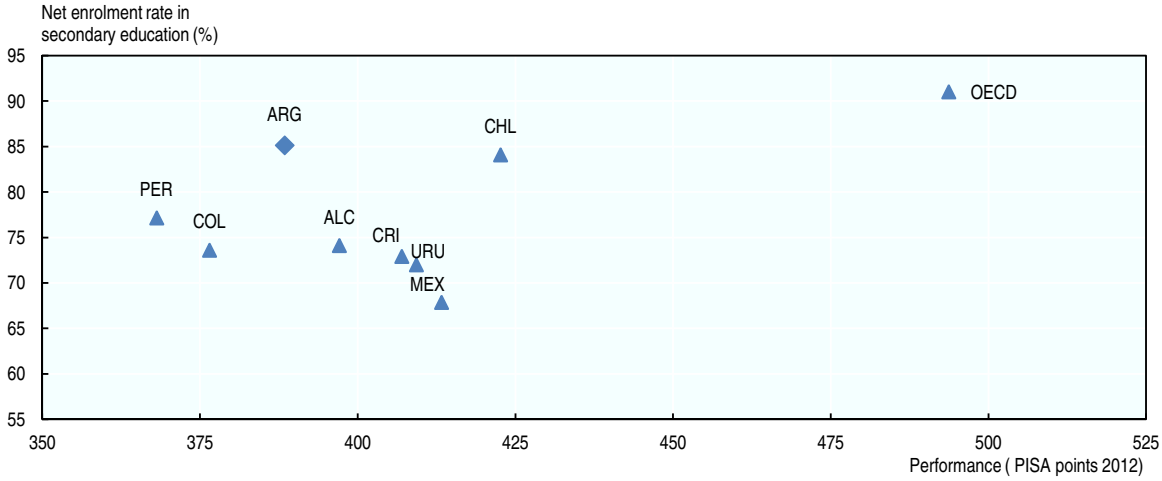
	Male	Female	Male	Female	Male	Female
Net enrolment rate, pre-primary (%), circa 2012	73	75	82	82	65	66
Gross enrolment ratio, primary (%), circa 2012	118	117	102	102	106	104
Net enrolment rate, secondary (%), circa 2012	81	89	91	91	71	77
Gross enrolment ratio, tertiary (%), circa 2012	62	96	64	79	34	50
Survival rate to the last grade of primary education (%), circa 2011	91	95	98	98	85	88
Survival rate to the last grade of lower-secondary education (%), circa 2011	77	85	93	94	81	87
PISA 2012 score in mathematics	396	382	499	489	406	388

Income	Quintile 1		Quintile 3		Quintile 5	
	Argentina	LAC	Argentina	LAC	Argentina	LAC
Net enrolment rate by income quintile, primary (%), 2011	99	95	99	98	99	98
Net enrolment rate by income quintile, secondary (%), 2011	80	56	92	72	94	87
Net enrolment rate by income quintile, tertiary (%), 2011	20	9	33	18	53	46

Economic, social and cultural status	< 25th percentile			> 75th percentile		
	Argentina	OECD	LAC	Argentina	OECD	LAC
PISA 2012 score in mathematics	354	438	360	424	530	436

Note: 41 PISA points is equal to 1 year of schooling. "GDP pc" refers to GDP per capita.
Source: See methodological note to country notes.

Net enrolment rate in secondary education and performance



Source: OECD/PISA 2012 and UNESCO Institute for Statistics (UIS) database.
StatLink http://dx.doi.org/10.1787/888933174673

Recent education policies

Several laws passed between 2003 and 2006 further centralised education at the national level, promoted vocational technical education and raised teachers' salaries. These laws included the new National Education Act (*Ley Nacional de Educación*), which declared education a "public good" and a "social right". Compulsory education was extended to include upper-secondary education (*ciclo orientado*).

Acknowledging the need for a single academic structure, the new government policy changed the structure of levels and cycles, although it did not harmonise their duration across the country's provinces. This legislation strengthened the role of central government in education policy and bolstered attempts to harmonise the system. The efforts were set in motion by the Federal Education Council (*Consejo Federal de Educación*), the body responsible for consultation, agreement and co-ordination of the national education policy.

In 2003, the education ministry's policies began to emphasise the inclusion of excluded sectors of society. Two national compulsory education plans (*Planes Nacionales de Educación Obligatoria*) were devised for 2009-11 and 2012-16 to ensure compliance with the National Education Act. Meanwhile, the AUH scheme (*Asignación Universal por Hijo*) was implemented to transfer income to parents who are unemployed or have precarious jobs, and the *Conectar Igualdad* digital-inclusion programme was implemented for students and teachers in public secondary schools. Since 2010, institutional improvement plans (*Planes de Mejora Institucional*) have been implemented for secondary schools to help the institutions function better; support them in making secondary education compulsory; improve the facilities, technology, teaching conditions and institutional framework; and draw up new curricula.

BRAZIL

Recent trends in education

Brazil increased its public spending in education from 4.0% of GDP in 2000 to 5.8% in 2010, taking it above the country averages for Latin America (5.0%) and the OECD (5.6%).

The 54% survival rate to the last grade of primary education is 31 points below the regional average; however, the survival rate gap reduces to just 10 percentage points in secondary education.

There are much wider differences in equality of access to education than in the rest of the region. In the case of secondary education, while access among the top income quintile is similar to the regional average, access among the bottom income quintile is 15 percentage points below the regional average (see the graphic).

Brazil's performance was close to the average for Latin American countries in the 2012 PISA tests (mathematics test) and 2.5 years of schooling below the average for the OECD countries. In terms of the influence of socio-economic factors on performance, the students in the lowest income quartile averaged 75 points less in the PISA mathematics test than students in the highest income quartile. This gap, equal to about two years of schooling, was similar to the regional average. The gender gap was also similar to the regional average, with male students averaging 17 points more than female students.

Key education indicators

	Brazil	OECD	LAC
Govt. expenditure on pre-primary education as % of GDP, circa 2012	0.4	0.5	0.3
Govt. expenditure per primary student as % of GDP pc, circa 2012	21	22	16
Govt. expenditure per secondary student as % of GDP pc, circa 2012.	22	26	18
Govt. expenditure per tertiary student as % of GDP pc, circa 2012.	28	30	26
Total govt. expenditure as % of GDP, circa 2012	5.8	5.6	5.0
Survival rate to the last grade of primary education (%), circa 2011	54	98	85
Survival rate to the last grade of lower-secondary education (%), circa 2011	74	94	84
PISA 2012 score in mathematics	391	494	397

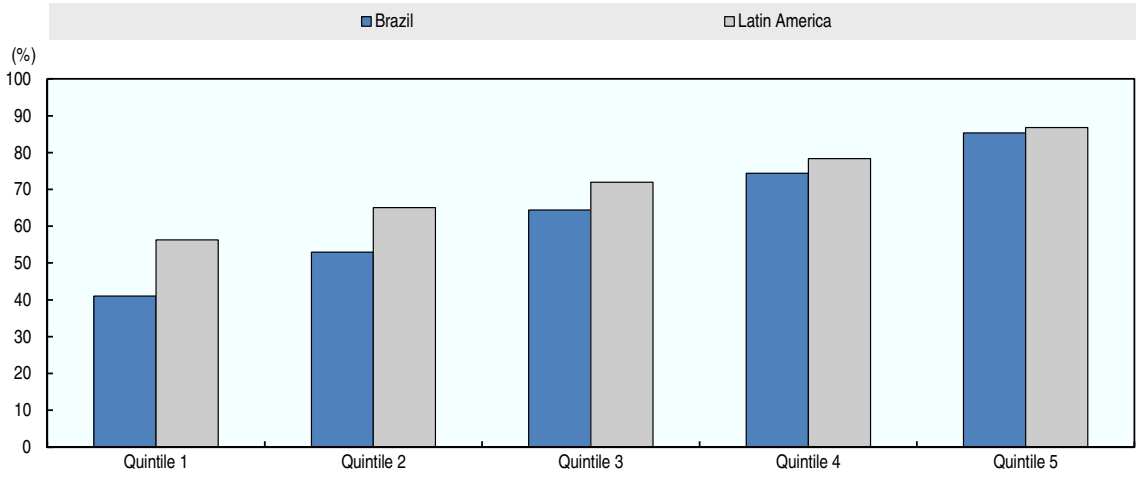
	Male	Female	Male	Female	Male	Female
PISA 2012 score in mathematics	397	380	499	489	406	388

Income	Quintile 1		Quintile 3		Quintile 5	
	Brazil	LAC	Brazil	LAC	Brazil	LAC
Net enrolment in secondary education by income quintile, circa 2011	41	56	64	71	85	87
Net enrolment in tertiary education by income quintile, circa 2011	5	9	12	18	47	46

Economic, social and cultural status	< 25th percentile			> 75th percentile		
	Brazil	OECD	LAC	Brazil	OECD	LAC
PISA 2012 score in mathematics	355	438	360	430	530	436

Note: 41 PISA points is equal to 1 year of schooling. "GDP pc" refers to GDP per capita.
Source: See methodological note to country notes.

Net enrolment rate by income quintile, secondary (%), 2011



Source: SEDLAC (SEDLAC and World Bank).
StatLink http://dx.doi.org/10.1787/888933174682

Recent education policies

In 2007, the government implemented an education development plan (*Plano de Desenvolvimento da Educação,* PDE) to reduce the country's education deficit. The plan introduced a system to allocate resources in a way that prioritised education networks with the lowest development of basic education, measured based on students' pass rates and performance in a standardised test.

In 2014, the 2014-24 national education plan (*Plano Nacional de Educação*, PNE) was approved, stipulating that no less than 7% of GDP will be allocated to education in 2019 and no less than 10% in 2024. It also prioritises reducing inequality and promotes education access and permanence in the education sector. Furthermore, it seeks to improve the management of the education sector and develop teaching skills.

In pre-primary education, the plan aims to achieve universal preschool enrolment by 2016 and education for 50% of children aged 0-3 by the end of the plan in 2024. The PNE also intends to triple enrolment in vocational and technical education and ensure that at least half of the additional provision of this form of education be done by the public sector. In higher education, the PNE emphasises quality by raising the requirements on teachers.

In 2011, *Ciência sem Fronteiras* was launched, a science programme to provide 101 000 grants for postgraduate studies abroad by the end of 2014. To date, 86 000 have been awarded. The programme also seeks to attract senior researchers to Brazil and stimulate innovation and competitiveness through international exchanges and mobility.

CHILE

Recent trends in education

In 2012, government expenditure on education in Chile was below the regional and OECD averages. Chile has a higher proportion of private funding for education than any other OECD member country, with 40.1% of education spending coming from private sources (16.1% average for OECD countries).

Educational enrolment in Chile is higher than the regional average at all levels of education and is close to the OECD average. Its gross enrolment rate in tertiary education doubled between 2000 and 2012, and is now higher than the OECD average (see the graphic). This progress was most marked in the rate of female enrolment, which rose from 36% to 79% during the same period. Chile also has a survival rate that is above the OECD average for primary and secondary education, reaching close to 100% for both levels. School life expectancy is below the OECD average, but around two years of schooling above the regional average.

Equality of access by socioeconomic status in Chile is substantially higher than the regional average, especially in secondary and tertiary education.

Equality of access by gender, meanwhile, is one of the highest in the region. However, the 25 point performance gap between female and male students in the 2012 PISA test (mathematics) was higher than both the OECD average (10 points) and the regional average (18 points).

Chile was the highest scoring Latin American country in the PISA 2012 mathematics test, but still 71 points behind the OECD average. In terms of socio-economic status, the difference in performance between the lowest and highest income quintile is equal to more than two years of schooling.

Key education indicators

	Chile	OECD	LAC
Govt. expenditure on pre-primary education as % of GDP, circa 2012	0.6	0.5	0.3
Govt. expenditure per primary student as % of GDP pc, circa 2012	17	22	16
Govt. expenditure per secondary student as % of GDP pc, circa 2012.	18	26	18
Govt. expenditure per tertiary student as % of GDP pc, circa 2012.	15	30	26
Total govt. expenditure as % of GDP, circa 2012	4.5	5.6	5.0
Net enrolment rate, pre-primary (%), circa 2012	85	83	66
Net enrolment rate, primary (%), circa 2012	93	97	91
Net enrolment rate, secondary (%), circa 2012	84	91	74
Gross enrolment ratio, tertiary (%), circa 2012	74	71	42
Survival rate to the last grade of primary education (%), circa 2011	99	98	85
Survival rate to the last grade of lower-secondary education (%), circa 2011	100	94	84
School life expectancy, 2012	15.2	16.9	13.4
PISA 2012 score in mathematics	423	494	397

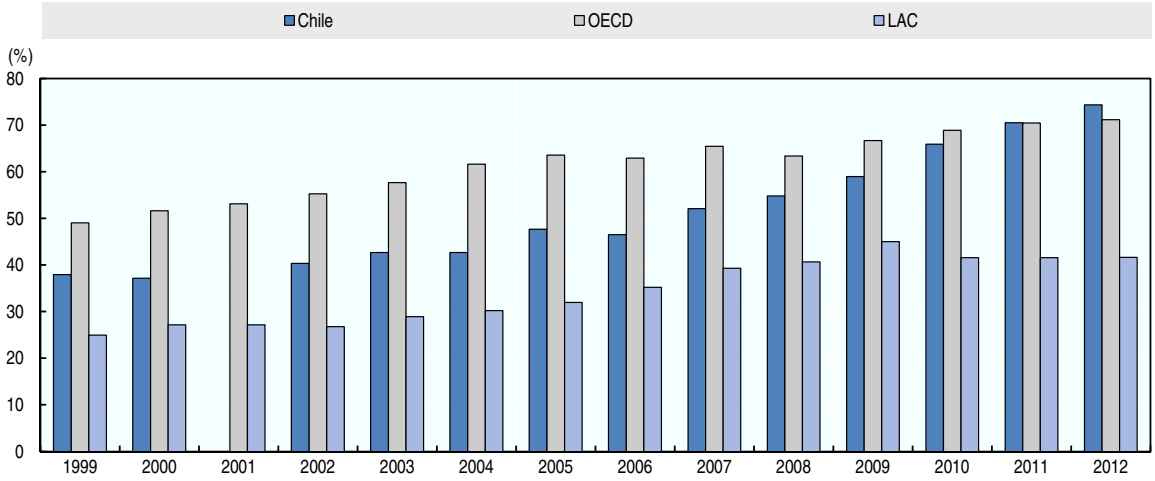
	Male	Female	Male	Female	Male	Female
Net enrolment rate, pre-primary (%), circa 2012	85	85	82	82	65	66
Net enrolment rate, primary (%), circa 2012	93	93	97	97	90	90
Net enrolment rate, secondary (%), circa 2012	82	86	91	91	71	77
Gross enrolment ratio, tertiary (%), circa 2012	70	79	64	79	34	50
Survival rate to the last grade of primary education (%), circa 2011	98	99	98	98	85	88
Survival rate to the last grade of lower-secondary education (%), circa 2011	100	100	93	94	81	87
PISA 2012 score in mathematics	436	411	499	489	406	388

Income	Quintile 1		Quintile 3		Quintile 5	
	Chile	LAC	Chile	LAC	Chile	LAC
Net enrolment in primary education by income quintile, circa 2011	99	95	99	98	99	98
Net enrolment in secondary education by income quintile, circa 2011	78	56	82	72	93	87
Net enrolment in tertiary education by income quintile, circa 2011	21	9	26	18	62	46

Economic, social and cultural status	< 25th percentile			> 75th percentile		
	Chile	OECD	LAC	Chile	OECD	LAC
PISA 2012 score in mathematics	377	438	360	472	530	436

Note: 41 PISA points is equal to 1 year of schooling. "GDP pc" refers to GDP per capita.
Source: See methodological note to country notes.

Gross enrolment ratio, tertiary (%) 1999-2012



Note: Data not available for Chile in 2001.
Source: UNESCO Institute for Statistics (UIS) database, Education.
StatLink http://dx.doi.org/10.1787/888933174694

Recent education policies

Because it has one of Latin America's highest levels of enrolment at all levels of education, emphasis in recent years has been placed on raising the coverage of early education, since it makes a major contribution to students' future educational paths and cognitive development.

Educational policy has also placed special emphasis on improving results and making access to education more equal. Processes have been initiated within each school to ensure quality, including the launch of new public bodies – the Superintendency of Education (*Superintendencia de Educación*) and the Agency for Quality (*Agencia de Calidad*) – to make it compulsory for educational institutions to meet certain quality standards and for the state to guide and support them.

The current government is introducing an educational reform to modify education in schools, especially the way subsidised private schools are run. The reform makes education a social right and a tool for good and efficient social inclusion.

The main measures include changing the financing of the system of state-subsidised private schools to reduce segregation in that system. The objective is to put an end to a system that allows state-subsidised private schools to make profits and charge additional tuition fees to families. The project is also intended to address discrimination by eliminating intake selection.

Additionally, to foster quality in education, new institutions are being set up to regulate the quality of preschool education and produce a national teaching policy. Finally, a gradual move towards truly free higher education for all of the most vulnerable students is also envisaged.

COLOMBIA

Recent trends in education

Colombia invests 4.4% of GDP in education, a lower proportion than the Latin American and OECD averages. The private sector provides 34.9% of total expenditure, twice as much as the average in the OECD countries (16.1%).

Colombia has increased enrolment levels, especially in secondary education, in which the net enrolment rate rose from 58% in 2004 to 74% in 2012, bringing it in line with the regional average. In pre-primary education, net enrolment increased from 36% in 2000 to 59% in 2012, but remains below both the regional average (66%) and the OECD average (83%). School life expectancy is close to the regional average, but is more than 3.5 years below the OECD average.

The equality of access figures by socio-economic levels reveal that net enrolment rates by income quintiles are generally higher than the regional average. In secondary education, 70% of the lowest-income students are enrolled, a figure that is 14 percentage points above the regional average.

In the PISA 2012 tests, Colombia scored 376 points in mathematics, 21 points below the average of participating Latin American countries. There is a performance gap by socio-economic status, with the lowest-income students averaging 71 points less than the highest-income students. Among the 65 economies participating in PISA 2012, Colombia had the best ratio of boys' performance to girls' performance. In mathematics and science, in which boys normally perform better than girls, the gap between the two sexes in Colombia is larger than the OECD and Latin American averages. In reading, meanwhile, where girls normally perform better than boys, the gap in Colombia is smaller than in the other regions (see the graphic).

Key education indicators

	Colombia	OECD	LAC
Govt. expenditure on pre-primary education as % of GDP, circa 2012	0.3	0.5	0.3
Govt. expenditure per primary student as % of GDP pc, circa 2012	15	22	16
Govt. expenditure per secondary student as % of GDP pc, circa 2012.	15	26	18
Govt. expenditure per tertiary student as % of GDP pc, circa 2012.	23	30	26
Total govt. expenditure on education as % of GDP, circa 2012	4.4	5.6	5.0
Net enrolment rate, pre-primary (%), circa 2012	59	83	66
Net enrolment rate, primary (%), circa 2012	84	97	91
Net enrolment rate, secondary (%), circa 2012	74	91	74
Gross enrolment ratio, tertiary (%), circa 2012	45	71	42
Survival rate to the last grade of primary education (%), circa 2011	85	98	85
Survival rate to the last grade of lower-secondary education (%), circa 2011	68	94	84
School life expectancy, 2012	13.2	16.9	13.4
PISA 2012 score in mathematics	376	494	397

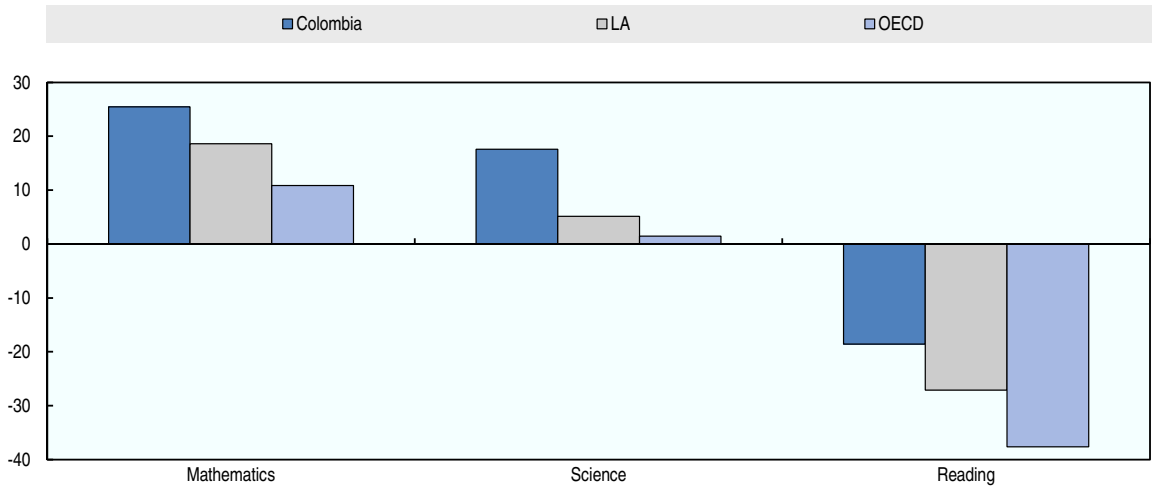
	Male	Female	Male	Female	Male	Female
Net enrolment rate, pre-primary (%), circa 2012	59	59	82	82	65	66
Net enrolment rate, primary (%), circa 2012	84	83	97	97	90	90
Net enrolment rate, secondary (%), circa 2012	71	77	91	91	71	77
Gross enrolment ratio, tertiary (%), circa 2012	42	48	64	79	34	50
Survival rate to the last grade of primary education (%), circa 2011	83	87	98	98	85	88
Survival rate to the last grade of lower-secondary education (%), circa 2011	63	73	93	94	81	87
PISA 2012 score in mathematics	390	364	499	489	406	388

Income	Quintile 1		Quintile 3		Quintile 5	
	Colombia	LAC	Colombia	LAC	Colombia	LAC
Net enrolment in primary education by income quintile, circa 2011	94	95	97	98	98	98
Net enrolment in secondary education by income quintile, circa 2011	70	56	81	72	93	87
Net enrolment in tertiary education by income quintile, circa 2011	9	9	19	18	53	46

Economic, social and cultural status	< 25th percentile			> 75th percentile		
	Colombia	OECD	LAC	Uruguay	OECD	LAC
PISA 2012 score in mathematics	344	438	360	415	530	436

Note: 41 PISA points is equal to 1 year of schooling. "GDP pc" refers to GDP per capita.
Source: See methodological note to country notes.

Performance gap between boys and girls (PISA points, 2012)



Source: OECD/PISA, 2012.
StatLink http://dx.doi.org/10.1787/888933174706

Recent education policies

There have been various Colombian initiatives to improve education policy over the past 15 years, particularly in recent years. The most notable include the 2002 reform of the teaching statute, which aims to improve the quality of teachers. Performance-related bonuses and penalties were introduced based on results in regular tests, but the scheme is not yet used at all institutions, and the government still faces pressure to reverse the reform.

Another initiative was a reform of public resource distribution systems in education in 2011 to improve equity among the regions of Colombia and provide better incentives for those resources to be used properly. Emphasis was also placed on improving quality by lengthening the school day and strengthening early education (the *De Cero a Siempre* programme), as well as enhancing the quality of education for more than 2 million students concentrated in the regions that need it most (*Todos a Aprender* programme).

Finally, the incoming government has announced a plan to continue strengthening the quality of teaching and to pursue the programmes to lengthen the school day, improve early education and extend coverage of conditional transfers to encourage school attendance by children from the lowest-income households. For tertiary education, in August 2014 the National Council of Education (*Consejo Nacional de Educación*) submitted its *Acuerdo por lo Superior 2034* proposal for higher education. The proposal looks at ten main areas, including access and quality, as well as linkages with higher education and vocational training, the internationalisation of higher education, and the education system's governance and financial sustainability.

COSTA RICA

Recent trends in education

Costa Rica has one of the highest levels of public investment in education in Latin America, at 6.3% of GDP.

Enrolment is close to the regional average at all levels of education. The pre-primary gross enrolment rate has risen rapidly since the turn of the century, from 47% in 2000 to 74% in 2012. The rate in secondary education has risen from 61% to 104% during the same period. The survival rate to the last grade of lower-secondary education, however, has lagged behind that of the rest of the region during the last ten years (15 percentage points behind in 2011), indicating high dropout rates (see graphic).

In the area of gender equality, Costa Rica's gross enrolment ratios are similar to the regional averages. In tertiary education there are more women than men, as is the case in the region as a whole, but the gross enrolment ratio among men is 41%, which is above the regional average. The PISA results reveal a gender gap of 24 points in favour of male students, compared to a regional average gender gap of 18 points.

Finally, the figures for equality of access by socio-economic status are very different to the regional averages. Although the enrolment rates for primary and secondary education in each income quintile are on par with the regional averages, in tertiary education, the enrolment rate for the lowest income quintile is 3%, one of the lowest in the region.

Key education indicators

	Costa Rica	OECD	LAC
Govt. expenditure on pre-primary education as % of GDP, circa 2012	0.3	0.5	0.3
Govt. expenditure per primary student as % of GDP pc, circa 2012	15	22	16
Govt. expenditure per secondary student as % of GDP pc, circa 2012.	14	26	18
Govt. expenditure on tertiary education as % of GDP, circa 2012	1.2	1.4	1.1
Total govt. expenditure as % of GDP, circa 2012	6.3	5.6	5.0
Net enrolment rate, pre-primary (%), circa 2012	72	83	66
Net enrolment rate, primary (%), circa 2012	92	97	91
Net enrolment rate, secondary (%), circa 2012	73	91	74
Gross enrolment ratio, tertiary (%), circa 2012	47	71	42
Survival rate to the last grade of primary education (%), circa 2011	88	98	85
Survival rate to the last grade of lower-secondary education (%), circa 2011	69	94	84
School life expectancy, 2012	13.7	16.9	13.4
PISA 2012 score in mathematics	407	494	397

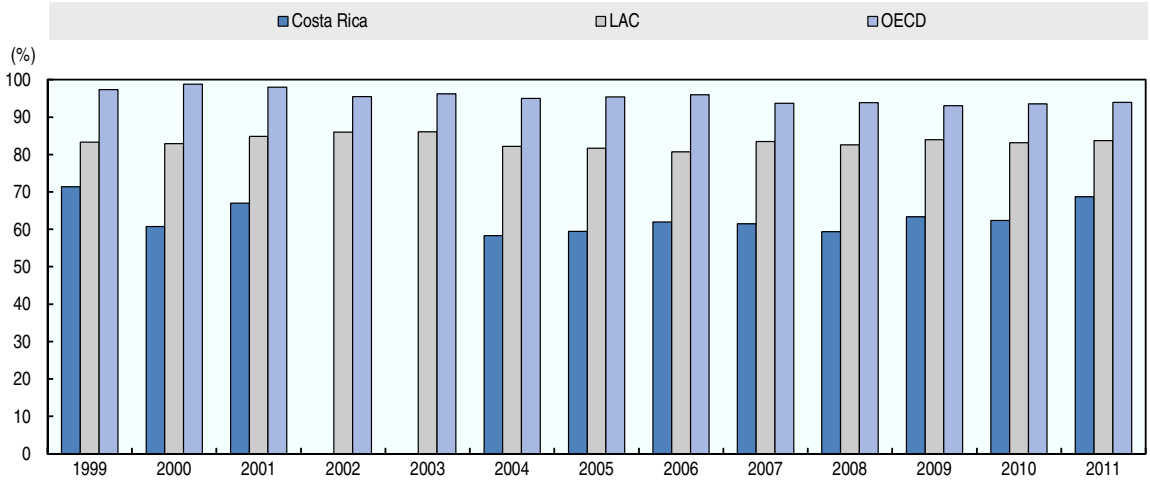
	Male	Female	Male	Female	Male	Female
Net enrolment rate, pre-primary (%), circa 2012	72	73	82	82	65	66
Net enrolment rate, primary (%), circa 2012	92	92	97	97	90	90
Net enrolment rate, secondary (%), circa 2012	71	75	91	91	71	77
Gross enrolment ratio, tertiary (%), circa 2012	41	53	64	79	34	50
Survival rate to the last grade of primary education (%), circa 2011	87	90	98	98	85	88
Survival rate to the last grade of lower-secondary education (%), circa 2011	63	75	93	94	81	87
PISA 2012 score in mathematics	420	396	499	489	406	388

Income	Quintile 1		Quintile 3		Quintile 5	
	Costa Rica	LAC	Uruguay	LAC	Costa Rica	LAC
Net enrolment in primary education by income quintile, circa 2011	98	95	100	98	100	98
Net enrolment in secondary education by income quintile, circa 2011	51	56	72	72	91	87
Net enrolment in tertiary education by income quintile, circa 2011	3	9	13	18	47	46

Economic, social and cultural status	< 25th percentile			> 75th percentile		
	Costa Rica	OECD	LAC	Costa Rica	OECD	LAC
PISA 2012 score in mathematics	373	438	360	448	530	436

Note: 41 PISA points is equal to 1 year of schooling. "GDP pc" refers to GDP per capita.
Source: See methodological note to country notes.

Survival rate to the last grade of lower-secondary education (%)
1999-2011



Note: Data not available for Costa Rica in 2002 and 2003.
Source: UNESCO Institute for Statistics (UIS) database.
StatLink http://dx.doi.org/10.1787/888933174712

Recent education policies

One of the main goals of Costa Rica's education policy is to reduce access inequalities. Efforts have been made to enable more people to benefit from the *Avancemos* conditional cash transfer programme run by the education ministry (MEP) and the Institute for Social Aid (IMAS) since 2006. One important initiative has been the European Union-supported ProEDUCA project, which seeks to keep students in school.

The country has made additional efforts to measure results so that it can improve them and make the curriculum more relevant. For this reason, Costa Rica participated in the PISA tests for the first time in 2009 to measure the skills and abilities of secondary-school students and compare them with those of other countries. Additionally, to improve the quality of teacher training and management, in 2010 the education ministry's quality management and assessment department, the DGEC (*Dirección de Gestión y Evaluación de Calidad*), set a mathematics test to 1 733 active teachers (*Informe Estado de la Educación*, 2011).

As at other levels of education, in higher education the aim is to reduce the socio-economic gaps in access and improve quality control. To achieve this, a new law was introduced in 2010 to strengthen the National Accreditation System for Higher Education (SINAES), which will regulate accreditation of higher-education institutions (university and para-university).

The current administration is faced with the challenge of implementing the constitutional provision introduced in 2010 to raise government expenditure on education, and is committed to increasing it to 8% of GDP by 2014. This is a formidable challenge, given the economic slowdown.

DOMINICAN REPUBLIC

Recent trends in education

Although enrolment in pre-primary and secondary education is low compared with the Latin American average, the gap has been closing. In the region as a whole, the net secondary-school enrolment rate increased by 20% between 2000 and 2012, but in the Dominican Republic it increased by more than 50% during the same period (see graphic). This was mainly thanks to the improved net enrolment rate for boys, which grew by more than 60%.

Similarly, the pre-primary net enrolment rate increased by 8 percentage points during the same period to 37% of children of pre-primary school age, still below the regional average of 66%. The survival rate to the last grade of lower-secondary education, meanwhile, was 86% in 2011, close to the regional average.

In terms of gender, the gap is greater than the regional average in both primary education (3 percentage points in favour of boys) and secondary education (8 percentage points in favour of girls).

The Dominican Republic has similar primary-school enrolment rates to the regional averages for all socio-economic levels, but the rates for secondary and tertiary education are lower than the regional averages, especially for the first and third income quintiles.

Key education indicators

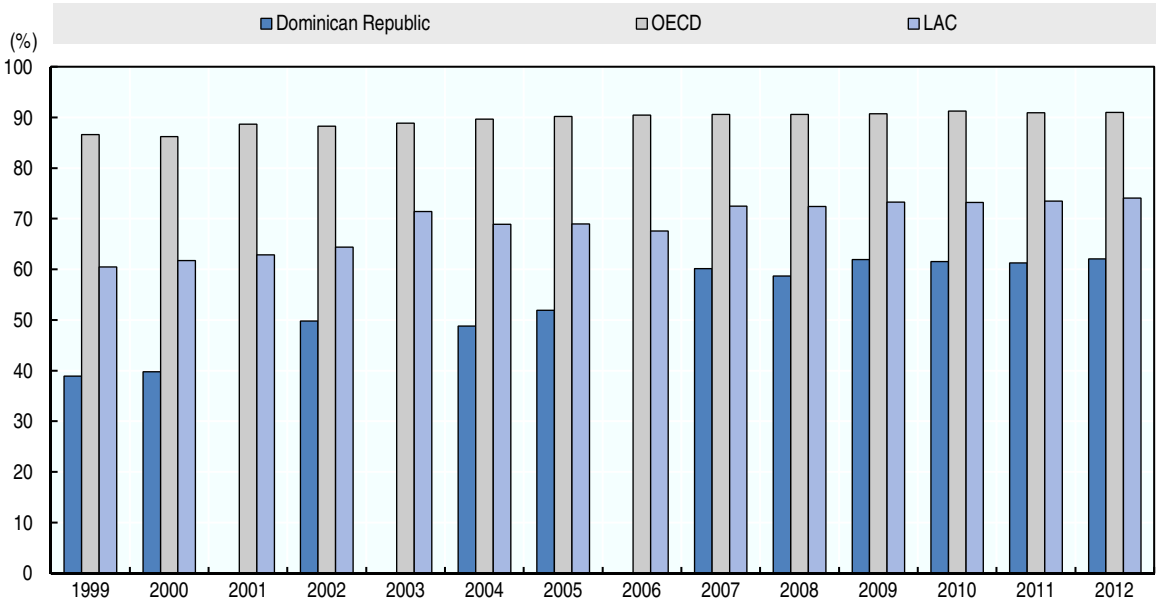
	Dom. Rep.	OECD	LAC
Govt. expenditure on pre-primary education as % of GDP, circa 2012	0.1	0.5	0.3
Govt. expenditure per primary student as % of GDP pc, circa 2012	9	22	16
Govt. expenditure per secondary student as % of GDP pc, circa 2012.	8	26	18
Total govt. expenditure as % of GDP, circa 2012	2.2	5.6	5.0
Net enrolment rate, pre-primary (%), circa 2012			
Net enrolment rate, primary (%), circa 2012	87	97	91
Net enrolment rate, secondary (%), circa 2012	62	91	74
Survival rate to the last grade of primary education (%), circa 2011	79	98	85
Survival rate to the last grade of lower-secondary education (%), circa 2011	86	94	84

	Male	Female	Male	Female	Male	Female
Net enrolment rate, pre-primary (%), circa 2012	36	38	82	82	65	66
Net enrolment rate, primary (%), circa 2012	88	85	97	97	90	90
Net enrolment rate, secondary (%), circa 2012	58	66	91	91	71	77
Survival rate to the last grade of primary education (%), circa 2011	76	83	98	98	85	88
Survival rate to the last grade of lower-secondary education (%), circa 2011	84	88	93	94	81	87

Income	Quintile 1		Quintile 3		Quintile 5	
	Dom. Rep.	LAC	Dom. Rep.	LAC	Dom. Rep.	LAC
Net enrolment in primary education by income quintile, circa 2011	97	95	98	98	95	98
Net enrolment in secondary education by income quintile, circa 2011	51	56	62	72	88	87
Net enrolment in tertiary education by income quintile, circa 2011	6	9	14	18	44	46

Note: Note: "GDP pc" refers to GDP per capita.
Source: See methodological note to country notes.

Net enrolment rate, secondary (%) 1999-2012



Note: Data not available for the Dominican Republic in 2001, 2003 and 2006.
Source: UNESCO Institute for Statistics (UIS) database, Education
StatLink http://dx.doi.org/10.1787/888933174755

Recent education policies

The Dominican Republic has made considerable efforts to improve education access and enrolment in recent years, creating a National Alliance for Education Reform (*Pacto Nacional para la Reforma Educativa*) in 2014. The alliance's actions represent an investment of more than 4% of GDP in eduction.

Various policy actions have been implemented, including promoting cross-sector initiatives to protect social well-being, education and health through conditional cash transfers to households (*Progresando con Solidaridad* programme). Furthermore, the *Quisqueya Empieza Contigo* programme includes measures to ensure development within the vulnerable population starting from early education and to improve the integration of mothers in the labour market.

Also, the extended school days programme is being introduced in primary and secondary education (*nivel básico* and *nivel medio*) with the aim of reaching more than 80% of public-school students by 2016. To achieve this goal and reduce the current shortage of education infrastructure, an ambitious programme has been launched to build 28 000 classrooms and renovate another 23 130. Postgraduate programmes for teachers have also been introduced in fields covered by the curriculum, as well as in innovative teaching practices, foreign languages and technology.

One of the current administration's main goals is to improve the coverage and quality of upper-secondary education (*nivel medio*) by providing qualified teachers, developing the curriculum and content, and creating mechanisms for graduate employment. In vocational and technical education, the Dominican Republic has been promoting public-private partnerships through the INFOTEP vocational education centre (*Instituto de Formación Técnica y Profesional*) and supporting technical and vocational training in high-technology domains through the ITLA technical college (*Instituto Tecnológico de las Américas*).

MEXICO

Recent trends in education

Mexico spends 5.2% of GDP on public education, a figure close to the Latin American and OECD averages. The balance between public and private funding is also similar to the OECD average, with the public sector providing 80.3% of funding and the private sector 19.7% (vs. OECD averages of 83.9% and 16.1%).

Education is universal among 5-14 year-olds. Enrolment rates in pre-primary and primary education are similar to the OECD averages, as are primary and lower-secondary survival rates, which are above the regional averages. In secondary and tertiary education, however, Mexico's enrolment rates are below the regional averages. In tertiary education, the gross enrolment ratio is 29%, well below the regional average of 42% and the OECD average of 71%. School life expectancy in Mexico is lower than the OECD average, and very close to the regional average (13.4 years).

Mexico's performance is above the regional average for equality of access by socio-economic status at all levels of education, except in tertiary education for the highest income quintile, where it performs slightly worse.

The gender gap for access is almost non-existent, but for performance, in the PISA 2012 survey (mathematics test) there was a gap of 14 points in favour of male students, a figure that is below the regional average of 18 points but above the OECD average of 10 points.

Overall, Mexico's PISA 2012 score (413 points on the mathematics test) was below the OECD average. However, the results showed that the country's performance and equity had improved, with a smaller proportion of the variation in performance being due to differences in socio-economic status (see the graphic).

Key education indicators

	Mexico	OECD	LAC
Govt. expenditure on pre-primary education as % of GDP, circa 2012	0.5	0.5	0.3
Govt. expenditure per primary student as % of GDP pc, circa 2012	15	22	16
Govt. expenditure per secondary student as % of GDP pc, circa 2012.	16	26	18
Govt. expenditure per tertiary student as % of GDP pc, circa 2012.	38	30	26
Total govt. expenditure as % of GDP, circa 2012	5.2	5.6	5.0
Net enrolment rate, pre-primary (%), circa 2012	82	83	66
Net enrolment rate, primary (%), circa 2012	96	97	91
Net enrolment rate, secondary (%), circa 2012	68	91	74
Gross enrolment ratio, tertiary (%), circa 2012	29	71	42
Survival rate to the last grade of primary education (%), circa 2011	96	98	85
Survival rate to the last grade of lower-secondary education (%), circa 2011	89	94	84
School life expectancy, 2012	13.1	16.9	13.4
PISA 2012 score in mathematics	413	494	397

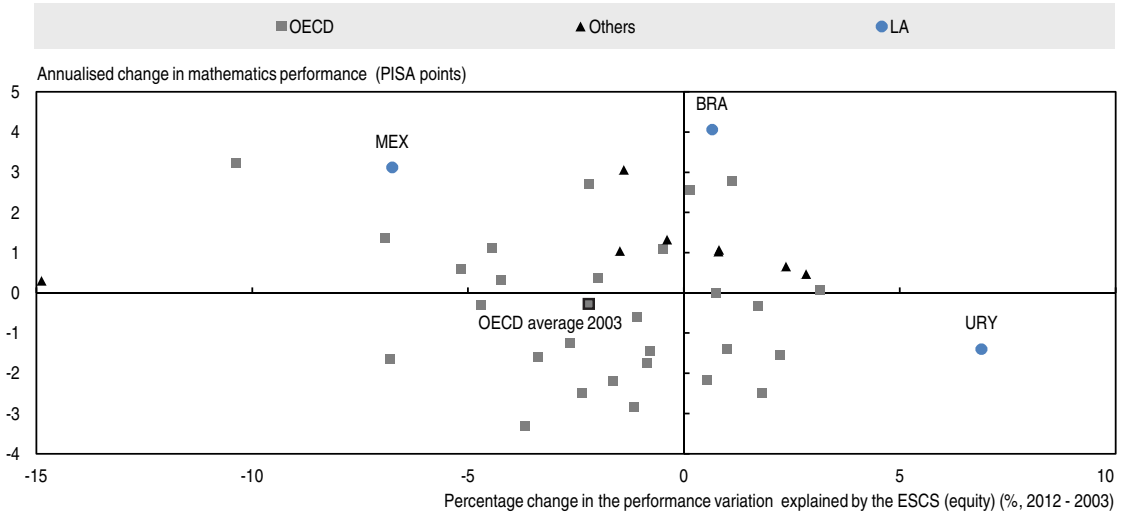
	Male	Female	Male	Female	Male	Female
Net enrolment rate, pre-primary (%), circa 2012	82	83	82	82	65	66
Net enrolment rate, primary (%), circa 2012	96	97	97	97	90	90
Net enrolment rate, secondary (%), circa 2012	66	69	91	91	71	77
Gross enrolment ratio, tertiary (%), circa 2012	30	28	64	79	34	50
Survival rate to the last grade of primary education (%), circa 2011	95	97	98	98	85	88
Survival rate to the last grade of lower-secondary education (%), circa 2011	88	92	93	94	81	87
PISA 2012 score in mathematics	420	406	499	489	406	388

Income	Quintile 1		Quintile 3		Quintile 5	
	Mexico	LAC	Mexico	LAC	Mexico	LAC
Net enrolment rate by income quintile, primary (%), circa 2011	97	95	99	98	100	98
Net enrolment rate by income quintile, secondary (%), circa 2011	65	56	77	72	90	87
Net enrolment rate by income quintile, tertiary (%), circa 2011	15	9	21	18	44	46

Economic, social and cultural status	< 25th percentile			> 75th percentile		
	Mexico	OECD	LAC	Mexico	OECD	LAC
PISA 2012 score in mathematics	385	438	360	444	530	436

Note: 41 PISA points is equal to 1 year of schooling. "GDP pc" refers to GDP per capita.
Source: See methodological note to country notes.

Performance and equity, 2003-12



Note: The annualised change is the average annual change in PISA scores between a country's results in its first participation in PISA and its results in 2012. Only countries with comparable data between 2003 and 2012 are included. The 2003 OECD average only considers countries with scores in mathematics and comparable socio-economic status values since 2003. "Others" refers to non-OECD countries outside Latin America that have participated in PISA. ESCS: Economic, social and cultural status
Source: OECD/PISA, 2012.
StatLink http://dx.doi.org/10.1787/888933174720

Recent education policies

The main goals of education policy in Mexico include ensuring educational opportunities for all social groups, promoting equitable access, and performance. Mexico has been one of the promoters of compensatory programmes in the region through the PROSPERA scheme, formerly the human-development programme *Oportunidades* (Opportunities). In 2012, Mexico extended compulsory education to include upper-secondary school, with the goal of making it universal by 2022.

Under the Pact for Mexico (*Pacto por México*) agreements signed in December 2012, the 2012-13 Education Reform is being implemented to strengthen the quality of education. The new teaching law (*Ley del Servicio Profesional Docente*) thus lays the groundwork for the professionalisation of teachers and education management staff, establishing the terms for their selection, assessment, training and incentives throughout their careers. For the first time, national competitions are being conducted for jobs in lower and upper secondary schools (*educación básica* and *educación media superior*), and promotion examinations are held for management posts in upper-secondary schools.

The reform aims to monitor the quality of results, giving autonomy to the national assessment agency (*Instituto Nacional para la Evaluación de la Educación*) and granting it the power to make policy recommendations. The reform also envisages creating an educational information system and developing a strategy for the autonomous management of schools. In 2014, the *Construye T* programme was introduced to develop socio-emotional skills in public upper-secondary schools. Other priorities have included introducing information and communication technologies into the education system and modernising schools' infrastructure, especially through the *Escuelas Dignas* programme, which targets lagging schools.

PANAMA

Recent trends in education

Government expenditure on education in Panama was 3.5% of GDP in 2011, below the regional average.

The country's school life expectancy is one year of schooling less than the regional average and more than four years less than the OECD average. Enrolment in education has risen, especially net pre-primary enrolment, which is up more than 50% since 2000, and is now close to the regional average. In primary schools, enrolment is below the OECD average. It is close to the regional average but government expenditure per primary student as a percentage of GDP per capita in Panama is less than half the Latin American average (see graphic).

Gross enrolment in tertiary education is much higher among women (51% in 2011) than among men (33%), reflecting a gender gap in favour of women of a similar magnitude to the regional average. There is also a gender gap in the lower-secondary education survival rate, with 73% of male students surviving to the final grade compared with 82% of female students, placing the country below the regional average. In primary education, however, Panama performs better than the regional average.

In terms of equality of access by socio-economic background, Panama equals or exceeds regional averages, except at tertiary level, where it shows a lower share of registered students, especially among the poorest.

Key education indicators

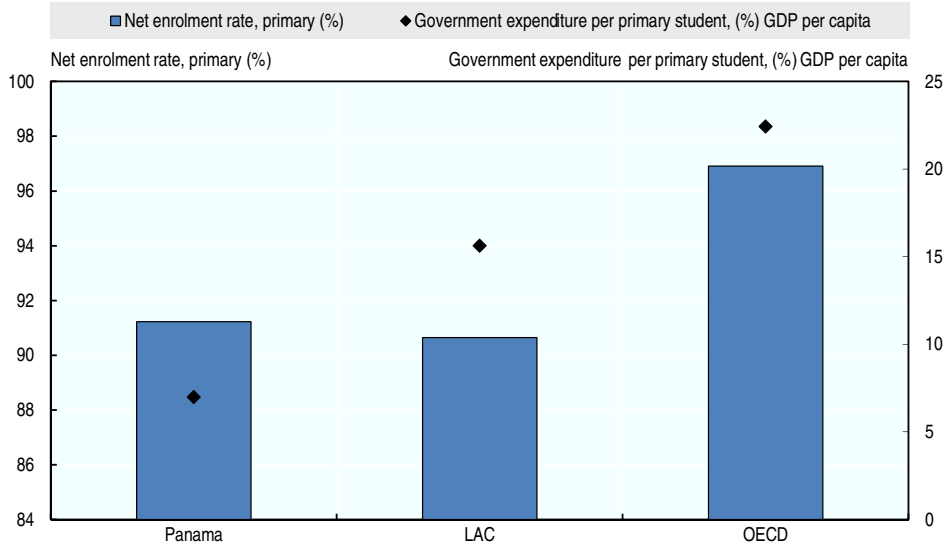
	Panama	OECD	LAC
Govt. expenditure on pre-primary education as % of GDP, circa 2012	0.1	0.5	0.3
Govt. expenditure per primary student as % of GDP pc, circa 2012	7	22	16
Govt. expenditure per secondary student as % of GDP pc, circa 2012.	10	26	18
Govt. expenditure per tertiary student as % of GDP pc, circa 2012.	22	30	26
Total govt. expenditure as % of GDP, circa 2012	3.5	5.6	5.0
Net enrolment rate, pre-primary (%), circa 2012	64	83	66
Net enrolment rate, primary (%), circa 2012	91	97	91
Net enrolment rate, secondary (%), circa 2012	76	91	74
Gross enrolment ratio, tertiary (%), circa 2012	42	71	42
Survival rate to the last grade of primary education (%), circa 2011	92	98	85
Survival rate to the last grade of lower-secondary education (%), circa 2011	77	94	84
School life expectancy, circa 2012	12.4	16.9	13.4

	Male	Female	Male	Female	Male	Female
Net enrolment rate, pre-primary (%), circa 2012	63	64	82	82	65	66
Net enrolment rate, primary (%), circa 2012	92	91	97	97	90	90
Net enrolment rate, secondary (%), circa 2012	74	79	91	91	71	77
Gross enrolment ratio, tertiary (%), circa 2012	33	51	64	79	34	50
Survival rate to the last grade of primary education (%), circa 2011	92	96	98	98	85	88
Survival rate to the last grade of lower-secondary education (%), circa 2011	73	82	93	94	81	87

Income	Quintile 1		Quintile 3		Quintile 5	
	Panama	LAC	Panama	LAC	Panama	LAC
Net enrolment in primary education by income quintile, circa 2011	98	95	100	98	100	98
Net enrolment in secondary education by income quintile, circa 2011	56	56	85	72	96	87
Net enrolment in tertiary education by income quintile, circa 2011	5	9	15	18	42	46

Note: Note: "GDP pc" refers to GDP per capita.
Source: See methodological note to country notes.

Net enrolment rate and government expenditure per student, primary, circa 2012 (%)



Source: UNESCO Institute for Statistics (UIS) database, Education.
StatLink http://dx.doi.org/10.1787/888933174733

Recent education policies

In recent years, the country has sought to bolster the quality of education through a curriculum-reform programme that emphasises skills training to improve students' integration into the workplace. Annual investment in the programme has averaged 0.9% of GDP since it was introduced in 2010. It provides training for teachers and introduces new curricula, and in 2012 it covered 70% of schools.

Meanwhile, two new national bodies were set up: the *Equipo Nacional de Innovación y Actualización Curricular* (ENIAC) to drive innovation and continuously update the curriculum and the *Equipo Nacional de Capacitación Docente* (ENCAD) to provide training for all teachers in the content innovations.

In 2003 the government made English compulsory in schools, and in 2013 it introduced a new bilingual teaching degree – the *Bachillerato Pedagógico Bilingüe Tecnológico* – to prepare future teachers for teaching English. More recently, the *Panama Bilingüe* (Bilingual Panama) programme was launched to boost the knowledge of teachers, students studying to become teachers and secondary-school graduates; provide English lessons outside normal classroom hours to students between grades 7 and 11; and make English compulsory from pre-primary school to the sixth grade.

In order to improve access to education, a universal grant (*Beca Universal*) was established in 2010. It provides financial support to all students registered at primary and secondary levels, both in public and private education centres (provided they are certified by the Ministry of Education), and according to their achievements. Students in private schools can benefit from the grant if the yearly amount of the tuition fee and monthly payments does not exceed 1 000 balboas.

Finally, as part of Microsoft's Partners in Learning scheme, the *Entre Pares Panamá* programme aims to empower schools to increase learning through the development and leadership of teachers. In 2012 the programme provided training for 100% of teachers in the pedagogical use of new technologies in education.

Note: The data used for Panama's country note were compiled from OECD, UNESCO and World Bank (CEDLAS) data. Discrepancies with education expenditure data published by the national government may be due to different methods used to measure GDP.

PERU

Recent trends in education

Peru spends 2.8% of GDP on education, one of the lowest percentages in the region.

Enrolment in pre-primary and primary schools is close to the OECD average, with a strong increase in the pre-primary net enrolment rate from 58% in 2000 to 74% in 2012. Enrolment is higher than the regional average at all levels of education. The survival rate in primary education, however, is 74%, 11 percentage points below the regional average, while the survival rate in lower-secondary education is closer to the regional average. School life expectancy is close to the regional average, but is almost four years below the OECD average.

Equality of access surpasses regional averages at all levels and for all income quintiles. The secondary-school enrolment rate among the lowest income quintile is particularly high at 72%, 16 percentage points above the regional average. Equality of access by gender is also remarkable at all levels of education.

In terms of quality and performance, Peru had the lowest score of all 65 economies in the PISA 2012 mathematics tests. Major inequalities lie behind this result, with a performance differential equal to 2.5 years of schooling (103 points) between the lowest-income and highest-income students. Analysis of the results by the language spoken in the home reveals that students from Spanish-speaking homes performed better than students from Quechua-speaking homes (with a gap equivalent to more than two years of schooling, as shown in the graphic), a difference that is not due to their socio-economic status.

Key education indicators

	Peru	OECD	LAC
Govt. expenditure on pre-primary education as % of GDP, circa 2012	0.4	0.5	0.3
Govt. expenditure per primary student as % of GDP pc, circa 2012	9	22	16.0
Govt. expenditure per secondary student as % of GDP pc, circa 2012.	10	26	18.0
Govt. expenditure per tertiary student as % of GDP pc, circa 2012.	9	30	26
Total govt. expenditure as % of GDP, circa 2012	2.8	5.6	5.0
Net enrolment rate, pre-primary (%), circa 2012	74	83	66
Net enrolment rate, primary (%), circa 2012	94	97	91
Net enrolment rate, secondary (%), circa 2012	77	91	74
Gross enrolment ratio, tertiary (%), circa 2012	43	71	42
Survival rate to the last grade of primary education (%), circa 2011	74	98	85
Survival rate to the last grade of lower-secondary education (%), circa 2011	82	94	84
School life expectancy, 2012	13.1	16.9	13.4
PISA 2012 score in mathematics	368	494	397

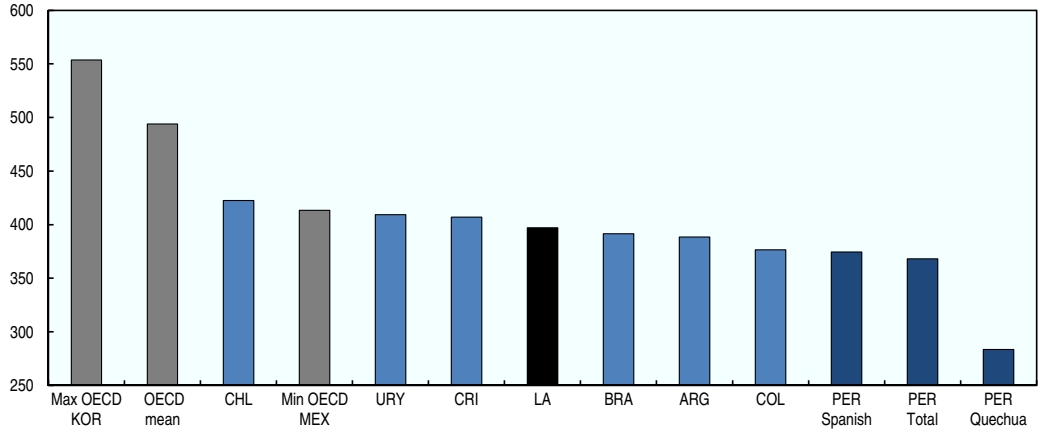
	Male	Female	Male	Female	Male	Female
Net enrolment in pre-primary education (%), circa 2011	75	74	82	82	65	66
Net enrolment in primary (%) education, circa 2011	94	94	97	97	90	90
Net enrolment in pre-primary education (%), circa 2011	77	77	91	91	71	77
Gross enrolment in tertiary education (%), circa 2011	41	45	64	79	34	50
Survival rate to the last grade of primary education (%), circa 2011	75	73	98	98	85	88
Survival rate to the last grade of lower-secondary education (%), circa 2011	80	84	93	94	81	87
PISA 2012 score in mathematics	378	359	499	489	406	388

Income	Quintile 1		Quintile 3		Quintile 5	
	Peru	LAC	Peru	LAC	Peru	LAC
Net enrolment in primary education by income quintile, circa 2011	99	95	99	98	99	98
Net enrolment in secondary education by income quintile, circa 2011	72	56	88	72	95	87
Net enrolment in tertiary education by income quintile, circa 2011	12	9	33	18	55	46

Economic, social and cultural status	< 25th percentile			> 75th percentile		
	Peru	OECD	LAC	Peru	OECD	LAC
PISA 2012 score in mathematics	317	438	360	420	530	436

Note: 41 PISA points is equal to 1 year of schooling. "GDP pc" refers to GDP per capita.
Source: See methodological note to country notes.

Performance in mathematics, PISA 2012 points



Source: Authors' work based on the OECD/PISA 2012 database
StatLink http://dx.doi.org/10.1787/888933174747

Recent education policies

To improve the quality of the education system, in 2012 the government enacted a reform (*Ley de Reforma Magisterial*) to improve the teaching profession, establishing a single regulatory framework with a meritocratic system to govern teachers' careers through open, transparent evaluation processes.

The achievements reported in pre-primary education, especially in rural areas, are linked to the implementation of comprehensive early childhood programmes. These programmes aim to achieve universal coverage by 2016 in the districts that benefit from the *Juntos* (Together) conditional-transfers programme, and 86% coverage at national level. These efforts have not only required additional government financing for infrastructure and equipment for targeted schools, but also the implementation of bilingual, intercultural education criteria and educational support mechanisms.

The government is considering infrastructure plans to extend the length of full school days in secondary schools by 2021. It is also developing a national policy for English teaching and working to reintroduce physical education into public schools.

To reduce the infrastructure gap, the government launched PRONIED (*Programa Nacional de Infraestructura Educativa*), a national education infrastructure programme to enable various tiers of government to work together to improve the planning and execution of public works and to encourage private-sector involvement.

Finally, the recent University Act (*Ley Universitaria*) establishes the National Superintendency of University Education (*Superintendencia Nacional de Educación Universitaria*) to monitor the quality of education in universities, supervise the use of their resources and approve or reject proposals to create new universities. The national quality-assessment and accreditation system (*Sistema Nacional de Evaluación, Acreditación y Certificación de la Calidad Educativa*) will also be reformed to adapt the accreditation processes.

To support these initiatives, the government has pledged to raise the sector's budget by 0.5% of GDP per year to 6% by 2021.

URUGUAY

Recent trends in education

Enrolment rates are generally higher than the regional averages, except the secondary-school rate, which is slightly lower. Enrolment in tertiary education has grown remarkably, increasing by nearly 30 percentage points in the 2000s. Government expenditure on education (4.5% of GDP) is below the regional average.

In the PISA 2012 assessment (mathematics test), Uruguay's performance was slightly higher than average for participating Latin American countries, but it deteriorated by more than that of the other eight Latin American countries (-1.4 points per year since 2003, as shown in the graphic). Like the region as a whole, Uruguay performed well below the OECD average in PISA 2012, with a performance gap equivalent to more than two years of schooling.

School life expectancy is above the regional average, but around 1.5 years below the OECD average. Gender inequalities in access to the first few levels of education are only small. In tertiary education, however, with low enrolment rates among males, the inequality rises substantially, more so than in other countries in the region.

Although socio-economic inequalities in access to primary and secondary education are not as strong as in the region as a whole (inequalities in secondary education have been reduced in the last five years), there are much stronger inequalities in tertiary education. These inequalities are also reflected in student performance: the performance gap between socio-economically advantaged and disadvantaged students in Uruguay is equal to more than 2.5 years of schooling, which is higher than the Latin American average gap.

Key education indicators

	Uruguay	OECD	LAC
Govt. expenditure on pre-primary education as % of GDP, circa 2012	0.5	0.5	0.3
Govt. expenditure on primary education as % of GDP, circa 2012	1.3	1.5	1.7
Govt. expenditure on secondary education as % of GDP, circa 2012	1.5	2.1	1.6
Govt. expenditure on tertiary education as % of GDP, circa 2012	1.2	1.4	1.1
Total govt. expenditure as % of GDP, circa 2012	4.5	5.6	5.0
Net enrolment rate, pre-primary (%), circa 2012	78	83	66
Net enrolment rate, primary (%), circa 2012	100	97	91
Net enrolment rate, secondary (%), circa 2012	72	91	74
Gross enrolment ratio, tertiary (%), circa 2012	63	71	42
Survival rate to the last grade of primary education (%), circa 2011	95	98	85
Survival rate to the last grade of lower-secondary education (%), circa 2011	84	94	84
School life expectancy, circa 2012	15.5	16.9	13.4
PISA 2012 score in mathematics	409	494	397

	Male	Female	Male	Female	Male	Female
Net enrolment rate, pre-primary (%), circa 2012	78	78	82	82	65	66
Net enrolment rate, primary (%), circa 2012	99	99	97	97	90	90
Net enrolment rate, secondary (%), circa 2012	68	76	91	91	71	77
Gross enrolment ratio, tertiary (%), circa 2012	47	80	64	79	34	50
Survival rate to the last grade of primary education (%), circa 2011	94	96	98	98	85	88
Survival rate to the last grade of lower-secondary education (%), circa 2011	81	88	93	94	81	87
PISA 2012 score in mathematics	415	404	499	489	406	388

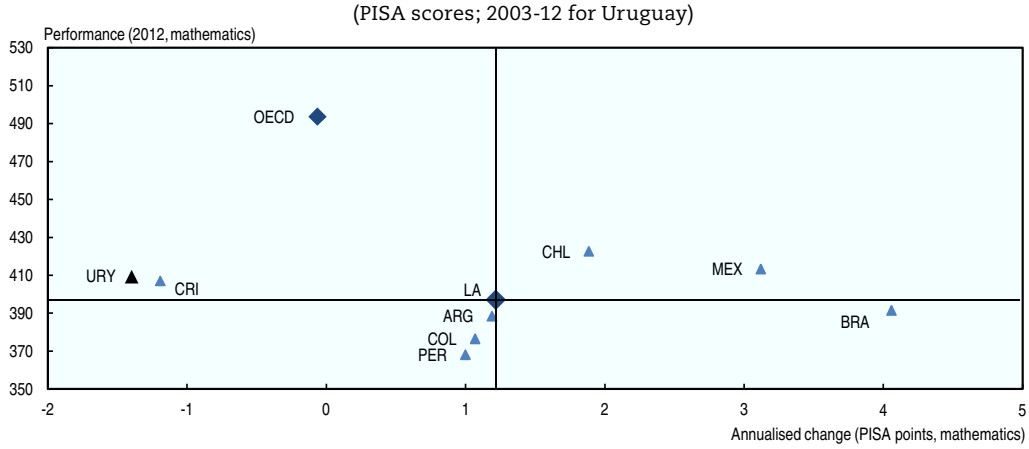
Income	Quintile 1		Quintile 3		Quintile 5	
	Uruguay	LAC	Uruguay	LAC	Uruguay	LAC
Net enrolment in primary education by income quintile, circa 2011	99	95	99	98	97	98
Net enrolment in secondary education by income quintile, circa 2011	69	56	85	72	97	87
Net enrolment in tertiary education by income quintile, circa 2011	4	9	18	18	56	46

Economic, social and cultural status	< 25th percentile			> 75th percentile		
	Uruguay	OECD	LAC	Uruguay	OECD	LAC
PISA 2012 score in mathematics	364	438	360	468	530	436

Note: 41 PISA points is equal to 1 year of schooling. "GDP pc" refers to GDP per capita.
Source: See methodological note to country notes.

Annualised change in mathematics performance in PISA assessments

(PISA scores; 2003-12 for Uruguay)



Note: Annualised change in mathematics performance refers to the annualised change in each country's performance in the PISA tests since that country participated for the first time (for comparison purposes, PISA 2000 results cannot be used). For Uruguay, the results are for the period 2003-12.
Source: OECD, PISA 2012.
StatLink http://dx.doi.org/10.1787/888933174766

Recent education policies

Various initiatives have been incorporated into all levels of education, including non-formal education, to improve quality and enrolment rates and to reduce dropout rates. These include programmes for community teachers (*Programa de Maestros Comunitarios*), community classrooms (*Programa de Aulas Comunitarias*), development and co-ordination of educational policy (*Programa Tránsito*), and vocational training (*Programa de Formación Profesional*). A national assessment body, the INEEd (*Instituto Nacional de Evaluación Educativa*), was set up for pre-primary, primary and secondary education. Another initiative in primary education is the *Plan Ceibal*, introduced in 2007 to provide all students and teachers in public education with a laptop computer.

Recently, the national public education authority (*Administración Nacional de Educación Pública*, ANEP) released a document entitled "*Aportes iniciales a la discusión sobre fundamentos y perfiles de la Educación Media Básica*" (Initial contributions to discussion of the fundamentals and profiles of secondary education), which will serve as the basis for dialogue among stakeholders. The *Consejo de Educación Técnico Profesional* (CETP-UTU) also initiated a period of reflection regarding how to improve technical and vocational education and tertiary education, while the United Nations, together with the government initiated a programme entitled "*Programa Aportes para la elaboración de políticas educativas en Uruguay*", meaning "contributions for policy making in Uruguayan education".

In tertiary education, the Technological University of Uruguay (UTEC) opened in 2014 to provide relevant training for the production sector. Through its regional campuses the university will provide higher education outside the capital, thus complementing the expansion by the University of the Republic (Udelar) into the hinterland and the launch of the National Public Tertiary Education System (*Sistema Nacional de Educación Terciaria Pública*). Several programmes have sought to improve the development of professional education staff by providing better work conditions, remuneration and training. Around 40% of secondary-school teachers are not certified. The Education Training Council (*Consejo de Formación en Educación*) was recently created and discussions are under way regarding the possible launch of a university dedicated to training teachers.

METHODOLOGICAL NOTE: DEFINITION OF VARIABLES USED

General education: education programmes designed to develop students' general knowledge and their reading, writing and numeracy skills, often to prepare students for more advanced education programmes at the same or a higher level. These programmes are usually taught in schools. *Source:* UNESCO (2011), *International Standard Classification of Education (ISCED)*, 2011.

Vocational education: programmes that are designed mainly for learners seeking to acquire practical skills, know-how and the necessary understanding to work in a particular occupation or trade. Vocational education programmes may be offered in schools or in the workplace. Successful completion of these programmes gives students vocational qualifications that are suitable for the labour market and recognised by the corresponding national authorities. *Source:* UNESCO (2011), *International Standard Classification of Education (ISCED)*, 2011.

School-life expectancy: total number of years that a child can expect to spend in schooling from the moment they enter the education system. It assumes that the probability of a child being enrolled in school at any particular age is equal to the current enrolment ratio. The school-life expectancy indicates the average years of schooling, not the expected number of grades completed. *Source:* UNESCO Institute for Statistics (UIS), Education.

Government expenditure on education as a percentage of GDP: total current and capital expenditure on education by government (local, regional and central), expressed as a percentage of GDP, for each level of education. Total government expenditure on education includes additional expenses not specified in the tables and is therefore greater than the sum of the items specified. *Source:* UNESCO Institute for Statistics (UIS), Education.

Government expenditure per student as a percentage of GDP per capita: government expenditure per student for a given level of education as a percentage of GDP per capita. *Source:* UNESCO Institute for Statistics (UIS), Education.

Proportions of public and private expenditure on education: distribution of public and private sources of funds for educational institutions after transfers from public sources. *Source:* OECD *Education at a Glance* database, based on data from the joint UIS/OECD/Eurostat surveys.

Net enrolment rate: total number of students in the theoretical age group for a given level of education enrolled in that level, expressed as a percentage of the total population in that age group. *Source:* UNESCO Institute for Statistics (UIS), Education.

Net enrolment rate by level of education and socio-economic status: total number of students in the theoretical age group for a given level of education enrolled in that level, expressed as a percentage of the total population in that age group, classified according to five household income quintiles. For each country, the latest year with available data was used. *Source:* SEDLAC (SEDLAC and World Bank).

Gross enrolment ratio: number of students enrolled in a given level of education, regardless of age, expressed as a percentage of the official school-age population corresponding to the same level of education. For the tertiary level, the population

used is the 5-year age group starting from the official secondary-school graduation age. *Source:* UNESCO Institute for Statistics (UIS), Education.

Survival rate: number of students enrolled in a given level of education as a percentage of the number of students originally enrolled in the first grade of primary school. *Source:* UNESCO Institute for Statistics (UIS), Education.

Secondary-education performance: the country's average score in mathematics in the PISA 2012 tests. PISA scores are between 0 and 1000, with 41 points equal to one year of schooling. The results are classed into six proficiency levels. Students at Proficiency Level 1 (≥358 points) can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and to carry out routine procedures according to direct instructions in explicit situations. The average score of the Latin American countries that participated in PISA 2012 (Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay) is at this proficiency level. Only Chile scored better, with an average that just qualifies as Proficiency Level 2. At Proficiency Level 3 (≥482 points), students can execute clearly described procedures, including those that require sequential decisions. Their interpretations are sufficiently sound to be a base for building a simple model or for selecting and applying simple problem-solving strategies. They can handle percentages, fractions and decimal numbers, and work with proportional relationships. They engage in basic interpretation and reasoning. The average score of the OECD countries is at this proficiency level. *Source:* OECD, PISA 2012

Countries included in the LAC and OECD averages: the countries included in the Latin America and the Caribbean (LAC) and OECD groups depends on the database used. For the UNESCO database, the OECD region comprises 30 countries on average, and the LAC region 25 countries. Of the seven largest Latin American economies, Brazil is not included in the gross enrolment and survival indicators and Argentina is not included in the net enrolment in secondary education indicator. LAC averages from the SEDLAC database are calculated from data for 15 countries. Of the seven largest Latin American economies, Brazil is not included in the primary-education data and Venezuela is excluded in all three levels of education. Lastly, in the PISA 2012 database, the OECD average comprises all 34 member countries and the LAC average comprises eight countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay. Averages were calculated using the latest data available for each country, excluding figures from before 2009.

Classification of education levels: the classification used in this report is based on UNESCO's International Standard Classification of Education (ISCED). Updated in 2011, the ISCED is a tool for compiling education statistics that distinguishes between six levels of education, from pre-primary to tertiary. This classification includes education levels and fields (see table below).

Education levels

Level	Entry age	Nomenclature	Subcategories
Pre-primary education			
Initial level of instruction to introduce children to the school environment. Minimum entry age: 3 years.	Minimum age: 3 years	ISCED 0	
Primary education			
Designed to provide a sound basic education in reading, writing and mathematics and an elementary understanding of some other subjects.	Ages 5-7	ISCED 1	
Lower-secondary education			
Completes basic education, usually with courses and teachers that are more specialised	Ages 11-12, lasting three years. In some countries, the end of this level denotes the end of compulsory education	ISCED 2	2A prepares students to continue their academic education, and leads to level 3A 2B has a vocational focus, and leads to level 3B 2C provides training for direct access to the labour market
Upper-secondary education			
Greater specialisation than in lower secondary, with more highly qualified teachers. Students generally have nine years of prior learning up to and including the lower-secondary level.	Usually ages 15-16	ISCED 3	3A prepares students for university education at level 5A 3B prepares students for tertiary vocational training at level 5B 3C prepares students for the labour market or for ISCED 4
Post-secondary non-tertiary education			
Straddles the boundary between upper-secondary and post-secondary education. The content is not significantly more advanced than in upper-secondary education. The duration is between six months and two years of study. Students tend to be older than those in upper-secondary education.		ISCED 4	4A prepares students for entry to university and vocational tertiary education. 4B prepares students for entry into the labour market.
Tertiary education			
Type-A tertiary education		**ISCED 5A**	
Extensive theoretical basis to provide skills for entry into advanced research programmes and professions with high skills requirements. Duration: three to four years.			
Type-B tertiary Education		**ISCED 5B**	
Typically shorter than type A, with a focus on technical, practical and occupational skills for entry into the labour market. Minimum duration: two years			
Advanced research programmes		**ISCED 5C**	
Leading to an advanced qualification such as a PhD. Theoretically lasting three years, but enrolment usually lasts longer in most countries. A focus on original, advanced research.			

Source: OECD (2013), *Education at a Glance 2013: OECD Indicators*, OECD Publishing, Paris. Available at: http://dx.doi.org/10.1787/eag-2013-en.
UNESCO (2013), International Standard Classification of Education: ISCED 2011, UIS, Montreal. Available at: www.uis.unesco.org/Education/Documents/isced-2011-en.pdf

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The OECD is a unique forum where governments work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

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For more information on the Centre and its members, please see *www.oecd.org/dev*

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ECLAC is one of the five regional commissions of the United Nations. ECLAC was founded in 1948 for the purpose of contributing to the economic development of Latin America and the Caribbean, coordinating actions to promote that development and reinforcing economic ties among the region's countries and with other nations of the world.

Over the years, the institution's in-depth analysis of the region has taken the form of two main lines of action: economic and social research and the provision of technical cooperation to Governments. The Commission's ongoing concern for growth, technical progress, social justice and democracy has characterized the integral approach towards development that now forms part of the legacy of its rich intellectual tradition.

The 33 countries of Latin America and the Caribbean are member States of ECLAC, together with the United States, Canada, and several European and Asian countries that have historical, economic or cultural ties with the region. The Commission thus has a total of 44 member States. In addition, 12 non-independent Caribbean territories hold the status of associate members.

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Latin American Economic Outlook 2015

EDUCATION, SKILLS AND INNOVATION FOR DEVELOPMENT

The *Latin American Economic Outlook* is the OECD Development Centre's annual analysis of economic developments in Latin America. It is produced in partnership with the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) as well as CAF, development bank of Latin America. Each edition includes a detailed macroeconomic overview as well as an analysis of how the global context is shaping economic performance in the region. It also provides an in-depth analysis of a special theme related to development in Latin America, taking into account future strategic challenges and opportunities. Supplementary material is available on ***www.latameconomy.org***.

Contents

Chapter 1: Education, skills and innovation for a more dynamic, inclusive Latin America

Chapter 2: Latin American macroeconomic outlook

Chapter 3: Skills in Latin America and the Caribbean amid shifting wealth

Chapter 4: Education and skills for inclusive growth in Latin America

Chapter 5: Innovation for development in Latin America

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