Chapter 1

What's next on Chile's growth and development agenda?

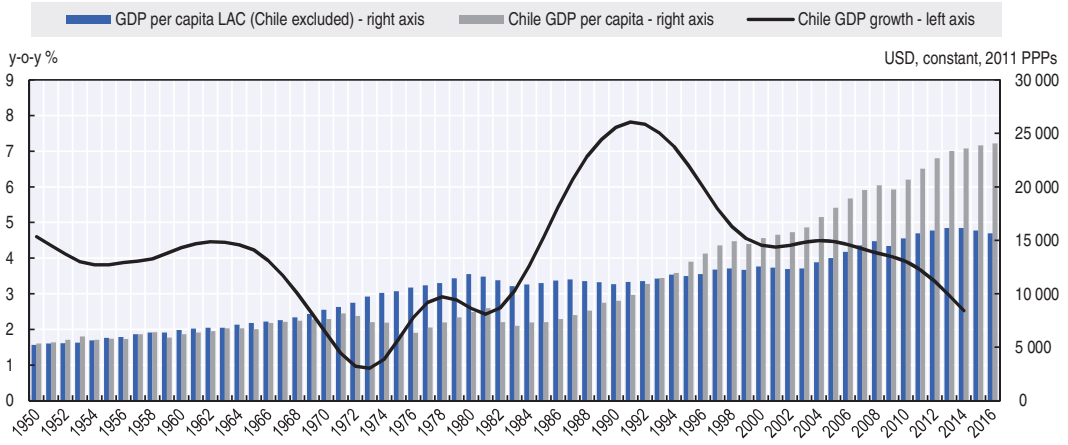
Chile has been growing in a sustained and relatively stable manner since the 1990s, thanks to effective macroeconomic management and its open economy. Today the Chilean model requires an "update" if it is to capture the gains offered by global technological and geopolitical changes and to meet the aspirations of its growing middle classes. Finding new sources of growth and broadening its economic base will be crucial for achieving shared prosperity. This chapter reviews Chile's economic transformation and identifies four structural weaknesses that will need to be overcome to benefit from the window of opportunity opened in today's global context.

Chile is a relatively stable, open and highly connected economy

Chile's economic growth has been sustained and relatively stable since the 1990s. Effective macroeconomic management has insulated Chile from the more volatile growth patterns of other Latin American countries. It has outperformed other economies in the region, overturning the persistent income per capita gaps of the 1980s. For example, its average gross domestic product (GDP) per capita is 40% higher than the Latin American average (Figure 1.1). Chile's performance has also allowed it to converge with more advanced economies in terms of income per capita: while Chile's average GDP per capita was only 26% of that of the United States in 1990, it reached 40% in 2016 (in 2016, Chile had an average GDP per capita of USD 24 000 in purchasing power parity in 2011 constant prices; Figure 1.1).

Figure 1.1. **Chile's GDP growth and GDP per capita**

Annual GDP growth rate (HP filter, left axis) and GDP per capita (right axis), 1950-2016



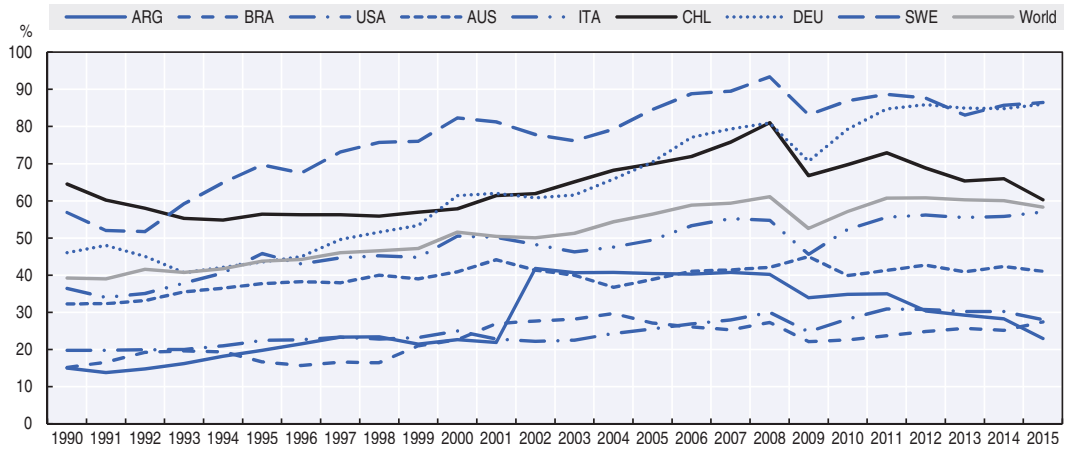
Note: GDP: gross domestic product; LAC: Latin American countries; y-o-y: year on year; PPP: purchasing power parity; HP: Hodrick Prescott Filter. The Lambda in the Hodrick Prescott filter has been chosen according to OECD (2016a), OECD Compendium of Productivity Indicators 2016, http://dx.doi.org/10.1787/pdtvy-2016-en.

Source: Authors' analysis based on the Conference Board (2017), Total Economy Database™ (Adjusted version), https://www.conference-board.org/data/economydatabase/index.cfm?id=27762.

Chile is an open economy. In 2016, total trade amounted to 60% of GDP. This figure is higher than for other countries in Latin America, such as Argentina (where trade as a share of GDP is 24%), and other natural resource-rich countries such as Australia (where trade amounts to 41% of GDP). Yet Chile's performance lags behind economies such as Sweden and Germany, where overall trade amounts to 86% and 84% of GDP (Figure 1.2). Central to Chile's positive growth performance has been the implementation of open trade and investment policies, co-ordinated by the General Directorate for International Economic Affairs (DIRECON). Chile has been a World Trade Organization (WTO) member since 1995, and has 21 free trade agreements in force, including with the European Union (2003), the United States (2004), the People's Republic of China (2006) and Japan (2007). The country also has five preferential trade agreements with Bolivia, Ecuador, India, Venezuela and the Mercosur custom union. The extensive trade network has led to an applied tariff of 0.93%. In 2000 Chile abandoned the floating exchange rate regime and introduced inflation targeting as its main monetary policy objective. Increasing liberalisation in the services sector has also played a role in sustaining growth by facilitating access to foreign upstream service providers and, in turn, improving the competitiveness of Chile's exports. Nowadays, Chile has a lower score than the OECD average in 18 out of 22 sectors in the OECD Services Trade Restrictiveness Index, signalling its above-average openness with respect to other OECD countries (OECD, 2017a; UNTAC, 2016).

Figure 1.2. **Chile is a very open economy**

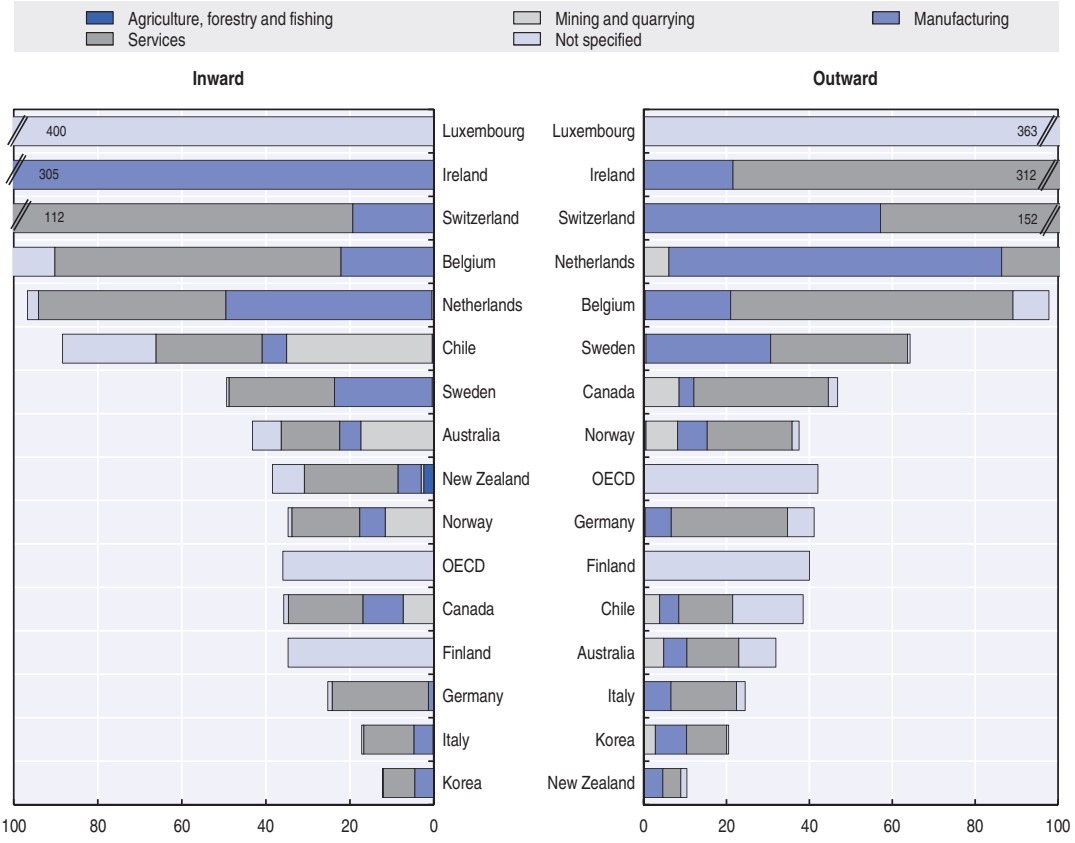
Trade as % of GDP, selected economies, 1990-2015



Source: Authors' analysis based on World Bank (2017), National Accounts Data, https://data.worldbank.org/indicator/NY.GDP.MKTP.CD; and OECD (2017e), National Accounts Data, http://stats.oecd.org.

Figure 1.3. **Chile is among the top economies for its share of FDI stock**

FDI as % of GDP by economic activity, top three and selected economies, 2015



Note: Data refer to 2015, or latest available year. Foreign direct investment (FDI) data exclude resident Special Purpose Entities (SPEs) with the exception of Australia, Canada, Chile and Ireland. Inward and outward FDI positions as a share of GDP are calculated using GDP at current prices and current exchange rates. Not Specified: For Luxembourg, Finland and aggregate OECD breakdown by sectors is not available.

Source: Authors' analysis based on OECD (2017f), International Direct Investment statistics, http://stats.oecd.org; and OECD (2017e), National Accounts Data, http://stats.oecd.org.

The opening up of the economy since the 1990s has encouraged foreign direct investment (FDI) into the country, especially in capital-intensive activities such as mining. In 2015, Chile's inward stock of FDI was among the highest in the OECD (around 80% of GDP). This figure is well above the OECD average of 40% and of similarly sized economies. The only OECD economies that outperform Chile are those specialised in services, including banking, such as Luxemburg, Switzerland, Belgium and the Netherlands (Figure 1.3). In 2015, Spain was the main investor in Chile, representing 12% of the total FDI stock, followed by the Netherlands, US and Japan (with 11%, 11% and 6%, respectively). FDI to Chile is not very diversified, with mining accounting for 40% of total stock of FDI (Figure 1.3).

New global and local challenges present a window of opportunities to Chile

The Chilean model requires an "update" if it is to continue to be successful. On the one hand, Chilean society – with its growing middle class – is demanding more opportunities for the youth, and access to new services. The traditional, highly concentrated export-led model will struggle to deliver these. Matching the aspirations of an inclusive society requires adjusting the model, and finding new sources of growth to broaden society's participation in the economy and achieve shared prosperity. The youth are calling for free and better university education to ensure better prospects for all in the future. Chilean society has become more vocal in the last decade and is calling for trust to be rebuilt between large companies and citizens. Addressing these new demands for accountability and inclusiveness will be an essential component of the country's new growth and development agenda.

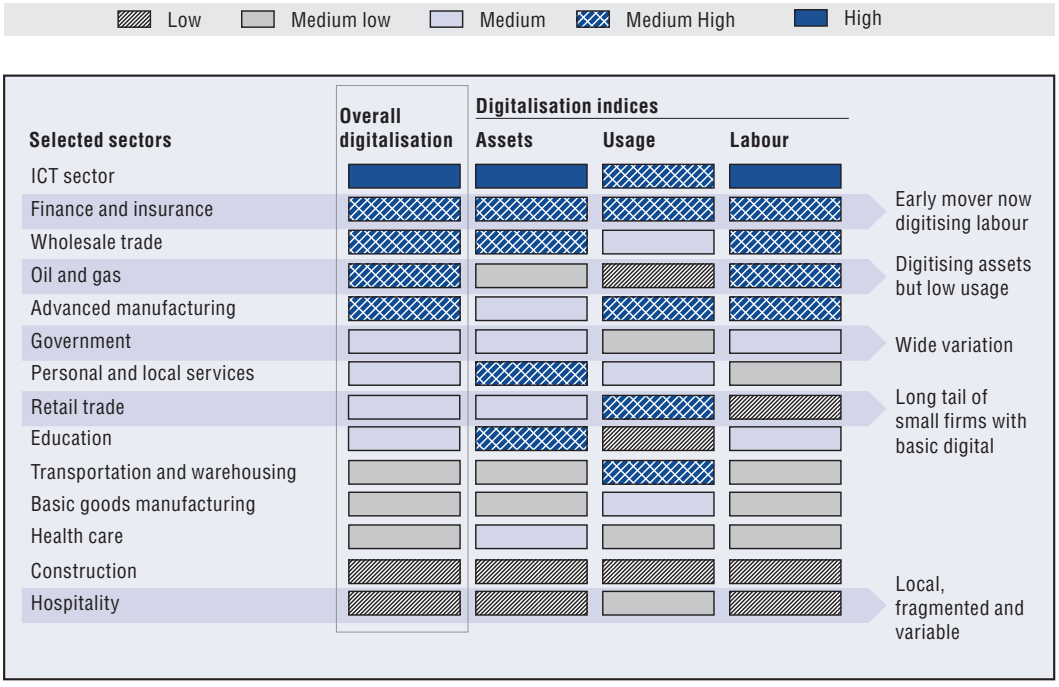
At the same time, the demand for more sustainable products and services is increasing globally. Greening the economy and developing inclusive and socially responsible businesses will be key drivers of competitiveness in the future (ECLAC, 2016). The global demand for sustainability limits the degree to which the current model can expand, but at the same time opens up new opportunities for Chile to partner with global players and identify new and sustainable solutions, for example to green the mining industry. The call for environmentally sustainable and "green" products and services could help to transform the Chilean economy, offering opportunities for innovative domestic entrepreneurs and research centres to generate new business opportunities along the whole value chain. This is true of traditional activities such as mining and agro-food, as well as in new enabling knowledge-based areas, including biopharma, solar energy, nanotechnology, big data and others. For example, solar energy widens business prospects to new, globally dynamic areas such as hydrogen, which has the potential to become one of the major future non-fossil fuels for industrial applications (for more information see Chapter 3). Through solar energy, hydrogen could be produced with almost zero environmental impact from renewables-based electrolysis at costs similar to those of traditional steam methane reforming or coal gasification technologies. This is an area of intense and growing technological research. For example, Eon's pilot plant in Germany is using renewable energy to produce hydrogen, which is then injected into the natural gas transmission system (IEA, 2017).

Global demand for lithium is expected to increase as its potential applications span many globally dynamic industries, especially those linked to electric-powered vehicles. Chile also hosts the largest world reserve of lithium (7.5 million of tonnes), corresponding to 52% of the world reserves. Electric cars require lighter inputs and more efficient and longer-lasting batteries. This is expected to increase the demand for lithium and for new solutions to generate energy from it. Currently, the global demand for electric vehicles is rising. In 2016, a record 750 000 electric cars were sold worldwide (IEA, 2017). Estimates

suggest that the future global stock of electric cars will range between 9 and 20 million by 2020 and between 40 and 70 million by 2025 (IEA, 2017). Chile hosts the world's largest reserve of the metal at 7 500 000 metric tons (Mt), or 37% of total reserves. It is the second biggest world producer of lithium after Australia, with 12 000 Mt produced in 2016. Chile exports 70% of its high-grade lithium carbonate to China and Korea. Drawing on its natural resource asset and activating international partnerships to enter into more sophisticated parts of the battery value chain could enable Chile to increase the benefits from natural resources and to avoid being locked out from the experimentation and learning processes that are currently occurring. Being involved in the global research on lithium could enable Chile to combine the advantages of exploiting natural resources with upgrading in the value chain by participating in research and development (R&D) activities. This would increase the value capture for the economy by enabling Chile to upgrade its participation in global value chains (GVCs) from purely being a natural resource provider to being an innovation driver. Even though lithium processing has increased threefold in the past five years, the value share of lithium in the final value of a battery ranges between 1% and 3% of the total battery value added (depending on the design).

Figure 1.4. **Digitalisation is affecting all aspects of businesses, but at different speeds**

The Industry Digitisation Index of US industries, 2017



Note: The MGI Industry Digitization Index examines sectors across the economy through the lens of digital assets, digital usage, and digital workers, compiling 27 indicators to capture the many possible ways in which companies are digitizing. To measure digital assets the index considers business spending on computers, software, and telecom equipment, as well as the stock of ICT assets, the share of assets such as robots and cars that are digitally connected and total data storage. Usage metrics include an industry's use of digital payments, digital marketing, and social technologies, as well as the use of software to manage both back-office operations and customer relationships.

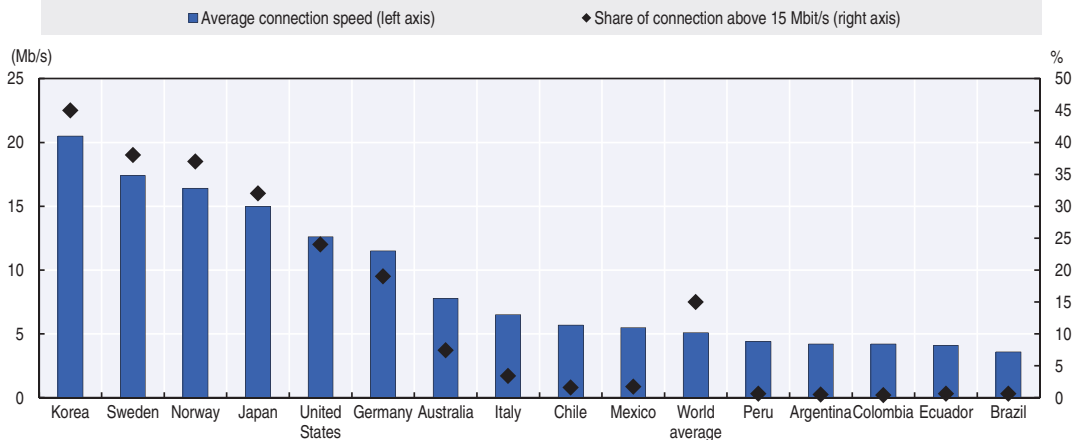
Source: Reames (2017), "Digital economy: snapshot of where we are today", McKinsey Institute presentation at the 9th Plenary Meeting of the OECD Initiative for Policy Dialogue on Global Value Chains, Production Transformation and Development.

The increasing demand for sustainability in business, coupled with the diffusion of new manufacturing techniques, big data and the internet of things (IoT), can help to increase productivity, and enhance innovation and learning (Cimoli et al, 2017). The current global landscape is characterised by the high-speed convergence and multiplicity in technologies and applications, transforming every aspect of the economy and of society. New technologies are changing the nature of manufacturing processes, service delivery and job creation. They will also have far-reaching consequences for employment, skills, income distribution, trade, well-being and the environment (OECD, 2017b). New technologies can increase productivity and enable the creation of new businesses. The technological complementarities and the simultaneous adoption of new technologies can have multiple impacts on productivity. In mining, for example, autonomous trucks could increase output by 15-20%, lower fuel consumption by 10% to 15% and reduce maintenance costs by 8% (OECD, 2017c). New technologies are affecting different industries in different ways and at different speeds, however. Figure 1.4 gives a United States example, where output and productivity for firms that adopt data-driven decision making are 5% to 6% higher than expected.

Structural weaknesses could hamper future progress

Exploring opportunities and synergies in solar, mining and electro-mobility could be a game changer for Chile, allowing it to be part of the next production revolution. However, there are two major agendas to be pursued if this is to occur. Firstly, the country needs to urgently close gaps in key enabling areas, especially in those that will determine the possibility of participating in the next production revolution. A major issue is linked with ensuring a resilient, redundant and high-speed Internet connection (Figure 1.5). A high-performing digital infrastructure is essential to fully reap the benefits of the digital era. Chile has increased the use of the Internet (the number of fixed and wireless broadband subscriptions per 100 inhabitants is 16 in 2017 compared to only 9 in 2008), but it still lags behind the frontier in terms of connection speeds. Chile's average broadband connection speed is 5 megabytes per second (Mb/s), four times slower than in Korea. Moreover, only 2% of broadband connections in Chile operate faster than 15 Mb/s, while in Sweden, Norway and Korea the share is above 35%.

Figure 1.5. **Chile lags behind in Internet connection speed, 2015**



Note: Mb/s: megabytes per second.

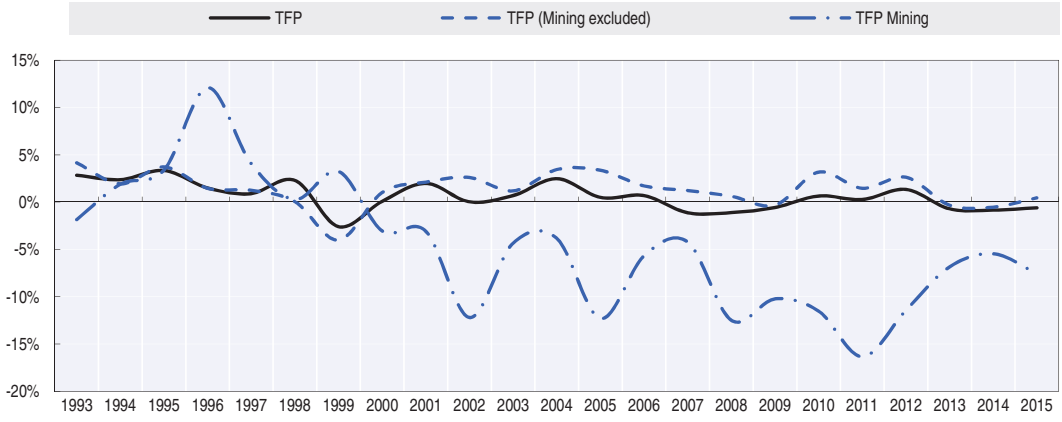
Source: Authors' analysis based on Akamai (2017), "State of the Internet report, 2017", https://www.akamai.com/us/en/about/our-thinking/state-of-the-internet-report.

Secondly, the country needs to address some structural weaknesses that are hampering future inclusive and sustainable growth. There is no unique formula for taking advantage of the opportunities offered by the global landscape and to respond to the growing domestic demands for sustained progress, but there are some gaps that need to be closed to enable a positive transition and sustain the country's path towards prosperity. These include the productivity and skills required to operate in the new industrial ecosystems, and a narrow learning and production base. Addressing these structural weaknesses will help to strengthen the Chilean economy by opening up new opportunities for learning and upgrading and by increasing its interconnectedness, regionally and globally. Advancing in this direction will enable the economy to better anticipate future options, adapt to changing global circumstances and increase the value capture for the whole economy and society.

Higher productivity will be needed to compete in global markets

Chile faces a structural problem in terms of productivity growth. The total factor productivity (TFP) of the economy has remained stagnant since the beginning of the 1990s, mostly stemming from mining, where TFP dropped by 4.7% on average every year between 1993 and 2015 (Figure 1.6). The decline has also been linked to a decline in copper ore grades, forcing mining to shift underground and demanding that producers process more ore for the same quantity of refined copper (for more information see Chapter 3 of this report). A misallocation of factors of production, a higher level of employment in low productive and non-tradable activities, and the lack of efficiency within activities have also contributed to a slowdown in TFP. The negative contribution of TFP from the mining industry threatens Chile's path to sustainable growth and prosperity and may start to reverse the convergence in income per capita that Chile has experienced in recent decades with more advanced countries (Figures 1.6 and 1.7). This reinforces the importance of policies for economic transformation.

Figure 1.6. **Total factor productivity growth in Chile, 1993-2015**

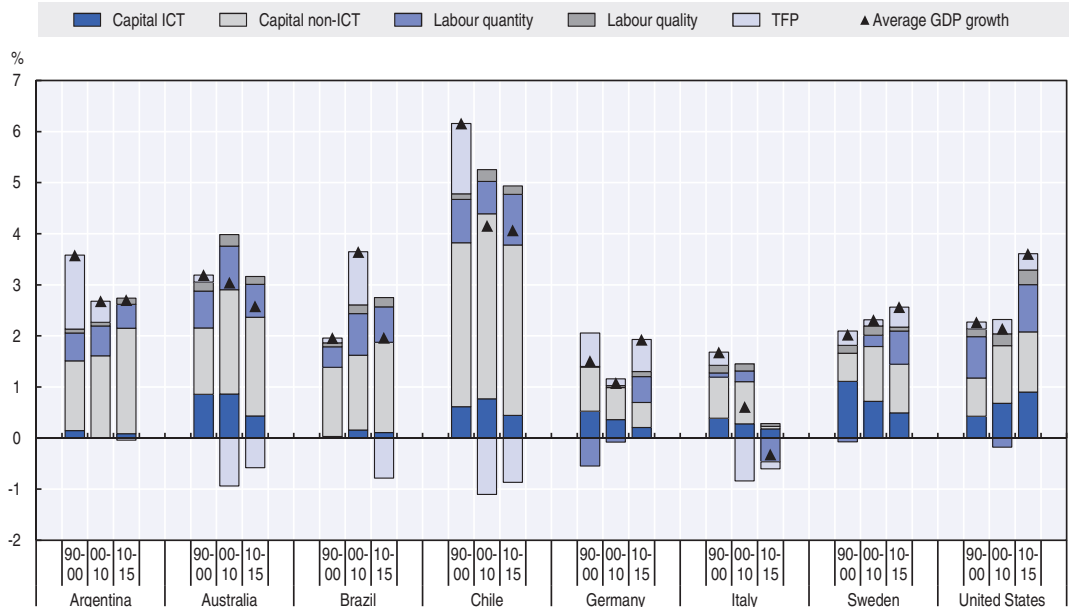


Source: Authors' analysis based on data from UAI/CORFO (2017), "Boletín trimestral Evolución de la PTF en Chile" (Quarterly Evolution of the TFP in Chile).

Most workers in Chile are employed in sectors that have low productivity and contribute little to GDP (Figure 1.8). Natural resource-intensive activities face a limit in terms of labour absorption, because of the characteristics of the production process and the move towards automated mining. Therefore, diversifying the economy by generating business opportunities for suppliers in related economic activities, and by enabling business development in new areas, would help to sustain growth and employment.

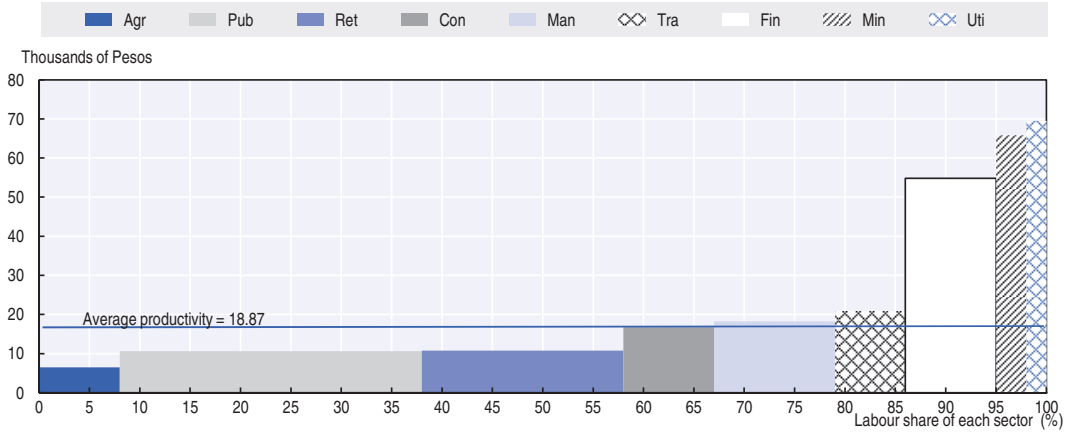
Figure 1.7. **Chile's growth is being held back by low total factor productivity**

Average percentage point contributions of factors to GDP growth, selected countries, 1990-2015



Source: Based on the Conference Board (2017), Total Economy Database™ (Adjusted version), https://www.conference-board.org/data/economydatabase/index.cfm?id=27762.

Figure 1.8. **Production structure and labour productivity gaps in Chile, 2015**



Note: Agr: agriculture; Pub: public administration; Ret: wholesale and retail; Con: construction; Man: manufacturing; Tra: transport; Fin: financial services; Min: mining; Uti: utilities.

Source: Authors' analysis based on ILO (2017), "ILO labour statistics", ILOSTAT, http://www.ilo.org/ilostat; and Central Bank of Chile (2017), http://www.bcentral.cl/en/web/central-bank-of-chile/statistics1.

Despite progress, the learning and knowledge base is still limited

There is increasing recognition that for sustained economic growth countries need to reduce the dependency on natural resources and invest more in innovation as a means of driving multi-factor and labour productivity growth across all sectors and as a driver of growth in new high value-added activities (ECLAC, 2016).

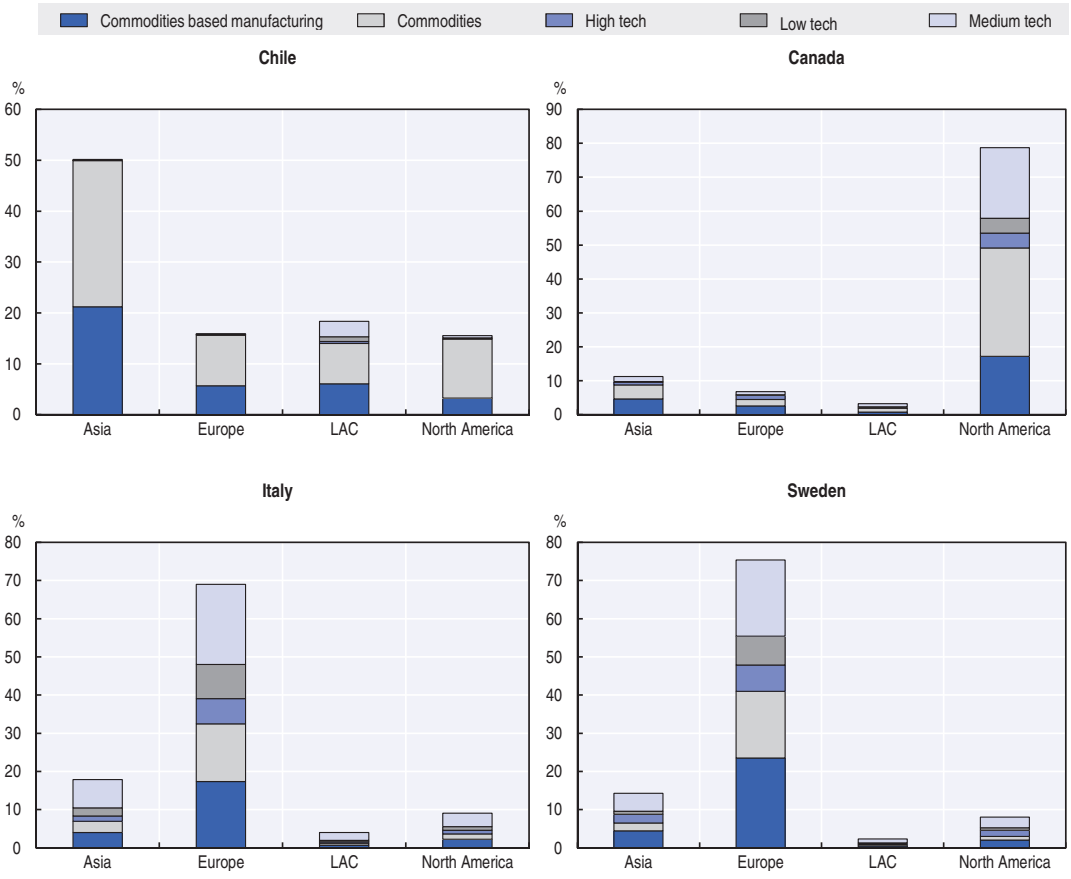
Since the 1960s, Chile has been progressively diversifying its export base. Mining still accounts for 52% of Chilean global exports, but the share is significantly lower than in the 1960s, when mining represented 80% of Chilean exports. Three main drivers of this diversification process can be identified:

4. The opening of the economy since the 1970s. This has facilitated exports, brought in FDI and created opportunities to learn from foreign companies. In the 1970s the country levelled import taxes to a single tariff, and since then has progressively reduced the tariff on multiple occasions. Today it applies a most favoured nation uniform tariff of 6%. Nevertheless, the investment in non-traditional export activities has remained below expectations. Over the years democratisation and the development of the financial system have helped to lower risk and encourage productive investment. In the 1990s, the country embarked on a liberalisation programme through an active trade policy directed by the Ministry of Foreign Trade through the General Directorate for International Economic Affairs (DIRECON), which facilitated exports and attracted FDI through non-discriminatory policies and state guarantees.
5. Public investment in the provision of public goods. Since the 1960s, Chile has strengthened the public institutions in charge of economic development. For example, the Chilean Economic Development Agency (CORFO), founded in 1939, has invested in infrastructure and human capital since its inception. CORFO initiatives have seen exports of fruits being sustained since the 1960s by the Fruit Plan, which invested in the provision of public goods such as sanitary surveillance and training. Human capital development was supported by fostering learning from international peers, for example through the Chile-California programme that enabled the development of agronomic schools in Chilean universities.
6. The capacity of public institutions to scan what is happening in more advanced countries. Chilean institutions have invested in learning from the experience of other countries, promoting co-operation programmes focusing on technology transfer, and implementing targeted policies for catching up, including export promotion for small and medium-sized enterprises (SMEs) through the Chilean Agency for Exports Promotion (PROCHILE). Foundation Chile, a public-private institution set up in 1976 to promote business activities, has scanned what was happening abroad and has been effective in bringing international experiences to Chile, including from the salmon industry in Scotland and Norway, and forestry in Finland – focusing on connecting science and business.

Nevertheless, the Chilean economy remains only modestly diversified (Figure 1.9). Its exports are mostly concentrated in natural resource-based and primary products, characterised by relatively low levels of sophistication and poor linkages with the rest of the economy (Chapter 3). Furthermore, 51% of Chile's exports are concentrated in China, the United States and Japan (Figures 1.10 and 1.11). Any contraction in demand by these countries could severely affect the entire economy.

Figure 1.9. **Commodities make up a high share of Chile's exports**

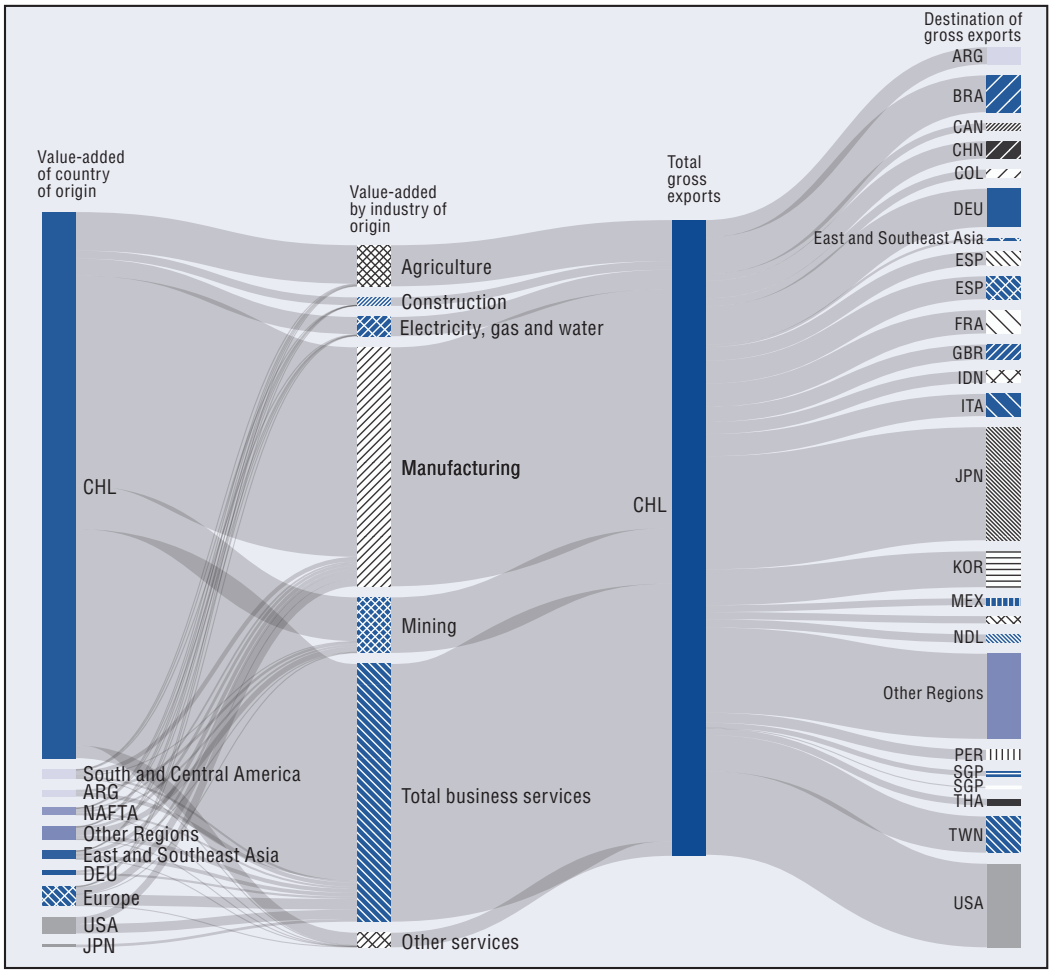
Share of gross exports by technology content towards selected regions, Chile and selected countries, 2016



Notes: LAC: All Latin American and Caribbean countries.
The technological classification follows Lall, S. (2000) and Aboal et al (2015).
Source: Authors' analysis based on UN (2017), Comtrade Database, https://comtrade.un.org.

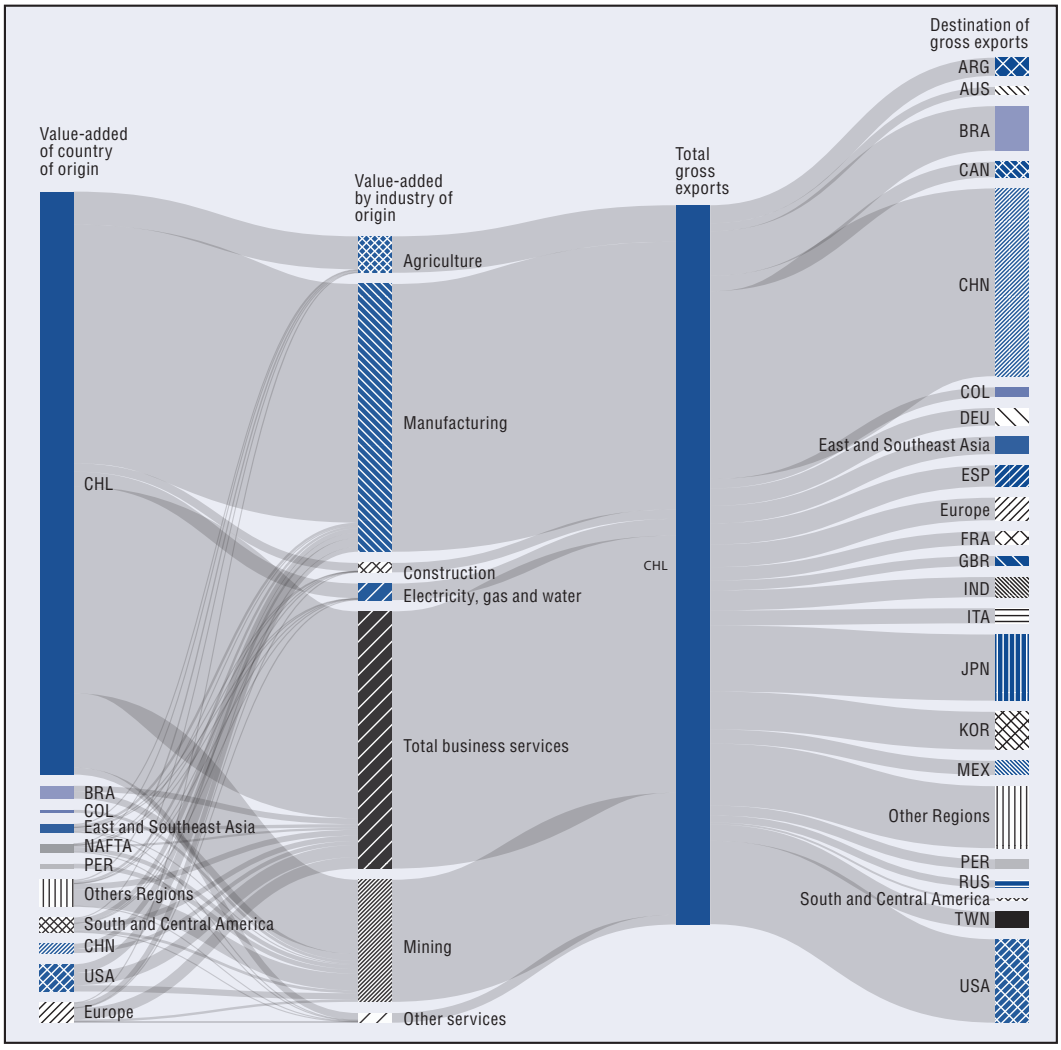
In mining, the shift towards extraction has intensified during the last 20 years. Between 1995 and 2014 China became the top export destination market for Chile (Figures 1.10 and 1.11), increasing its share in Chile's exports from 2% to 27%. A deeper look at the composition of trade in value added shows that the relative importance of mining increased, with copper ore increasing from 12% of exports to 21%. Meanwhile, refined copper remained stable, at around 23% of total exports. The growing specialisation in extraction and the consequent reduction in smelting and refining help to explain this pattern In fact, imports of smelting and refining products from China expanded five-fold between 2000 and 2015 (see Chapter 3).

Figure 1.10. **Decomposition of Chilean gross exports by origin and destination, 1995**
Value added of exports by origin and destination (%)



Note: Regional aggregates exclude member countries reported in the graph.
Source: OECD (2017d), TiVA Nowcast Database, http://stats.oecd.org/Index.aspx?DataSetCode=TIVA_NOWCAST.

Figure 1.11. **Decomposition of Chilean gross exports by origin and destination, 2014**
Value added of exports by origin and destination (%)



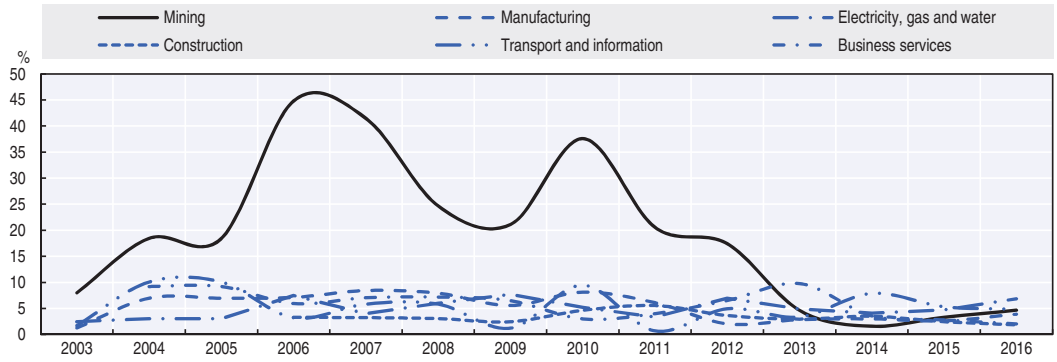
Note: Regional aggregates exclude member countries reported in the graph.
Source: OECD (2017d), TiVA Nowcast Database, http://stats.oecd.org/Index.aspx?DataSetCode=TIVA_NOWCAST.

Chile accounts for over one-third of the world's total copper reserves, and is among the top three producers of lithium. Mining will certainly be an important driver of growth and development in the future. However, there is a debate on the possibility – and the need – for the country to shift gears towards a new development model that builds on its natural resource assets to enable a more learning and knowledge-intensive development model (ECLAC, 2013). Achieving successful diversification in Chile would not mean dismissing mining, but instead transforming it and making it more productive. For example, the number of workers per unit of output in mining is three times higher in Chile than in Sweden. There are also opportunities to create the conditions for mining to become a learning platform for other industries and for new capabilities (such as solar and digital technologies), and to identify ways to enable the creation of new firms and develop new activities benefiting from global opportunities, unique local assets and new technologies.

The debate surrounding diversification is, of course, not new to Chile. The issue of diversification and the need to shift to a new development model surfaced in the political and economic debate at the end of the 1990s (Fajnzylber, 1990; Solimano, 2012; Ffrench-

Davis, 2010). However, it never became "the" key issue for the country's development because of an established policy approach that placed a premium on market forces as drivers of transformation. A booming mining sector, sustained by a growing Chinese appetite for raw materials and sound macroeconomic management, ensured high and stable economic growth over a long period of time. Coupled with more recent targeted policies to improve citizen well-being, the Chilean model was seen as a winning card, limiting the appeal of more transformative changes. In addition, the boom in copper prices in the mid-2000s significantly increased the profitability of mining, sustaining economic growth, but limiting the incentives to invest in other activities (Figure 1.12) (Correa and Stumpo, 2017).

Figure 1.12. **Return on assets (ROA) of biggest companies in Chile, 2003-16**



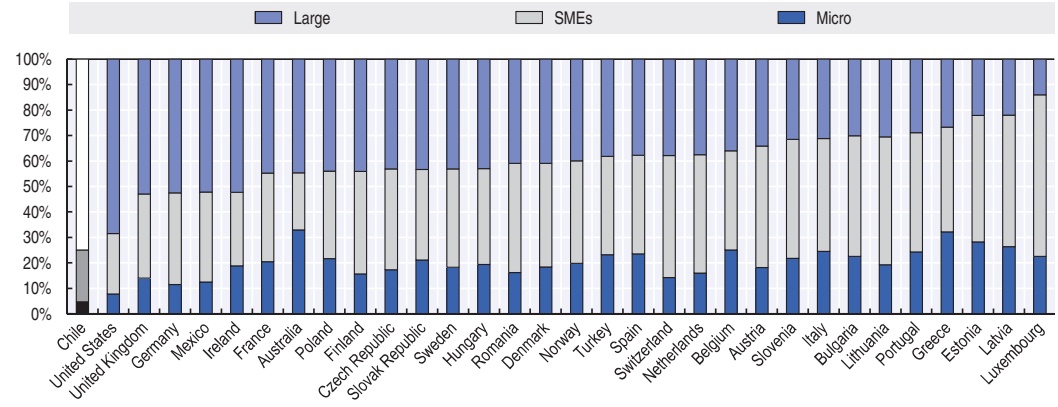
Note: Biggest companies are defined as the 500 largest companies in the region according to sales in each year, and includes state-owned, private national and private foreign companies that operates in the region, excluding the financial sector.

Source: Authors' analysis based on data from América Economía (2017), "Rankings", https://www.americaeconomia.com/rankings.

The limited diversification of the economy leaves Chile vulnerable to external shocks. Fluctuations in cooper prices have a major effect on the economy, despite effective mechanisms to maintain macroeconomic stability through the creation of the stabilisation fund in 2007 that manages the sourced from surplus revenues from Chile's copper exports. They also affect business and citizen perceptions, limiting pro-innovation, risky and long-term investments. In addition, specialisation patterns in Chile are associated with a highly concentrated economic structure. In 2015, large firms accounted for around 75% of turnover, SMEs for 20%, and microenterprises for 5% (Figure 1.13). Yet the contribution of large firms to total business R&D is only 57% (Figure 1.14).

Figure 1.13. **Large firms play a dominant role in Chile's economy**

Share of total turnover in business activities by firm size, selected countries, 2015

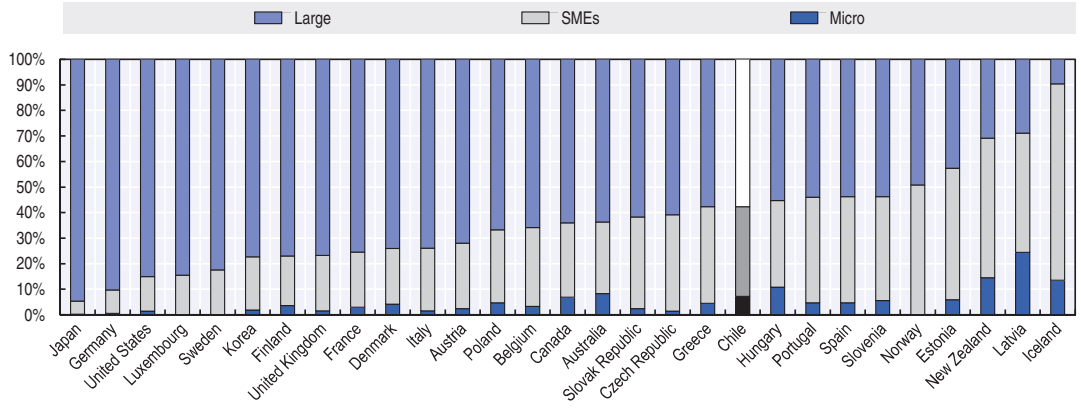


Note: Business activities comprises ISIC 4.0 Div 5-90.

Source: Authors' analysis based on OECD (2017g), *Structural and Demographic Business Statistics database*, http://stats.oecd.org; and SII (2017), "SII statistics and studies", www.sii.cl/estadisticas.

Figure 1.14. **Business enterprise R&D expenditure by firm size, 2015**

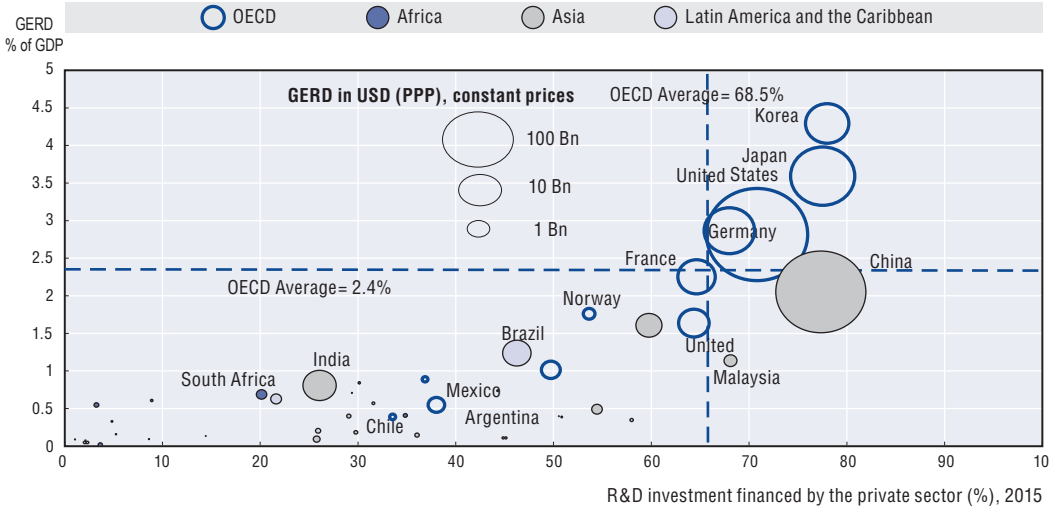
Share of total business R&D expenditure by firm size, 2015



Source: Authors' analysis based on OECD (2017h), *OECD Science, Technology and Patents Database*, http://stats.oecd.org.

The limited innovation effort of large firms and the country's economic specialisation help to explain why Chile still lags behind frontier countries in terms of innovation and technological capabilities. With roughly USD 1.2 billion of gross domestic expenditure on research and development (GERD) (0.39% of GDP), Chile has one of the lowest R&D intensities of all OECD countries (Figure 1.15). Moreover, the private sector's contribution -at 33% of total R&D expenditure- is significantly below the OECD average of around 68% (Figure 1.15). Innovation output, particularly among SMEs; the quality of scientific publications; and science-industry collaboration patenting activity per capita are also well below most OECD countries (OECD, 2018). Recent studies on Chile suggest that the propensity for firms to co-operate is lower than in other OECD countries (OECD, 2013a; UNCTAD, 2017) and that the absorption of external knowledge increases the probability of developing R&D activities (González and Cristian, 2017).

Figure 1.15. **Public and private investment in R&D in Chile remain below average, 2015**



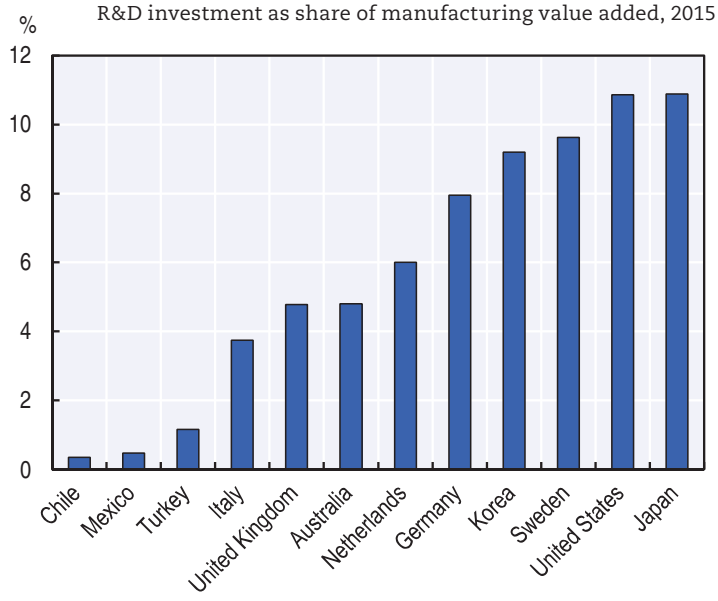
Note: GERD: Gross domestic expenditure on research and development.

Source: OECD (2016e), "Main science and technology indicators", http://oe.cd/msti; RICYT (2015), *Red de Indicadores de Ciencia y Tecnologia* (database), www.ricyt.org; UNESCO (2016), *Institute for Statistics Database*, http://data.uis.unesco.org.

The scant innovation propensity is particularly evident in manufacturing. Chilean manufacturing firms invest only 0.4% of their gross value added in research and

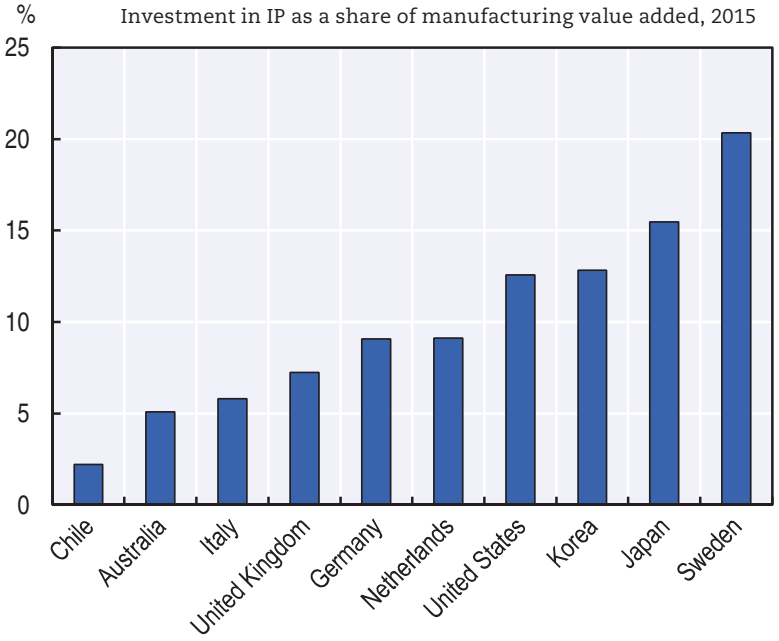
development, which compares poorly to the 5% invested by Australian manufacturing firms, for example (Figure 1.16). Similar patterns emerge even when looking at broader measures of innovation, such as investment in software and other intellectual property products as defined in the 2008 System of National Accounts (Figure 1.17).

Figure 1.16. **Chile's manufacturing sector invests little in R&D**



Source: Based on OECD (2017e), National Accounts Data, http://stats.oecd.org/; and OECD (2017i), Structural Analysis Statistics (TAN) Database, http://stats.oecd.org.

Figure 1.17. **Manufacturing investment in intellectual property (IP) products, 2015**



Note: Intellectual property products refer to the fixed capital formation (investment) in R&D and other IP products such as software and databases.
Source: Based on OECD (2017e), National Accounts Data, http://stats.oecd.org/.

There is room to maximise the gains from participation in the global economy

Chile is integrated into global value chains, but mostly as a commodity producer (Box 1.1). The country mostly provides inputs (raw materials, copper and lithium) that are then embedded in other countries' exports. The domestic value added embodied in foreign exports is 30% and the foreign value added embodied in domestic exports is 20% (Figure 1.18). China accounts for the largest part of Chile's upstream activities, with 9 USD billion of Chilean value added embedded in Chinese exports (Figure 1.19). The United States, with 3.21 USD billion embedded in Chilean exports, is the main provider of intermediary inputs to the country.

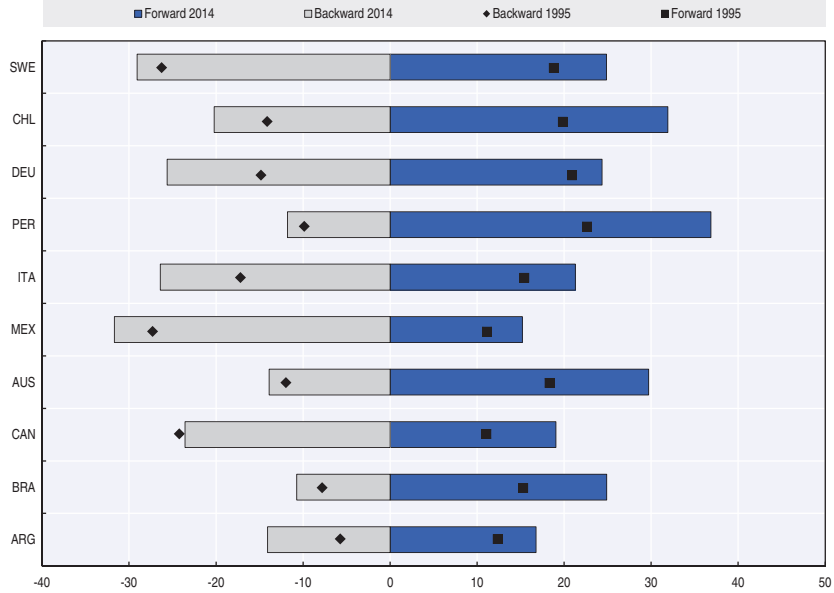
Box 1.1. **Understanding global value chain participation**

A country's participation in GVCs is measured by the foreign content of domestic exports and the domestic content embedded in foreign exports. It is mostly determined by the size of the economy, the distance from final markets and the relevance of natural resource endowments in countries' exports. For example, small open economies rely more on imported inputs and also produce more inputs for other countries' exports. This can be described as having larger "upstream" or "forward" participation in GVCs. The foreign content of a country's exports indicates the relevance of foreign goods and services embodied in domestic exports; in general, a relatively high share indicates that the country participates in GVCs and that it is specialised in downstream activities. A country's participation in GVCs can also be measured by the domestic value added embodied in foreign exports, thus indicating the extent to which the country is providing inputs to other countries' production processes.

Source: OECD (2013b), *Interconnected Economies: Benefiting from Global Value Chains*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264189560-en.

Figure 1.18. **Chile's participation in global value chains**

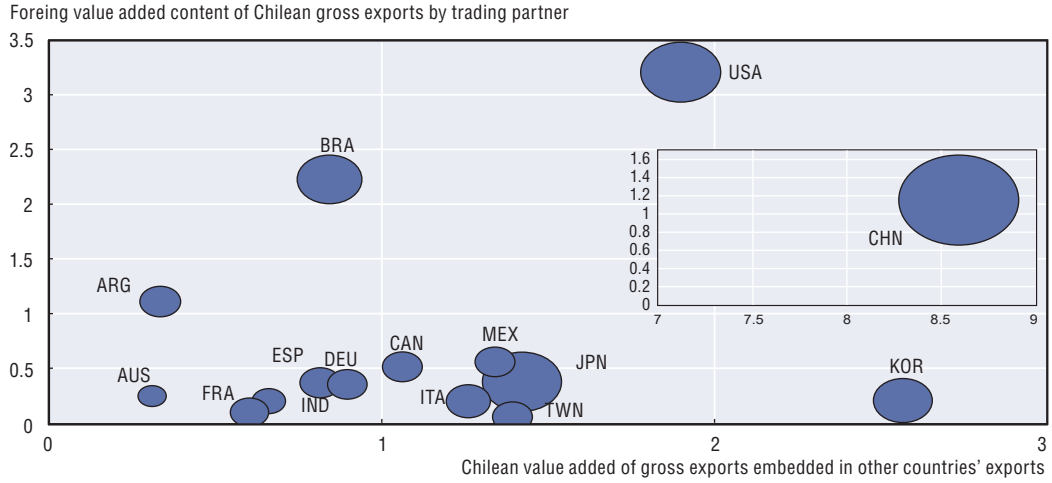
Foreign value added embodied in domestic exports (backward) and domestic value added embodied in foreign exports (forward), as % of total gross domestic exports, 1995 and 2014



Source: Authors' analysis based on OECD-WTO (2017), Trade in Value Added database, http://stats.oecd.org.

Figure 1.19. **GVC participation by partner country, Chile, 2014**

Billion USD



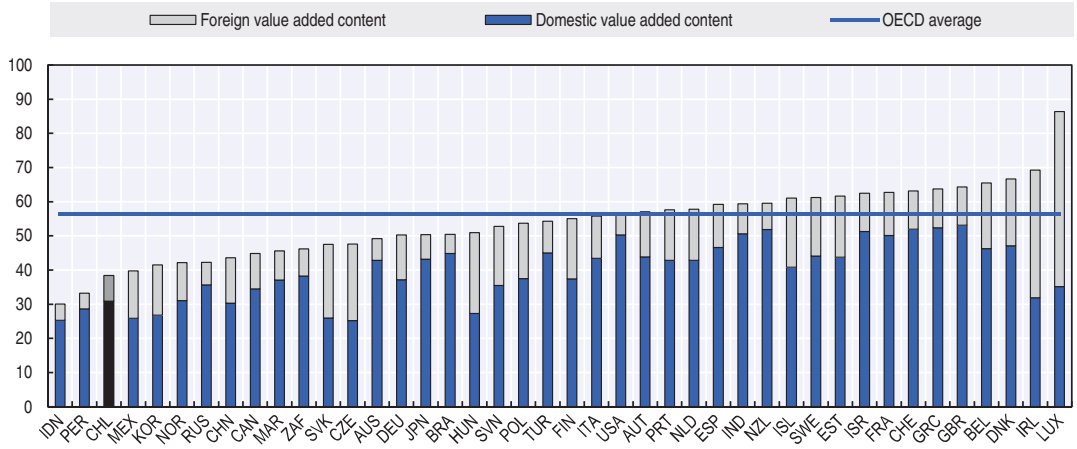
Note: Bubble size represents the share of Chilean exports to that country. Only countries that account for at least 2% of Chile's exports are displayed.

Source: Authors' analysis based on OECD-WTO (2017), Trade in Value Added database, http://stats.oecd.org.

Chile has the potential to benefit more from its openness and improve its participation in GVCs by seeking opportunities beyond mining, including in services. In 2014 the services value-added content of Chile's total exports was 38.4%, below the OECD average of 55.5% (Figure 1.20). This in large part reflects the country's relative specialisation in mining activities, which typically have lower services content than other activities. However, even looking at shares within sectors, Chile lags behind the OECD average in a number of activities (Figure 1.21 and see Chapter 3). Another channel for improving participation would be to activate learning in domestic firms and research centres and capitalise on knowledge spillovers and technology transfer offered by enhanced foreign partnerships and foreign direct investment (Box 1.2) (UNCTAD 2015). This could also help domestic SMEs to participate more in GVCs. In Chile, only 10% of SMEs are involved in export activities, one of the lowest shares in the OECD (OECD, 2018; UNCTAD/GDS/ECIDC, 2015).

Figure 1.20. **Services content of gross exports, Chile and selected countries, 2014**

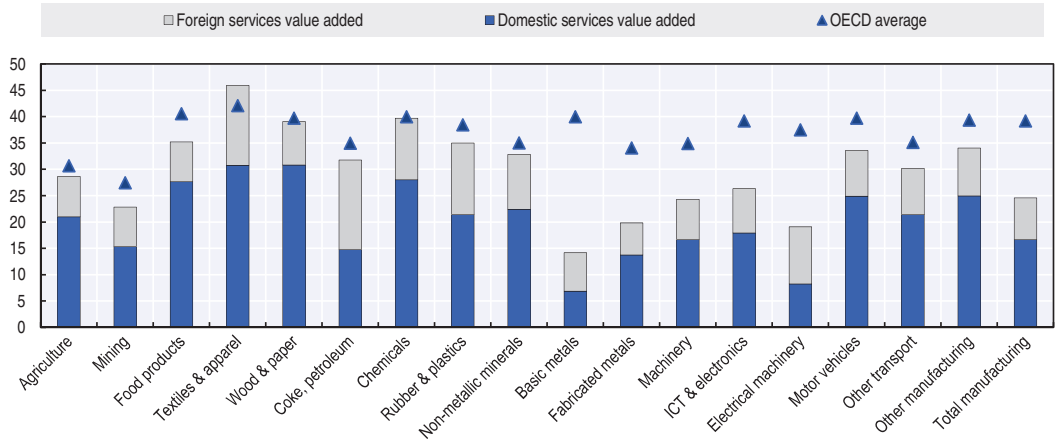
Share of value added (VA) of services content in total gross exports



Source: Authors' analysis based on OECD (2017d), TiVA Nowcast Database, http://stats.oecd.org/Index.aspx?DataSetCode=TIVA_NOWCAST.

Figure 1.21. **Chile's services content of gross exports, by industry and service category, 2014**

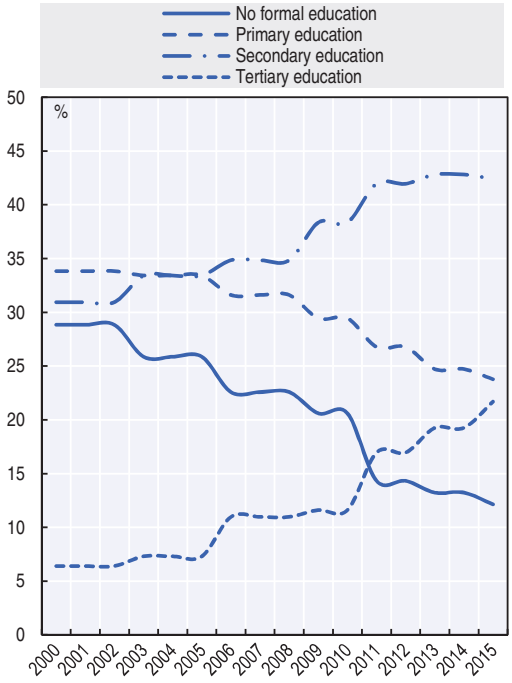
Share of industry gross exports



Source: Authors' analysis on OECD (2017d), TiVA Nowcast Database, http://stats.oecd.org/Index.aspx?DataSetCode=TIVA_NOWCAST.

To realise the potential of improving the participation of domestic firms in GVCs, Chile will need to address the issue of human capital. Despite having one of the highest shares of participation in tertiary education among OECD countries, Chile has gaps in several dimensions linked to skills development. The proficiency in literacy, mathematics and science of 15-year-olds in Chile is among the lowest in OECD countries; 28% of students lack the elementary skills required to read and understand simple texts, or to master basic mathematical and scientific concepts and procedures (OECD, 2017c). Graduate, post-graduate and vocational training are poorly connected to the needs of the private sector. Continuous updating of vocational programmes, as well as of university curricula, will be essential to close the gap between supply and demand in the labour market. At the tertiary level the highest shares of graduates are found in the fields of business, administration and law; and health and welfare (23% and 21% respectively). Only 3% of tertiary students graduate from information and communication technology (ICT), and only 1% from natural sciences, mathematics and statistics. The latter is the lowest share of all OECD countries and four percentage points below the OECD average. This skills gap is limiting Chile's opportunities to innovate in its strategic areas, such as earth science, natural resources and digital technologies. It is also hampering its capacity to be connected to global production systems, which will be increasingly dominated by digitalisation and new technologies. While the employment composition in terms of educational levels shows an increase of secondary and tertiary educated workers (Figure 1.22), levels of numeracy proficiency among adults are lower than in other OECD countries (Figure 1.23).

Figure 1.22. **Evolution of labour force by education level, Chile, 2000-15**



Source: Authors' analysis on CASEN and COFRO Information http://observatorio.ministeriodesarrollosocial.gob.cl/casen/casen_obj.php.

Figure 1.23. **Numeracy proficiency among adults, Chile and selected economies, 2015**

Percentage of 16-65 years old scoring at each proficiency level in numeracy

Note: Proficiency is described on a scale of 500 points divided into levels. Each level summarises what a person with a particular score can do. Six proficiency levels are defined for literacy and numeracy (Levels 1 through 5 plus below Level 1) and four are defined for problem solving in technology-rich environments (Levels 1 through 3 plus below Level 1).

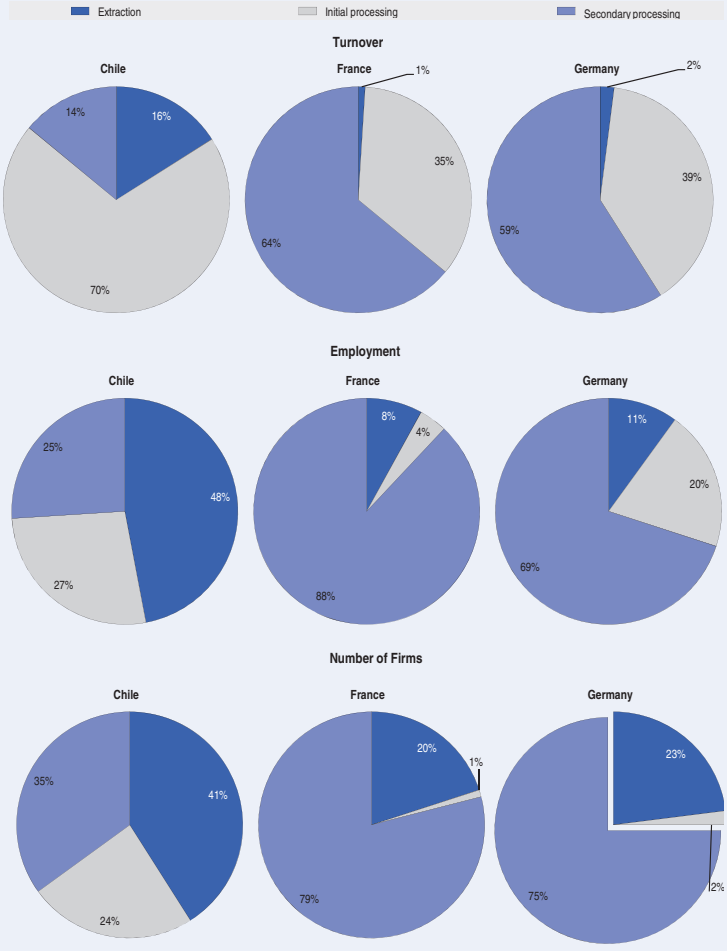
Source: Based on OECD (2017j), Survey of Adults Skills (PIAAC) Database, www.oecd.org/skills/piaac/.

Box 1.2. **Moving up the value chain to improve productivity and employment in Chile's timber industry**

In Chile, 70% of the income generated by the timber industry comes from extraction, 16% from secondary transformation and 14% from primary transformation. In Germany, on the other hand, 59% comes from secondary transformation, 39% from primary transformation and only 2% from primary extraction (Figure 1.24). Chile's forest industry has opportunities to scale up and generate value in ways other than just primary processing. This would be particularly important for certain regions, including Bío-Bío, which accounts for almost 40% of the national forest resources and 60% of domestic timber production. To do so would require appropriate infrastructure; standard-setting, including standards linked to environmental sustainability; and targeted support for SMEs. It would also require a change in mind-set and branding: for example wood could be rebranded from a low-quality material to a future-oriented product that is sustainable and recyclable. Extraction is increasingly automated and less job-intensive and is normally managed by a few large companies. Shifting to more value-added activities would therefore help to increase employment opportunities in the timber cluster. The German timber industry employs, on average, 7.4 times more workers than Chile per processed cubic meter due to its specialisation in other segments of the value chain.

Source: OECD (2013b), *Interconnected Economies: Benefiting from Global Value Chains*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264189560-en.

Figure 1.24. **Different production structures of the forestry industry in Chile, France and Germany, 2013**

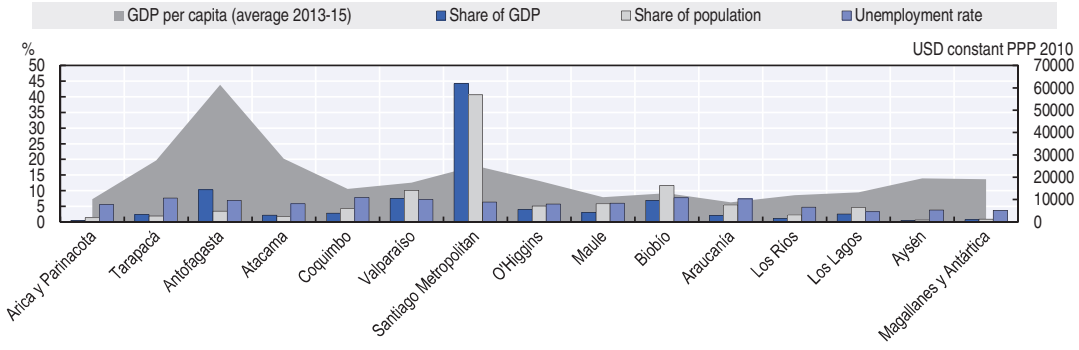


Source: Zilic (2014), Biobío Región Maderera. Una propuesta de valor agregado para la madera.

Economic opportunities are still unequally distributed between regions

Chile's population and GDP are highly concentrated territorially (OECD, 2016b). The Santiago Metropolitan Region (RMS) alone accounts for 30% of Chile's 18 million people and 44% of its national GDP (Figure 1.25). In comparison, the Paris region in France (Île-de-France) accounts for 18% of the national population and 30% of GDP. Three regions (RMS, Bío-Bío and Valparaiso) account for 62% of Chile's total population, and three regions (RMS, Antofagasta and Bío-Bío) account for 61% of total national GDP. Chile also shows pronounced differences in terms of GDP per capita among regions (Figure 1.26). The difference between the top and the bottom regions in per capita income is the second highest of all OECD countries (after Mexico). Only Antofagasta, Atacama, Tarapacá and the RMS have an annual income per capita that is above the national average of USD 22 000. The mining region of Antofagasta has the highest income per capita, three times the national average (Figure 1.25).

Figure 1.25. **Chile's population and GDP are concentrated in the Metropolitan Region, 2015**

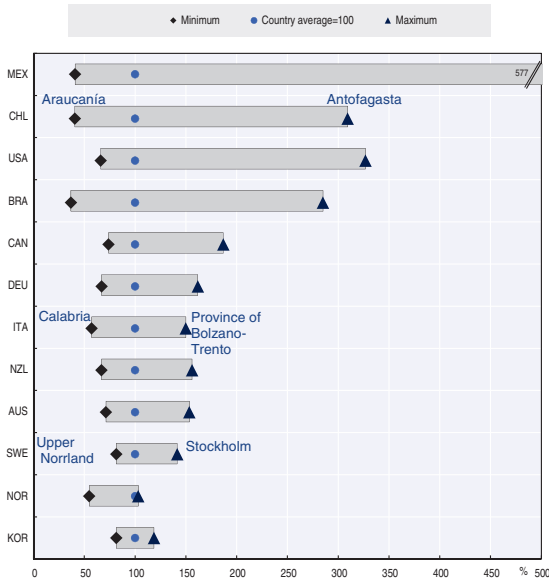


Source: Authors' analysis based on OECD (2017k), Regional Statistics Database, http://stats.oecd.org/; and Central Bank of Chile (2017), "Statistics", webpage, www.bcentral.cl/en/web/central-bank-of-chile/home.

How economic activities are distributed across the Chilean territory reflects its natural endowments. RMS generates more than half of the national GDP in financial intermediation (85%), retail (65%), and real estate, education, and health services (55% each). Manufacturing is also concentrated in RMS, which accounts for almost 50% of national GDP, followed by Bío-Bío and Valparaiso. Antofagasta alone accounts for 50% of national mining GDP, and fishery activities are clustered in the south, with Los Lagos, Aysen and Bío-Bío accounting for almost 90% of total national fishing GDP. Agriculture is mostly located in the central valley, with four regions accounting for 60% of national agriculture GDP.

Figure 1.26. **Chile's regional disparities in GDP per capita are the second highest of all OECD countries**

GDP per capita of top and bottom region as a % of national average, top and bottom OECD countries and selected economies, 2016

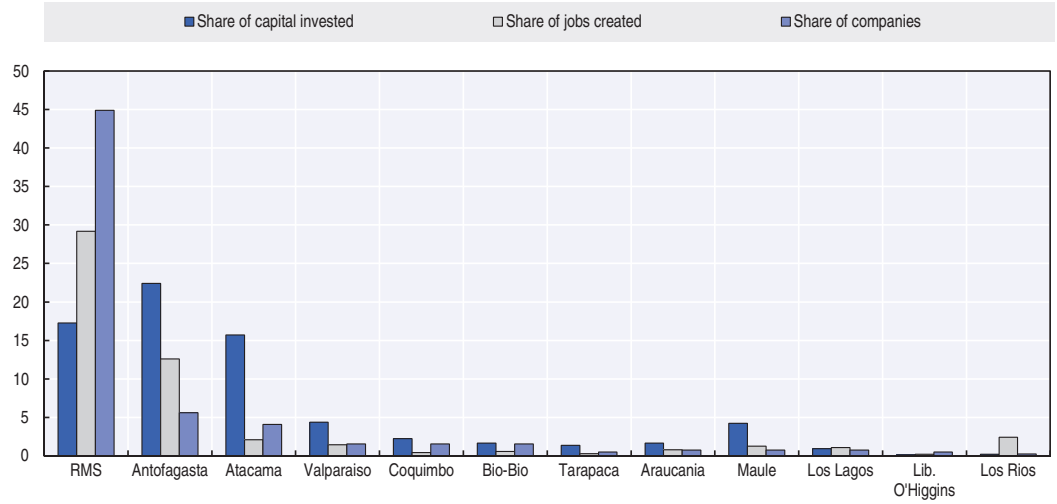


Notes: TL3 regions for Germany, Italy, New Zealand, Sweden, Korea and Japan.TL2 regions for Australia, Canada, Chile, Mexico and Brazil. Data refer to 2013 or latest available year. Brazil, Germany, Italy, and Sweden 2012.
Source: Authors' analysis based on OECD (2016d) Regional Statistics (database), http://stats.oecd.org/

RMS, Antofagasta and Atacama attract most FDI (Figure 1.27). The RMS is Chile's top region in terms of number of projects and jobs created (accounting for more than 40% of total green-field projects and 30% of jobs created), and comes second in terms of capital expenditures (17% of total capital expenditures in green-field projects in 2013-16). The mining regions of Antofagasta and Atacama are first and third in per capita expenditures (accounting for 22% and 16% respectively), attracting major investments in mining, and in solar energy in recent years.

Figure 1.27. **Foreign direct investment concentrates in Santiago, Antofagasta and Atacama**

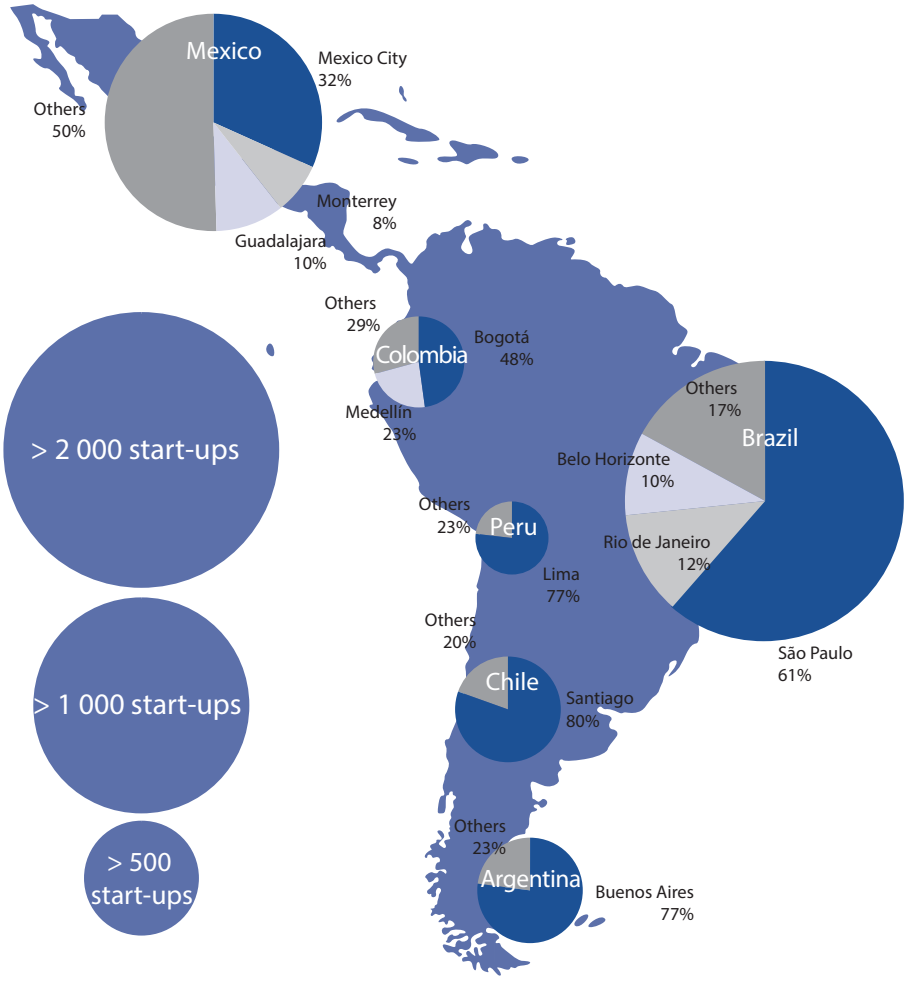
Regional shares of total national number of projects, jobs created, and capital expenditures of greenfield FDI inflows to Chile



Source: Authors' analysis based on data from FDI Markets (2017), FDI Markets, database, a service from the Financial Times Ltd, https://www.fdimarkets.com/

The creation of new firms is concentrated in Chile's capital region. Estimates from AngelList – a database used by investors to find information on start-ups before making investment decisions – show that Chile ranks fourth in Latin America (after Brazil, Mexico and Argentina) for the number of start-ups. However, it is the country with the highest territorial concentration, with 80% of start-ups located in the RMS. In Colombia, by comparison, the capital region only accounts for 48% of total national start-ups (Figure 1.28) (OECD, 2016c).

Figure 1.28. **Santiago is the Chilean start-up hub, 2016**



Note: The graph includes selected Latin American countries which had more than 200 start-ups as of October 2016, according to AngelList. Circle sizes represent the number of start-ups. The figure is meant to show an approximation of the size of the start-up landscape in the different countries and its distribution in the territory.
Source: OECD (2016c), Start-up Latin America 2016: Building an Innovative Future, http://dx.doi.org/10.1787/9789264265660-en, based on data from AngelList (www.angellist.com, accessed October 2016).

Conclusions

Chile's endowments offer it potential to be part of the next production revolution. Its natural resources could position the country in future green value chains. It has a sound reputation as a business partner and as a stable economy, and it counts on an extensive network of investors and trade partners. However, the speed of global change and the competition for lead positions mean that this window of opportunity will not remain open forever. Development is a moving target – successful countries are those that are able to seize opportunities at an early stage. Taking full advantage of global opportunities will require Chile to address the current structural weaknesses in its production ecosystem described in this chapter. This can be achieved only through investment and renewed and effective partnerships among government at all levels, businesses and society. Chapters 2 and 3 of this review provide suggestions in this direction.

References

Aboal, D., Garda, P., Lanzilotta, B. & Perera, M. (2015). "Innovation, Firm Size, Technology Intensity and Employment Generation: Evidence from the Uruguayan Manufacturing Sector." *Emerging Markets Finance and Trade* 51(1): 3-26.

Akamai (2017), "State of the Internet report, 2017", Akamai, available at https://www.akamai.com/us/en/about/our-thinking/state-of-the-internet-report.

América Economía (2017), "Rankings", https://www.americaeconomia.com/rankings.

Central Bank of Chile (2017), "Statistics", webpage, Central Bank of Chile, Santiago, www.bcentral.cl/en/web/central-bank-of-chile/home.

Cheyre, H., G. Larraín, G. Rivas and K. Schmidt-Hebbel (2016), "A common view and four proposals for promoting productive development in Chile", mimeo.

Cimoli, M., Castillo, M., Porcile, G. y Stumpo, G., (2017), *Políticas industriales y tecnológicas en América Latina*. Comisión Económica para América Latina y el Caribe (CEPAL).

Conference Board, The (2017), *Total Economy Database*™ (Adjusted version), The Conference Board, https://www.conference-board.org/data/economydatabase/index.cfm?id=27762.

Correa, F., Stumpo, G. (2017), Brechas de productividad y cambio estructural, in Cimoli, M., Castillo, M., Porcile, G. y Stumpo, G., (2017), *Políticas industriales y tecnológicas en América Latina y el Caribe. Comisión Económica para América Latina*.

Corvalán Quiroz and D. Pezo Villar (2014), Growth and convergence in Chilean regions 1960-2010, Universidad de Playa Ancha, Valparaíso, Chile.

CPC (2016a), 109 Propuestas para la productividad.

CPC (2016b), Informe Anual de Productividad.

Crespi, G. et al. (2014), "¿Cómo repensar el desarrollo productivo? Políticas e instituciones sólidas para la transformación económica", Inter-American Development Bank, Washington, D.C.

ECLAC (2016), Horizons 2030: Equality at the centre of sustainable development. Thirty-sixth session of ECLAC. Mexico City: United Nations.

ECLAC (2013), Sustainable development in Latin America and the Caribbean. Follow-up to the United Nations development agenda beyond 2015 and to Rio+20. United Nations.

Fajnzylber, F. (1990), "Industrialization in Latin America: from the 'black box' to the 'empty box': a comparison of contemporary industrialization patterns", *Cuadernos de la CEPAL*, 60, ECLAC, Santiago.

FDI Markets (2017), *FDI Markets* (database), a service from the Financial Times Ltd, https://www.fdimarkets.com/

Ffrench-Davis, R. (2010), "Macroeconomics for development: from 'financierism' to 'productivism', *CEPAL Review*, 102, ECLAC, Santiago.

Frigolett, H. (2013), "Economías regionales en Chile: desigualdad y heterogeneidad", *Documento de Trabajo*, N°12, Serie Estudios Territoriales, Programa Cohesión Territorial para el Desarrollo, Rimisp, Santiago.

González U., Cristian. M. (2017), *Cooperar en I+D+i: Con quien y para qué? Evidencia Microeconométrica para Chile*, Dirección de Desarrollo Estratégico, CORFO, Santiago"

IDB-OECD (2010), "Strengthening institutional capacities for innovation policy design and implementation in Chile", *Inter-American Development Bank, Social Sector Science and Technology Division Technical Note*, No. IDB-TN-130, Inter-American Development Bank, Washington DC, http://services.iadb.org/wmsfiles/products/Publications/35166758.pdf

IEA (2017), *Global EV Outlook 2017: Two million and counting*, IEA, Paris, http://dx.doi.org/10.1787/9789264278882-en.

ILO (2017), "ILO labour statistics", *ILOSTAT*, International Labour Organization, Geneva, www.ilo.org/ilostat.

Lall, Sanjaya. (2000). The Technological Structure and Performance of Developing Country Manufactured Exports, 1985-98, Oxford Development Studies, Taylor & Francis Journals, 28(3): 337-369.

OECD (2018, forthcoming), *OECD Economic Surveys: Chile 2018*, OECD Publishing, Paris.

OECD (2017a), *OECD Services Trade Restrictiveness Index Database*, OECD, Paris, https://stats.oecd.org/Index.aspx?DataSetCode=STRI.

OECD (2017b), *The Next Production Revolution: Implications for Governments and Business*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264271036-en.

OECD (2017c), "Chile", in *Education at a Glance 2017: OECD Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eag-2017-42-en.

OECD (2017d), *TiVA Nowcast Database*, http://stats.oecd.org/Index.aspx?DataSetCode=TIVA_NOWCAST.

OECD (2017e), *National Accounts Data*, OECD, Paris, http://stats.oecd.org.

OECD (2017f), *International Direct Investment Statistics*, OECD, Paris, http://stats.oecd.org.

OECD (2017g), *Structural and Demographic Business Statistics Database*, OECD, Paris, http://stats.oecd.org.

OECD (2017h), *OECD Science, Technology and Patents Database*, OECD, Paris, http://stats.oecd.org.

OECD (2017i), *Structural Analysis Statistics (STAN) Database*, OECD, Paris, http://stats.oecd.org.

OECD (2017j), *Survey of Adults Skills (PIAAC) Database*, OECD, Paris, www.oecd.org/skills/piaac.

OECD (2017k), *Regional Statistics Database*, OECD, Paris, http://stats.oecd.org.

OECD (2016a), *OECD Compendium of Productivity Indicators 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pdtvy-2016-en.

OECD (2016b), "Chile", in *OECD Regional Outlook 2016: Productive Regions for Inclusive Societies*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264260245-19-en

OECD (2016c), *Start-up Latin America 2016: Building an Innovative Future*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264265660-en.

OECD (2016d), *Regional Statistics* (database), OECD, Paris, http://stats.oecd.org.

OECD (2016e), "Main science and technology indicators", OECD, Paris, http://oe.cd/msti.

OECD (2015), *OECD Economic Surveys: Chile 2015*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-chl-2015-en.

OECD (2013a), *Perspectives on Global Development 2013: Industrial Policies in a Changing World*, OECD Publishing, Paris, http://dx.doi.org/10.1787/persp_glob_dev-2013-en.

OECD (2013b), *Interconnected Economies: Benefiting from Global Value Chains*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264189560-en.

OECD (2012), Industrial Policy and Territorial Development: Lessons from Korea, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264173897-en.

OECD (2011), *Regions and Innovation Policy*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264097803-en.

OECD-WTO (2017), *Trade in Value Added Database*, OECD, Paris, http://stats.oecd.org.

Reames, J. (2017), "Digital economy: snapshot of where we are today", McKinsey Institute presentation at the 9th Plenary Meeting of the OECD Initiative for Policy Dialogue on Global Value Chains, Production Transformation and Development, OECD, Paris.

RICYT (2015), *Red de Indicadores de Ciencia y Tecnologia* (database), www.ricyt.org.

SII (2017), "SII statistics and studies", SII, Santiago, www.sii.cl/estadisticas.

Solimano, A. (2012), *Chile and the Neoliberal Trap: The Post-Pinochet Era*, Cambridge University Press.

UAI/CORFO (2017), "Boletín trimestral Evolución de la PTF en Chile" (Quarterly Evolution of the TFP in Chile), Universidad Adolfo Ibáñez and CORFO, Santiago.

UN (2017), *Comtrade Database*, United Nations, New York, https://comtrade.un.org.

UNCTAD (2017), *Trade and Development Report 2017 - Beyond austerity: Towards a global new deal*, United Nations Publication, New York and Geneva.

UNCTAD (2015), *Global Value Chains and South-South Trade*, United Nations Publication, New York and Geneva.

UNCTAD/GDS/ECIDC (2015) *Global value chains and South-South Trade: economic cooperation and integration among developing countries*, United Nations Publication, Geneva.

UNESCO (2016), *Institute for Statistics Database*, UNESCO, Paris, http://data.uis.unesco.org.

World Bank (2017), *National Accounts Data*, The World Bank, Washington, DC, https://data.worldbank.org/indicator/NY.GDP.MKTP.CD.

Zilic, F. (2014), "Biobío Región Maderera. Una propuesta de valor agregado para la madera", Polomadera, Universidad de Concepción.