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OVERVIEW

OECD
BETTER POLICIES FOR BETTER LIVES

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Executive summary

- *Main findings*
- *Key recommendations*

Main findings

Luxembourg is one of the most prosperous countries in the OECD with very high levels of well-being, particularly incomes. The economy, including its financial sector, has weathered the crisis well, growth has picked up, supported by sound macroeconomic policies.

Strengthening the financial sector. Luxembourg's large financial sector still plays a pivotal role, although its share in total output has fallen. Product diversification into investment funds, wealth management and insurance is continuing. However, changing financial market regulation in Europe, increased international transparency requirements for banking and heightened international competition pose challenges. Further diversification of the financial sector into new areas requires investors' trust in regulators safeguarding financial market stability. Nevertheless, the financial sector might have reached a size where its contribution to GDP growth might fade, and high dependence on one sector poses medium-term risks.

Boosting productivity and diversifying the economic base. Potential output growth has slowed significantly in recent years, reflecting rising structural unemployment and declining trend productivity growth. Private spending on research and development (R&D) is low and falling, although public R&D spending has been boosted. The secondary education system is hampered by high repetition rates of students; female labour force participation, although it increased, is still low. Enterprise clusters do not yet fully exploit potential benefits from cooperation between enterprises and research institutions.

Medium-term fiscal pressures. The fiscal position is strong, and the main fiscal challenges are age-related spending, which is projected to rise by about 5.25 percentage points of GDP by 2030. There is some uncertainty surrounding financial-sector tax revenues, which can be subject to large fluctuations due to financial market volatility.

Key recommendations

Strengthening the performance of the financial sector

- Continue to monitor financial market risk while using a comprehensive approach to risk assessment that accounts for financial linkages between banks and non-bank financial intermediaries, notably investment funds. Continue efforts to develop resolution plans and to undertake resolvability assessments so that important banks could be resolved effectively across borders. For this end, continue to cooperate with regulatory authorities in other jurisdictions outside the EU.

Boosting productivity and diversifying the economic base

- Better evaluate the effectiveness of public R&D spending and cluster policies.
- Strengthen the cooperation between enterprises, University of Luxembourg and research institutions in Luxembourg and abroad.
- In secondary education, reduce grade repetition, provide more school autonomy and better monitor education quality.

Greening growth

- To reduce carbon emission, continue substantial investment in public transport infrastructure, using the receipts from fuel taxation for this purpose. Explore the introduction of a system of congestion charges. Increase taxes on petrol and diesel to gradually eliminate price differentials with neighbouring countries.

Medium-term fiscal pressures

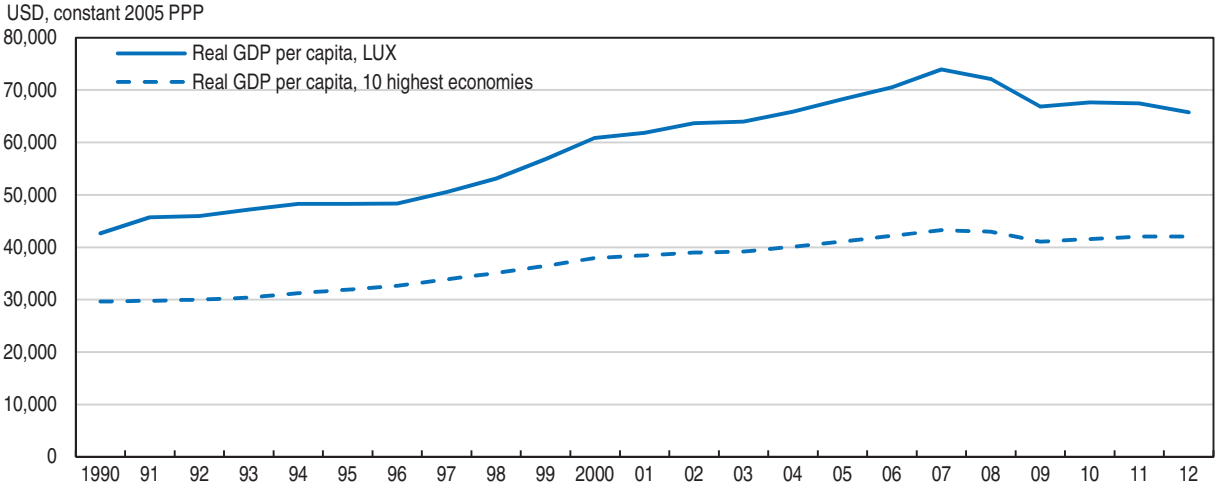
- Strengthen fiscal planning by introducing a spending review mechanism and link it to the medium-term budgeting framework. Consider introducing a spending ceiling for the general government.
- Continue to actively participate in international negotiations on co-ordinated action to combat tax base erosion and profit shifting of multinational enterprises, including action to prevent double non-taxation. Change domestic laws if necessary.

Assessment and recommendations

- *Macroeconomic outlook*
- *Strengthening the performance and resilience of the financial sector*
- *Fostering the emergence of innovative industries*
- *Greening growth*

In the two decades prior to the crisis, Luxembourg grew twice as fast as the European average and per capita incomes climbed to one of the highest in the OECD area (Figure 1). Non-residents account for a large share of the economy's employment. Thus, gross national income (GNI), which excludes factor income from domestic production that accrues to non-residents, undercuts gross domestic product (GDP) by about a third. Nonetheless, even if aggregate income per capita is measured by GNI rather than GDP Luxembourg still ranks at the top of the OECD, surpassed only by Norway. Growth has also enhanced well-being. Luxembourg exceeds the OECD average in most dimensions of the OECD's well-being index by a significant margin (Figure 2). Specialisation in fast growing, high-value-added service sectors, notably financial and related services, transformed a steel producing economy to a major financial centre. This transformation was facilitated by financial sector liberalisation and early adoption of a number of EU financial services directives. Luxembourg is an attractive business location reflecting its regulatory and tax systems, sound macroeconomic policies and openness to skilled workers from other countries.

Figure 1. **Difference in GDP per capita in the 10 OECD economies with the highest GDP**



Note: Simple average of the 10 OECD countries with the highest GDP per capita (in constant 2005 PPPs) in 2012.
Source: OECD Economic Department Database.

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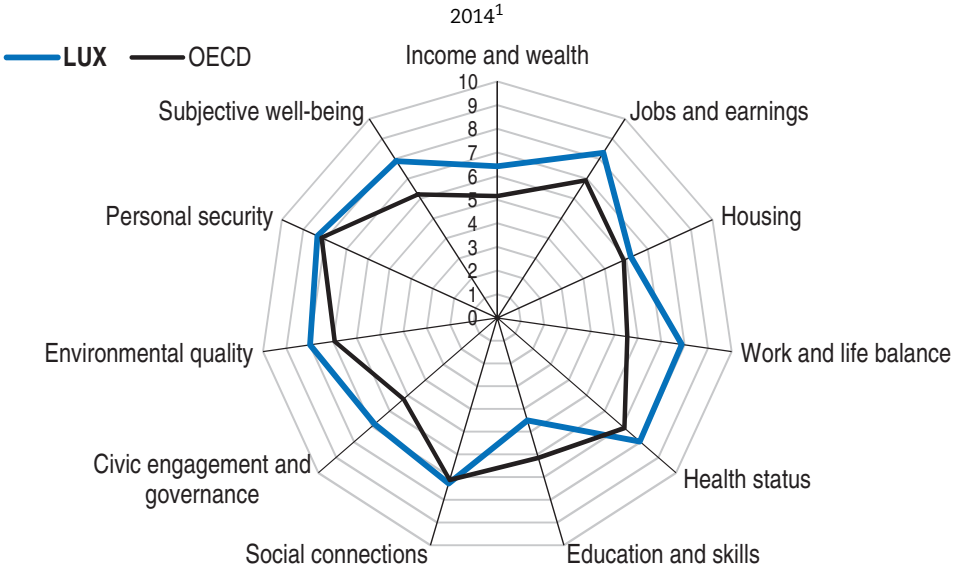
However, the economy depends heavily on its financial sector, creating potential vulnerabilities, and the sector's contribution to the economy's growth might diminish. At the same time, labour productivity growth has trended down. Unemployment among lower skilled is relatively high reflecting challenges in the education and training systems. To raise productivity and potential growth, the economy should diversify towards such

Figure 2. **Well-being outcomes: Better Life Index**



1. Each well-being dimension is measured by one to four indicators from the OECD Better Life Index set. Normalised indicators are averaged with equal weights. Indicators are normalised to range between 10 (best) and 0 (worst) according to the following formula: (indicator value – minimum value)/(maximum value – minimum value) x 10.

Source: OECD (2014), OECD Better Life Index, *www.oecdbetterlifeindex.org*.

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activities as R&D, product design or marketing (OECD, 2013a). The key messages from the *Survey* are:

- Investors' trust in financial market stability is key to the financial sector.
- Diversifying the economy would help to keep Luxembourg's living standards high.
- On unchanged policies, ageing-related government spending would steeply increase.

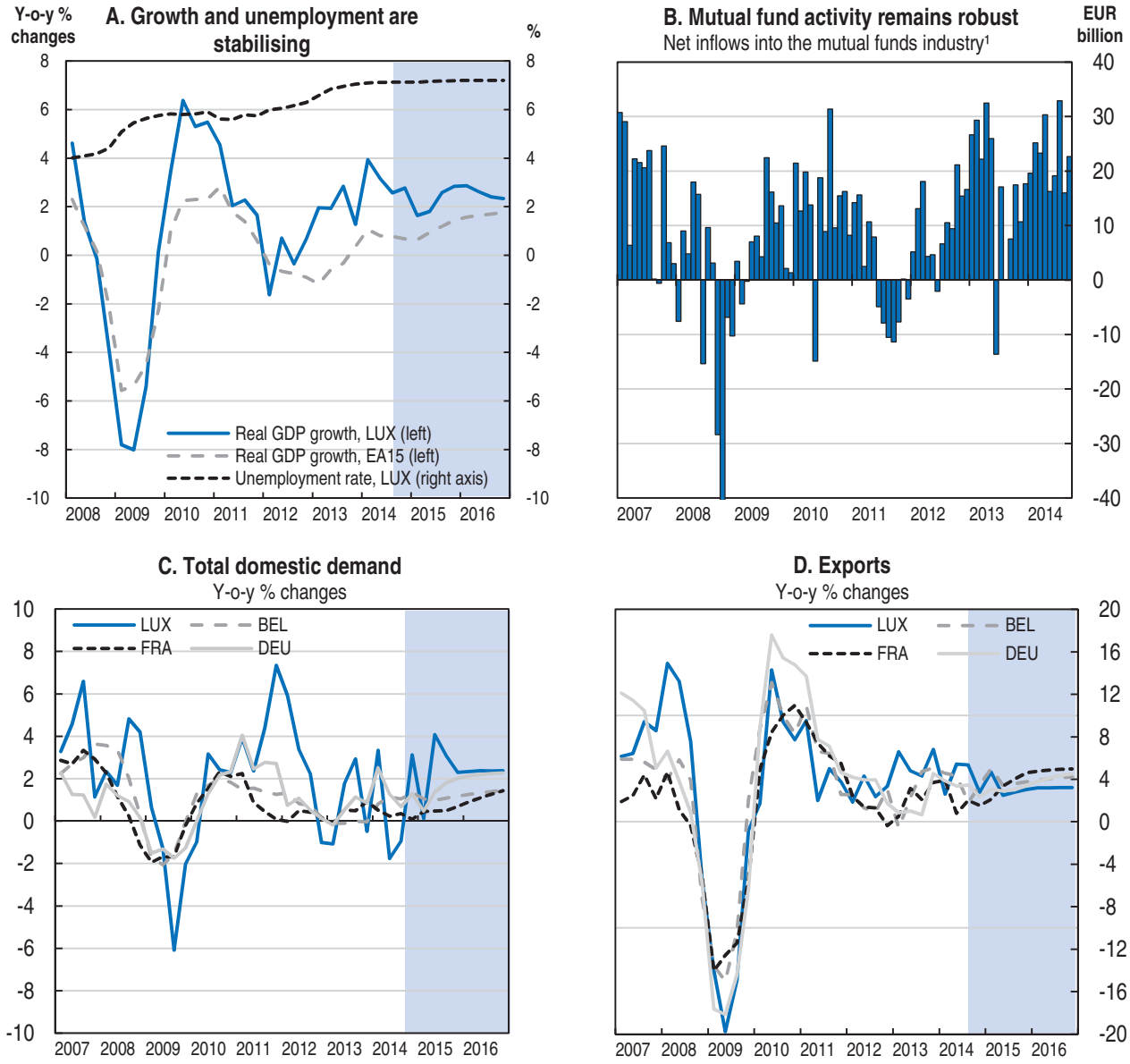
Macroeconomic outlook

Recent economic developments

Economic growth slowed in the course of 2014, but it remained significantly higher than the euro area average (Figure 3). Growth is benefiting from resilient domestic demand and robust activity in the mutual fund industry. However, unemployment has continued to rise, to 7.1% at end-2014, youth unemployment (15 to 24 year-old) has drifted up to above 15% in the first three quarters of 2014, and the share of the long-term unemployed (unemployed for a year or more) to more than 25% of total unemployment. Youth unemployment (relative to the labour force of the 15 to 24 year-old) exceeded 30% at the end of 2014 (4.7% of all persons aged 15-24 in 2012). New OECD estimates suggest that more than 80% of unemployment is structural, although structural unemployment, as well as potential output, is difficult to estimate in such a small open economy with a high share of cross-border workers and a large financial sector.

Luxembourg's external position is strong, with a persistent current account surplus and a net international asset position of 216% of GDP (Figure 4). The surplus, which has fallen from around 10% of GDP prior to the crisis to about 5% since, is entirely attributable to sustained services exports, mainly financial services.

Figure 3. **Macroeconomic developments**



1. Three-month moving average. Inflows are defined as net of markets' variations.

Source: OECD Economic Outlook 96 Database; and Commission de Surveillance du Secteur Financier (CSSF).

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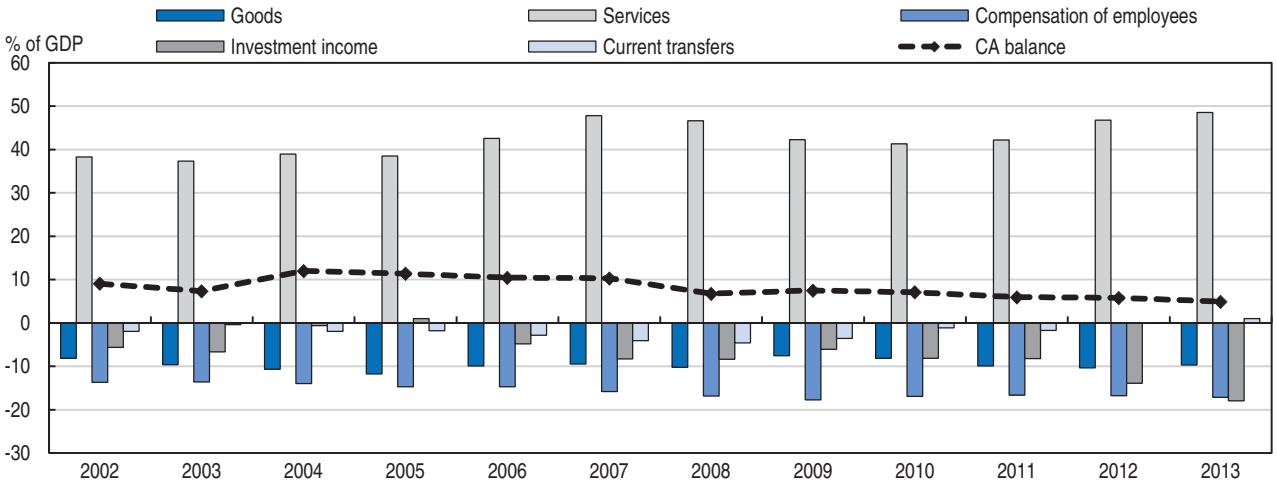
The value added share of the financial and insurance sector in Luxembourg is about 27%, well above other OECD financial centres such as Switzerland or the United Kingdom (around 10½ and 8¼ per cent). The large size of Luxembourg's financial sector reflects that the country is a major financial centre, but it also means that the economy is highly dependent on the evolution of financial sector output (OECD, 2008; and 2010b). The sector's share has declined by some 3½ percentage points since the beginning of the crisis as traditional bank business fell and financial services such as insurance and asset management increased (Figure 5). In 2013, more than 3 800 investment funds were located in Luxembourg. By end-2014, the funds had some EUR 3 trillion under management, a figure that has doubled since the trough of the financial crisis. Luxembourg is now the

Figure 4. **Current account as percentage of GDP**



Source: STATEC.

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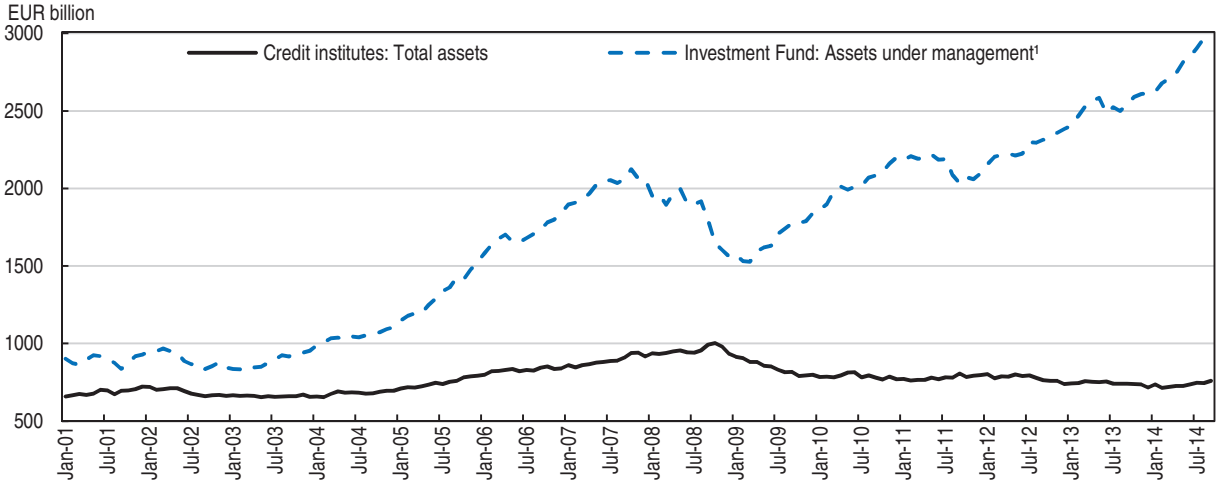
world's second largest investment fund centre after the United States. Fund and wealth management and insurance services have been estimated to account for 80% of total financial sector, with banking services accounting for the rest (Wintersteller, 2013).

Figure 5. **Assets of banks and investment funds**



Note: Undertakings for collective investment (UCI): net assets.
Source: CSSF.

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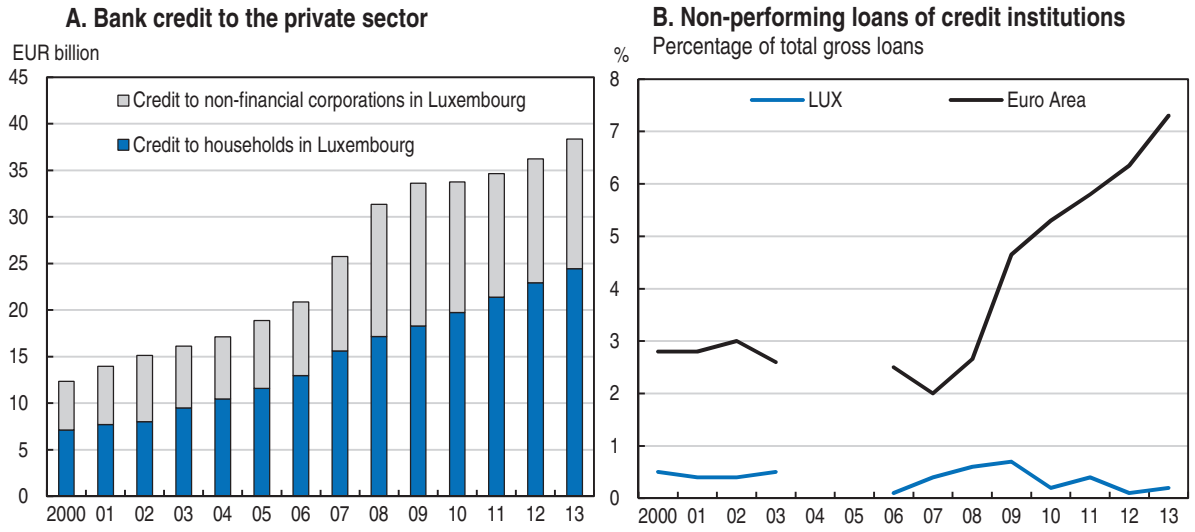
The drop in the value added share of the financial sector since the crisis is mainly due to reductions in cross-border credit by bank subsidiaries and branches to their group's foreign banks. Credit to the domestic private non-financial sector was remarkably resilient (Figure 6, Panel A). Bank balance sheets are strong. Non-performing loans account for a very small portion of total bank assets, reflecting past bank restructuring and economic growth above the EU average in recent years (Figure 6, Panel B).

Figure 6. **Bank credit and non-performing loans**



Source: BCL and World Bank, *World Development Indicators Database*.

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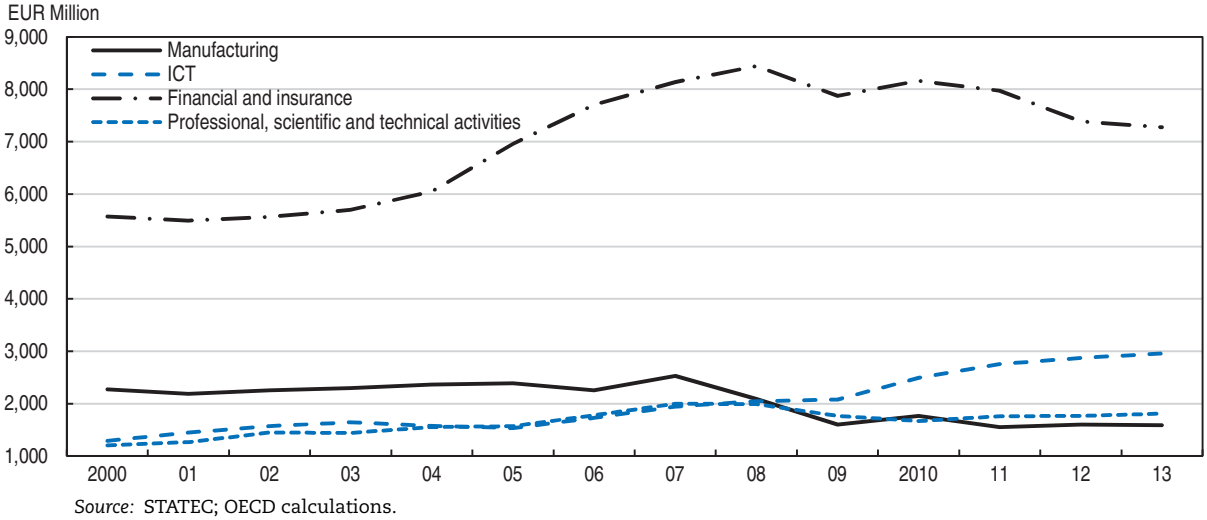
Financial sector diversification muted the contraction following the crisis. Mutual funds and insurance business have been quite resilient, moderating the impact of the down-turn that occurred in banking activity (Figure 7). Outside the financial sector, manufacturing output was particularly hard hit, with a decline of about one third since 2007. By contrast, output of the Information and communications technology (ICT) sector continued to expanded steadily.

Figure 7. **Sectoral output diverged during the crisis**

Real value added, at constant prices, reference year = 2005



Source: STATEC; OECD calculations.

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Growth is projected to slow to 2.2% in 2015 as the shift of the EU VAT regime for e-commerce from the seller to the buyer country weakens export growth, and higher value-added tax (VAT) rates bear on demand (Table 1). Activity will firm somewhat in 2016

Table 1. **Macroeconomic indicators and projections**

	2011 Current prices, billion €	2012	2013	2014	2015	2016
GDP at market prices	42.4	-0.2	2.0	3.1	2.2	2.6
Private consumption	13.3	1.9	1.5	1.8	2.4	2.8
Government consumption	6.9	3.8	5.1	2.9	1.5	2.1
Gross fixed capital formation	7.6	2.7	-4.3	-2.9	3.3	1.9
Final domestic demand	27.9	2.6	0.8	0.9	2.4	2.4
Stockbuilding[1]	0.5	-1.6	-0.1	-1.6	-0.9	0.0
Total domestic demand	28.3	0.2	0.5	-0.8	1.2	2.5
Exports of goods and services	78.5	3.0	5.6	4.0	3.2	3.2
Imports of goods and services	64.5	3.8	5.8	2.1	3.1	3.3
Net exports[1]	14.0	-0.3	1.6	4.6	1.4	1.0
Other items						
Potential GDP		2.5	2.3	2.0	2.0	2.0
Output gap[2]		-3.9	-4.1	-3.1	-2.9	-2.4
Employment		2.4	1.9	2.2	2.3	2.3
Unemployment rate		6.1	6.9	7.1	7.2	7.2
GDP deflator		3.4	1.4	0.6	1.3	1.3
Harmonised index of consumer prices		2.9	1.7	0.9	1.2	1.5
Harmonised core consumer prices		2.1	2.0	1.4	1.4	1.5
Household saving ratio, net[3]		13.7	16.9	17.7	17.9	18.2
Trade balance[4]		33.8	35.1	38.6	39.1	39.0
Current account balance[4]		5.8	4.9	5.1	4.0	4.0
General government financial balance[4]		0.1	0.6	0.9	0.2	0.5
General government underlying primary balance[4]		1.4	2.3	2.4	1.6	1.7
General government gross debt[4]		29.6	27.9	30.6	32.0	33.3
General government debt, Maastricht definition[4]		21.4	23.6	24.4	25.9	27.1
General government net debt[4]		-48.3	-49.0	-48.1	-46.7	-45.4
Short-term interest rates		0.6	0.2	0.2	0.1	0.1
Long-term interest rates		1.8	1.8	1.4	0.8	0.8

1. Contributions to changes in real GDP, actual amount in the first column.
2. As a percentage of potential GDP.
3. As a percentage of disposable income.
4. As a percentage of GDP.

Source: OECD Database.

but the upswing will be moderate by past standards, as macro-economic activity in the euro area overall is set to remain sluggish. The national unemployment rate is projected to peak at 7.2% in 2015. No significant decline is projected for 2016. The VAT hike and wage indexation will keep inflation above the euro area average.

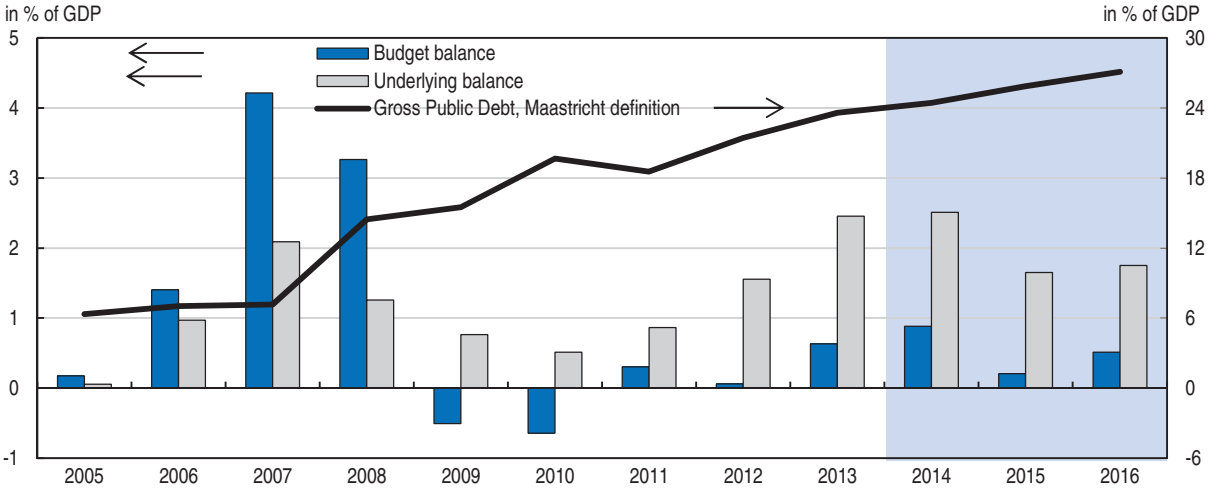
Short-term risks have been to the downside, but recent developments present upside risks. Much depends on growth in the euro area, given Luxembourg's strong trade and financial linkages. The negative effect of the new EU VAT regime on Luxembourg's position in the e-commerce industry could be larger than expected. Changes in financial sector regulation require some banks to adapt their business models and could reduce the profitability of the financial sector, at least in the short run. On the other hand, the solid reputation of Luxembourg's financial sector could help it attract larger safe haven capital inflows. A sustained drop in the oil price, the European central bank's (ECB) quantitative easing programme und euro depreciation might also support stronger growth.

Fiscal developments

The government has taken measures to contain the rise in the deficit

In 2014, the general government surplus was 0.9% of GDP and general government gross debt totalled 24.4% in the Maastricht definition, up significantly from only 7% in 2007 (Figure 8). These fiscal positions compare favourably to most other countries in the OECD area. Moreover, on a net basis, taking into account financial assets as well, the general government has net assets of 48% of GDP. The new EU VAT regime will shift the e-commerce VAT from the country of sale to the country of consumption as of January 2015, cutting government revenues by about 1.5 % of GDP in 2015. According to official estimates, this drop in revenues, if left uncompensated, would risk the structural balance falling below Luxembourg's Medium Term Objective (MTO).

Figure 8. **Evolution of the fiscal position**



Notes: The underlying fiscal balance is adjusted for cyclical fluctuations and one-offs.
Shaded area: OECD projections.
Source: OECD Economic Outlook 96 Database.

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In anticipation, the government has taken compensatory tax and spending measures. An increase in the VAT rate, to take effect in January 2015, is officially estimated to raise revenues by some 0.5% of GDP. In addition, the government has presented some 250 measures to curb spending, which is estimated to generate net savings of 0.4% of GDP in 2015. The OECD projects the general government balance to deteriorate to a surplus of 0.2% in 2015, raising to a surplus of 0.5% as the new fiscal measures become increasingly effective. General government gross debt is projected to rise to 27% (Maastricht basis) by 2016.

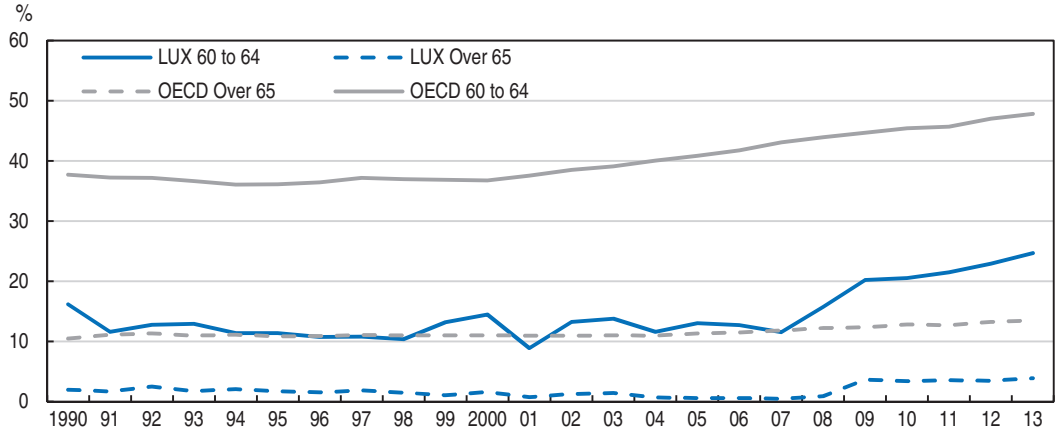
There is a risk that in the near future Luxembourg could face lower revenues from multinational enterprises as a consequence of the ongoing evolution of international tax regulations that necessarily trigger changes of tax rulings. Based on the current international tax framework, including the application of non-double taxation treaties, the interaction of the tax regimes of multiple countries could lead to a significant reduction of a company's tax burden, or even no taxation at all. In response to this challenge, work has been undertaken at the request of the G20 to develop solutions to address base erosion and profit shifting (BEPS). Luxembourg has actively participated in discussions at OECD level on

the BEPS project, which aim at achieving greater fairness in international tax matters at the global level. At the European level, in July 2014 Luxembourg supported the introduction of provisions in the Parent-Subsidiary Directive which aims to prevent the double non-taxation of groups of companies arising from hybrid loans. Luxembourg also supports the proposal to introduce a general anti-abuse clause into the Parent-Subsidiary Directive. The government's plan is to transpose the amended Directive swiftly into national law.

Fiscal policies to prepare for medium-term challenges

The pension reform of 2013 provides for a phased reduction of pensions. By 2052, the active career would need to be prolonged by approximately 3 years to achieve a level of pension comparable to the one generated by the previous system (BDO, 2013). The reform also links the adjustment of current pension payments to the financial position of the pension plan (CNAP, 2013). The reform will raise the labour force participation of older people, which is low by international comparison (Figure 9). The effects are likely to materialise only very gradually as the changes in the system's parameters are phased in over a 40-year transition period.

Figure 9. **Labour force participation rates over time**



Source: OECD Labour Force Statistics.

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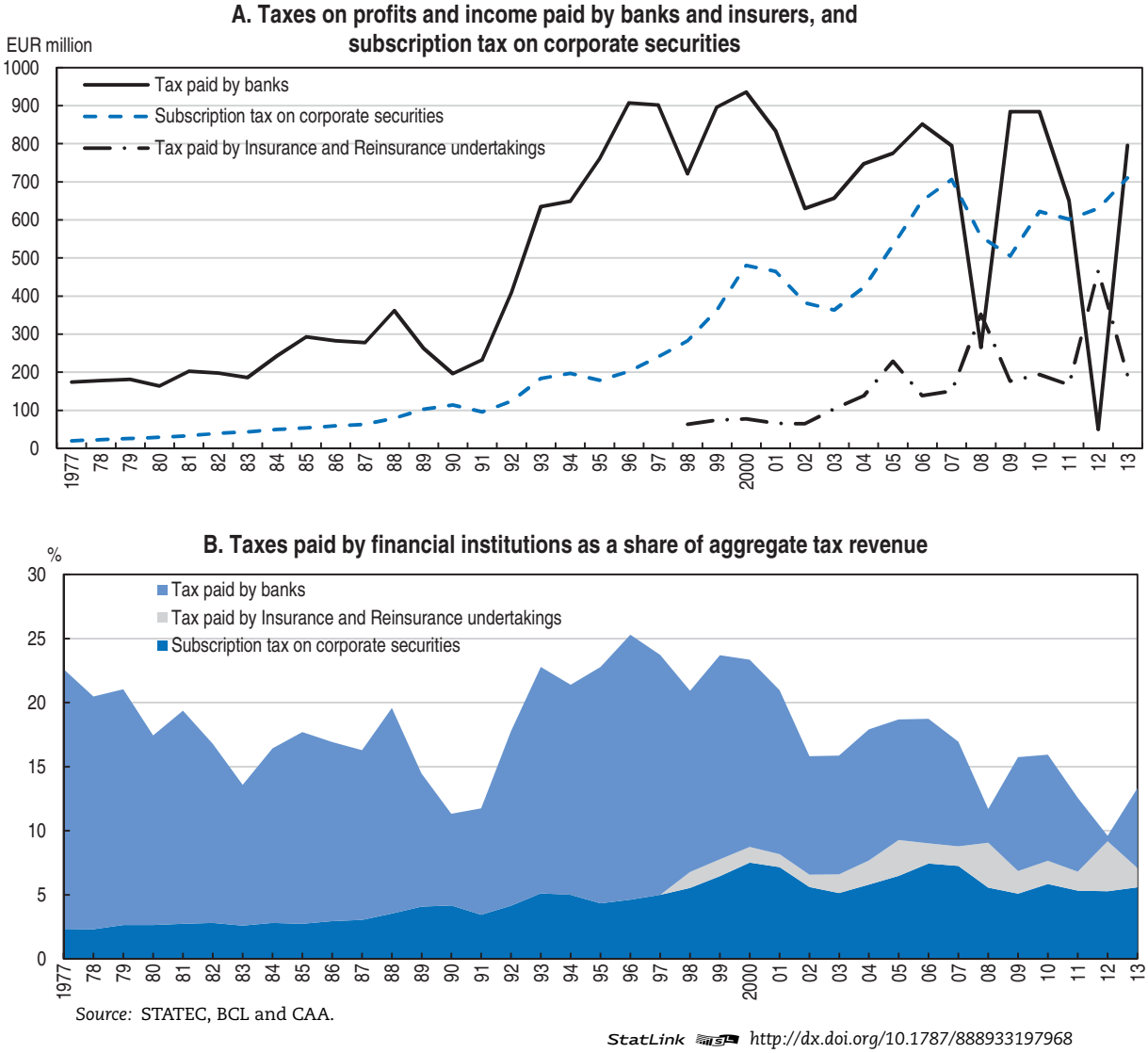
Nevertheless, work by the OECD indicates that age-related spending by the general government – old-age pensions, health care and long-term care spending – might increase by about 5¼ percentage points of GDP between now and 2030, despite the 2013 pension reform. This would be the highest increase in age-related spending in the OECD. Outlays for health care would account for more than a quarter of the increase, although the scenario assumes some cost containment (De la Maisonneuve and Oliveira-Martins, 2013). Doubt about the sustainability of Luxembourg's low-debt fiscal position would pose a risk in that the large financial sector depends not least on the market's trust in financial and fiscal stability.

Thus, pension reform should be followed up by further measures increasing the effective age of pension entitlement, either directly or indirectly via further reductions in the system's "proportional supplements", which determine the earnings-related part of pensions. Simulations by Bouchet et al. (2014) with an overlapping-generations model for Luxembourg suggest that such amendment can provide significant incentives for labour

force participation with substantial positive budgetary effects. Such measures should be supplemented by health care reform (see the 2012 *Survey on Luxembourg*, OECD, 2012a). The government is currently preparing an initiative to improve the efficiency of the hospital sector, which should be a first step in this direction.

Previous *Surveys* have pointed to the volatility of government revenues in Luxembourg (OECD, 2012a), linked to volatile taxes on the financial sector (Figure 10, upper panel). The diversification of the financial sector in recent years might reduce this volatility, as the share of bank profit taxes in total tax receipts has declined while the share of insurance profit taxes and of the subscription tax, a tax on corporate securities (essentially on mutual funds) has risen (Figure 10, lower panel). The latter have been less volatile during the crisis than the bank profit tax.

Figure 10. **Developments in tax revenues from the financial sector**



Source: STATEC, BCL and CAA.

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Managing medium-term budgeting pressures would be facilitated by introducing tools for more effective spending control. The government undertook a comprehensive spending review in 2014, on which the 2015 budget is based. This can serve as a base to develop future spending priorities. Indeed, effectiveness of a medium-term budgeting framework requires underlying information to prioritise the budget. A spending review mechanism for future reviews is not yet in place in Luxembourg and should be established, as suggested in *Budgeting in Luxembourg* (OECD, 2012b). The government should consider introducing a spending ceiling for the general government into the medium-term budgeting framework. Spending grew by 6.7 per cent of GDP between 2001 and 2013, and, as in other countries, there has been a tendency to spend available revenues. A spending ceiling is one way to break such trends. The new Fiscal Council could be charged with evaluating how well budgets are adhering to the medium-term budgets and spending ceilings.

Recommendations on macroeconomic policies

Key recommendation

- Strengthen fiscal planning by introducing a spending review mechanism and link it to the medium-term budgeting framework. Consider introducing a spending ceiling for the general government.
- Continue to actively participate in international negotiations on co-ordinated action to combat tax base erosion and profit shifting of multinational enterprises including action to prevent double non-taxation. Change domestic laws as necessary.

Further recommendation

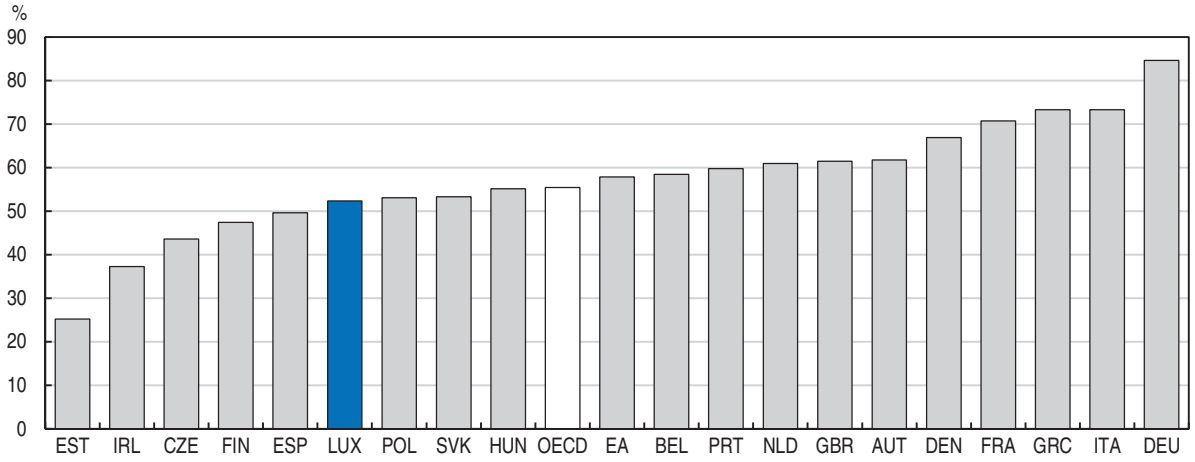
- Increase the effective age of pension entitlement, either directly or indirectly via further reductions in the system's "proportional supplements".
- Identify possible efficiency gains in the health care system.

Strengthening the performance and resilience of the financial sector

The success in diversification already achieved within the financial sector reflects the competitiveness of Luxembourg as a financial centre and safe-haven flows after the crisis. For example, the low cost-to-income ratio by OECD and euro area standards indicates a high degree of technical efficiency for banks operating in Luxembourg (Figure 11). Contestability tests for the banking sector point to some market power, which appears to be relatively low (Samantas, 2013).

However, the sector faces several challenges. Cross-border demand for credit might develop less vigorously than it did in past decades. Changing financial market regulation in Europe and the drive for more transparency reinforce the need to further adjust. High cross-border financial links between Luxembourg's banks on the one hand and their groups' foreign banks and investment funds on the other hand, could transmit external shocks into the economy, even if limited domestic inter-bank exposures of the credit institutions in Luxembourg is reducing domestic inter-bank contagion. More generally, high and rising international competition in the provision of financial services mean that Luxembourg's financial sector needs to rely on maintaining a highly qualified workforce and stability-oriented framework conditions to stay competitive.

Figure 11. **Cost-to-income ratio in the banking sector, 2011**



Source: World Bank, *Global Financial Development Indicators*, November 2013 version.

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The move towards Banking Union in the European Union, including the Single Supervisory Mechanism (SSM) for large participating banks, the Single Resolution Mechanism (SRM), common rule books for bank supervision and resolution, and stronger bank capital requirements, can be beneficial for Luxembourg in that they help to control counter-party risks stemming from the rest of the EU. In particular, Supervisory Colleges, involving the national supervisory authorities, serve to exchange information and co-ordinate key supervisory tasks across borders, and the SRM is responsible for resolution planning and resolution of cross-border European banking groups. Risks to financial sector stability are assessed by the financial market regulator *Commission de Surveillance du Secteur Financier* (CSSF) in co-operation with the Luxembourg central bank (BCL), and this has involved *inter alia* regular stress-testing of banks' liquidity. The government plans to establish a national Systemic Risk Committee, involving all authorities that are relevant for macro-prudential policy: the CSSF, the BCL, the insurance regulator (CAA) and the ministry of finance. Identifying, assessing and monitoring risks to financial stability will be a key task of the Committee. For this co-operation to be successful, it is important to elaborate the analytical framework that accounts for the financial linkages between the banks and the other relevant financial market actors, notably investment funds. For example, investment funds provided some 15% of the banks' funding at the end of 2013. While this funding remained stable during the crisis, there could be adverse spill-over effects from investment funds to banks if the former come under severe stress.

The crisis revealed that risks for banks in Luxembourg can originate from their exposure to parent groups (IMF, 2011). It is welcome that the CSSF has strengthened the criteria to be complied with when engaging in large intragroup transactions. Ownership links between banks across different legal entities and borders can provide a certain degree of risk sharing. However, it can complicate bank resolution in bad times, in particular for bank groups with dependencies located outside the European banking union. It is thus vital to ensure that resolution plans be developed and resolvability assessments undertaken so that important banks could be resolved effectively across borders.

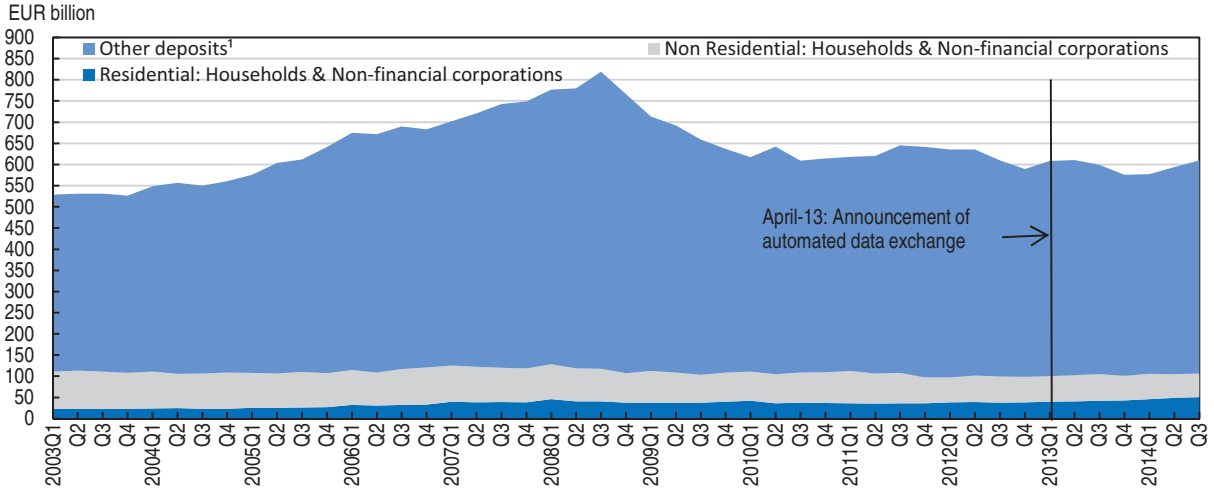
The comprehensive review of bank balance sheets by the European Central Bank, published in October 2014, showed that the capitalisation of the large banks in

Luxembourg is good on the usual metric of capital to risk-weighted assets (ECB, 2014a). It is welcome that the Luxembourg authorities have introduced the fully phased-in Basel III solvency ratio as of 2014 and have made use of the discretion left by European legislation to introduce a capital conservation buffer of 2.5% for all banks as of 2014. Draft laws providing for the anticipated full introduction of the countercyclical capital buffer as well as buffers for systemic banks and for systemic risk are in the legislative process. Maintaining high standards of capitalisation and macro-prudential norms is important to minimise systemic risk and to validate investors' trust, which is crucial for further progress in financial sector diversification.

The Phase-2 review of the Global Forum on Transparency and Exchange of Information for Tax Purposes showed that Luxembourg's tax relevant information practices during the review period were not fully in line with the standard on exchange of information on request. The legal and regulatory framework provides for the availability of ownership, accounting and bank information, and Luxembourg exchanges a considerable amount of information in a timely manner. However, information gathering and enforcement powers to obtain requested information have not been used in all instances. To improve its rating by the Global Forum, Luxembourg has reported that it has acted on all of the recommendations made in its report by the Global Forum. Also, Luxembourg has committed to implementing the new automatic exchange of information standard by 2017 and signed the Multilateral Competent Authority Agreement with 51 other jurisdictions.

Following the government's announcement, in April 2013, to introduce an automated data exchange, bank deposits from non-financial counterparties remained stable (Figure 12). Reductions in deposits by non-financial and non-residential counterparties – notably private households in neighbouring countries – were offset by increases in deposits by non-financial and residential counterparties. The remaining steps in upgrading

Figure 12. **Deposits held by credit institutions in Luxembourg**



1. Categories in Other deposits: Credit institutions, General government, Other financial intermediaries & Financial auxiliaries, Insurance corporations & Pension funds.

Source: BCL.

StatLink http://dx.doi.org/10.1787/888933197988

the tax transparency regulations should be made soon. This would increase incentives for banks to further refine their business models, benefitting Luxembourg's financial sector in the medium term.

Recommendations on the financial sector

Key recommendations

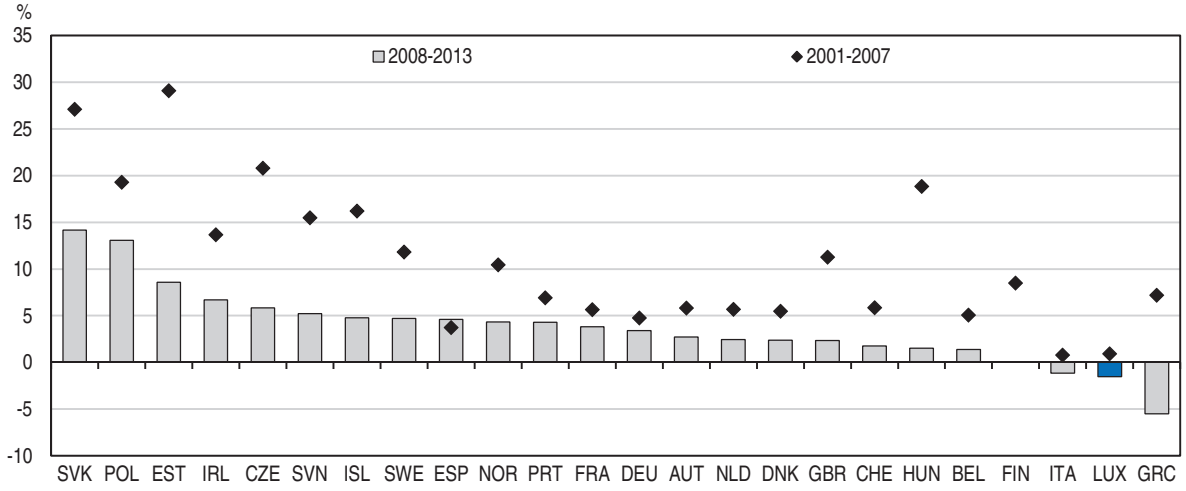
- Continue to monitor financial market risk while using a comprehensive approach to risk assessment that accounts for financial linkages between banks and non-bank financial intermediaries, notably investment funds.
- Continue efforts to develop resolution plans and to undertake resolvability assessments so that important banks could be resolved effectively across borders. For this end, continue to co-operate with regulatory authorities in other jurisdictions outside the EU.

Fostering the emergence of innovative industries

Productivity and potential growth have declined

While productivity is particularly hard to measure in Luxembourg because of the large share of the financial sector, OECD estimates point to declining and even negative growth of trend productivity (Figure 13). The economy's productivity growth, measured in real GDP per employee or, alternatively, per hour worked, is among the lowest in the OECD. Furthermore, the drop was particularly strong during the crisis.

Figure 13. **Trend productivity growth, cumulated**

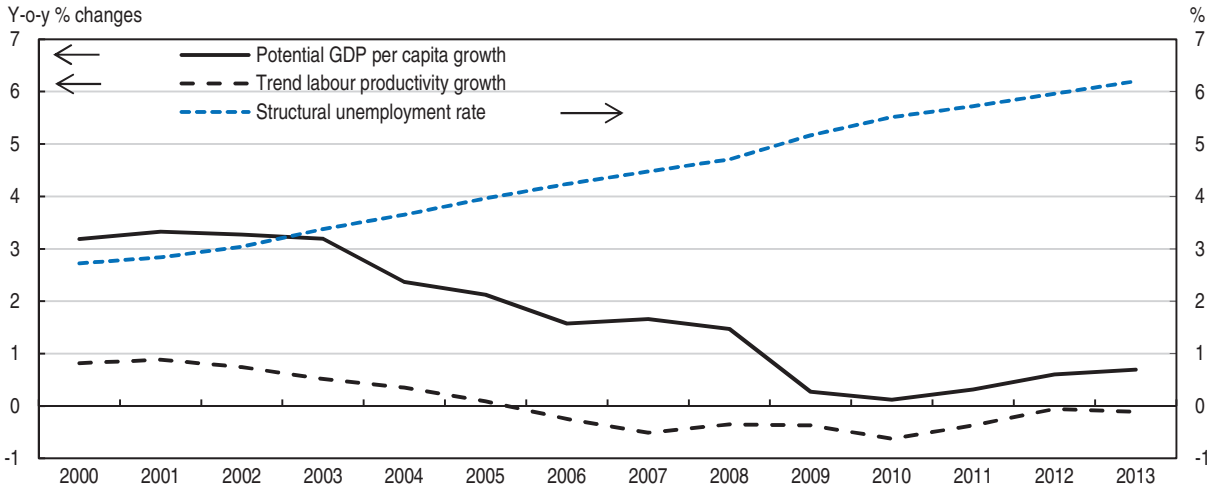


Note: Calculated as growth rate from initial level to the end-period level.
Source: *OECD Economic Outlook 96 Database.*

StatLink http://dx.doi.org/10.1787/888933197996

Potential output growth has also slowed significantly according to the recent OECD estimates (Figure 14), reflecting the decline in productivity growth but also the sharp rise in structural unemployment. Both are likely to reflect structural rigidities in the economy outside the financial sector, which weaken the mobility of resources, human capital

Figure 14. **Trend unemployment and productivity**



Source: OECD Economic Outlook 96, November 2014.

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development and capital upgrading. The booming financial sector may also have pushed up the real exchange rate, thereby raising costs in the rest of the economy and making the development of other sectors harder in a "dutch disease" type of effect.

Slowing reallocation of resources between sectors is bearing on productivity growth

Sectoral shift-share analysis, which distinguishes growth within a sector versus growth from shift in output between sectors, points to declining contribution to productivity of the traditional growth drivers of financial and other business services. Since the middle of the 1980s until the onset of the crisis, financial intermediation, manufacturing, transport, storage and communication and community and social services were the largest contributors to overall within-sector productivity growth (Figure 15, upper panel). Financial intermediation was the only sector that had a further increase in productivity growth in the decade prior to the crisis.

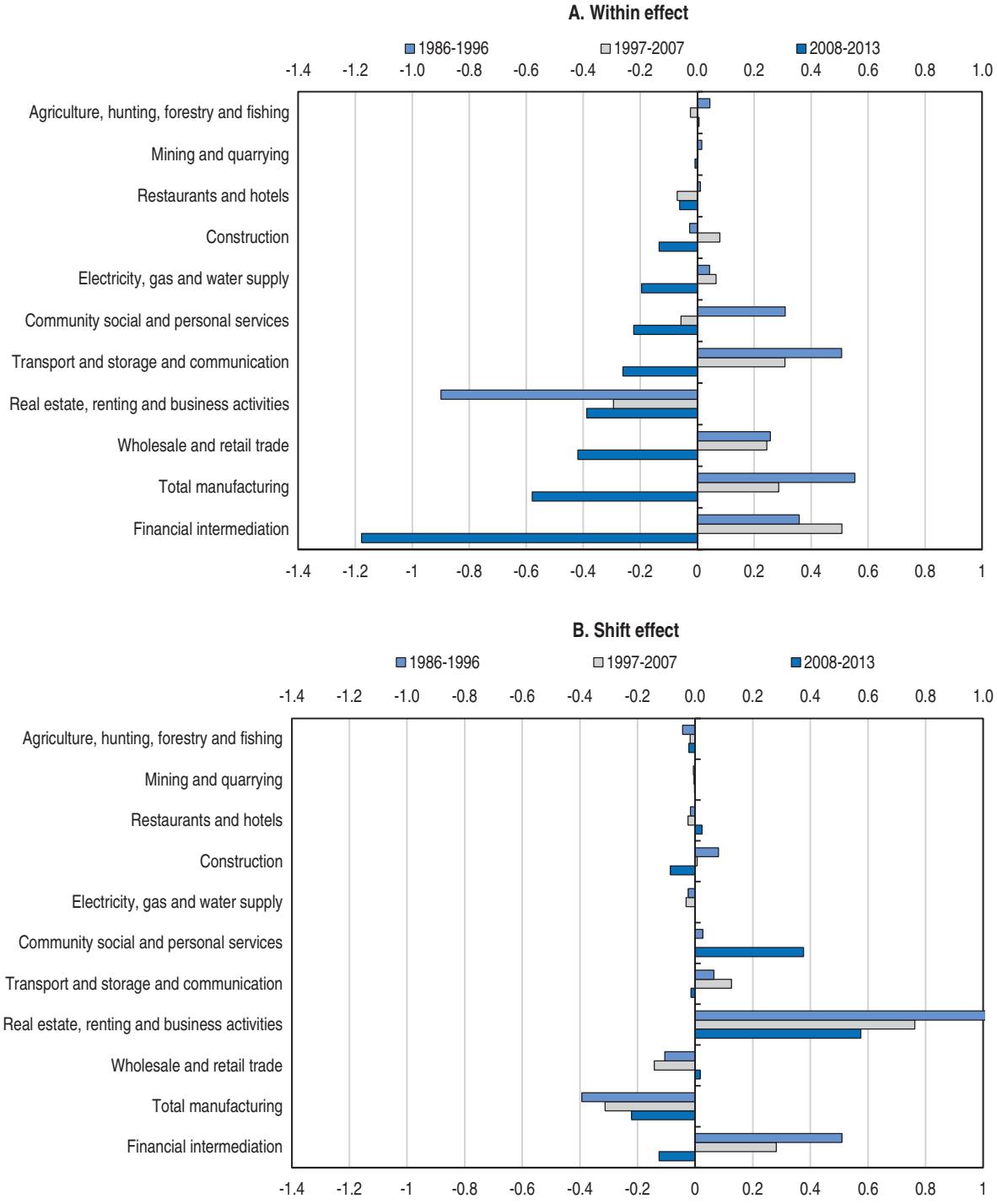
The shifting of resources towards sectors with high productivity – notably real estate, renting and business activities and financial intermediation – accounted for a significant part of overall productivity growth (Figure 15, lower panel). This positive reallocation effect slowed significantly after the crisis and turned negative in financial intermediation as its output fell. Securing and further developing Luxembourg's high living standards calls for fully exploiting the scope for structural reform to enhance reallocation of resources to new activities.

Future growth potential is likely to lie in high value-added activities

For high-income economies like Luxembourg activities that produce high value-added should be particularly important as they are relatively highly remunerated. High value-added activities tend to be technology and knowledge intensive. Indeed, in the EU value-added per employee in the high-tech manufacturing and the knowledge intensive service sectors (in the classification of the EU Commission) exceeds that in the rest of the economy by some 25% (Table 2). Thus, high-value-added activities are also less contestable because required skills are more difficult to obtain. Moreover, given the small size of the domestic

Figure 15. **Shift-share analysis of labour productivity growth**

Percentage points



Source: OECD STAN *Database*.

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economy, Luxembourg will have to rely on high integration in global value-chains, which broadens effective market size and can generate beneficial spillovers of knowledge and best practices (OECD, 2013a).

Table 2. **High-tech manufacturing and knowledge-intensive services industries**

NACE/area letter codes	Industry type
High- and medium-high technology manufacturing	
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment
Knowledge-intensive services	
50	Water transport
51	Air transport
58	Publishing activities
59-60	Motion picture, video, television programme production; programming and broadcasting activities
61	Telecommunications
62-63	Computer programming, consultancy, and information service activities
64	Financial service activities, except insurance and pension funding
65	Insurance, reinsurance and pension funding, except compulsory social security
66	Activities auxiliary to financial services and insurance activities
69-70	Legal and accounting activities; activities of head offices; management consultancy activities
71	Architectural and engineering activities; technical testing and analysis
72	Scientific research and development
73	Advertising and market research
74-75	Other professional, scientific and technical activities; veterinary activities
78	Employment activities
80	Security and investigation services
O	Public administration and defence; compulsory social security
P	Education
Q	Human health and social work activities
R	Arts, entertainment and recreation

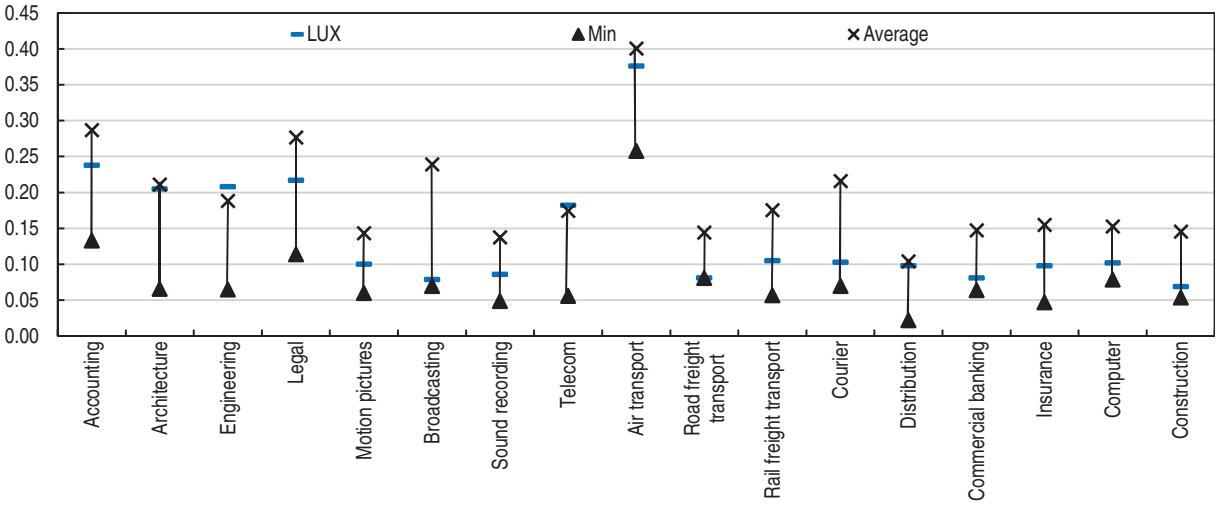
Note: Classification by Eurostat, see the ISIC Rev. 3 Technology-intensity definition; *www.oecd.org/sti/ind/48350231.pdf*.
Source: Eurostat indicators on High-tech industry and Knowledge-intensive services, Annex 2.1, *http://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf*.

Luxembourg is one of the most open countries in the OECD with respect to international trade in services. The scores on the OECD's Services Trade Restrictiveness Indicators (STRIs) are below (meaning more open) the OECD average in 16 out of 17 sectors (Figure 16). The share of services value added in Luxembourg's total exports exceeds 80%, which is the largest in the OECD. In the same vein, the integration of financial services in the global value added chains (GVC) is the highest in the OECD (Figure 17). At the same time, integration is considerably lower in other knowledge-intensive services, such as transportation and telecommunications, leaving potential to raise productivity by further integration into international value chains in higher value-added non-financial activities. Integration in business services also still leaves some scope for benefitting from higher integration.

Policies to promote high value added activities to raise productivity and potential output

In high-income economies the role of innovation and knowledge-based capital (KBC) – assets that lack physical embodiment, such as computerised information, intellectual property and economic competencies – is increasingly important for productivity and growth. Overall investment in knowledge based capital as a share of GDP is lower in

Figure 16. **Services Trade Restrictiveness Index (STRI): Luxembourg**



Note: The STRI indices take the value from 0 to 1, where 0 is completely open and 1 is completely closed. They are calculated on the basis of information in the *STRI Database* which reports regulation currently in force. For further information, see *www.oecd.org/tad/services-trade/services-trade-restrictiveness-index.htm*.
Source: OECD STRI Database.

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Luxembourg than in other OECD countries (Figure 18). The economy is also below the OECD average in terms of business and overall spending on research and development (R&D) (Figure 19). Enterprise R&D spending declined from 1.4% of GDP in 2007 to 1% in 2012, widening the gap to the OECD and the EU average. On the other hand, in trademark applications Luxembourg scores highest in the OECD (Figure 20).

Stepping up investment in KBC and enterprise innovation can help Luxembourg to maintain and further develop its position in the global value added chains, raise productivity and keep its high living standards. Important policies for innovation and KBC are those related to the business environment, labour markets, education, patenting, bankruptcy law, access to finance and competition. Indeed, several of these factors are cited by entrepreneurs as important barriers for doing business (Figure 21). Lately, cluster policies have also gained in importance among policy makers. The role of these various factors in Luxembourg is discussed in more detail below.

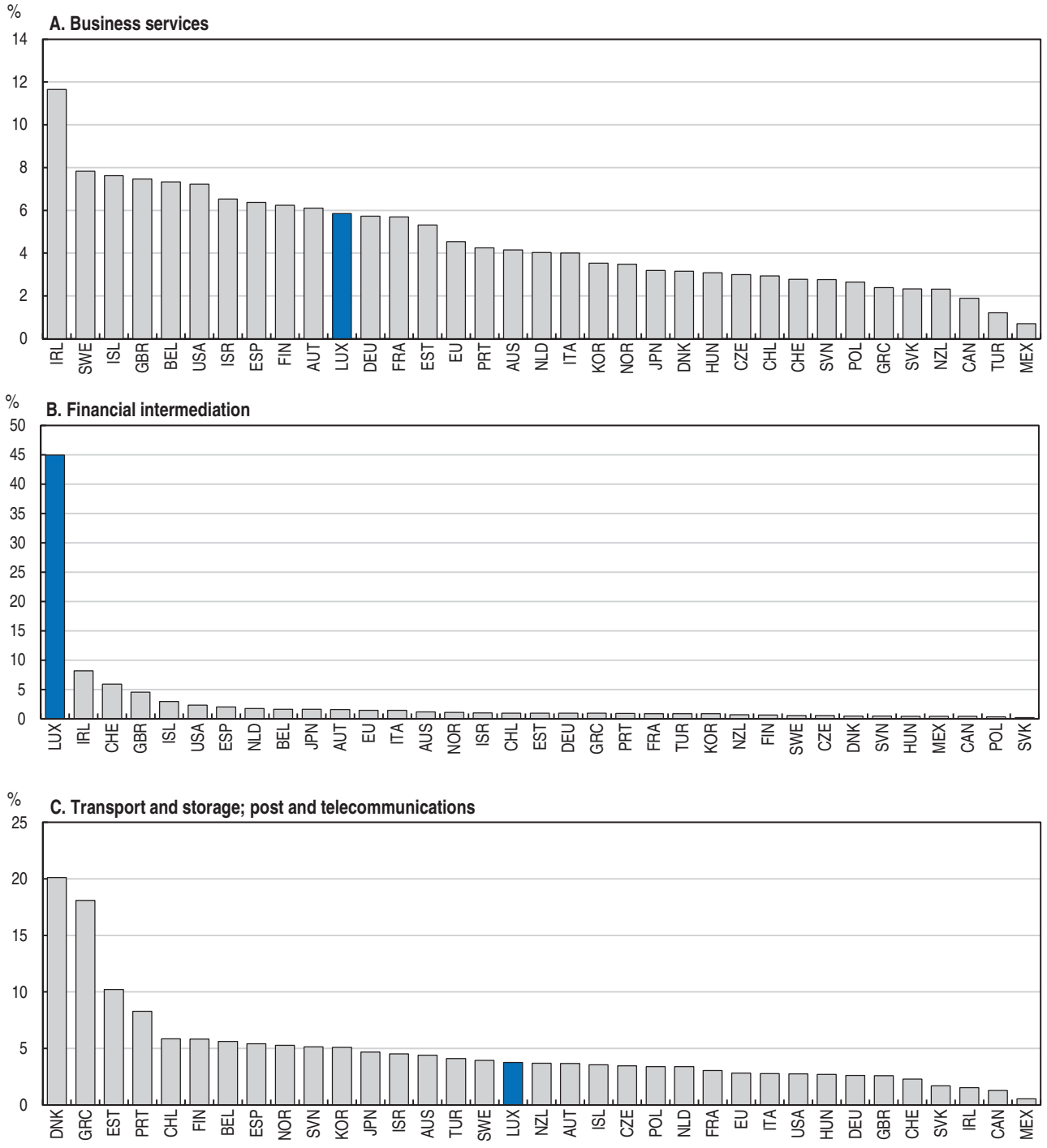
Developing entrepreneurship

Improving the business environment to foster innovation

Entrepreneurship and productivity are heavily influenced by the business environment. There is a strong negative relationship between the strictness of product market regulation (PMR) and productivity, both in the aggregate (Bouis et al., 2011) and at the firm and sectoral levels (Aghion et al., 2004; Bourlès et al., 2010). In particular, lower entry barriers increase the supply of new ideas by raising firm entry rates, which in turn increases the pressure on incumbent firms to innovate.

Overall, barriers to entrepreneurship have declined in Luxembourg between 2003 and 2013, but remain higher than those in best-practice countries (Figure 22). Administrative burden for sole proprietor firms and of barriers in network sectors declined, but in the services sector business conditions became more restrictive due to tighter regulation in licencing in retail trade. There has been little progress in making regulation in

Figure 17. **International comparison of GVC participation index for selected industries, 2009**



Note: The participation index is calculated as the sum of: i) the share of foreign inputs in overall exports, and ii) the share of gross exports that are used as inputs in other countries' exports.
Source: OECD *Global Value Chains Indicators*.

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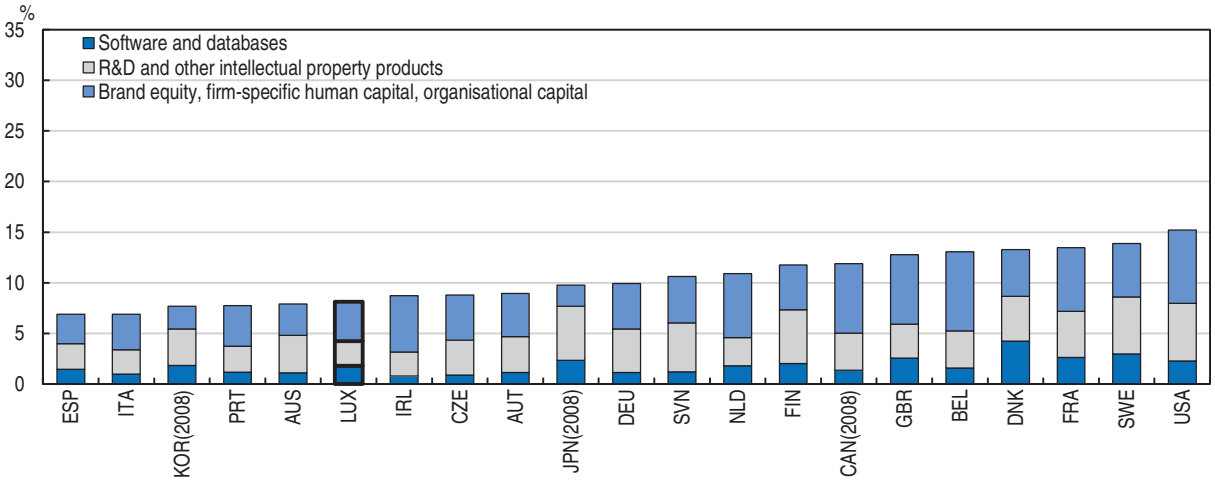
professional services, such as architecture, engineering, accounting and legal services, more competition friendly. Barriers in these sectors appear to be relatively high by international comparison due to high entry barriers, such as compulsory qualifications

Figure 18. **Investment in knowledge based capital, 2010**

As a percentage of value added of the business sector



Source: OECD *Science, Technology and Industry Scoreboard 2013*.

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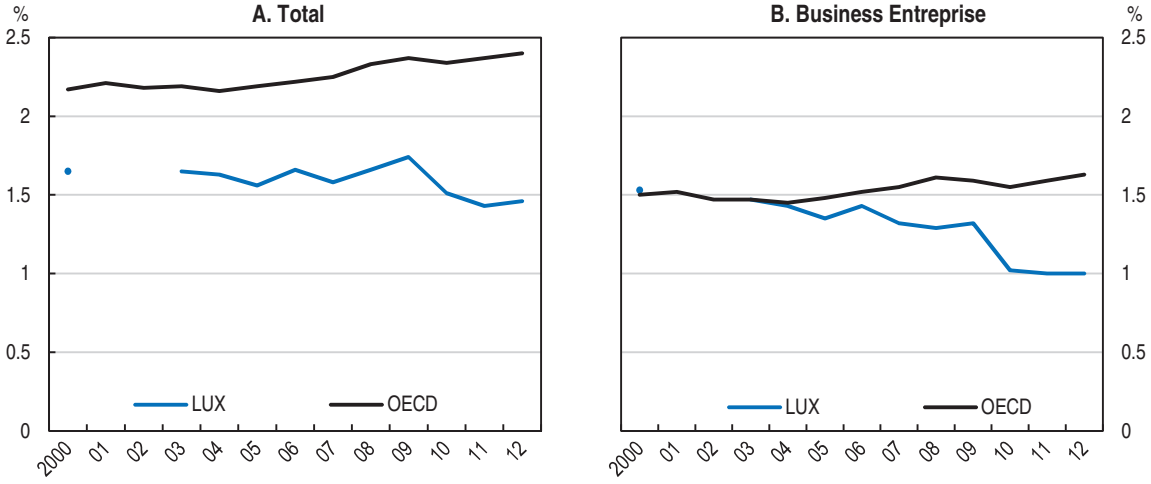
Figure 19. **Research and development expenditure**

Gross domestic expenditure in per cent of GDP



Source: OECD (2014), *Main Science and Technology Indicators*.

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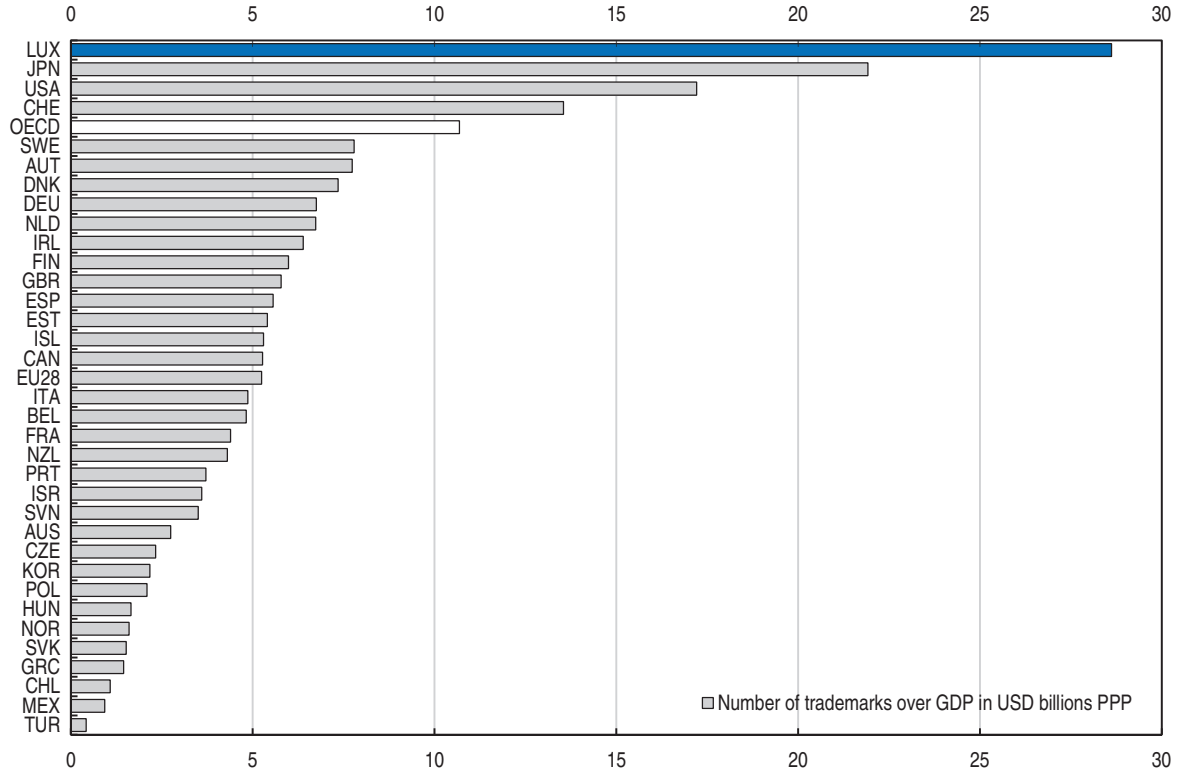
and duration of compulsory practice. However, the Competition Authority was able to abolish recommended fee structures published by several professional associations, such as architects and safety and health co-ordinators.

Entrepreneurial barriers in the network sector remain relatively high. As the government retains full ownership in the major telecommunication network operators (*Luxconnect* and *Entreprise des Postes et Télécommunications*), they are not open to investment by private firms. Opening the sector to foreign participation might lead to more investment, although the outcome is not certain and will depend on expected returns. The government should consider opening the telecommunications sector to private ownership and investment.

Figure 20. **Trademark applications, 2009-11 average**



Note: Registered at JPO (Japan Patent Office), OHIM (Office for Harmonization in the Internal Market) and USPTO (US Patents and Trademark Office).
Source: OECD *Science, Technology and Industry Scoreboard 2013*.

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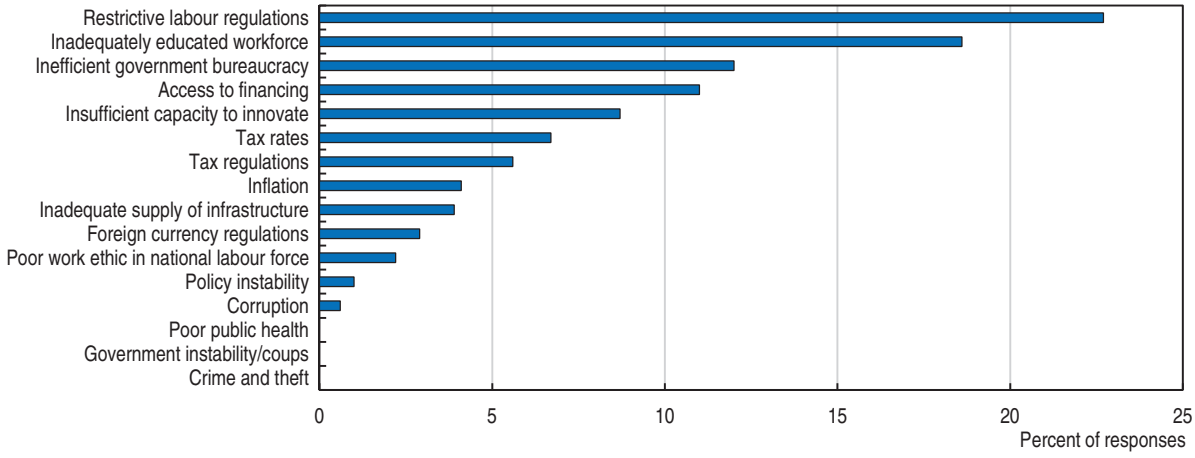
Figure 21. **Luxembourg: Factors considered most problematic for doing business**



Note: From the list of factors above, respondents were asked to select the five most problematic for doing business in their country and to rank them from the most problematic to the least problematic one. The bars in the figure show the responses weighted according to the rankings. Respondents are business executives from small- and medium-sized enterprises and large companies representing all fields of activity.
Source: World Economic Forum, *The Global Competitiveness Report* 2014-2015, *www.weforum.org/reports/global-competitiveness-report-2014-2015*.

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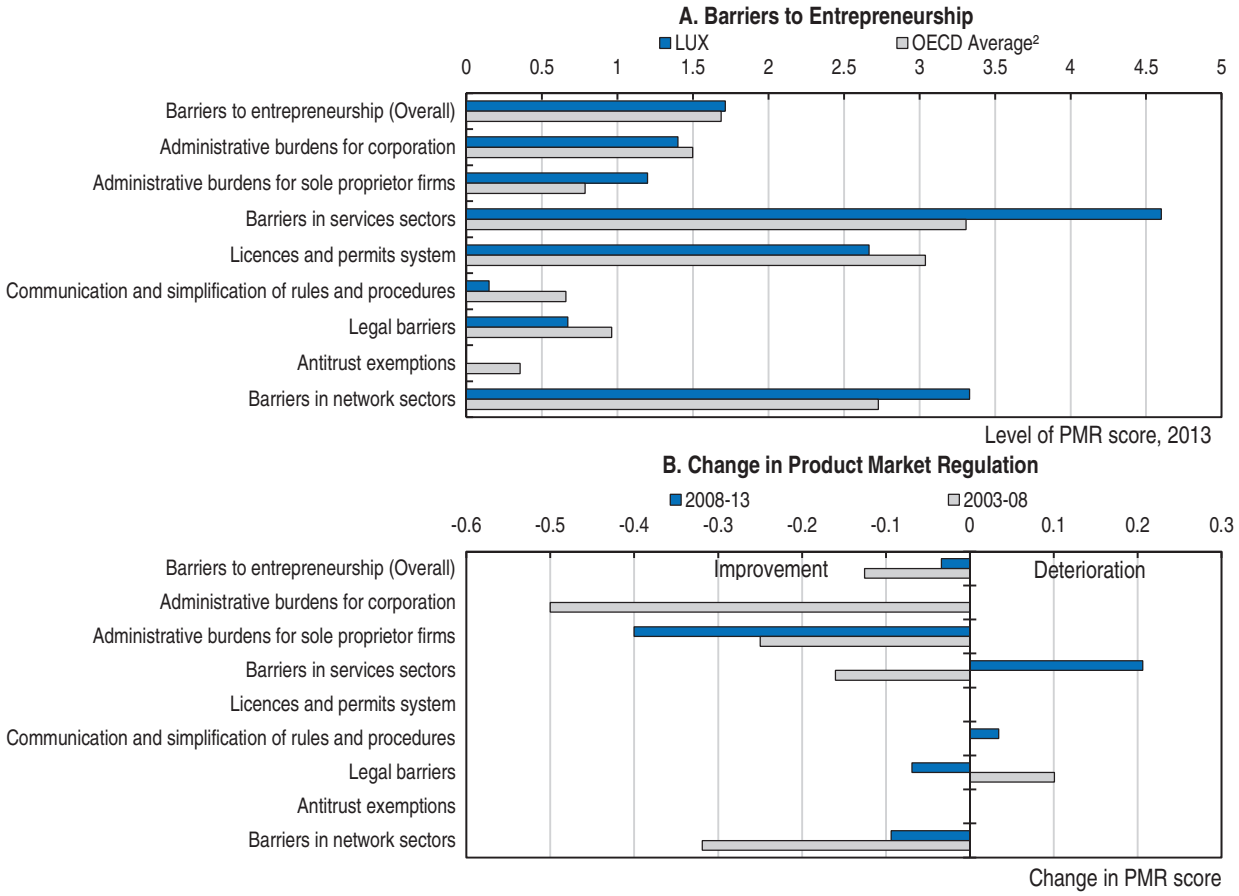
Figure 22. **Product Market Regulation: Barriers to entrepreneurship**[1]



1. All indices below the first line are sub-indices of the index "Barriers to entrepreneurship".
2. Simple average of OECD countries, 2013 data. USA latest data is 2008.

Source: OECD *Product Market Regulation Database*, 2013 edition.

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Policies helping enterprises to form clusters could support innovation and productivity growth

The case for public policies that promote "clustering", the tendency of firms in related lines of business to concentrate geographically, rests on the idea that regional clusters might internalise spill-overs, thereby spurring innovation and productivity growth (Beaudry and Breschi, 2000). Clusters might also help firms to attract a workforce with characteristics that best match their projects.

The government is supporting the formation of enterprise clusters in sectors that it considers promising for Luxembourg. At present, the initiative comprises the following clusters: eco-innovation technologies; healthcare and biotechnologies; information and communication technologies; materials technologies; space technologies; automotive components; logistics; and the maritime transport (Box 1). These sectors fit with the usual classification of high value-added activities (Table 2). However, it is important to ensure that the approach remains flexible with respect to new demands and avoids creating disadvantages for business in sectors that are not covered by the initiative. Experience in other countries suggests that favourable regulatory framework conditions are important to the success of clusters (OECD/DSTI, 2014). In particular, this concerns: overall competition-

Box 1. **The government's cluster initiative**

In 2002, the government launched a cluster initiative, which, in its present form, pursues the following objectives:

- Foster communication and the exchange of knowledge and know-how between cluster and innovation network members.
- Stimulate the development and implementation of collaborative projects on a national, European and an international level.
- Enhance the visibility of the technological excellence and the innovation potential of cluster and innovation network members.
- Encourage the uptake of new technologies and the identification of potential business opportunities.

The aim is to create 3 000 new jobs and contribute to the establishment of 300 new businesses by 2020.

Most of the clusters are led by a president coming from the private sector, who is supported by a vice-president from public research. Designated cluster managers are in charge of the daily organisational management.

friendly product market regulation to foster the reallocation of resources; labour market regulation that raises employment and supports efficient matching of workers with jobs; and policies that raise skills. Sector-specific regulation might also be relevant. For example, the forthcoming *OECD Innovation Report on Luxembourg* found a need to adapt the legal framework regulating activity in bio-health for the relevant cluster to become a success (OECD, 2015a, forthcoming).

Studies on cluster policies suggest that they need to build on existing strengths to be successful. Policies disregarding comparative advantages can entail high economic costs and risks (OECD/DSTI, 2014). Support for clusters run the risk of "backing losers" rather than "picking winners" (Hospers et al., 2008). Several evaluations of cluster policies in OECD countries found no positive effect on employment, exports, sales, patents or R&D productivity (Martin et al., 2011; Bellego and Dortet-Bernadet, 2013; Nishimura and Okamuro, 2011). Other evaluations found modest positive effects of cluster policies such as a slightly higher share of knowledge-based firms in the locality, albeit stagnating over time (Viladecans-Marsal and Arauzo-Carod, 2012), and a somewhat higher probability that firms in a target industry would innovate (Falck et al., 2010). Also, valuation based on interviews and self-reports show that cluster policies can succeed in fostering inter-firm collaboration or business contacts (Engel et al., 2012; Uyarra and Ramlogan, 2012).

The government has undertaken substantial infrastructure investment supporting cluster activities. Luxembourg now has one of the most modern data centre parks in Europe with 19 data centres in operation that conform to high standards in security, availability and environmental benchmarks. For the bio-medicine cluster important research infrastructures were built up. The forthcoming *OECD Innovation Policy Review on Luxembourg* (OECD, 2015a) finds that the quality of research in bio-health has recently improved, largely owing to international co-operation. At the same time, the *Review* sees a need to reconsider regulatory framework conditions that are relevant for research in biomedicine and points to a number of other issues that can hamper health-related innovation such as a relatively weak industrial base in the field and a lack of linkages between researchers, business and clinicians.

To enhance the efficiency of cluster policies, outcome-oriented evaluation should be given high priority to ensure that costly infrastructure investment yield results. The government is presently establishing a comprehensive data-base containing key characteristics of the enterprises participating in clusters. This is an important step towards effective policy evaluation. Project funding should rely increasingly on private resources as cluster participants obtain benefits from the policy stimulus. Also, evaluation should go hand in hand with an assessment whether regulatory policy settings would need to be adapted. Efforts should be made to create synergies via cross-border initiatives. To enhance innovation, clusters should also be kept inclusive through impartial public co-ordination and adaptable by effective interaction of firms and research institutions. A proper assessment of market failures that the cluster policy is trying to address should be an integral part of policy formulation.

Equity financing of start-ups is subdued

Venture capital and start-up investment in Luxembourg is low by international comparison, although funding appears volatile over time (Figure 23). The government is promoting the availability of venture capital via two public investment funds set up in 2012. The funds are designed to invest in innovative small and medium-sized enterprises (SMEs) in the development phase, in sectors supported by the government's cluster initiative (such as ICT and clean technologies). Other direct support programmes exist to fund innovation, and royalties and capital gains derived from most types of intellectual property are tax deductible to some extent. OECD research suggests that R&D tax incentives benefit incumbents at the expense of entrants, suggesting that direct support is better suited for small and young firms facing constraints to access finance (Westmore, 2013; Jaumotte and Pain, 2005).

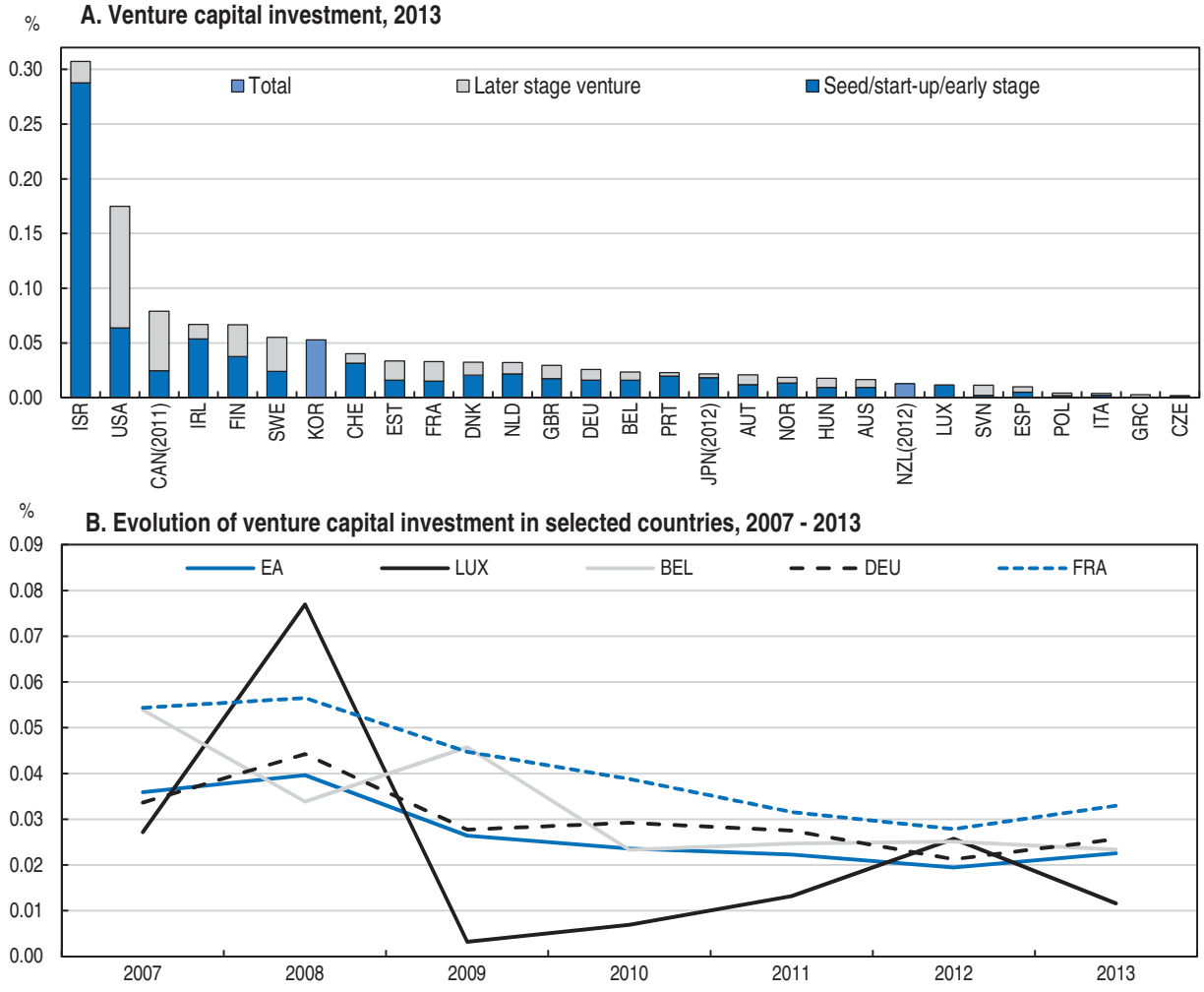
These initiatives have not yet lead to a significant boost in venture capital, however. The funding programmes should be carefully evaluated in terms of how effective they are in achieving their goals, and adjusted periodically as needed.

Collaboration with other companies, universities and research institutes can help innovation by SMEs that may otherwise have more limited resources for R&D. Innovative SMEs in Luxembourg are actively engaging in international collaboration on trademarks and patent submissions, as well as on joint marketing and distribution schemes (Figure 24, Panel A). Collaboration of enterprises with public research institutions has been relatively weak (Figure 24, Panel B), but has made progress in recent years as the governance of public research institutions improved (OECD, 2015a). Scope remains for further improving the performance of public research centres (CRP), as argued in the forthcoming OECD Innovation Policy Review on Luxembourg, notably via exploring closer co-operation of the research centres with the University of Luxembourg and foreign-based research institutes, considering the possibility of further mergers of CRPs, and utilising the merger process for developing co-operation with international institutions (OECD, 2015a).

Raising the quality of human capital

Educational attainment is high, with tertiary education rates among the adult working-age population well above the OECD average (Figure 25), and have increased over time. This upward dynamic, which is broadly in line with that in many OECD countries, should provide an increasing pool of skilled workers for Luxembourg.

Figure 23. **Venture capital investment as a percentage of GDP**



Source: OECD, *Entrepreneurship at a Glance 2014*; European Private Equity and Venture Capital Association.

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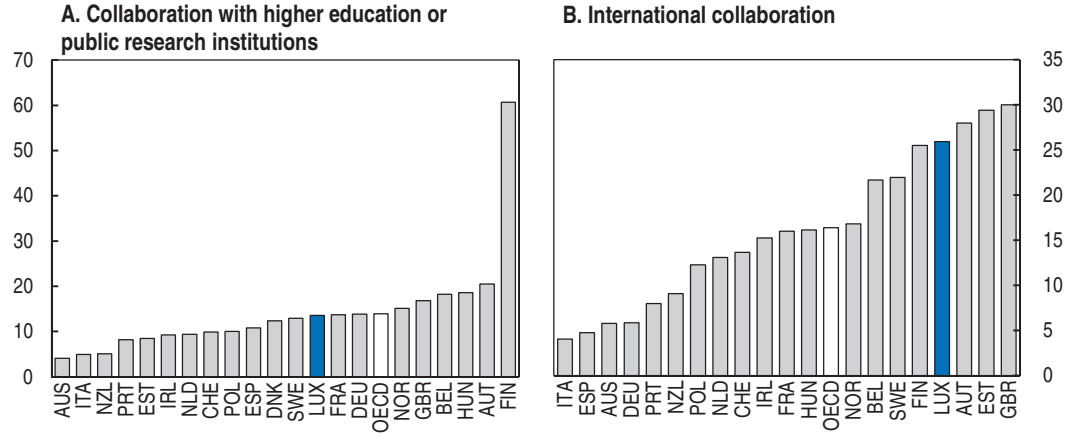
Secondary schooling also has many strengths, but PISA results for 15 year-old students show performance somewhat below the OECD average in all three components, mathematics, reading and science (OECD, 2014a). Class sizes are small and the teaching workforce is the youngest within the OECD. Teachers receive the highest salary per student within the OECD (measured in purchasing power parities).

However, the share of students needing another two years on top of the regular time for high school completion is the highest among the OECD countries, due to the widespread practice of repeating one or more years of school (Figure 26). Grade repetition is costly and studies have shown that it is largely ineffective in raising educational outcomes (OECD, 2012c). Additional support in addressing learning gaps and more use of special education techniques can be employed in decreasing grade repetition. Also, the completion rate of vocational programmes (which are part of upper secondary education) barely exceeds 60% (OECD, 2014b). Even though it is possible that some non-completing school leavers find their way back into education and gain qualifications, the window of opportunity between ages of 15 and 20 has been lost (OECD, 2010a).

Figure 24. **SMEs collaboration on innovation**

Per cent of product and/or process innovative firms, 2008-10[1]



1. 2011 for Australia, 2006-08 for Ireland, 2009-10 for New Zealand and 2009-11 for Switzerland. SME: Small- and medium-sized enterprises. The OECD aggregate covers 30 countries in Panel A and 28 in Panel B.

Source: OECD (2013), OECD *Science, Technology and Industry Scoreboard 2013*.

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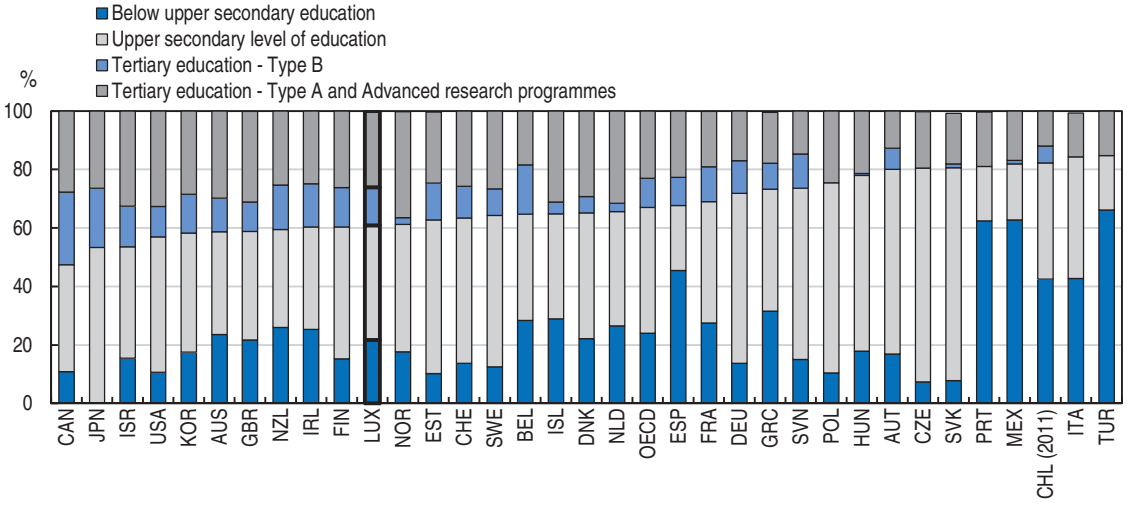
Figure 25. **Educational attainment of 25-64 year-olds, 2012**



Source: OECD (2014), *Education at a Glance*.

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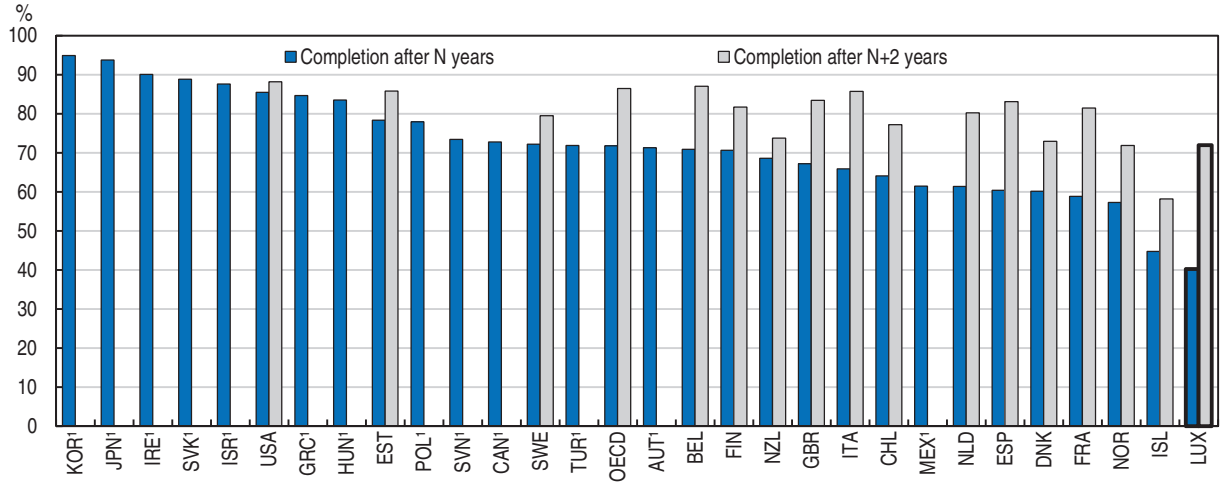
Students with immigrant backgrounds have lower performance and parents' educational attainment substantially affects student achievement (Figure 27). The government has proposed measures to raise the equality of opportunities and educational outcomes of vulnerable groups. A free childcare programme for children below 3 years will become effective in September 2016. This can improve language competences in the three official languages used in schools, and thereby raise learning outcomes among the vulnerable groups. OECD work indicates that early childhood education and care helps in improving learning outcomes and provides foundation for lifelong learning, but the magnitude of benefits is conditional on quality (OECD, 2012d). Also, in mid-2014, reform of the financial aid system for students lowered the annual sum paid to all students regardless of background, with topped up funding subject to eligibility criteria and means testing. The revised system focusses more on students with disadvantaged backgrounds.

Figure 26. **Successful completion of upper secondary programmes, 2012**
(N: theoretical duration of the programmes)



Note: Please refer to Annex for details concerning this indicator, including methods used, programmes included/ excluded, year of entry, etc.
1. N + 2 information missing.
2. Countries are ranked in descending order of the successful completion of upper secondary programmes.
Source: OECD (2014), *Education at a Glance*, Table A2.4. See Annex 2.1 for notes (*www.oecd.org/edu/eag.htm*).
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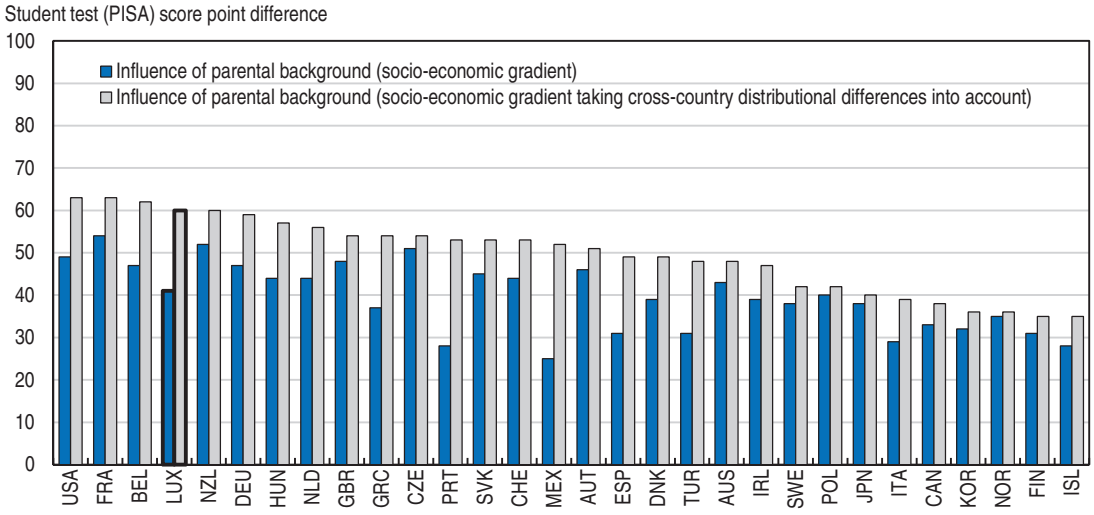
Figure 27. **The influence of parental background on student achievement in secondary education**[1]



Note: Regression of students' PISA science performance scores on their PISA economic, social and cultural status (ESCS), a broad indicator of family's socio-economic background. Country-by-country least squares regressions weighted by students' sampling probability. Robust standard errors adjusted for clustering at the school level.
1. The socio-economic gradient represents the change in PISA science score due to an improvement of one international standard deviation in the PISA index of student socio-economic background. The socio-economic gradient taking cross-country distributional differences into account is the change in PISA science score due to an improvement of one country-specific, inter-quartile change in the PISA index of student socio-economic background. Note that science literacy was the focus of PISA 2006, upon which these results are based.
Source: Causa and Chapuis (2009).
StatLink http://dx.doi.org/10.1787/888933198137

Overall, recent reform plans of the government, such as better targeting support to disadvantaged students, are welcome. Enrolment in early childhood education with emphasis on low-income and foreign-language families should be increased. Raising the educational performance of the school system suggests to broaden these initiatives, to include reforms that have proven to be effective in other OECD countries, such as providing schools with more autonomy in choosing teachers and in budgetary matters (Sutherland and Price, 2007), and better monitoring of education quality. These reforms would help potentially to reduce the structural unemployment and raise the pool of workers able to work in the higher value-added activities.

Getting workers to move to new activities

Labour market policies to improve reallocation of labour into new sectors would help diversification. This is especially the case as high wage premia in the financial sector relative to the rest of the economy can make it difficult for other sectors to attract qualified workers. Employment protection legislation (EPL) in Luxembourg is above the OECD average, with notice periods for individual dismissals relatively long (Figure 28). Therefore, further liberalisation of these requirements could facilitate reallocation of labour to growing sectors' activities (Haltiwanger et al., 2006; Bassanini et al., 2009).

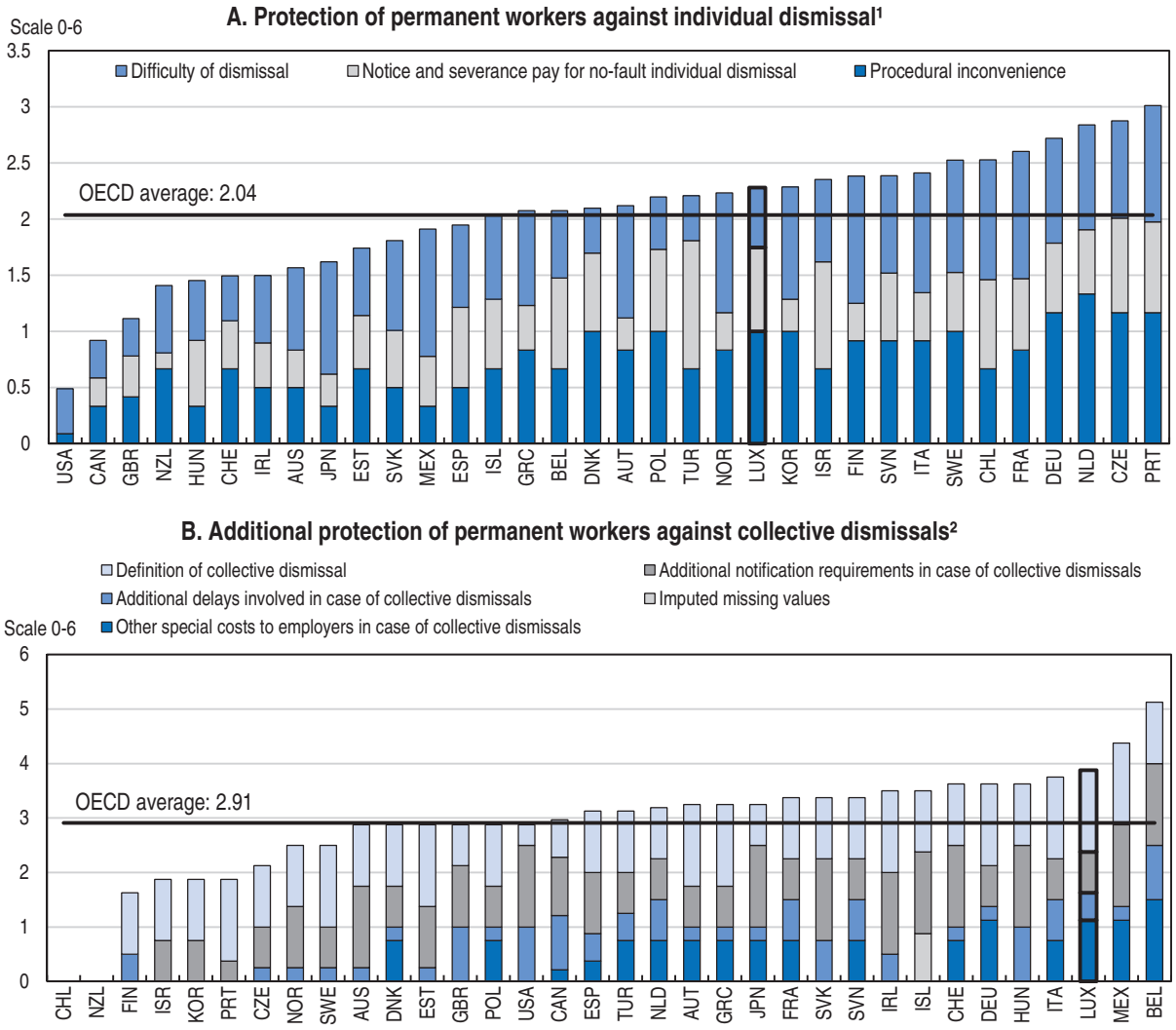
The mechanism of wage indexation has been restarted in 2015, after a temporary moderation between 2012 and 2014. The government has announced that the economic situation and the evolution of prices will be taken into consideration in the adjustment. Wage indexation can lead to increases in unit labour costs with negative implications for competitiveness. Thus the wage indexation system should be reviewed to ensure that wages reflect productivity developments and do not present risks to competitiveness (OECD, 2012).

The expenditure on active labour market policies (0.46% of GDP) in 2011 was about the same as in the EU (0.47%). The policy mix is very different, though. Active labour market policies (ALMP) in Luxembourg are heavily geared towards temporary job creation schemes (*incitations à l'emploi*) that represent 75% of active labour market policies spending, as opposed to 24% in the EU (STATEC, 2012). These schemes have been found to be generous and long, and in many cases participants return to unemployment after their completion (OECD, 2010b). On the other hand, expenditures on training represent only 9% of ALMP measures in Luxembourg compared with 43% in the EU. The authorities should review the existing ALMP programmes, evaluate their effectiveness in accelerating jobseekers employment prospects and divert resources to uses supporting stronger activation policies, such as training and start-up incentives.

Residence permits requirements for non-EU nationals have a preference for highly qualified workers, such as educational attainment, work experience and a minimum level for the annual salary to be earned in Luxembourg (a proxy for skills). Moreover, a specific residence permit is granted to persons with certain professions, such as managers, medical doctors, teachers and accountants. It has been argued that these permits do not include Physical and Engineering Science technicians (ISCO classification 311) (University of Luxembourg, 2013), which might be relevant to strengthen economic development outside the financial sector and the clustering of enterprises. It is thus worth examining whether eligibility criteria are defined broadly enough.

Non-monetary factors affecting the perceived quality of life are also relevant for attracting a highly qualified workforce. As noted, Luxembourg scores very high on all

Figure 28. **Protection of permanent workers, 2013**



1. The figure presents the contribution of different subcomponents to the indicator for employment protection for regular workers against individual dismissal (EPR). The height of the bar represents the value of the EPR indicator.
2. The figure presents the contribution of different subcomponents to the indicator for additional provisions for collective dismissals (EPC). The height of the bar represents the value of the EPC indicator. Note that this indicator quantifies only additional restrictions, over and above those for individual dismissals. For the sole purpose of calculating the EPC indicator, missing values of specific subcomponents are set equal to the average of other non-missing subcomponents for the same country.

Source: OECD *Employment Protection Database*, 2013 update, *http://dx.doi.org/10.1787/lfs-epl-data-en*.

StatLink *http://dx.doi.org/10.1787/888933198142*

measures of the OECD well-being measures (Figure 2). Traffic congestion is an increasing problem, given the large number of the cross-border workers from neighbouring Belgium, France and Germany, an increasing share of whom are highly-qualified. The government plans to build new hubs at the outskirts of Luxembourg City that will be linked by tram and tangential buses, so that commuters can avoid travelling through the city centre. This initiative should be implemented. The initiative can also contribute to reducing CO_2 emissions. Raising investment in public transport and co-operation within the greater region should continue to increase the capacity of the public transport system, reduce congestion

and thus CO_2 emissions. Introducing a system of congestion charges around Luxembourg City is worth considering (European Conference of Ministers of Transport, 2003).

Luxembourg's supply of housing may be falling short of demand, as rising real house prices indicate. The government plans to increase the VAT on building not intended for owner-occupation from the current preferential rate of 3% to the standard rate of 17%. Since projects completed before 2017 will not be affected, housing supply is likely to increase prior to the tax hike as projects are brought forward to benefit from the still-low tax rate, but the more fundamental effect is to increase taxation of those residents who are able to afford more than one property. The preferential tax treatment of housing investment is likely to be reduced, but rents may rise, too, as owners attempt to pass on the higher tax rates on tenants. The government also plans stepping up the construction of social housing. More fundamental reform appears necessary, however (OECD, 2012a). Procedures for granting construction permits should be speeded up and property taxes be raised by updating property values used as a tax base.

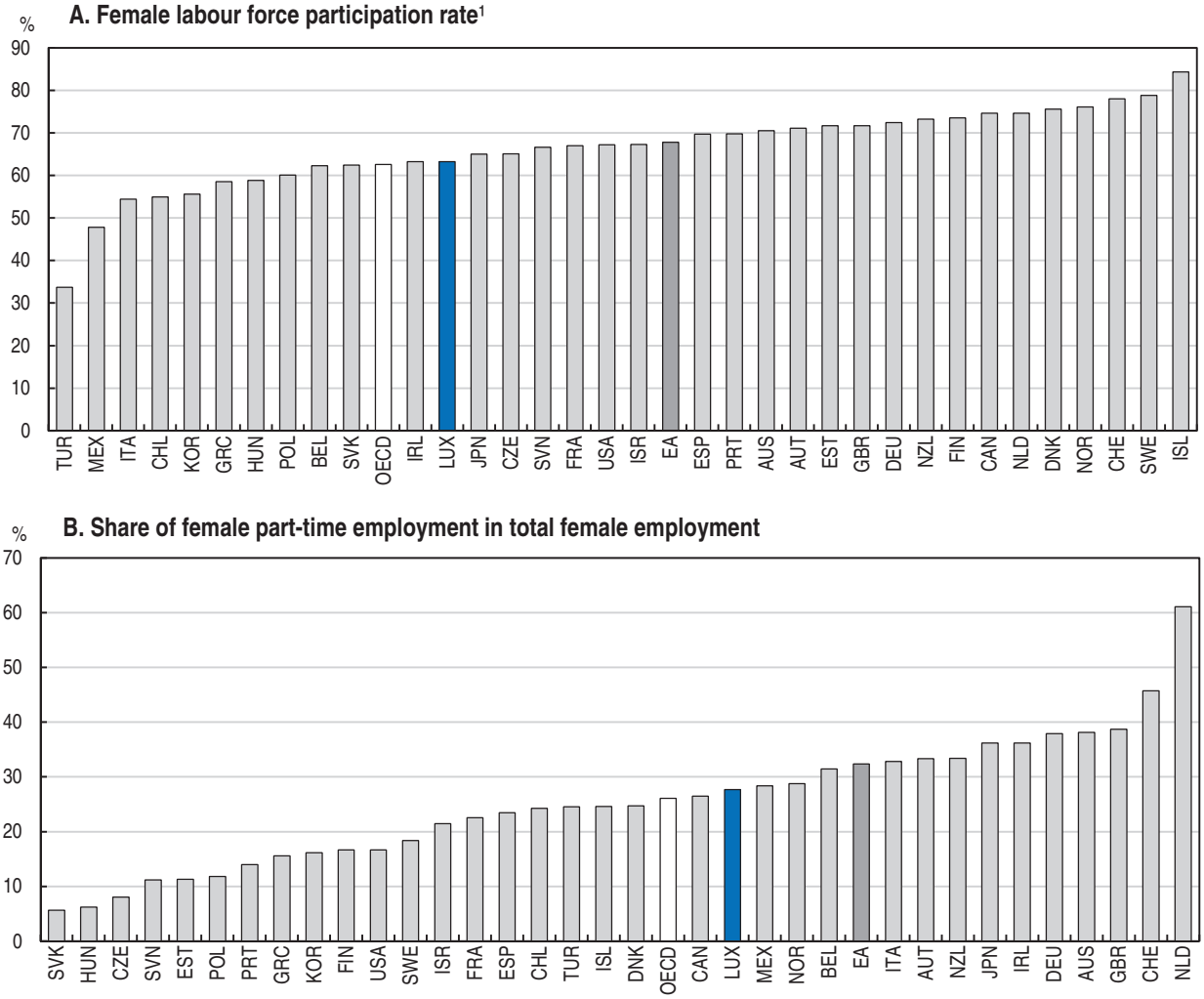
Enhance incentives to work for second earners and women

The pool of workers is also reduced by the low participation of second earners, mainly women (Figure 29). Female part-time employment also falls short of the average in the euro area. Reducing disincentives for second earners' participation can increase labour supply for new industries, which otherwise would have to come from the financial sector and abroad.

A number of provisions in the tax and transfer system discourage labour supply of second earners. In the universal health care insurance system, all family members are covered by contributing family members, effectively reducing the earnings of working spouses. Resident married couples, taxpayers living in registered partnerships, and non-resident married couples with earnings taxable in Luxembourg can file jointly and are taxed at lower average rates. This reduces work incentives for the spouse with the lower income. Also, effective marginal taxation of additional hours worked seems to be particularly high for lone parents due to the interaction of benefits and income taxation (OECD, 2007). These issues should be addressed. The government's plan to move away from joint income tax assessment for couples is welcome.

Significant fixed costs of work, notably the monetary and non-monetary costs of child care can be important impediments for higher female or spouses' labour force participation. Means-tested childcare service vouchers for children aged below 12 are addressing this issue. The government's plan to augment this system by free childcare combined with promotion of French, German and Luxembourgish language skills for all children aged 1 to 3, starting in 2016 will be financed via a tax of 0.5% on households' total revenues (with part of subsistence income exempted). This initiative could increase labour force participation by families with small children, while avoiding distortions from the financing side. The government should reduce disincentives for labour force participation of spouses and lone parents by charging health care contributions for each spouse individually.

Figure 29. **Female labour market participation, 2013**



1. The labour force participation rate is defined as the ratio of the labour force to the working age population, expressed in percentages.

Source: OECD *Labour Force Statistics*.

StatLink http://dx.doi.org/10.1787/888933198155

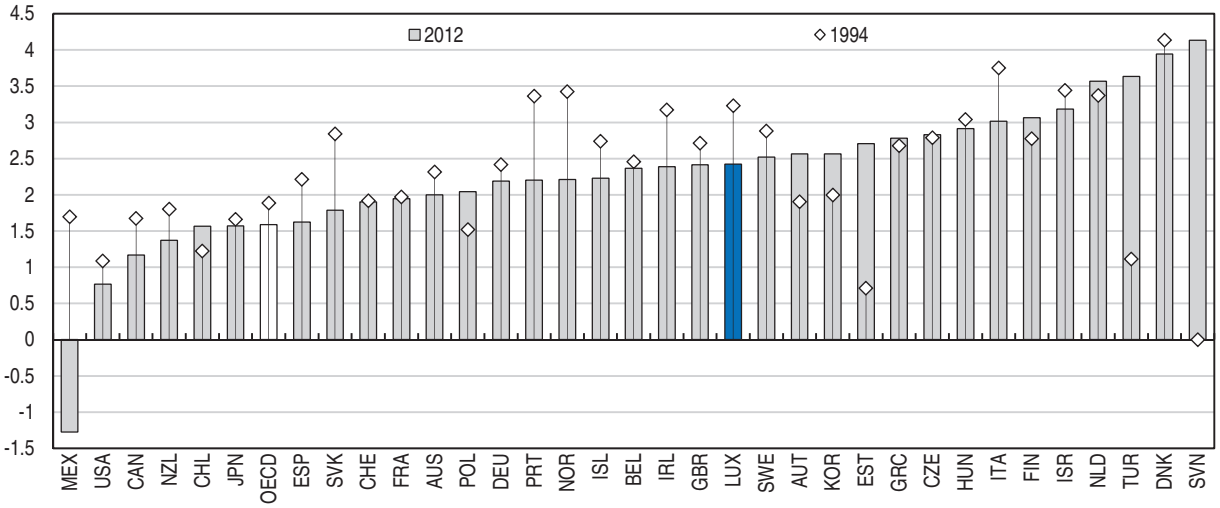
Greening growth

Luxembourg's main environmental challenges were analysed in Chapter 2 of the previous *Economic Survey* (OECD, 2012a). A key policy priority is to reduce carbon emissions, especially through further reforms in the transport sector, which accounts for more than a half of the greenhouse gas (GHG) emissions. Luxembourg's total GHG emissions in 2012 still stood about 20% above its Kyoto emissions target, although emissions have decreased by more than 8% compared to the base year (1990). Higher taxation of fuel and continuing investment into public transport are crucial for reducing GHG emissions further.

Revenues from environmental taxes as a share of GDP, just below 2.5% in 2012, have decreased since 1994 and are well above the OECD average (Figure 30). Tax rates are generally levied at or slightly above the minimum level prescribed by the EU Energy Taxation Directive. Zero rates apply to coal, coke, and natural gas not used for heating purposes. Additionally, a concessionary rate is applied to LPG used as a propellant or for

Figure 30. **Revenues from environmental taxes**

Per cent of GDP



1. Environmentally related taxes include: energy products for transport purposes (petrol and diesel) and for stationary purposes (fossil fuels and electricity); motor vehicles and transport (one-off import or sales taxes, recurrent taxes on registration or road use and other transport taxes); waste management (final disposal, packaging and other waste-related product taxes); ozone-depleting substances and other taxes.

Source: OECD(2014), "Green Growth Indicators", OECD *Environment Statistics*.

StatLink http://dx.doi.org/10.1787/888933198169

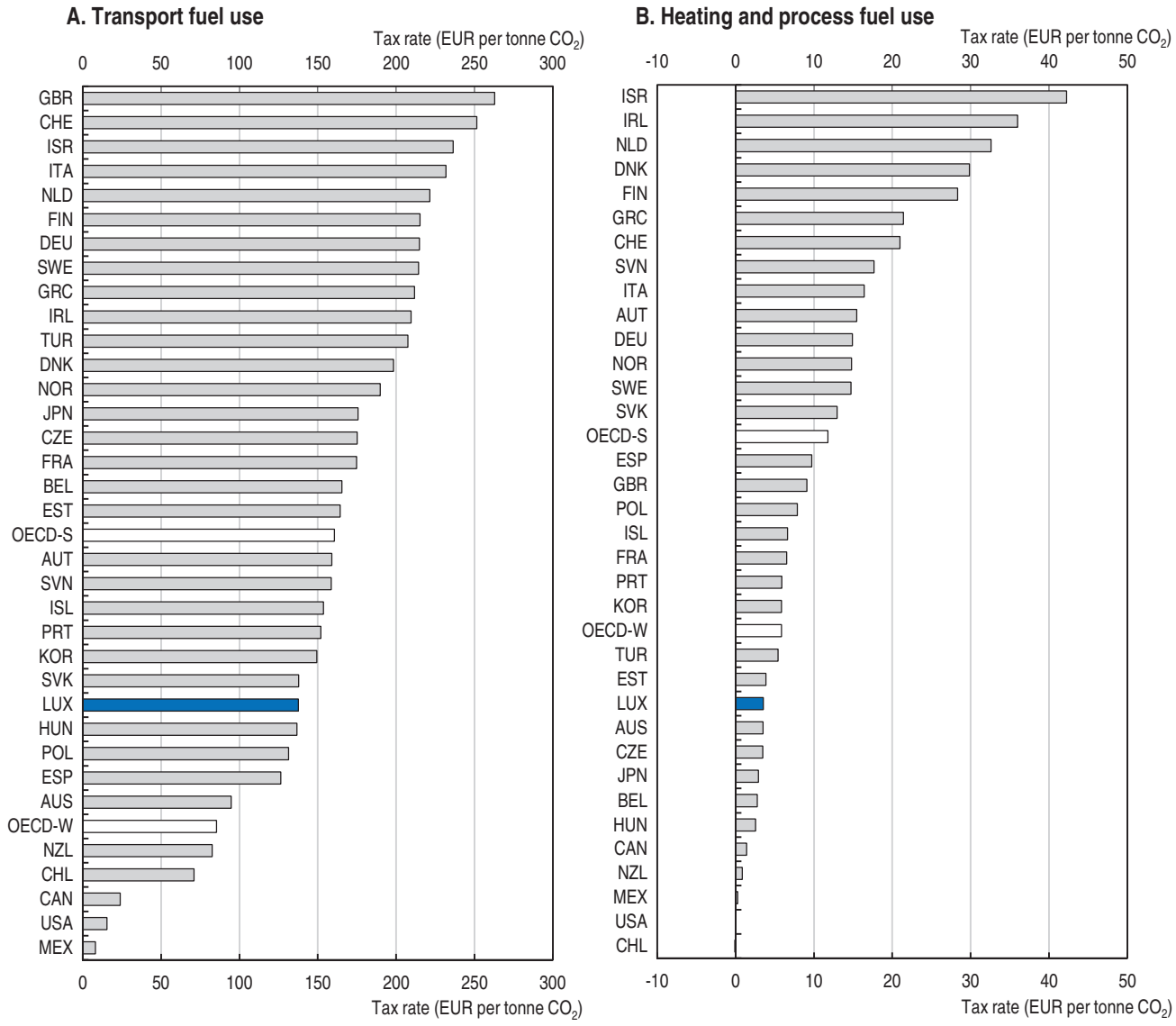
industrial/commercial use, in accordance with Article 18(1) of the Directive. Diesel and LPG are taxed at differing rates according to purpose.

Gasoline and diesel used for transport constitute 65% of energy use and 67% of CO_2 emissions from energy use in Luxembourg (OECD, 2015b). Their predominance in both bases is explained by sales of gasoline and diesel to foreign drivers, who take advantage of Luxembourg's taxes, which are lower than those of neighbouring countries notwithstanding increases in 2008, 2010 and 2015. Domestic transport is estimated to account for just one-fifth of total transport fuel sales (OECD, 2013c). This leaves Luxembourg with the highest CO_2 footprint per capita among the European OECD members.

Effective tax rate on transport fuel, below EUR 150 per tonne of CO_2, is below the OECD average (Figure 31, Panel A). Taxation of heating and process fuel use, at about EUR 3 per tonne of CO_2, is also below the OECD average (Figure 31, Panel B). The heating and process use category is dominated by natural gas and diesel, which constitute 52% and 30% of the CO_2 emissions in this category. These fuels are taxed at differing rates according to user. Diesel for commercial use is taxed at the highest effective rate (both in terms of energy and CO_2), and is twice the rate that applies to diesel used for producing commercial heat. Meanwhile, 38% of the natural gas use (both in terms of energy and CO_2) is in industry or agriculture, and is untaxed. Fuels used to generate electricity constitute less than 3% of total energy use and CO_2 emissions in Luxembourg (OECD, 2015b). In order to reduce per capita carbon emissions, Luxembourg should increase taxes on diesel and gasoline so as to gradually eliminate the price differential with neighbouring countries.

Traffic flows are also influenced by factors other than fuel taxation, such as geographic organisation of transport in the internal market or the attractiveness of public transport for commuters. It is therefore important that Luxembourg increases the capacity of the public transport system in co-operation with neighbouring countries, as mentioned above.

Figure 31. **Effective tax rates on CO_2 in OECD countries**



Note: Tax rates are as of 1 April 2012 (except 1 July 2012 for AUS); energy use data is for 2009 from IEA. Figures for CAN and USA include only federal taxes.
Source: OECD calculations.

StatLink http://dx.doi.org/10.1787/888933198177

Recommendations on raising human capital and enhancing resource allocation

Key recommendations

- Better evaluate the effectiveness of public R&D spending and cluster policies.
- Strengthen the co-operation between enterprises, University of Luxembourg and research institutes in Luxembourg and abroad.
- In secondary education, reduce grade repetition, provide more school autonomy and better monitor education quality.
- To reduce carbon emission, continue substantial investment in public transport infrastructure, using the receipts from fuel taxation for this purpose. Explore the introduction of a system of congestion charges. Increase taxes on petrol and diesel that gradually eliminate price differentials with neighbouring countries.

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Thematic chapters

Chapter 1

New challenges ahead – Strengthening the performance and resilience of the financial sector

Over the last two and a half decades, Luxembourg's financial sector emerged as a leading international hub for asset management and investment funds and became a key contributor to growth. Diversification into new areas of financial asset management is continuing. However, changing financial market regulation in Europe, increased international transparency requirements for banking and heightened international competition pose challenges. Moreover, the financial sector has reached a size where its contribution to the economy's overall growth might diminish.

Maintaining sound framework conditions is important for further diversification in the financial sector, building on Luxembourg's existing comparative advantage and investors' trust in its economic stability. Regulators should ensure financial intermediaries maintain strong capital ratios to address potential financial market shocks from abroad and real estate risks in the domestic economy. Assessment of systemic risks should be based on a framework that accounts for the various linkages between the banks and the other relevant financial market actors, notably investment funds. Given that the bulk of the banks in Luxembourg are affiliates of foreign bank groups, the authorities should seek clear procedures that govern the (cross-border) resolution of large banks in bad times. Moreover, implementation of the remaining steps in upgrading the tax transparency regulations Luxembourg has committed to can increase incentives for banks to further refine their business models, benefitting Luxembourg's financial sector in the medium term.

Chapter 2

Fostering the emergence of innovative industries

Developing activities in areas other than finance would help to sustain growth and deal with the declining potential output and trend productivity growth that Luxembourg's economy is facing. Given the relatively high labour costs, Luxembourg's future comparative advantages are likely to lie in higher value-added and skill intensive activities. Further development of Luxembourg's high living standards thus requires strengthening the economy's growth potential via further diversification of activity in high value-added sectors.

Stepping up investment in knowledge based capital and enterprise innovation can help Luxembourg to maintain and further develop comparative advantages in high value-added activities. The government is promoting the formation of enterprise clusters by providing networking, infrastructure investment and financial support for research and development. To enhance the efficiency of the government's policy, high priority should be given to outcome-oriented evaluation. This is required to ensure that costly infrastructure investment yields good results. Further efforts should be made to create synergies via cross-border initiatives, in particular with respect to research. Experience in other countries points to the importance of regulatory framework conditions in product and labour markets to spur enterprise dynamics. Regulation in professional services can be made more competition friendly, and impediments to labour force participation, notably for women, can be reduced. Productivity and innovation are also affected by the effectiveness of the secondary education system to produce skilled workers, which in Luxembourg is hampered by high repetition rates among students.

This Overview is extracted from the 2015 Economic survey of Luxembourg. The Survey is published on the responsibility of the Economic and Development Review Committee of the OECD, which is charged with the examination of the economic situation of member countries. The economic situation and policies of the Luxembourg were reviewed by the Committee on 9 February 2015. The draft report was then revised in the light of the discussions and given final approval as the agreed report of the whole Committee on 26 February 2015.

The Secretariat's draft report was prepared for the Committee by Eckhard Wurzel and Jan Strasky, under the supervision of Piritta Sorsa. Statistical research assistance was provided by Damien Azzopardi and Guillaume Bousquet with general administrative assistance provided by Anthony Bolton and Mikel Inarritu. The Survey also benefitted from contributions at different stages by Arnaud Daymard and Giuseppe Maggio.

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