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SCALING NEW HEIGHTS: ACHIEVEMENTS AND FUTURE CHALLENGES FOR PRODUCTIVITY CONVERGENCE IN LITHUANIA

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By Ben Westmore

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Abstract/Résumé

Scaling new heights: achievements and future challenges for productivity convergence in Lithuania

GDP per capita in Lithuania rose from one third to two thirds of the OECD average level between 1995 and 2014, despite internal and external crises. Productivity catch-up was critical to this process, although the level of labour productivity also remains around one-third below the OECD average. Further productivity gains will partly rely on improvements in resource allocation. In particular, the Lithuanian government should promote better governance of state-owned enterprises, more effective bankruptcy procedures and new forms of business financing. However, convergence will also require policy settings that encourage advances in within-firm productivity growth. Improvements to the quality of education at all levels and increasing the role of workplace training will be important. So too will be further measures that support the innovation capacity of the business sector, including innovation policies that promote the absorptive capacity of firms and do not favour incumbents at the expense of young businesses. This Working Paper relates to the 2016 OECD Economic Survey of Lithuania
[\(www.oecd.org/eco/surveys/economic-survey-lithuania.htm\)](http://www.oecd.org/eco/surveys/economic-survey-lithuania.htm)

Key words: *productivity convergence, resource allocation, product market regulations, education, knowledge transfer, innovation.*

JEL Classification: *F43, O10, O24, O33, O38, O47, O52.*

Atteindre des nouveaux sommets : réalisations et défis futurs pour une convergence de la productivité en Lituanie

Le produit intérieur brut (PIB) par habitant s'est hissé d'un tiers à deux tiers de la moyenne de l'OCDE entre 1995 et 2014, malgré des crises internes et externes. Le rattrapage du retard qu'avait accumulé la Lituanie en termes de productivité a joué un rôle essentiel dans ce processus, même si le niveau de la productivité du travail demeure inférieur d'un tiers environ à la moyenne de l'OCDE. La poursuite de cette convergence dépendra en partie d'une amélioration de la répartition des ressources. Le gouvernement devrait notamment favoriser une amélioration de la gouvernance des entreprises publiques, la mise en place de procédures de faillite efficaces et l'émergence de nouvelles formes de financement des entreprises. Cette convergence passera aussi par des politiques publiques propices à l'amélioration de la croissance de la productivité au sein des entreprises. Il sera également important d'améliorer la qualité de l'enseignement à tous les niveaux et de renforcer le rôle de la formation en entreprise. Néanmoins, il conviendra aussi de prendre de nouvelles mesures pour renforcer la capacité d'innovation du secteur des entreprises, notamment en mettant en œuvre des politiques d'innovation qui permettent d'améliorer encore la capacité d'absorption des entreprises et ne favorisent pas les acteurs en place au détriment des jeunes entreprises. Ce Document de travail se rapporte à l'Étude économique de l'OCDE 2016 de la Lituanie
[\(www.oecd.org/fr/eco/etudes/etude-economique-lituanie.htm\)](http://www.oecd.org/fr/eco/etudes/etude-economique-lituanie.htm)

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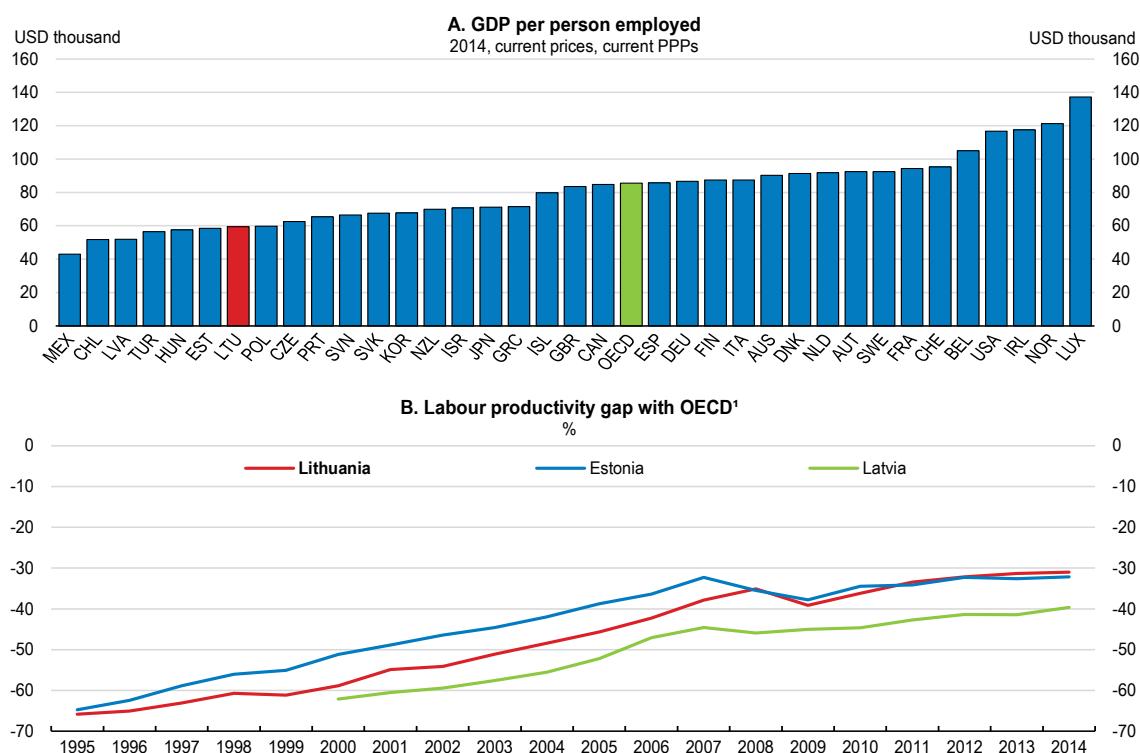
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SCALING NEW HEIGHTS: ACHIEVEMENTS AND FUTURE CHALLENGES FOR PRODUCTIVITY CONVERGENCE IN LITHUANIA

by Ben Westmore¹

1. In the past two decades, the income level in Lithuania has steadily risen toward that of OECD countries. Between 1995 and 2013, GDP per capita rose from one third to two thirds of the OECD average level. Productivity catch up was critical to this process, aided by enhanced integration into the global economy which enabled the adoption of more advanced production technologies from abroad. Even so, the level of labour productivity in Lithuania today remains around one-third below the OECD average (Figure 1.). With a workforce that is ageing at the fastest pace of any country in the European Union (EU; European Commission, 2015a), future advances in Lithuanian living standards will mostly rely on the country's ability to raise productivity.

Figure 1. Despite convergence, Lithuania's productivity gap with the OECD remains large



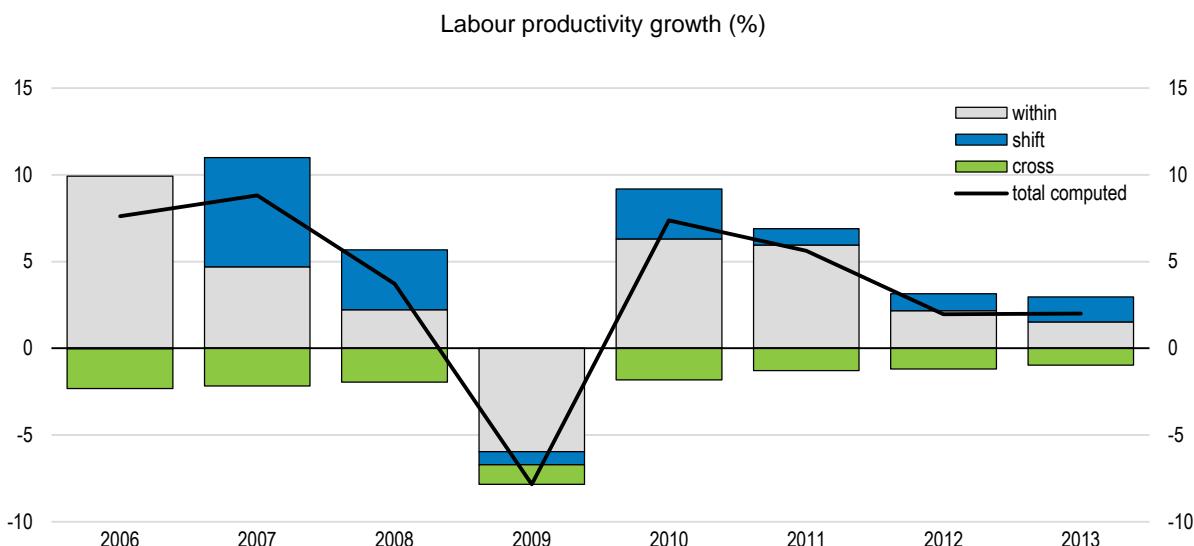
Note: Labour productivity is measured as GDP per person employed.

Source: OECD calculations based on OECD National Accounts Statistics.

1. Ben Westmore (ben.westmore@oecd.org) is a member of the OECD Economics Department. The author would like to thank Lilas Demmou, Alvaro Pereira, Robert Ford, Andreas Wörgötter, Bert Brys, Sigita Strumskyte, Claire Shewbridge, Gernot Hutschenreiter, Korin Kane, Hans Christiansen, Dan Andrews, Przemyslaw Kowalski and Kateryna Perepechay for valuable discussions and feedback on earlier drafts. The paper also benefitted from the comments of Lithuanian government officials. Special thanks to Corinne Chanteloup for statistical support and Heloise Wickramanayake for editorial assistance.

2. Decomposing Lithuanian labour productivity growth since 2006 reveals that both reallocation of resources between sectors and within-sector productivity growth have been important (Figure 2). The latter can be driven by reallocation between firms in the same sector as well as increases in within-firm productivity which often relies on absorbing and implementing new ideas and technologies.

Figure 2. Productivity has benefitted from both within-sector advances and between sector reallocation



Note: "Within" measures the contribution to total labour productivity growth from productivity growth within sectors. "Shift" measures the contribution resulting from the movement of labour between sectors. "Cross" indicates whether the within-sector and between-sector effects are complementary. A negative value for the latter indicates that productivity growth is particularly strong in sectors that have a contracting labour share.

Source: OECD calculations based on data from Statistics Lithuania.

3. Changes in government policy settings are important determinants of both resource allocation and within-firm productivity growth. This chapter examines public policy settings in Lithuania in the context of two critical objectives: 1) continuing to improve the efficiency of resource allocation, and 2) promoting within-firm productivity growth. To set the scene, recent productivity-related trends are first assessed.

Main findings

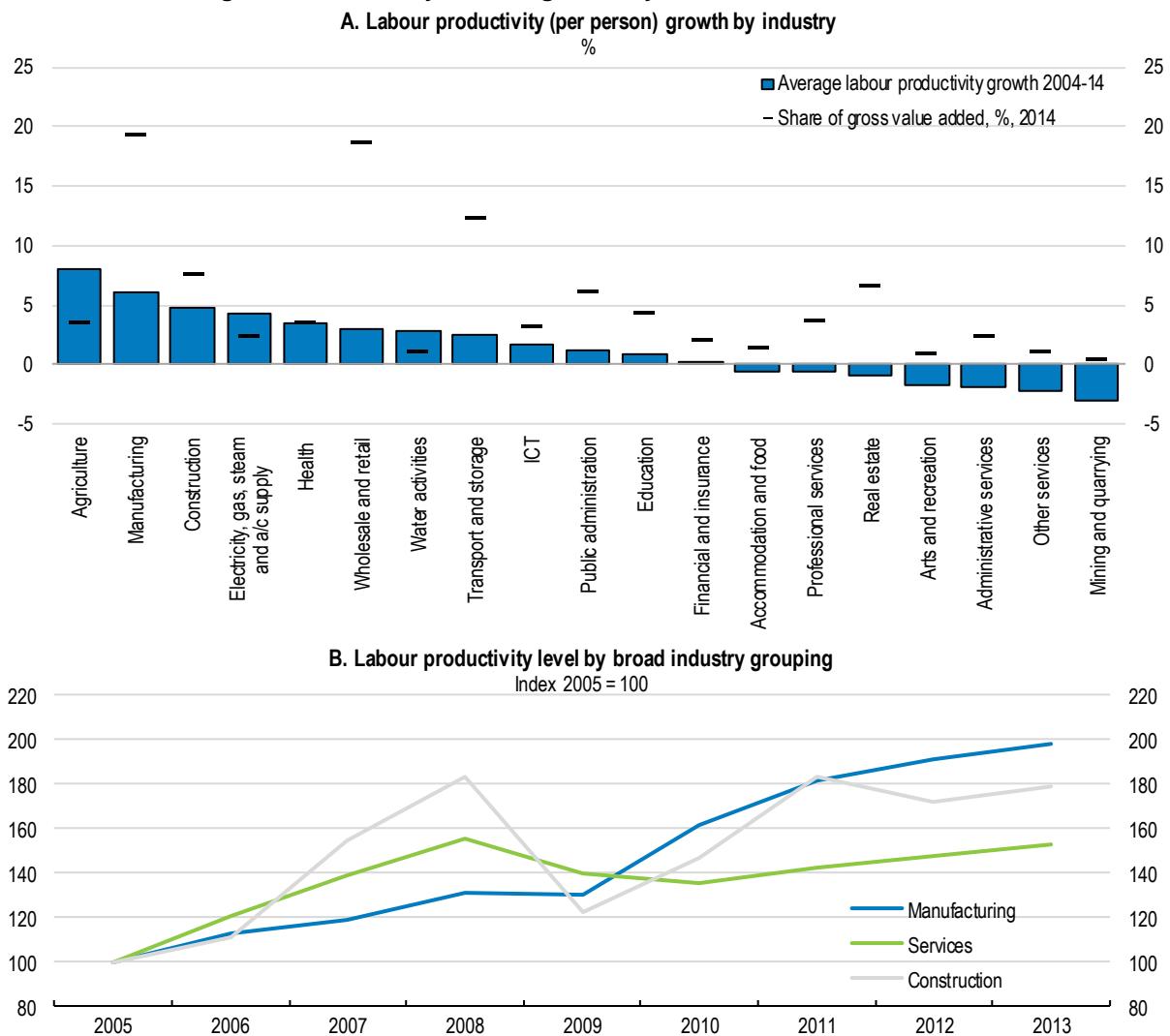
- Most industries in the services sector experienced negligible productivity growth over the past decade. There are signs of suboptimal resource allocation in the broad services industry, with the largest firms not the most productive.
- Compared to other countries, a high proportion of firms report difficulty in finding adequately skilled workers as a constraint to business operations.
- Participation in early childhood education is relatively low and test scores for high school students in reading and mathematics are poor. Teaching careers do not appear to be attractive compared with other European Union (EU) countries.
- Lithuania's reforms to product market regulations over the past decade have been impressive. However, burdensome regulations relating to the employment of foreign workers from outside the EU and time-consuming bankruptcy procedures may still hamper firm growth.
- Innovation intensity in Lithuanian firms is low, despite supportive framework conditions and innovation-specific policies. Some measures, such as R&D tax incentives, may be less-supportive of young firms.
- Knowledge spillovers may have been muted by relatively modest backward participation in global value chains (GVCs).
- The financial performance of Lithuanian state-owned enterprises (SOEs) is poor. The composition of some SOE boards may cause conflicts of interest and raise the potential for political interference in business operations.
- Access to finance is an obstacle to business operations for some productive firms. The development of new sources of finance for young firms is in its infancy.
- A number of noteworthy infrastructure projects have been undertaken in recent years or are currently underway. Projects aimed at further integration with the European rail, electricity and gas network are a priority.

Recent productivity trends are strong but uneven

4. Aggregate labour productivity growth has been strong over the past decade, but it has masked sectoral disparities. In particular, advances have been quite slow in some services sectors.

5. Since EU-accession in the mid-2000s, Lithuanian labour productivity growth has averaged 5% per year. Between 2005 and 2013 there were particularly sizeable productivity gains in the manufacturing, health, utilities (electricity, gas, steam and air conditioning supply) and agricultural industries. This reflected a combination of government reforms (i.e. utilities and health), absorption of EU structural funds (i.e. agriculture) and strong foreign direct investment flows (i.e. manufacturing). In a number of these sectors, growth has also reflected a reallocation of resources to more productive uses following the burst of the housing bubble.

6. In contrast, productivity growth in a number of service sectors was modest. In particular, there was negligible productivity growth in a number of professional and business services. Aggregate services sector labour productivity only returned to its 2008 level in 2013, by which time the level of productivity in the manufacturing sector was 50% higher than in 2008 (Figure 3, Panel B).

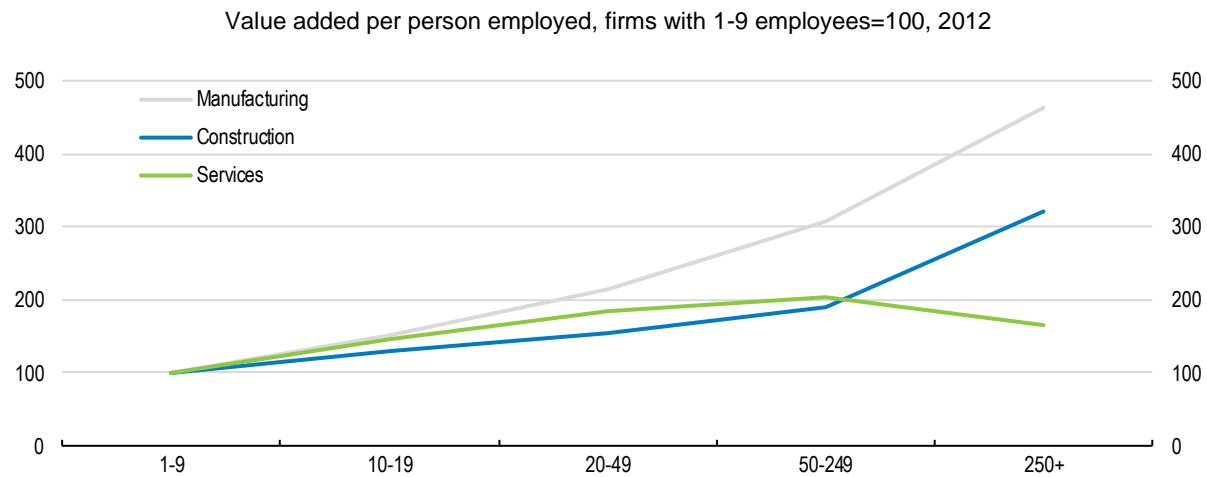
Figure 3. Productivity differs significantly across Lithuanian industries

Note: Consistent with the definition used in OECD (2015a), in Panel B, manufacturing industries include mining and quarrying, manufacturing, electricity, gas, steam and air conditioning supply and water supply, sewerage, waste management and remediation activities. Services industries include wholesale and retail trade, transport and storage, accommodation and food services, ICT services, real estate, financial and insurance services, professional, scientific and technical services, administrative and support services, education, health and social work activities, arts, entertainment and recreation and other service activities. Industries are weighted according to gross value added at previous year prices. Panel B presents gross value added per employed person in euro currency.

Source: Statistics Lithuania, OECD calculations.

7. One factor weighing on service sector productivity may be that the largest service companies in Lithuania are on average less productive than some smaller companies (Figure 4). This is not the case in Lithuania's manufacturing or construction industry. In order to maximise aggregate productivity, a situation where the most productive firms are the largest is optimal. Such a scenario signals that resources have been allocated efficiently and are not encumbered by adjustment frictions that constrain firm growth and reallocation away from less productive entities. Disaggregating the results for Lithuania's services industry, there appears to be particularly low efficiency of resource allocation in the wholesale and retail trade sectors.

Figure 4. Larger companies are not the most productive in Lithuania's services sector

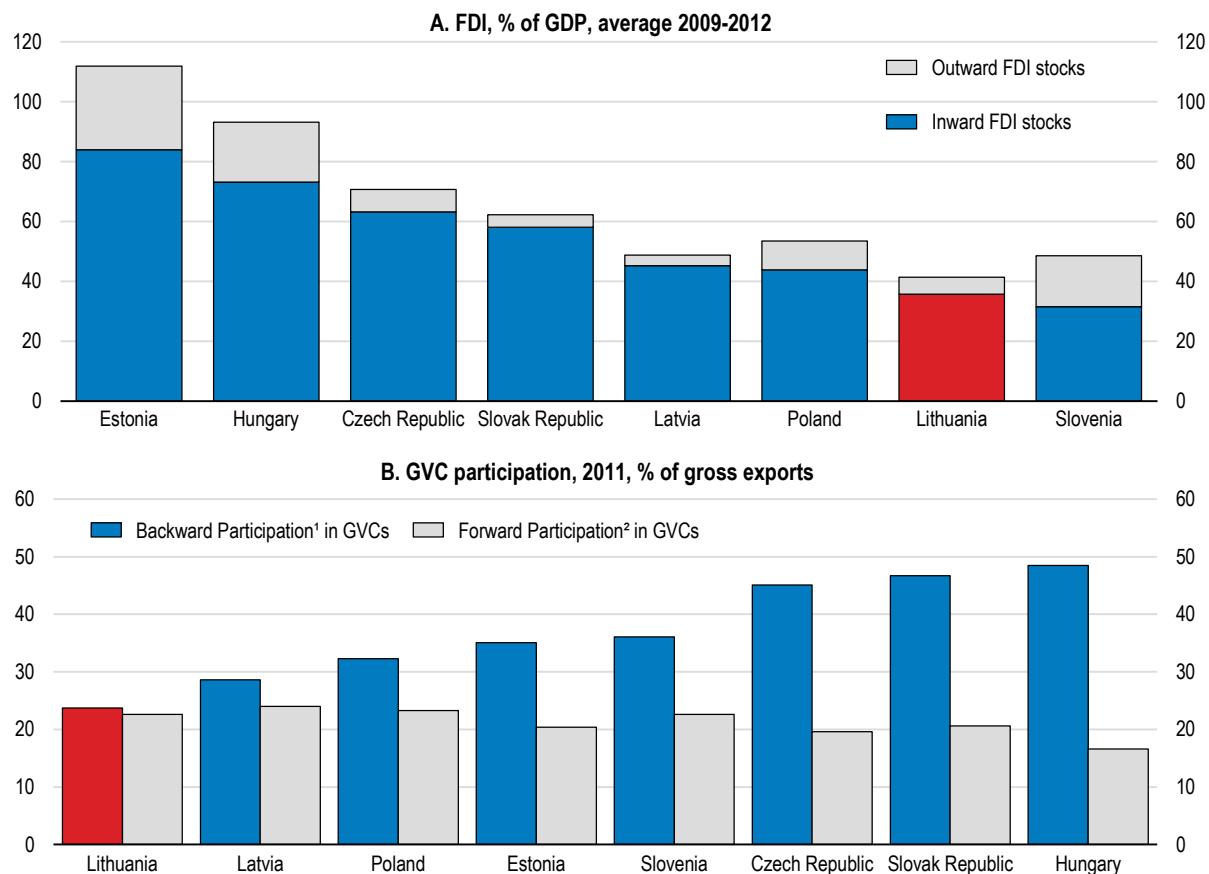


Note: Value added per person employed is an average across the enterprises in the particular employment size-class presented on the horizontal axis.

Source: OECD, 2015a.

8. An efficient services sector is especially important given that services are intermediate inputs for other firms and can be integral to successful participation in GVCs. In turn, involvement in GVCs can benefit productivity growth as it increases the exposure of domestic firms to new ideas and technologies, heightens product market competition and increases market size for domestic firms (Adalet McGowan et al., 2015; Crespi et al, 2008; Acemoglu and Lin, 2004). Lithuania's trade and financial openness has increased significantly since independence, partly through joining the EU (OECD, 2016b). However, the "backward participation" of Lithuanian firms in GVCs (i.e. share of foreign value added embodied in Lithuanian exports) was relatively low as at 2011 (Figure 5, Panel B; OECD, 2016b).

9. Participation in GVCs tends to be higher in countries that are more open to FDI (Kowalski et al., 2015). In addition to the impact through GVC participation, FDI can foster technology transfer. While Lithuania's inward FDI stock at 2012 was below that in the other Baltic countries (Figure 5, Panel A), there are signs of relatively strong growth in inward FDI flows since then (Invest Lithuania, 2014). Furthermore, inward FDI to Lithuania is characterised by a relatively large share of greenfield investment, which may be more beneficial than other types of FDI for domestic job creation.

Figure 5. FDI and participation in global value chains are low

1. Foreign Value Added embodied in exports, as % of total gross exports.

2. Domestic Value Added embodied in foreign exports, as % of total gross exports.

Source: Eurostat, OECD-WTO Statistics on Trade in Value Added.

Further improving resource allocation requires new policy reforms

10. Policy settings that allow efficient resource reallocation raise the returns to businesses from implementing productivity-enhancing improvements. Policies that promote favourable firm dynamics – the entry of new firms, their expansion in the initial years of life and the exit of less productive entities are critical in this regard. This process is particularly important for Lithuania as it entered the global financial crisis with large scale distortions and an unsustainable current account deficit. Furthermore, recent analysis using firm-level data suggests that the pace of resource reallocation in Lithuania has slowed in recent years (Earle et al., 2015).

Lithuania's product market regulations are generally conducive to efficient resource allocation

11. Since regaining independence in 1990, successive Lithuanian governments have undertaken reforms to improve the market orientation of the economy. Along with the country's entry into the EU in 2004, advances have been made that reduce the burden of product market regulations deterring firm entry and hence the growth of high potential firms. By 2013, Lithuania's overall product market regulation, as judged by the OECD PMR index, was roughly in line with the OECD average (OECD, 2013a).

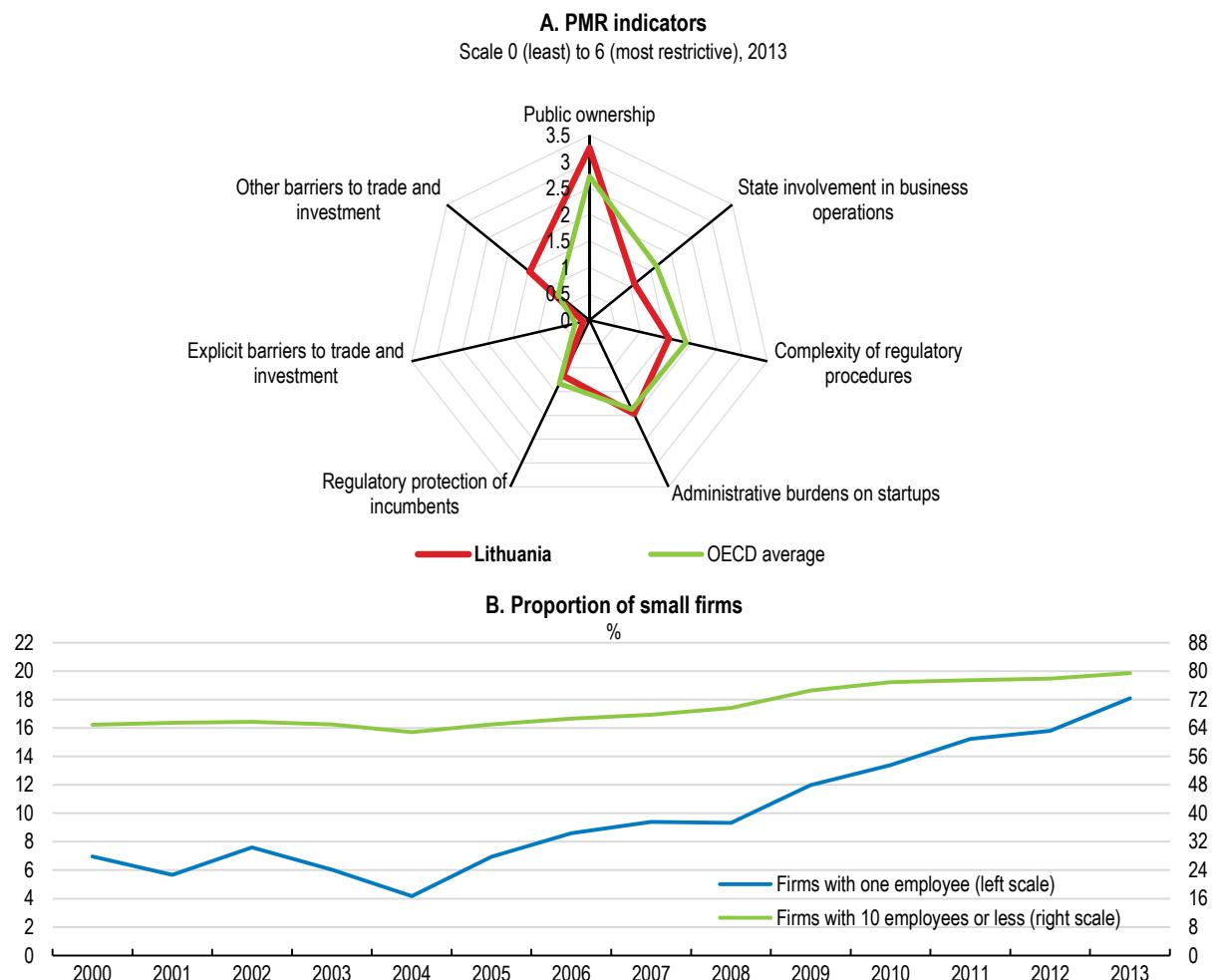
12. Some aspects of Lithuania's regulatory framework are particularly competition-friendly. Government has relatively little involvement in business operations through price controls and command and control regulation (Figure 6, Panel A). Furthermore, there have been large reductions in the complexity of regulatory procedures, especially when establishing a firm. The World Bank *Doing Business* indicators highlight that the time and cost to start a business were significantly reduced between 2003 and 2015 (Table 1.), by which time Lithuania was ranked 8 of 189 countries for ease of starting a firm.

Table 1. Starting a business has become significantly easier

	2003	2015
Procedures to start a business (number)	8	2
Time to start a business (days)	26	3.5
Cost to start a business (% of income per capita)	4	0.6
Paid-in minimum capital to start a business (% of income per capita)	68	0

Source: World Bank *Doing Business*.

13. Specific reforms in the past few years have included the introduction of a one-stop shop for online business registration and measures that reduce the difficulty of companies to register as a value added taxpayer. A new form of legal company (a "small partnership") has also been established that has no minimum capital requirement and a reduced number of regulatory procedures, meaning registration now takes only one third the amount of time it previously did. As a consequence, the number of days it takes to register a business has fallen from 26 in 2005 to 3.5 in 2015 and the cost to start a business as a percent of income per capita has declined by 85% (World Bank, 2015). Unsurprisingly, this has coincided with a pick-up in the proportion of small businesses (Figure 6, Panel B). In particular, the proportion of firms with one employee has risen sharply.

Figure 6. Product market regulations have become market-friendly but there is scope for further reform

Note: In Panel A, “OECD average” is a simple average for all the OECD countries that reported. The US is the only OECD country not included in this aggregate.

Source: OECD (2013a), Statistics Lithuania.

14. Importantly, new OECD analysis suggests that the reduction in the cost to start a business contributed to the productivity-enhancing shift of labour resources recently observed in Lithuania (Box 1.). Moreover, reductions in the number of procedures needed to start a business and the time it takes to start a business have been associated with higher within-industry productivity.

Box 1. The impact of Lithuania’s product market reforms on productivity growth

High capital intensity or technological complexity of production in some sectors creates naturally higher barriers to firm entry than in others (Andrews and Cingano, 2013). This feature can be used in a regression analysis to identify any influence of the reduction in regulatory costs for starting a business in Lithuania on labour productivity growth (for further technical details, please see Annex 1.1).

The dependent variable in the regression analysis is aggregate labour productivity growth. However, in order to identify the particular channel through which productivity is impacted, separate regressions are also run with the dependent variable being the within-effect and the shift-effect highlighted in Figure 1.2. Any impacts of policy are identified through the coefficient on an interaction term $\Delta Policy_t * Exposure_i$ which reflects whether various policy

changes (at the country level) had a larger impact on industries that are particularly exposed to such measures. The time period considered is 2006-2013.

Selected results of the regression analysis are presented in the below table. They suggest that recent reforms in Lithuania to improve the business climate have benefitted resource reallocation both within industries and between industries. To summarise the main findings:

- Policy changes in Lithuania that have increased the ease of starting a business have had a positive effect on labour productivity growth (Column 1). This impact may have arisen through beneficial resource allocation within industries or increased firm productivity due to the reduction in administrative costs. Specifically, policy measures that have reduced the number of procedures needed to start a business (Columns 2 and 5) and the time it takes to start a business (Columns 3 and 6) have been associated with higher productivity growth.
- Policy changes that have reduced the cost of starting a business (Column 7) have been associated with productivity-enhancing shifts in resources between industries (although the impact on aggregate productivity growth is not identified).

The estimated effect of policy changes on productivity growth

Dependent variable	(1) LP growth	(2) LP growth	(3) LP growth	(4) Within effect	(5) Within effect	(6) Within effect	(7) Shift effect
manufacturing*year	0.0271 (1.57)	0.0221 (1.24)	0.0743* (1.96)	-0.0003 (0.01)	-0.0076 (0.3)	0.0499 (1.56)	0.0344 (1.43)
Δoverall ease of starting a business*exposure	0.0266* (2.05)			0.0309** (2.38)			
Δcost to start a business*exposure							-0.0201* (1.93)
Δnumber of procedures to start a business*exposure		-0.0381* (1.92)			-0.0470** (2.32)		
Δtime to start a business*exposure			-0.0176* (1.98)			-0.0179*** (3.63)	
Constant	-33.15 (1.57)	-27.03 (1.24)	-90.96* (1.96)	0.44 (0.01)	9.42 (0.27)	-60.99 (1.56)	-42.09* (1.43)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	184	184	184	184	184	184	184
R-squared	0.16	0.16	0.16	0.19	0.19	0.18	0.07
Number of NACE sectors	23	23	23	23	23	23	23
F	3.02	2.96	2.65	6.94	6.56	6.63	2.99

*** p<0.01, ** p<0.05, * p<0.10.

Note: t-statistics in parentheses. The regressions include industry and year fixed effects and standard errors clustered at the industry level. The policy measures are taken from the World Bank Doing Business Indicators. The variable “manufacturing*year” is a time-varying dummy for industries that belong to the broad manufacturing sector and should capture the fact that productivity growth was generally stronger in manufacturing during the sample period.

Source: Annex 1.1.

15. As highlighted in the recent OECD *Regulatory Policy Review of Lithuania*, further efforts should be made to establish a framework for evaluating whether well-designed regulatory policies are implemented in practice (OECD, 2015b). Encouragingly, compared with similar countries, firm level surveys suggest good alignment in Lithuania between the proportion of firms reporting obstacles to obtaining business licenses and permits, and the *Doing Business* indicator of the ease of starting a business (World Bank, 2013).

16. According to the OECD PMR indicators, non-explicit barriers to trade and investment is one area in which regulations in Lithuania are less conducive to firm growth than in the average OECD country. Specific regulations include tight restrictions and administrative costs on the employment of workers from outside the EU (Box 2). These regulations can cause delays for businesses that are trying to expand, particularly those in specialised sectors where the global talent pool is shallow. Furthermore, firms from non-EU countries that are trying to relocate operations to Lithuania may be deterred by the regulatory barriers to migrating firm-specific human capital. This reduces competition and can cause resources to be trapped in domestic incumbent firms that are less productive. Such barriers to foreign investment may also limit the potential for Lithuanian firms to embed themselves into GVCs (Kowalski et al., 2015), reducing their ability to raise market size and capture knowledge spillovers from foreign firms.

17. The large size of Lithuania's shadow economy may contribute to inefficient resource allocation that limits aggregate productivity growth. Recent work suggests that despite falling in recent years, Lithuania's informal economy is one of the largest in the EU (Schneider, 2015). Compared with other transition economies in the region, a relatively high proportion of Lithuanian firms responding to the EBRD-World Bank *Business Environment and Enterprise Performance Survey (BEEPS)* in 2013 identified practices of competitors in the informal sector as a barrier to their operations. By not paying tax, firms operating in the shadow economy are able to provide goods and services at a lower price, which may displace more efficient taxpaying firms. This means that informal sector firms absorb resources that would be allocated elsewhere if all firms operated on a level playing field. As informality tends to be concentrated in services industries (Hazans, 2011), Lithuania's large informal sector may help explain the relatively disappointing productivity growth in services.

Box 2. Obtaining a Lithuanian work permit for non-EU foreign nationals

The conditions for non-EU foreigners to live and work in Lithuania are governed by the Law on the Legal Status of Aliens issued by the Lithuanian Ministry of Social Security and Labour. A work permit must be obtained before entering the country and will only be issued to a non-EU foreigner if there is no specialist in Lithuania meeting the employer's qualification requirements. As at 2013, only 3 of the 34 OECD countries required the fulfilment of such a test in order to employ a foreign worker (OECD, 2013a). A non-EU foreigner can only be employed for a specific job after the following process has occurred:

1. The employer registers a vacancy in the regional labour exchange.
2. If no EU workers with the appropriate skills are found after one month, the employer submits an application to employ a foreign worker to the regional labour exchange.
3. The regional labour exchange then submits an application to the Lithuanian Labour Exchange. The time within which an application needs to be submitted is determined by the type of worker obtaining a visa. The time limit varies between 7 and 21 calendar days depending whether the worker is employed under a contract of employment, is posted by their company or is an intern or trainee.
4. If the application is approved, the Lithuanian Labour Exchange issues a work permit within 7-20 calendar days (depending on the type of worker).
5. Once the work permit is issued, the employee submits an application for a national visa or residence permit to a diplomatic mission or a consular post of Lithuania abroad or a migration service in Lithuania.
6. A work permit is issued within the following 2 months (in practice often less than 1½ months), the employer must then submit the employment contract to the local labour exchange office for approval.

An express EU Blue Card (all inclusive residency and work permit) can be obtained for a non-EU worker in less than 15 days. However, such a procedure is only for professionals that earn 3 or more times the average Lithuanian salary.

Work permits for non-EU foreigners are issued for the work contract duration. However, for employees posted by a foreign company, work permits are issued for a maximum of 2 years. For such workers, an additional application process is required for renewal, albeit shorter than the original procedure. A new procedure has been drafted whereby foreign companies recognised by the Ministry of Economy as strategic investors are eligible to receive assistance from immigration specialists in preparing the necessary documentation.

Source: Lithuanian Labour Exchange, Ministry of Social Security and Labour and Invest Lithuania.

Lithuania's state-owned enterprises hold back aggregate productivity growth

18. In terms of employment share, the size of Lithuania's SOE sector is above the OECD average (OECD, 2015c). This is partly a legacy of the Soviet system. In general, the existence of SOEs may be justified in industries where natural monopolies exist or where such firms undertake non-commercial functions that improve public welfare. However, in many countries, poor corporate governance and weak incentives lead SOEs to perform commercial functions poorly (Estrin et al., 2009). This both reduces aggregate productivity growth and means that unproductive SOEs absorb resources that could be reallocated to more productive firms. There is some evidence that this is the case in Lithuania. The average return on equity (ROE) for SOEs in the energy and transport and communications sectors in 2013 was less than half that of comparable foreign companies (Table 2). Even so, performance of Lithuanian SOEs in these sectors was substantially better than those in the manufacturing, finance and telecoms sectors, which, on average, posted negative rates of return (OECD, 2015c). The government set a 5% target ROE for SOEs engaged in commercial activities for the 2013-15 period, though in 2013 the ROE for this group was only half that (OECD, 2015c). SOEs also exist in some sectors, such as retail trade and accommodation and food services, where the rationale for public sector ownership is not clear.

Table 2. The performance of Lithuanian SOEs is relatively poor

	Energy		Transport and communications	
	Lithuanian SOEs %	Comparable foreign companies %	Lithuanian SOEs %	Comparable foreign companies %
Return on equity	2.66	5.36	2.64	8.93

Note: Comparable foreign companies operate in the particular sector (i.e. energy or transport and communications) and are located in Western Europe, Eastern Europe or Russia.

Source: State Property Fund (2014).

19. Beginning in 2010, the government has made efforts to more closely align the corporate governance of SOEs with the *OECD Guidelines on Corporate Governance of State-Owned Enterprises* (Martinkus, 2014). As of 2014, SOEs have publicly disclosed separate financial results for commercial activities and non-commercial activities a private company would not assume. This promotes greater transparency and allows the performance of the commercial activities of SOEs to be evaluated against non-public companies. The separation of the ownership and regulatory functions of SOEs has been stated as a goal. However, in many cases, the two functions continue to be performed by the same ministry (OECD, 2015c). Further reform efforts are important given recent work has highlighted a positive relationship between the performance and the corporate governance of Lithuanian SOEs (Jurkanis and Petrusauskaité, 2014).

20. SOE performance may also benefit from improvements in the composition and administration of boards. There have been changes to the guidelines for appointing SOE board members, emphasising the importance of independent board appointees that possess the required competencies. In June 2015, a government resolution outlined the selection procedure for board members to statutory SOEs. However, outside of listed SOEs, independent non-executive board members are relatively rare. Instead, SOE boards tend to have a high concentration of representatives from government ministries (Baltic Institute of Corporate Governance, 2013). Such an arrangement can cause conflicts of interest and raise the potential for personal interference in business operations. Indeed, the Baltic Institute of Corporate Governance has recently warned that the government has excessive influence on the hiring of the Chief Executive Officers of SOEs and the overall management of the institutions (Baltic Institute of Corporate Governance, 2013).

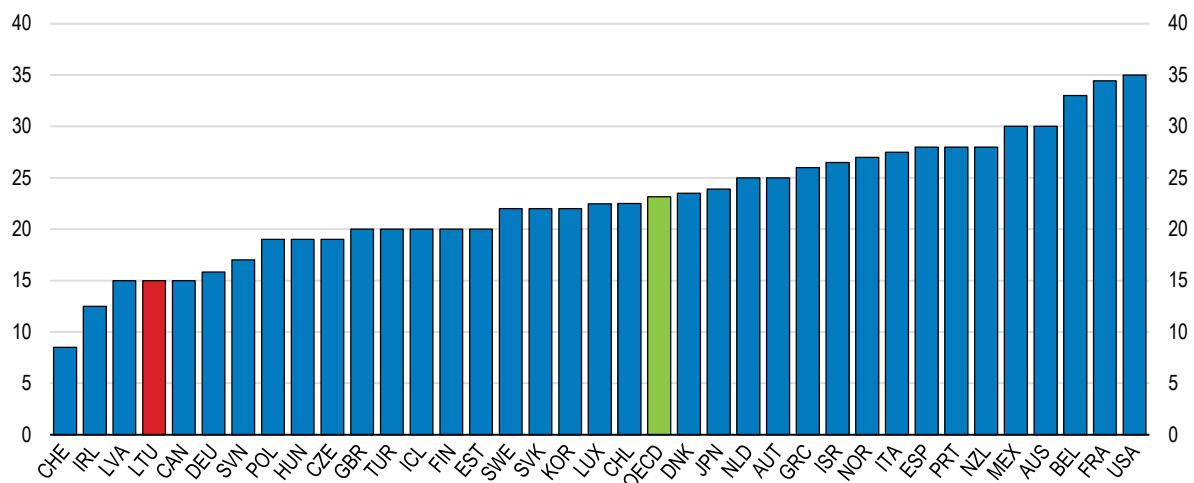
A recent government bail-out of the state-owned Lithuanian Shipping Company, which had filed for bankruptcy, also sends a poor signal to other underperforming SOEs.

The corporate tax rate is low but differential tax treatment could cause distortions

21. Lithuania's corporate income tax rate is low by international standards at 15% (Figure 7). However, the tax rate is reduced to 5% for micro companies that have up to 10 employees and 300 000 Euros (24 times GDP per capita) income per year. The rational for having a preferential rate for micro companies is not clear, as past OECD work suggests that the investment decisions of small firms tend to be less sensitive to corporate taxes than those of larger firms (OECD, 2010). Furthermore, such differential tax treatment can have negative consequences for the efficiency of resource allocation.

Figure 7. The corporate tax rate is relatively low

Statutory corporate income tax rate (%), 2015

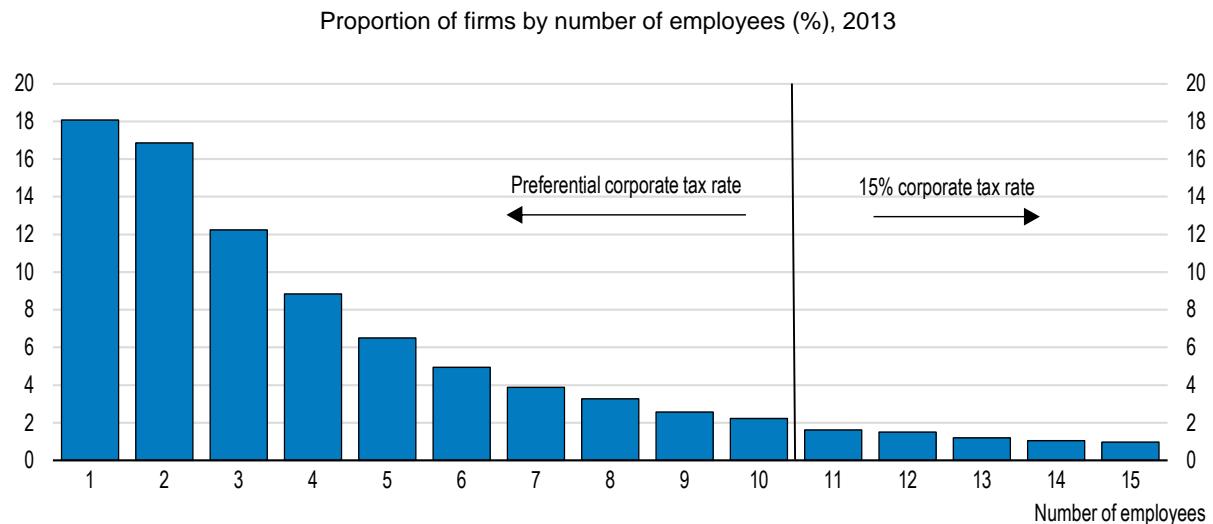


Source: OECD Tax Database, KPMG.

22. While many young highly productive Lithuanian firms may fall under the classification of a micro company, there will also be a number of businesses where their small size reflects underperformance. The tax advantage for micro firms in Lithuania will not discriminate between these firm types and may cause resources to be trapped in unproductive small businesses rather than being reallocated to more productive small firms, thereby allowing the latter to grow.

23. It is also possible that size-dependent tax advantages disincentivise firms from growing beyond the tax deduction threshold, and hence slow the reallocation process (Chen and Mintz, 2011). Nevertheless, the evidence of such a threshold effect in Lithuania was not conclusive in 2013. For example, there was not a disproportionately large share of firms reporting just below the employment threshold (10 employees or less; Figure 8). The distribution of firms should continue to be closely monitored to ensure that the small business tax advantages do not distort the pattern of firm growth. Such monitoring, along with other evidence-based advice on the economy-wide effects of government policies, could be performed by the establishment of an independent institution similar to the productivity commissions of Australia and New Zealand. Such an institution may be especially worthwhile in Lithuania given the importance of achieving productivity gains for the country's future income convergence.

Figure 8. There is no strong evidence so far of differential tax rates distorting firm size



Note: In addition to having 10 employees or less, eligibility for the preferential corporate tax rate in 2013 was also subject to firms having income of less than 1 million Lita (approximately 300 000 Euros).

Source: Statistics Lithuania.

Bankruptcy procedures are relatively time consuming and recovery rates are low

24. Costly and time consuming insolvency procedures can slow the movement of resources between lower productivity firms and better performing ones (Adalet McGowan et al., 2015). Such procedures may also deter entrepreneurship and experimentation by businesses with new risky technologies, having negative consequences for within-firm productivity. In the past decade there have been ongoing reforms in Lithuania to simplify bankruptcy procedures. These have included simplifying insolvency laws and reducing the timeframe for decisions on appeal. Nevertheless, it remains relatively time consuming to close a business in Lithuania. According to the World Bank *Doing Business* indicators, finalising an insolvency procedure took 2.3 years on average, relative to 1.8 years in the OECD.

25. The recovery rate for investors in the event of insolvency is low; 43 cents per dollar in Lithuania compared with 71 cents in the average OECD country (World Bank, 2015). While less punishing bankruptcy laws can be beneficial for encouraging entrepreneurship and the reallocation process, there may be unintended consequences that stifle firm growth. In particular, lower recovery rates for creditors may reduce access to finance for firms.

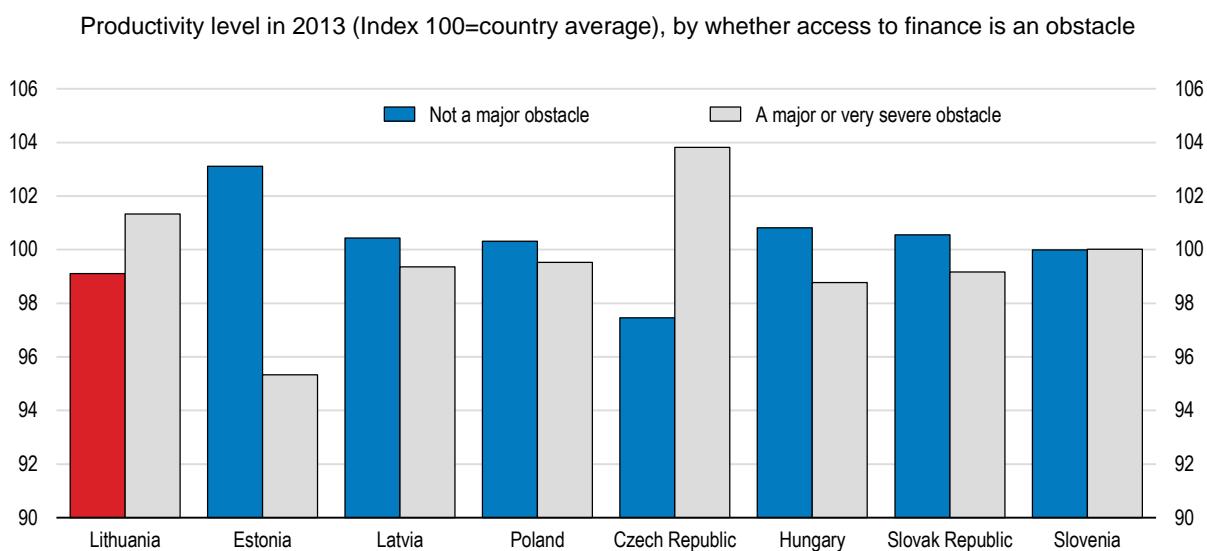
Access to finance is a constraint for some productive firms

26. Around 16% of the Lithuanian firms responding to BEEPS cited access to finance as a major or very severe obstacle to their operations in 2013. This was higher than in Estonia (5%) and about the same as in Latvia (15%). Across countries, access to finance can be an obstacle for the growth of young firms, slowing the reallocation process, as they often have an unproven track record and limited internal funds or physical collateral. This is more often the case in countries, such as Lithuania, where the financial system is heavily bank-based.

27. Financial constraints are especially concerning if more productive firms are unable to gain access to funding. The BEEPS data suggests that this may be the case in Lithuania. Unlike in the other Baltic countries, the Lithuanian firms that cited access to finance as a major or very severe obstacle to their

operations in 2013 were generally those with higher levels of labour productivity (Figure 9). These firms also tended to be smaller as measured by the number of full-time employees, suggesting that poor access to finance may constrain resources being reallocated to some small high-potential Lithuanian firms.

Figure 9. Some productive Lithuanian firms face difficulty accessing finance



Note: Calculations are based on 218 firm responses for Lithuania, 241 for Estonia, 269 for Latvia, 382 for Poland, 211 for Czech Republic, 190 for Hungary, 171 for Slovak Republic and 241 for Slovenia. Productivity is calculated as total sales per full-time employee. The survey is taken from a stratified random sample where the dimensions of the strata are firm size, business sector and geographic region within the country.

Source: OECD calculations based on EBRD-World Bank Business Environment and Enterprise Performance Survey 2013.

28. In many countries, the financing gap for young firms is bridged by venture capital funds that overcome information asymmetries by investigating and monitoring firm performance (OECD, 2011). However, the venture capital market is in its infancy in Lithuania with businesses reporting greater availability of such funding in the other Baltic countries (World Economic Forum, 2014). There have been advances, such as through the JEREMIE initiative, whereby EU structural funds have been used to establish five venture capital funds. These venture capital funds are designed to finance the main stages of firm development (i.e. seed, start-up, later-stage venture and growth) and focus on businesses that have their principal location in Lithuania (Leichteris et al., 2015).

29. As much as possible, government support of equity investments in high-potential young firms should be done in partnership with the private sector (Wilson, 2014). Such an arrangement is likely to be more successful in fostering a sustainable venture capital sector and will help avoid the common pitfalls of government ‘picking winners’. An example is the Baltic Innovation Fund, which is a fund-of-funds that is partly financed by each of the Baltic country governments. The Fund invests in existing private equity and venture capital funds that then finance high potential Baltic firms.

30. Expanding the Lithuanian equity market could also improve financing conditions for some companies. Of the Baltic exchanges, the market capitalisation of the Nasdaq Vilnius is the largest. The adoption of the euro appears to have heightened investor interest in the Vilnius exchange, as it has enabled diversification with lower currency risk. Further development of the equity market may allow for new platforms such as an alternative investment market similar to those currently operating in the UK and Italy for smaller growing companies with lower listing values. These alternative platforms have services

designed to help small companies become listed and a lighter regulatory environment more suited to their characteristics. Some other countries, such as Austria and Germany, have recently adjusted regulatory settings in order to promote equity-based crowdfunding of young businesses. Under such an arrangement, a modest amount of external finance is raised from small contributions by a large number of investors through a web platform, typically to finance a specific project (OECD, 2015d). Nevertheless, the scale of finance through this channel is limited, meaning that other sources of seed and early stage financing should be fostered in conjunction.

Labour markets are flexible but skill mismatch is high

31. Estimates of Lithuania's structural unemployment rate, at 10-12%, are high by international standards. As well as the existence of a sizeable informal economy, high structural unemployment reflects problems with the allocation of labour resources. Significant occupational mismatches exist, with 31% of workers employed in a field not related to their study compared with 23% on average in the EU (IMF, 2015a). Such disconnects between the qualification and skill profile of labour and the demands of industry have been found to be associated with lower firm productivity (Adalet McGowen and Andrews, 2015).

32. The share of the working age population with tertiary education in Lithuania is well above the EU average. However, value added shares by industry (Figure 3, Panel A) and revealed comparative advantage (Saboniene et al., 2013) highlight traditional sectors, which generally have a larger share of jobs without specific skills requirements, as Lithuania's major industries. A study by the Research and Higher Education Monitoring and Analysis Centre (MOSTA) found that 36% of employed bachelor graduates in 2013 held positions that did not require a higher education qualification. Substantial policy advances have been made that aim to develop the knowledge economy in Lithuania (discussed further below). Regardless, providing better information to students about the qualification requirements of different jobs is important. As are further efforts to ensure the education system teaches the skills needed by employers. For meeting both these objectives, the planned 'qualifications map' – which uses registry and social insurance data to highlight the links between graduate fields and employment – should be utilised.

33. High structural unemployment may also reflect uncertainty relating to labour market regulations. The labour code is rigid for both regular and temporary workers, but is in some aspects weakly enforced (Demmou, 2016). As a result, labour reallocation is swift in practice. This is highlighted by the relatively large contribution of shifts in labour resources across sectors to recent aggregate productivity growth (Figure 2 further above) and the substantial fluctuations in employment observed during the financial crisis (Earle et al., 2015). However, gaps between legislation and practices create legal uncertainty for firms and insecurity for workers. This may undermine Lithuania's attractiveness for FDI, as foreign firms are less aware of national practices. The anticipated reform of the labour code should help reduce such uncertainty by more closely aligning the legislation with current practices.

Promoting within-firm productivity growth through education and innovation

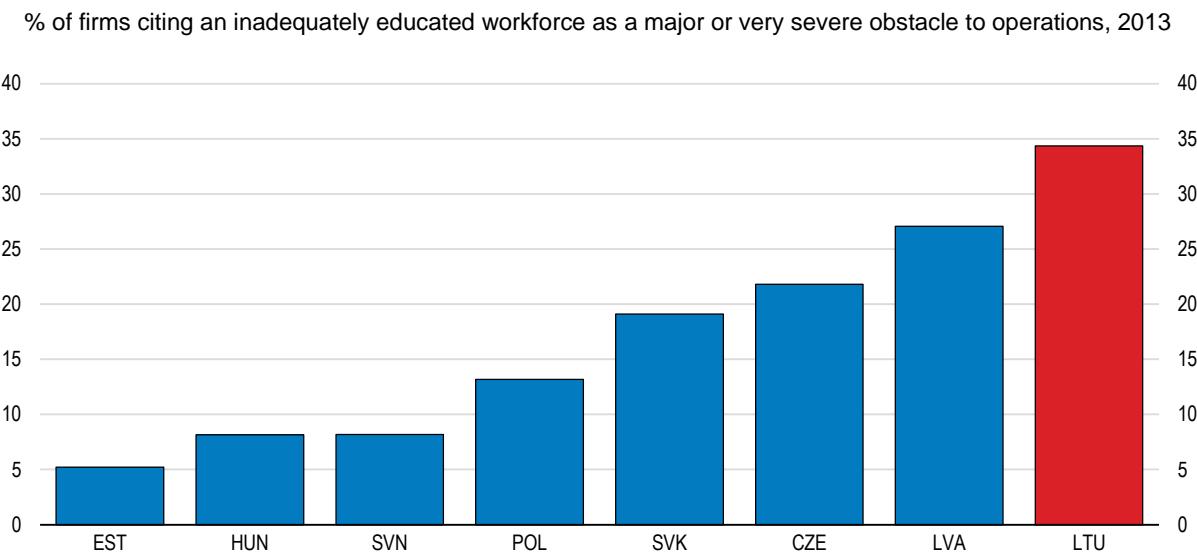
34. Figure 2 suggests that much of Lithuania's measured labour productivity growth during the past decade has owed to within-firm productivity improvements. Gains in organisational efficiency can be enabled by advances in the stock of human capital (de la Fuente, 2011), not least through the positive influence it can have on firm innovation (Youl Lee et al., 2010). One of the primary ways that Lithuania has managed to "catch up" with more advanced economies is by firms implementing new technologies and organisational practices from entities at the productivity frontier, whether they be domestic or foreign. New cross-country evidence suggests that the pace of diffusion from the global technological frontier has generally slowed since 2000 (Adalet McGowan et al., 2015). Promoting the ability of Lithuanian businesses to absorb and implement new ideas and practices is a priority going forward. In particular,

government policies that support advances in Lithuania's human and intellectual capital resources will be critical for further developing firm's absorptive capacity.

Basic skills are poor and workplace learning is underdeveloped

35. Relative to other comparable countries, a high proportion of Lithuanian firms cite an inadequately educated workforce as a significant obstacle to their operations (Figure 10). Furthermore, over 40% of businesses surveyed in the first half of 2015 for Lithuania's *Investor Confidence Index* characterised the availability of qualified labour as insufficient. Human capital improvements are important for Lithuania's future productivity growth as they will reflect in worker performance and the ability of management to organise production processes efficiently. For example, Bloom et al. (2013) estimate that managerial quality explains half the productivity gap between the United States and countries such as Italy and Portugal.

Figure 10. Lithuanian industry finds the education of the labour force inadequate



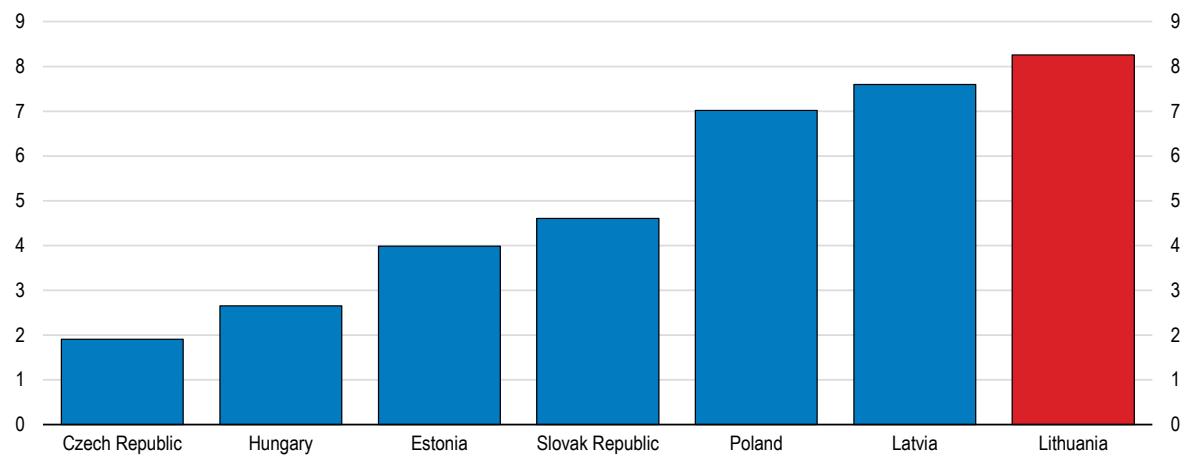
Note: Calculations are based on 259 firm responses for Lithuania, 329 for Latvia, 243 for Czech Republic, 267 for Slovak Republic, 516 for Poland, 269 for Slovenia, 307 for Hungary and 268 for Estonia.

Source: OECD calculations based on EBRD-World Bank Business Environment and Enterprise Performance Survey 2013.

36. Part of the explanation for insufficiently skilled labour in Lithuania may be large emigrant outflows in recent years. The number of high skilled Lithuanian workers that emigrated to OECD countries in the decade to 2011 constituted more than 8% of Lithuania's domestic tertiary-educated population (Figure 11). There can be benefits to a country from emigration such as remittances and the potential for migrants to return with new skills. However, combined with a rapidly ageing population, the pace of skilled emigration makes it more pressing that the Lithuanians entering the domestic labour force have sufficient skills.

Figure 11. High skilled emigration has depleted Lithuania's pool of human capital

High skilled emigrants to OECD at 2010-11 that moved in the past 10 years, % of domestic high skilled 15+ population



Note: High skilled workers are defined as those with tertiary education.

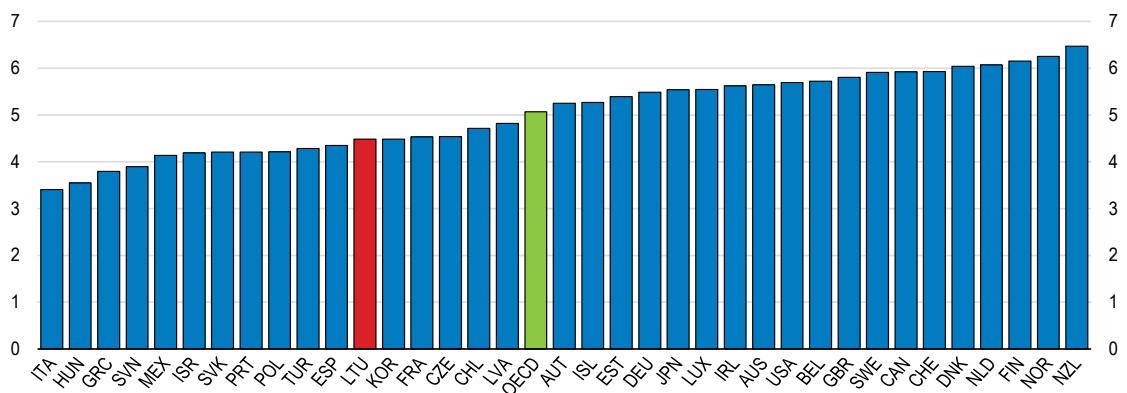
Source: Calculations based on OECD Database on Immigrants in OECD Countries (DIOC) 2010/11 and Eurostat data.

Post-secondary education

37. As noted earlier, the incidence of tertiary education in Lithuania is high. In 2014, 53% of Lithuanians aged 30-34 were tertiary educated compared with 38% across the EU. Nevertheless, firms report inadequate technical skills of graduates as a key factor behind labour shortages (European Parliament, 2015) and the extent of well-qualified managers in Lithuanian firms is modest (Figure 12). This reflects both failings in the skills being taught in the education system and the fact that lifelong learning participation rates are low (for further discussion on the latter, see Demmou, 2016). In 2015, the proportion of 25 to 64 year-olds participating in education and training in Lithuania was around half the EU average (European Commission, 2014a).

Figure 12. Qualified professional managers are less common in Lithuania than in the OECD

Reliance on professional management (value), 2014-15



Note: The score is derived from the answers of business leaders to the question: "In your country, who holds senior management positions? (1=usually relatives or friends without regard to merit; 7=mostly professional managers chosen for merit and qualifications)"

Source: World Economic Forum Global Competitiveness Index.

38. No Lithuanian university was ranked in the top 400 universities published by the *Times Higher Education World University Rankings 2014-15*. This contrasts with some of the smaller OECD economies such as Finland and Denmark that have seven and five universities in the top 400 respectively. Scope for improvement in the quality of Lithuanian universities was highlighted by a MOSTA study in 2015 that found that the short-run returns to university education were low relative to other forms of education (MOSTA, 2015). Higher education expenditure by the government (as a percent of GDP) is in line with many OECD countries, but the system may benefit from some rationalisation: there are 14 state universities and 13 state colleges in Lithuania which, on a per capita basis, is relatively high (Mitchell, 2014). In this process, there may also be scope for increased specialisation by institutions.

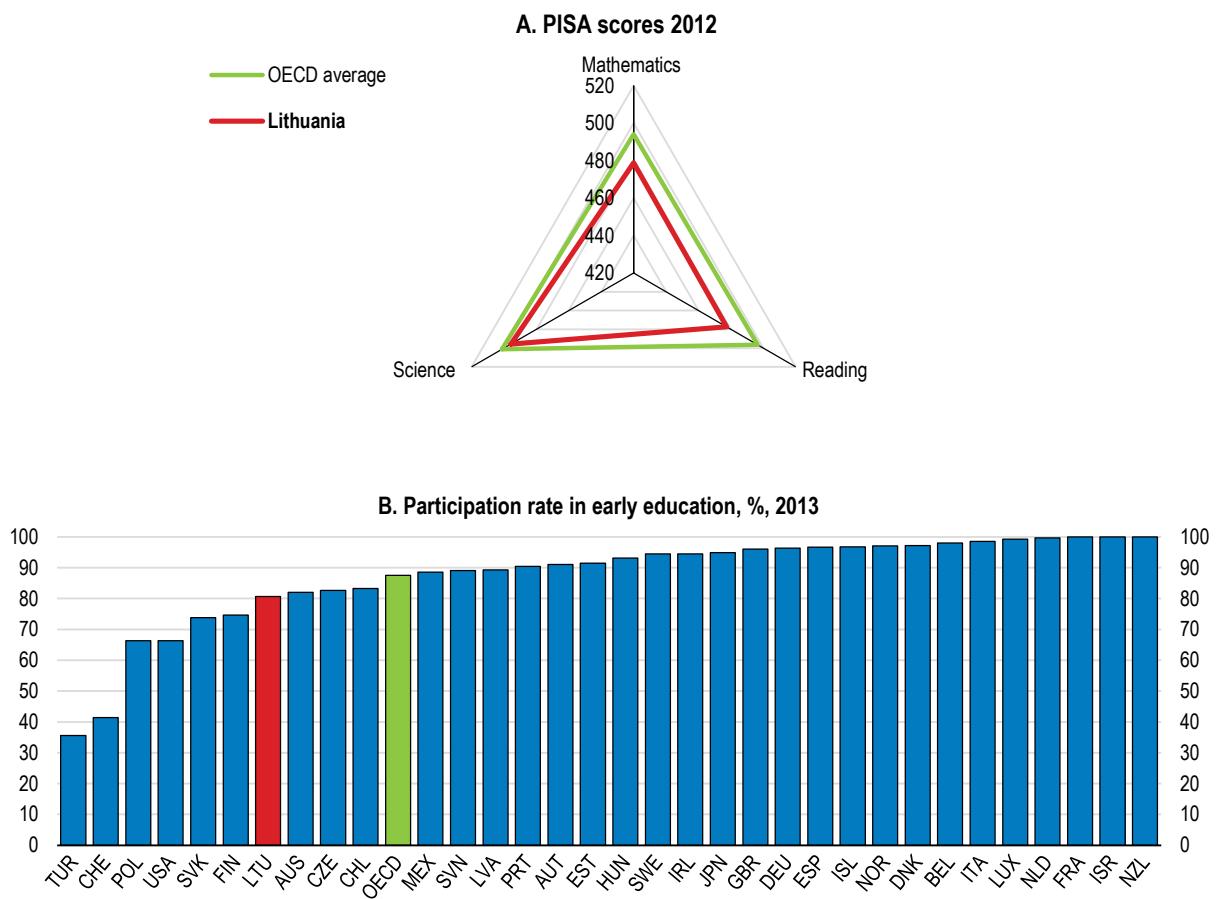
39. Government reforms have improved the responsiveness of universities to student demand, but differences in course fees may contribute to skill mismatch. In 2009, the government replaced direct funding for institutions with the provision of education vouchers to the best-performing students. This sought to foster a competitive funding environment and ensure institutions were more responsive to student needs. Nevertheless, roughly half the full-time students do not receive vouchers but pay full tuition fees. The fact that such fees for social sciences courses are relatively low has been blamed for an oversupply of social sciences graduates (IMF, 2015b). Indeed, the estimated returns to such courses are the lowest among the fields of study offered by Lithuanian universities and colleges (MOSTA, 2015). Greater efforts to communicate to students the labour market outcomes of graduates by field of study may be needed.

40. More work-based training that teaches practical skills is necessary given the difficulties faced by firms in finding adequately-skilled workers. The Lithuanian government has prioritised reform of vocational education and training (VET), which is largely school-based and has low enrolment rates. Only 29% of students in upper secondary education in 2013 were enrolled in vocationally-oriented programmes compared with 50% on average in the EU (OECD, 2015c). A recent initiative has been the establishment of sectoral practical training centres, which are modern training facilities that can be used by VET students along with higher education students and members of industry. The government is aiming to double the proportion of work-based learning in higher education and in-company training/apprenticeships that VET institutions provide by 2020. As highlighted in the recent OECD *Policy Note on Youth in Lithuania* (OECD, 2015c), complementary measures that further encourage participation by businesses may also be needed. These could include direct subsidies to participating firms. In most countries with well-functioning VET systems, the future employers of VET graduates as well as social partners play an important role in school governance and curriculum development. Such systems often emphasise a strong foundation in basic and transferable skills (like numeracy and literacy) in the VET programme (OECD, 2012a).

Secondary and early childhood education

41. The inadequate skills of the labour force may also reflect deficiencies in the education system at early ages. Lithuanian secondary students participating in the most recent wave of the Programme for International Student Assessment in 2012 (PISA; Figure 13, Panel A) scored particularly poorly for reading and mathematics compared with students in OECD countries. Low participation in early childhood education in Lithuania, especially in rural areas (Figure 13, Panel B; Poviliūnas, 2014), may contribute to students' future poor test scores. Furthermore, there is scope for improvement in the quality of the school system.

Figure 13. Poor basic skills partly reflect low participation in early childhood education



Source: OECD (2015), Education at a Glance 2015, Indicator C2; Eurostat Education indicators database; OECD, PISA 2012 Database.

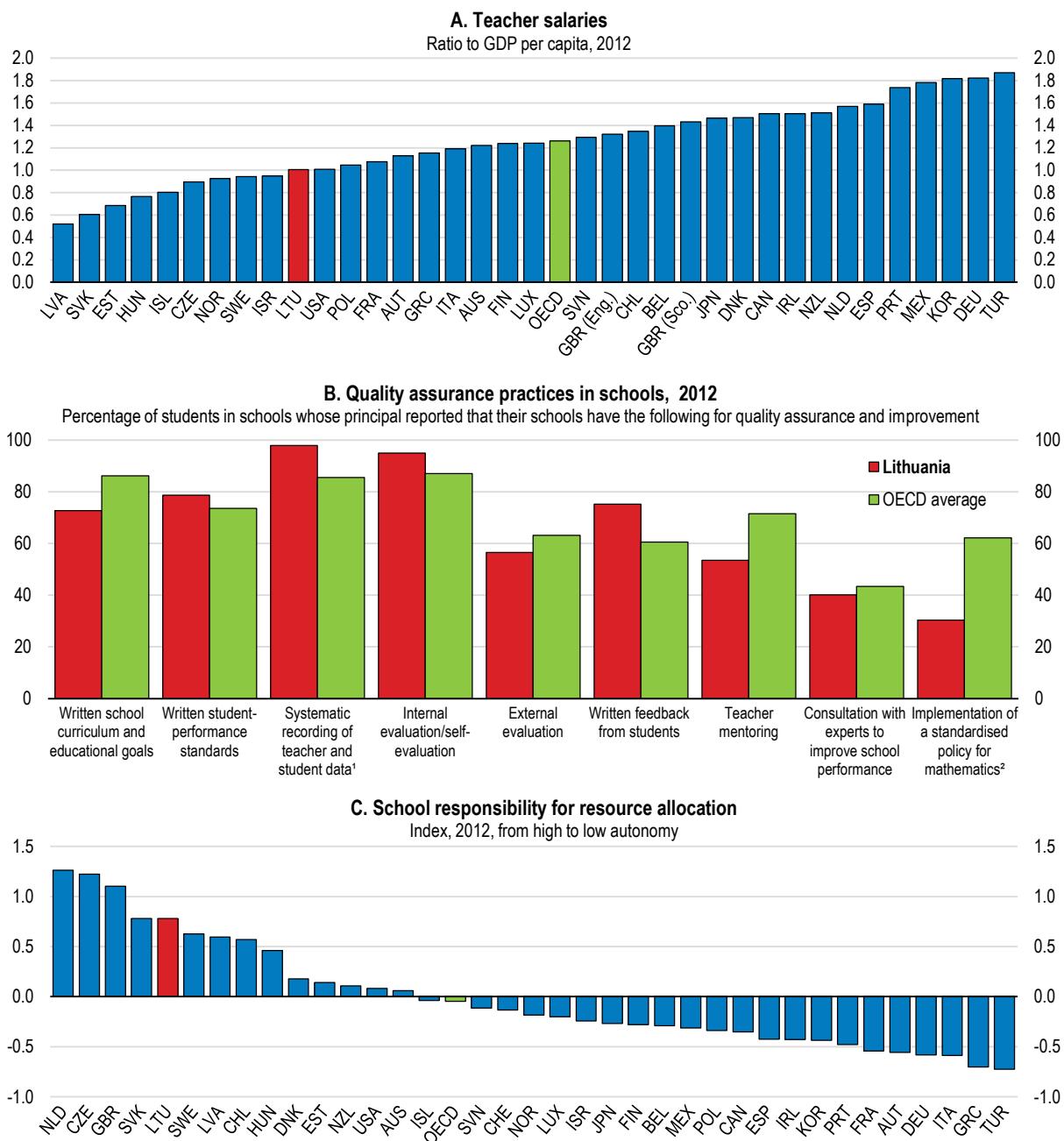
42. Talented graduates may be discouraged from becoming teachers because teacher salaries are low. Indeed, young teachers are scarce in Lithuania compared with other EU countries (European Commission, 2013). Past empirical work suggests that up to one-third of the variation in PISA scores between OECD countries can be explained by differences in teacher salaries (Ali, 2009). In general, teacher salaries are relatively low in the Baltics (Figure 14, Panel A). In Lithuania they are in line with GDP per capita, while they are around 20% higher than GDP per capita in the average OECD country.

43. For countries with low teacher salaries, performance-based pay scales have been found to benefit student performance (OECD, 2012b). Such mechanisms help preserve incentives and may be particularly useful in countries where budget constraints limit a broad-based salary increase. Teacher performance has typically not been a criterion for setting base salary and supplementary payments in Lithuania (OECD, 2013b). Nonetheless, it can be difficult to evaluate the impact of an individual teacher on students' results. A system based on the evaluation of good practices or group performance (i.e. a grade level team) may be more beneficial for encouraging teamwork and teacher training.

44. There is also scope to improve the professional development of Lithuanian teachers. While most Lithuanian schools collect data to monitor student and teacher progress and seek written feedback from students, mentoring programmes for teachers are relatively uncommon (Figure 14, Panel B). Furthermore,

in relation to mathematics courses, school principals report that it is not common for senior staff to observe lessons to monitor the practices of teachers (OECD, 2013b). Mentoring and development programmes that help young teachers develop their skills in motivating students to learn, classroom management and assessing student work, can benefit teaching quality and combat early dropout from the profession (OECD, 2009).

45. External evaluations of Lithuanian schools should be undertaken more frequently. Schools have a relatively high level of autonomy in making decisions about salaries, recruitment and budget allocations (Figure 14, Panel C). This is positive given such autonomy allows more tailored educational offerings that reflect student needs. However, in 2012, school principals reported that external evaluations in Lithuania were less common than in the OECD (Figure 14, Panel B) and in subsequent years their frequency appears to have declined (Shewbridge et. al., 2016). As such, the role of the school inspectorate or other external review body could be boosted to ensure schools are more regularly evaluated.

Figure 14. Teacher salaries are low and there is scope for improving quality assurance

Note: The ratios in Panel A are calculated as a simple average of those for lower and upper secondary education.

1. Including teacher and student attendance and graduation rates, test results and professional development of teachers.

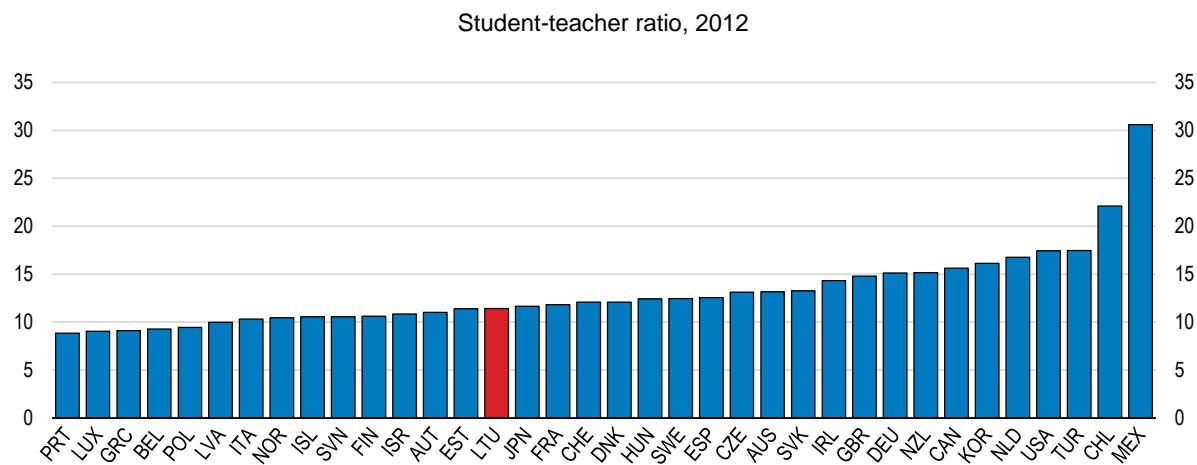
2. Such as a school curriculum with shared instructional materials accompanied by staff development and training.

Source: OECD PISA 2012, OECD Education at a Glance 2013, PISA system-level data collection in 2013.

46. The costs involved in further improving educational quality may be partly offset by efficiency gains in the system. A decline in Lithuania's school-aged population has prompted the government to consolidate schools. However, the student-teacher ratio is still fairly low compared with most OECD countries (Figure 15). Furthermore, population projections by the United Nations suggest that the school-

age population will fall by over 20% between 2010 and 2030, assuming constant fertility (United Nations, 2015). Some further consolidation of schools may enable cost savings and facilitate better coordination of curricula and teaching standards. However, this should be accompanied by measures such as improved transport infrastructure that ensure educational opportunities for students, especially those in rural areas, are not reduced.

Figure 15. The student-teacher ratio is relatively low and likely to further decline

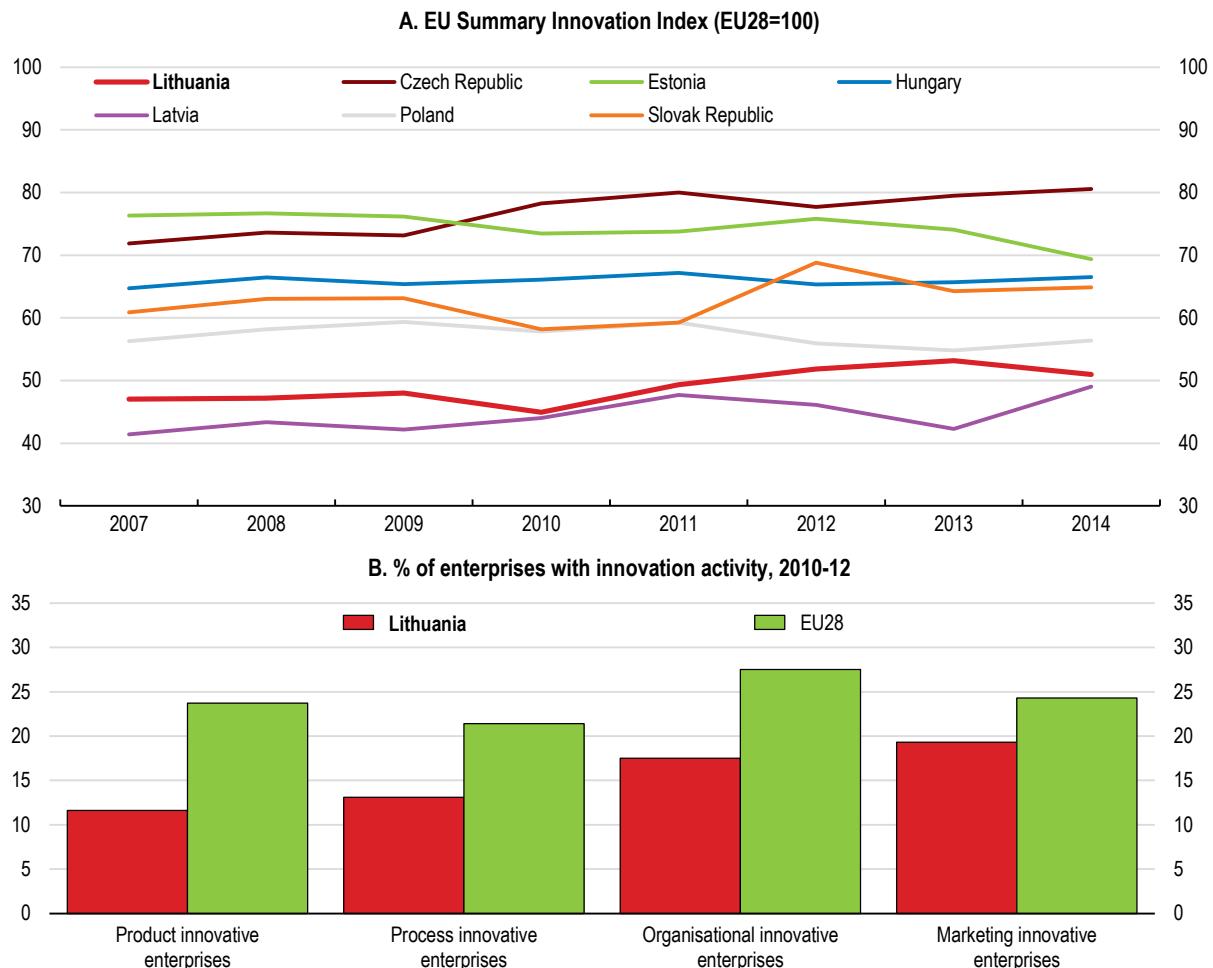


Source: OECD PISA 2012.

Innovation intensity is low despite a number of supportive government policy measures

47. Advances in productivity can also be fostered through the implementation of firm-level innovations which will, in turn, be influenced by the policy environment. Measures include many of the structural policies already discussed but also innovation-specific policies.

48. Lithuanian firms report relatively low levels of innovation. The EU Summary Innovation Index for Lithuania was around half the EU average in 2014 and below most comparable countries (Figure 16, Panel A). The most recent EU Community Innovation Survey found that just 32.9% of Lithuanian enterprises undertook innovation activity in the 2010-12 period compared with 48.9% on average across the EU (Eurostat, 2015). Compared with the average EU business, Lithuanian firms reported particularly weak product and organisational innovation activity (Figure 16, Panel B). Part of the problem may be that businesses in Lithuania suffer from poor capacity to absorb new foreign ideas and technologies (Angelis et al., 2014). A recent survey suggests that over 80% of Lithuanian Small and Medium Enterprises (SMEs) can be classified as having “low-absorptive capacity”; that is, they underperform in knowledge and technology transfer activities (Leichteris et al., 2015).

Figure 16. Firm level innovation in Lithuania is low

Note: The *Summary Innovation Index* in Panel A is a composite indicator obtained by an aggregation of 25 innovation indicators. In Panel B, a *product innovation* is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. A *process innovation* is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. An *organisational innovation* is the implementation of a new organisation method in the firm's business practices, workplace organisation or external relations. A *marketing innovation* is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.

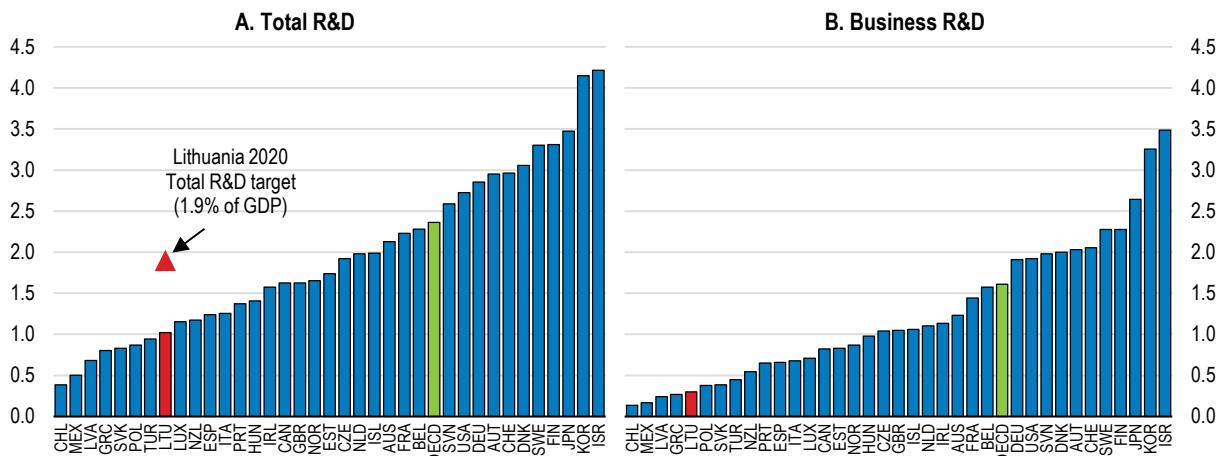
Source: European Commission (2015b), Eurostat (2015).

Innovation-specific policies

49. Relatively weak innovation performance coincides with low business research & development (R&D) intensity in Lithuanian firms (Figure 17, Panel B). Past cross-country analysis has highlighted the importance of R&D for enhancing the absorptive capacity of the economy (Griffiths et al., 2004). Compared with other countries, a higher proportion of R&D in Lithuania is undertaken by the higher education and government sector. Much of this focuses on basic research which is critical for innovation but can take many years before it is applied commercially (Sheehan and Wyckoff, 2003).

Figure 17. Business R&D intensity is very low

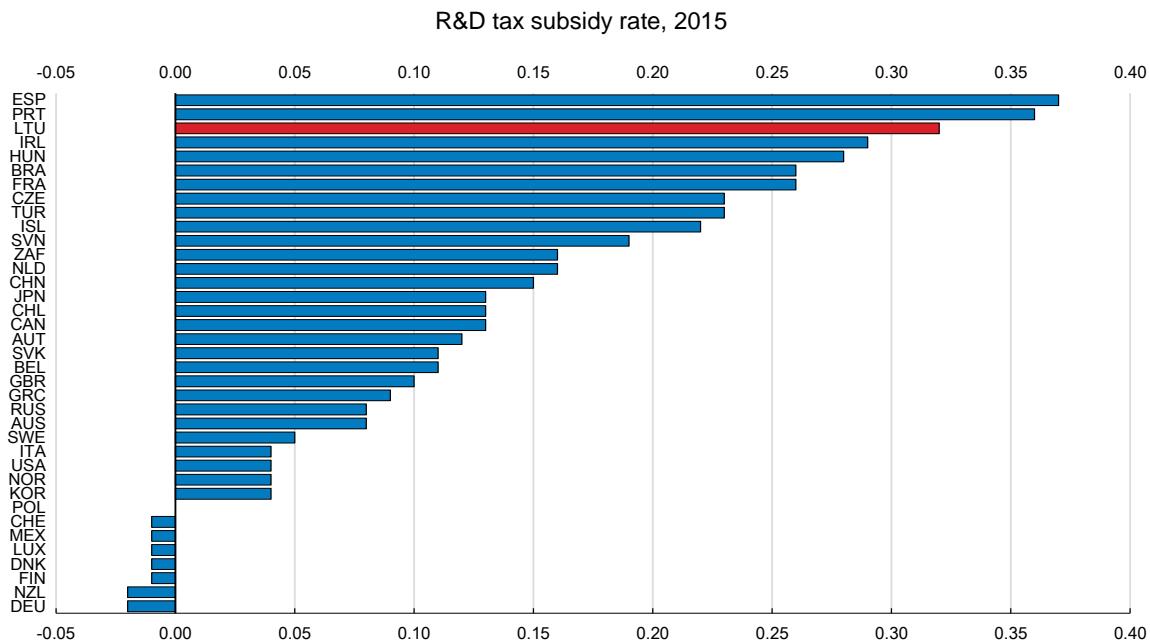
% of GDP, 2013 or last available year



Source: OECD Main Science and Technology Indicators and Eurostat Statistics on Research and Development database.

50. The Lithuanian government has set a national R&D target for 2020 at 1.9% of GDP, aiming for half to be contributed by the business sector. Achieving this objective may be challenging given that firms already report a shortage of researchers (Angelis et al., 2014), due in part to Lithuania's elevated high skill emigration rate and the significant administrative burden associated with hiring some foreign specialists (Box 2). Indeed, the share of researchers working in the business enterprise sector in Lithuania was 12% in 2012. This was lower than in the other Baltic countries and markedly lower than in some OECD members such as France (60%) and the Netherlands (68%). Any improvement in the availability of researchers should complement the policy measures already in place to encourage business R&D.

51. Along with an accelerated depreciation allowance for some R&D capital, since 2008 companies have been able to deduct 300% of R&D expenditures from taxable income. This is generous compared with such tax incentives in OECD countries (Figure 18). Nevertheless, the utilisation of R&D tax incentives by Lithuanian businesses remains low even though it has increased in recent years (European Commission, 2015c). Poor research capacity at the firm level and a relatively large number of firms operating in the informal economy may be partial explanations for low utilisation. However, poor understanding about the tax incentives also appears to be a problem. A recent survey of Lithuanian businesses found that two-thirds of the respondents were unaware that a tax deduction for R&D expenditures existed (Deloitte, 2015). Of those that were aware, a commonly cited deterrent to applying for incentives was uncertainty relating to the definition of eligible R&D. Upon request by a firm, the agency for Science, Innovation and Technology (MITA) is able to verify whether activities can be classified as R&D. Along with the existence of R&D tax incentives, this service should be better communicated to firms.

Figure 18. Tax incentives for R&D are generous in Lithuania

Note: The index is for large profitable firms. The tax subsidy rate is calculated as $(1 - B\text{-index})$, where the B-index is a measure of the before-tax income needed to break even on 1 dollar of R&D outlays (Warda, 2001). A decline in the B-index reflects an increase in R&D tax generosity. The calculation of the measure for Lithuania is based on the 300% deduction of R&D expenses, a 15% corporate tax rate, 2 year straight line depreciation and no expenditure ceiling for the tax advantage. The value for Lithuania is calculated based on these parameters, whereas published numbers from the below source are used for all other countries presented in the figure.

Source: OECD Science, Technology and Industry Scoreboard 2015, OECD calculations

52. While R&D tax incentives can encourage business R&D expenditures, they may favour incumbents at the expense of young firms. This is because the implicit subsidy rate of such measures increases with firm profitability and young firms are often in a loss position in the early years of an R&D project (Adalet McGowan et al., 2015). While the R&D tax deduction can be carried-over to future years, the value of future claims for young loss-making firms is lower than the value of present claims for profitable firms due to time-discounting. To ensure that this does not create a barrier to firm entry or growth, other measures such as government R&D grant and loan schemes, which are often particularly important for young innovative firms, should continue to play a prominent role in the innovation policy mix.

53. To complement the various supply-side policies, the Lithuanian government is also developing demand side measures to support innovation. Such measures can be useful in creating a market for innovations that address particular environmental and societal challenges (e.g. healthcare and pollution reduction). Innovative pre-commercial public procurement is one such measure. In this case, a public contracting authority, for the purpose of purchasing goods, services or works, introduces into the procurement terms criteria that require innovative solutions. While the government's procurement-related objectives under the Strategy of the Development and Improvement of the Lithuanian Public Procurement System for 2009-13 were not met (Leichteris et al., 2015), public institutions such as the Ministry of Economy and MITA are currently reforming the regulatory and legal framework to be more conducive to such innovative public procurement practices. Legislation providing guidelines for pre-commercial public procurement was adopted by the government in July 2015 and a draft law is being considered that provides advantages in the bidding process for innovative suppliers. The design of further policy initiatives in this area must ensure that there is not undue favouritism to large firms that are well-connected to the government and that technology lock-in is avoided. To counter such unintended consequences, some

OECD countries have put in place incentives for the participation of young firms in the bidding process and improved the transparency of the procurement framework (OECD, 2014b).

Improving science-industry collaboration in the innovation process

54. An ongoing challenge for innovation is to promote collaboration between research institutions and commercially-oriented firms. The public good properties of knowledge justify a role for public policy in encouraging this nexus. In the 2004-12 period, less than 10% of Lithuanian businesses considered partnering with public research institutes in the innovation process (Leichteris et al., 2015). Poor science-industry collaboration has motivated various policy measures including innovation vouchers for SMEs to buy industrial or applied R&D from selected public research institutions.

55. The government has also established five integrated science, studies and business centres (“valleys”) in Lithuania’s three largest cities (Vilnius, Kaunas and Klaipeda). These focus on high-tech sectors that align with the smart specialisation priority areas of the government (Box 3). The initiative is beneficial for encouraging knowledge spillovers and the commercialisation of new concepts. However, there are concerns that spending is too focused on physical infrastructure with insufficient support for professional innovation services (Paliokaite, 2014). More broadly, a country such as Lithuania with a lagging productivity level should ensure that public funding is not too concentrated on frontier technology innovation at the expense of promoting incremental innovation and the absorption of new foreign technologies and best practices.

Box 3. Lithuania’s integrated science, studies and business centres

Partly financed by EU structural funds, the establishment of Lithuania’s science, studies and business centres followed a long period of underinvestment in the country’s research infrastructure. With the project initiated in 2007 and amended in 2014, the “valleys” focus on achieving a number of science and innovation policy objectives including strengthening knowledge capacity and encouraging cooperation between various entities important to the innovation process. Five valleys were established, with each specialising in knowledge areas corresponding with the broad smart specialisation priority areas announced by the government as an ex ante condition for the use of the 2014-20 EU Structural Funds. The specialisations were designed to reflect the comparative advantages of each region:

- **Santara and Sauletekis Valleys (Vilnius)** - Knowledge areas: biotechnologies, innovative medicine, biopharmacy, ecosystems, ICT, laser and light technologies, nanotechnologies, semiconductors and electronics and civil engineering.
- **Nemunas and Santaka Valleys (Kaunas)** - Knowledge areas: agro biotechnologies, bioenergy and forestry, food technologies, safety and wellness, sustainable chemistry and pharmacy, mechatronics, future energy and ICT.
- **Maritime Valley (Klaipéda)** - Knowledge areas: maritime technologies and maritime environment.

All resources in the valleys are open access. The infrastructure of the valleys includes science laboratories and business incubators as well as complementary service partners (e.g. venture capital funds).

Source: Leichteris et al., 2015.

56. Nine science and technology parks have been established to promote the absorptive capacity of businesses and their exposure to new knowledge from universities and research institutions. These areas offer complementary infrastructure for the establishment of innovative businesses and promote collaboration between scientists, businesses and students. The recently operational Kaunas Science and Technology Park is one of the largest such areas in the Baltic countries. Nevertheless, the number of science parks in Lithuania is high compared with other countries and fragmentation may reduce the

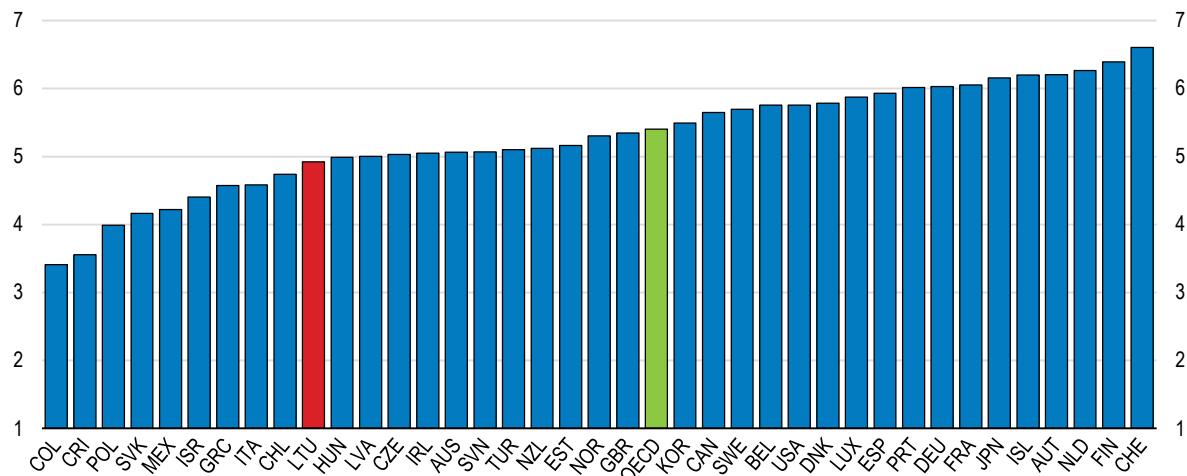
potential scale of knowledge spillovers (Leichteris et al., 2015). This may be exacerbated by the fact that many of the beneficial activities undertaken in science and technology parks are also encouraged in the valleys and 46 business clusters that have been created.

Infrastructure has improved but continued investment is needed

57. Well-developed physical infrastructure is critical for the efficiency of many businesses (Yeaple and Golub, 2007). Lithuania's infrastructure is being steadily updated, partly through the use of EU funding. In 2014, Lithuania was the leading country for the absorption of EU structural funds. While some infrastructure is well developed, such as the broadband network (Fibre to the Home Council Europe, 2015), businesses judge Lithuania's infrastructure overall to be below the OECD average (Figure 19). Improvements in the quality of infrastructure will benefit within-firm labour productivity, not least because such improvements are positively associated with a country's participation in GVCs (Kowalski et al., 2015). It will also have a beneficial impact on the efficiency of resource allocation.

Figure 19. The quality of Lithuanian infrastructure could be improved

Quality of overall infrastructure score, 2014-15



Note: The score is based on the assessment of business leaders operating in the country to the question: *how would you assess general infrastructure (e.g. transport, telephony and energy) in your country?* [1 = extremely underdeveloped – among the worst in the world; 7 = extensive and efficient – among the best in the world]

Source: World Economic Forum Global Competitiveness Index dataset.

Transport infrastructure

58. There are persistent issues with the railway system. Some narrow gauge rail tracks still exist (a hangover from the Soviet period), limiting interoperability with the European gauge railway network. Furthermore, over half of Lithuania's railway network does not have double tracks, reducing the potential for trains to overtake and causing problems with trains travelling in opposite directions. As well as economic consequences, an inefficient rail network can reduce energy efficiency which has environmental impacts. Adding to this, the degree of electrification of the railway network in Lithuania is substantially lower than the EU average. Rail infrastructure will be boosted by the completion of the Rail Baltica project which will run through Kaunas and connect Finland, Poland, Germany and the Baltic States.

59. Water transport has benefitted from a sequence of recent port investments, but there is scope to further increase the use of inland waterway transport. The expansion of the capacity of the Klaipeda port enabled cargo volumes to rise by one third between 2007 and 2014. However, the use of inland waterway transport remains low: the proportion of total inland freight transport by water is less than 1% compared with over 5% on average in the EU. Any initiatives to further develop inland waterways could reduce costs and environmental damages given that this form of freight transport tends to be relatively energy efficient.

Energy infrastructure

60. Connection to the electricity network has become less of an impediment to business operations. In 2013, over one third of Lithuanian firms responding to BEEPS reported electricity as either a major or very severe obstacle to their operations, which was high compared with the other Baltic countries. Such obstacles can create a barrier to firm entry and potentially deter FDI. However, new measures including stricter enforcement of the legal time period for connection works appear to have improved the ease of getting an electricity connection. From a year earlier, the time it took to obtain electricity connection fell from 135 days to 95 days in Lithuania in 2015 (World Bank, 2015).

61. A risk to business conditions is Lithuania's high vulnerability to disruptions in electricity supply. Until 2010, Lithuania's Ignalina Nuclear Power Station was the main source of electricity. However, following the closure of the plant, reliance on imported electricity from Latvia and Kaliningrad increased substantially. This was partly due to poor connectivity with the main electricity networks in continental Europe and Scandinavia (Miliauskaitė, 2012). Several infrastructure projects that will diversify the sources of electricity supply have been undertaken. These include the NordBalt electricity transmission line between Klaipeda and Nybro (Sweden) and the LitPol link with Poland that commenced operation at the end of 2015.

62. Lithuania should continue to improve integration with the European gas market to reduce potential disturbances to business operation from disruptions to gas supply. Until recently, Russia was the sole supplier of gas to Lithuania. However, the completion of the Klaipeda liquefied natural gas (LNG) terminal at the end of 2014 began to diversify the sources of Lithuania's gas. The announcement of the Gas Interconnector Poland-Lithuania project is very welcome, as completion will connect the gas networks of all the Baltic countries with that of the EU.

Recommendations for boosting productivity in Lithuania

Continuing to improve the efficiency of resource allocation

- Ensure that the ownership and regulatory functions of state-owned enterprises are not performed by the same government ministry.
- Increase the proportion of independent non-executive board members of state-owned enterprises.
- Promote new forms of business financing and ensure that innovation policies support young innovative firms. Reform bankruptcy procedures to reduce the time it takes to close a business.
- Monitor the impact of preferential corporate tax treatment of small firms for any unintended consequences.
- Further reduce regulatory barriers to the employment of non-EU workers.

Promoting within-firm productivity growth

- Attract higher-performing graduates to the teaching profession by paying higher wages and investing in teacher development.

- Promote greater participation in pre-primary education.
- Further increase the role of workplace training and cooperation with employers in the education system, especially in the context of vocational education and training programmes.
- Undertake further consolidation of institutions in the school and university system whilst ensuring that educational opportunities are not impaired.
- Provide better information to students regarding the qualification requirements for jobs.
- Promote innovation and firm's absorptive capacity by improving awareness of the existence of R&D tax incentives.
- Ensure that the tender process for innovative public procurement contracts is open to all firms and does not favour large firms that are well-connected to the government.
- Fully integrate Lithuania's electricity, rail and gas network with the rest of Europe.

BIBLIOGRAPHY

- Acemoglu, D. and J. Lin (2004), "Market Size in Innovation: Theory and Evidence from the Pharmaceutical Industry", *Quarterly Journal of Economics*, Vol. 119, No. 3.
- Acemoglu, D., U. Akcigit, N. Bloom and W. Kerr (2013), "Innovation, Reallocation and Growth", *NBER Working Papers*, No. 18993.
- Adalet McGowan, M., D. Andrews, C. Criscuolo and G. Nicoletti (2015), *The Future of Productivity*, OECD Publishing, Paris.
- Adalet McGowan, M. and D. Andrews (2015), "Labour Market Mismatch and Labour Productivity: Evidence from PIAAC Data", *OECD Economics Department Working Papers*, No. 1209, OECD Publishing, Paris. <http://dx.doi.org/10.1787/5js1pxz1r2kb-en>
- Aghion, P., N. Bloom, R. Blundell, R. Griffith and P. Howitt (2005), "Competition and innovation: An inverted-U relationship", *Quarterly Journal of Economics* 120, No. 2, pp. 701-728.
- Ali, A (2009), "The Impact Teacher Wages on the Performance of Students", *MPRA Paper*, No. 18252.
- Amann, E. and S. Virmani (2014), "Foreign direct investment and reverse technology spillovers: The effect on total factor productivity", *OECD Journal: Economic Studies*, Vol. 2014.
- Andrews, D. and C. Criscuolo (2013), "Knowledge-Based Capital, Innovation and Resource Allocation", *OECD Economics Department Working Papers*, No. 1046, OECD Publishing.
- Angelis, J., et al. (2014), "Lithuanian High Technologies Development Feasibility Study", Visionary Analytics JSC.
- Ashraf, A., D. Herzer and P. Nunnenkamp (2014), "The Effects of Greenfield FDI and Cross-border M&As on Total Factor Productivity", *MPRA Paper*, No. 65060.
- Avram S., L. Demmou and J. Navické, "The Effects of Reform Scenarios for Unemployment Benefits and Social Assistance on Work Incentives and Poverty in Lithuania" *OECD Economics Department Working Papers* No. 1310, OECD Publishing, Paris, www.oecd.org/eco/surveys/economic-survey-lithuania.htm.

Baltic Institute of Corporate Governance (2013), “CEOs in Lithuanian State-Owned Enterprises”, May 2013.

Bartelsman, E., J. Haltiwanger and S. Scarpetta (2004), “Microeconomic evidence of creative destruction in industrial and developing countries”, *Policy Research Working Paper Series*, No. 3464, The World Bank.

Bloom, N., R. Sadun, and J. Van Reenen (2013b) "Management as a Technology", LSE mimeo http://cep.lse.ac.uk/textonly/_new/staff/vanreenen/pdf/2015aea_MAT.pdf.

Brynjolfsson, E., and A. McAfee (2011), *Race against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy*, Digital Frontier Press.

Chen, D., and J. Mintz (2011), “Small Business Taxation: Revamping Incentives to Encourage Growth”, *The School of Public Policy Research Papers*, Vol. 4, No. 7, University of Calgary.

Crespi, G., C. Criscuolo and J. Haskel, (2008), "Productivity, Exporting, and the Learning-by-Exporting Hypothesis: Direct Evidence from UK Firms", *Canadian Journal of Economics*, Vol. 41, No. 2.

de la Fuente, A (2011), “Human Capital and Productivity”, *Barcelona Economics Working Paper Series*, No. 530.

Deloitte (2015), *Lithuania Corporate R&D Report*, July 2014.

Demmou, L (2016), “Growing Together: Making Lithuania’s Convergence Process More Inclusive”, *OECD Economics Department Working Paper* No. 1308, OECD Publishing, Paris, www.oecd.org/eco/surveys/economic-survey-lithuania.htm.

Earle, J et al. (2015), “Recent Employment Dynamics in Lithuania”, *Technical Background Paper for the OECD Economic Assessment of Lithuania*.

European Bank for Reconstruction and Development (2009), “Transition Report 2009: Transition in Crisis?”, London.

European Bank for Reconstruction and Development (2012), *Strategy for Lithuania*, London.

European Commission (2015a), “Country Report: Lithuania 2015” *Staff Working Document*.

European Commission (2015b), *Innovation Union Scoreboard 2015*, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs.

European Commission (2015c), ERAWATCH: Platform on Resource and Innovation Policies and Systems, http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/lt.

European Commission (2014a), *Education Training Monitor 2014*, Vol. 1.

European Commission (2013), “Key Data on Teachers and School Leaders in Europe”, *Eurydice Report*, Luxembourg: Publications Office of the European Union.

European Commission (2003), *The EU Economy: 2003 Review*, European Economy, No. 6.

Eurostat (2015), *Community Innovation Survey 2012*, News Release, 21 January 2015.

Estrin, S., J. Hanousek, E. Kocenda and J. Svejnar (2009), "The Effects of Privatization and Ownership in Transition Economies", *Journal of Economic Literature*, Vol. 47, No. 3.

Fiber to the Home Council Europe (2015), *Annual Report 2013-14*, Brussels.

Gompers, P.A (1994), "The Rise and Fall of Venture Capital", *Business and Economic History*, Vol. 23, No. 2.

Green, F. and Y. Zhu (2010), "Overqualification, Job Dissatisfaction and Increasing Dispersion in the Returns to Education", *Oxford Economic Papers*, Vol. 62, No. 4.

Griffith, R., S. Redding and J. Van Reenen (2004), "Mapping the Two Faces of R&D: Productivity Growth in a Panel of OECD Industries", *The Review of Economics and Statistics*, Vol. 86, No. 4.

Haltiwanger, J. C., R. S. Jarmin and J. Miranda (2010), "Who Creates Jobs? Small vs. Large vs. Young", *NBER Working Papers*, No. 16300.

Hazans, M (2011), "Informal Workers Across Europe: Evidence from 30 Countries", *IZA Discussion Paper*, No. 5871.

IMF (2015a), "Republic of Lithuania 2014 Article IV Consultation – Staff Report", *IMF Country Report*, No. 14/113.

IMF (2015b), "Republic of Lithuania 2014 – Selected Issues", *IMF Country Report*, No. 15/139.

IMF (2014), "Baltic Cluster Report", *IMF Country Report* No. 14/117.

Invest Lithuania (2014), "Lithuania the regional leader for attracting foreign investment projects", September 23, www.investlithuania.com/news/lithuania-the-regional-leader-for-attracting-foreign-investment-projects/.

Johansson, Å., et al. (2013), "Long-Term Growth Scenarios", *OECD Economics Department Working Papers*, No. 1000, OECD, Paris.

Jurkonis, L. and D. Petrusauskaité (2014), "Effects of Corporate Governance on Management Efficiency of Lithuanian State-owned Enterprises", *Ekonomika*, Vol. 93, No. 2.

Kowalski, P., et al. (2015), "Participation of Developing Countries in Global Value Chains: Implications for Trade and Trade-Related Policies", *OECD Trade Policy Papers*, No. 179, OECD Publishing, Paris. <http://dx.doi.org/10.1787/5js33lfw0xxn-en>

Leichteris, E., et al. (2015), "Initial Assessment of Lithuanian Innovation Policy", Knowledge Economy Forum, *mimeo*.

Martinkus, P (2014), "Governance Issues in SOE's Within the Baltic States", Ethical Boardroom, <http://ethicalboardroom.com/>

Melitz, M. and D. Trefler (2012), "Gains from Trade When Firms Matter", *Journal of Economic Perspectives*, Vol. 26, No. 2.

- Meroni, E., E. Vera-Toscano and S. Lombardi (2014), “The persistence of over-education and over-skilling among recent graduates. Labour market mobility or educational system failure?”, *mimeo*.
- Miliauskaitė, N (2012), “Lithuania’s Energy Security in the European Context: the search for alternatives in Central Asia”, Aalborg University, June 2012.
- Mitchell, N (2014), “Higher education shake-up to stem ‘brain drain’”, *University World News*, Issue No. 306.
- MOSTA (2015), “Effectiveness of Higher Education – Overview and Recommendations”, *Policy Brief*, 20 April 2015.
- National Audit Office of Lithuania (2014), "Financial Risk Management in State-Owned Enterprises and Public Establishments: Executive Summary of the Public Audit Report", 30 June 2014, http://www.vkontrole.lt/pranesimas_spaudai_en.aspx?id=18067.
- OECD (2016a), *OECD Economic Surveys: Lithuania 2016: Economic Assessment*, OECD Publishing, Paris.
- OECD (2016b), *Market Openness Review of Lithuania*, OECD Publishing, Paris, *forthcoming*.
- OECD (2015a), *Entrepreneurship at a Glance 2015*, OECD Publishing, Paris.
- OECD (2015b), *Regulatory Policy Review: Lithuania*, OECD Publishing, Paris.
- OECD (2015c), *Review of Lithuania’s Position Relative to the OECD Guidelines on Corporate Governance of State-owned Enterprises*, OECD Publishing, Paris.
- OECD (2015d), “New Approaches to SME and entrepreneurship finance: Broadening the range of instruments”, *Final Synthesis Report*, Working Party on SMEs and Entrepreneurship.
- OECD (2014a), *Summary Description of R&D Tax Incentive Schemes for OECD Countries and Selected Economies 2013*, Directorate for Science, Technology and Innovation, <http://www.oecd.org/sti/rd-tax-stats.htm>.
- OECD (2014b), *OECD Science, Technology and Industry Outlook 2014*, OECD Publishing.
- OECD (2013a), *OECD Product Market Regulation Indicator Database*, <http://www.oecd.org/eco/growth/indicatorsofproductmarketregulationhomepage.htm>.
- OECD (2013b), *PISA 2012 Results: What Makes Schools Successful? Resources, Policies and Practices (Volume IV)*, PISA, OECD Publishing.
- OECD (2012a), *OECD Economic Surveys: Estonia*, OECD Publishing.
- OECD (2012b), “Does performance-based pay improve teaching?”, *PISA In Focus 2012/05 (May)*.
- OECD (2011), “Financing High Growth Firms: The Role of Angel Investors”, OECD, Paris. <http://www.oecd.org/sti/financinghigh-growthfirmstheroleofangelinvestors.htm>.
- OECD (2010), Tax Policy Reform and Economic Growth, OECD Publishing. <http://dx.doi.org/10.1787/9789264091085-en>.

OECD (2009), *Creating Effective Teaching and Learning Environments: First Results from Teacher and Learning International Survey*, OECD Publishing.

OECD (2008), “The Impact of Foreign Direct Investment on Wages and Working Conditions”, *OECD-ILO Conference on Corporate Social Responsibility*, Background Document.

Paliokaite, A (2014), *ERAWATCH Country Reports 2013: Lithuania*, European Commission.

Saboniene, A., R. Masteikiene and V. Venckuviene (2013), “Lithuanian Export Specialization According to Technological Classification”, *Mediterranean Journal of Social Sciences*, Vol. 4, No. 2.

Schneider, F (2015), “Size and Development of the Shadow Economy of 31 European and 5 other OECD Countries from 2003 to 2015: Different Developments”, *mimeo*.
<http://www.econ.jku.at/members/Schneider/files/publications/2015/ShadEcEurope31.pdf>.

Sheehan, J. and A. Wyckoff (2003), “Targeting R&D: Economic and Policy Implications of Increasing R&D Spending”, *OECD Science, Technology and Industry Working Papers*, 2003/08, OECD, Paris.

Shewbridge,C., K. Godfrey, Z. Hermann and D. Nusche (2016), *OECD Reviews of School Resources: Lithuania 2016*, OECD Reviews of School Resources, OECD Publishing, Paris.

State Property Fund (2014), “State-Owned Enterprises in Lithuania, Annual Report 2013”, *State-Owned Enterprises Governance Coordination Department*.

Streimikiene, D., J. Bruneckiene and A. Cibinskiene (2013), “The Review of Electricity Market Liberalization Impacts on Electricity Prices”, *Transformations in Business & Economics*, Vol. 12, No 3.

United Nations (2015), *World Population Prospects: The 2015 Revision*, DVD Edition.

Warda, J. (2001), “Measuring the Value of R&D Tax Treatments in OECD Countries”, *STI Review No. 27: Special Issue on New Science and Technology Indicators*, OECD Publishing, Paris.

Wasmer, E. (2006), "Interpreting Europe-US Labor Market Differences: the Specificity of Human Capital Investments", *American Economic Review*, Vol. 96, No. 3.

Wilson, K (2014), “Policy Lessons from Financing Young Innovative Firms”, OECD Directorate for Science, Technology and Innovation, *mimeo*.

World Bank (2013), *Business Environment and Enterprise Performance Survey (BEEPS)*,
<http://data.worldbank.org/data-catalog/BEEPS>.

World Bank (2015), *Doing Business 2016 Measuring Regulatory Quality and Efficiency: Lithuania*, World Bank Group.

World Economic Forum (2014), *The Global Competitiveness Report 2014-15*, Switzerland.

Yeaple, S.R. and S.S. Golub (2007), “International Productivity Differences, Infrastructure, and Comparative Advantage”, *Review of International Economics*, Vol. 15, No. 2.

You Lee, S., R. Florida and G. Gates (2010), “Innovation, Human Capital and Creativity”, *International Review of Public Administration*, Vol. 14, No. 3.

ANNEX 1.

As presented in Figure 1.2, labour productivity growth can be decomposed into contributions from three distinct components (European Commission, 2003; Molnar and Chalaux, 2015). Firstly, a within-sector effect (“within effect”), which measures the impact of productivity growth within each sector of the economy assuming that sector labour shares are unchanged. Secondly, a shift effect (“shift effect”), which results from the movement of labour resources between sectors, assuming productivity levels in each sector are unchanged. Finally, a cross-term (“Cross-term”), which reflects changes in the labour share and the productivity level in each sector. In Lithuania’s case, the latter term is negative when an increase in productivity growth is exhibited in shrinking sectors, which may reflect structural adjustment. In the analysis that follows, the within effect and shift effect are the primary focus. The decomposition is as follows:

$$\overbrace{\frac{\Delta LP_t}{LP_{t-1}}}^{\text{LP growth}} = \underbrace{\sum_i \frac{\Delta LP_{it}}{LP_{it-1}} \frac{Y_{it-1}}{Y_{t-1}}}_{\text{within effect}} + \underbrace{\sum_i \frac{LP_{it-1}}{LP_{t-1}} \left(\frac{L_{it}}{L_t} - \frac{L_{it-1}}{L_{t-1}} \right)}_{\text{shift effect}} + \underbrace{\sum_i \frac{1}{LP_{t-1}} (\Delta LP_{it}) \Delta \left(\frac{L_{it}}{L_t} \right)}_{\text{cross-term}} \quad (1)$$

Where LP reflects the level of labour productivity in industry i at time t , L is the number of hours worked and Y is output.

Reductions in regulatory costs for businesses may foster productivity-enhancing resource allocation by promoting the entry of new firms into areas of the economy where returns are the highest. This can either happen by labour resources moving between firms within the same industry (i.e. captured by the “within effect”) or between firms in different industries (i.e. the “shift effect”). Of course, some sectors of the economy are more conducive to firm entry than others. For example, there can be “naturally” high entry barriers in the form of high capital intensity or technological complexity of production in some sectors (Andrews and Cingano, 2013). This differential impact can be used in a regression analysis to identify if there has been any influence of the reduction in regulatory costs for starting a business in Lithuania on labour productivity growth. More specifically, the following equation is estimated:

$$X_{i,t} = \Delta Policy_t * Exposure_i + \mu_i + \mu_t + \varepsilon_{i,t} \quad (2)$$

The dependent variable, X , is aggregate labour productivity growth. However, in order to identify the particular channel through which productivity is effected, separate regressions are also run with the dependent variable being the within effect and the shift effect outlined in equation (1).

Any impacts of policy are identified through the coefficient on the interaction term $\Delta Policy_t * Exposure_i$ which reflects whether policy changes (at the country level) had a larger impact on industries that are particularly exposed to such policies. As in past work (Andrews and Cingano, 2013), the level of industry exposure to policies that impact resource reallocation is proxied by a measure of within-industry firm turnover in the US (as it is assumed to be the closest to a “frictionless” economy) taken from Bartelsman et al., (2004). The time period considered is 2006-13.

The policy measures used in the regression analysis are taken from the World Bank *Doing Business* indicators. The overall ease of starting a business is an aggregate that summarises policy settings across a number of policy dimensions. Three of these are taken as the policy indicators in the subsequent regressions; the cost to start a business, the number of procedures to start a business and the time it takes to start a business. The variable “manufacturing*year” is a time-varying dummy for industries that belong to the broad manufacturing sector. The estimated coefficient on this variable highlights whether productivity growth has been identifiably stronger in the broad manufacturing sector over this time period (as highlighted in Figure 1.3, Panel B).

The results of the regression analysis are presented in the below table. They suggest that recent policy changes in Lithuania to improve the business climate have benefitted resource reallocation both within industries and between industries. To summarise the main findings:

- Policy changes in Lithuania that have increased the ease of starting a business have had a positive effect on labour productivity growth (Column 1). This impact may have arisen through beneficial resource allocation within industries or increased firm productivity due to the reduction in administrative costs. Specifically, policy measures that have reduced the number of procedures needed to start a business (Columns 3 and 7) and the time it takes to start a business (Columns 4 and 8) are associated with higher productivity growth.
- Policy changes that have reduced the cost of starting a business (Column 10) have led to productivity-enhancing shifts in resources between industries (although the impact on aggregate productivity growth is not identified).

Table A1.1. The estimated effect of policy changes on productivity growth

Dependent variable	(1) LP growth	(2) LP growth	(3) LP growth	(4) LP growth	(5) Within effect	(6) Within effect	(7) Within effect	(8) Within effect	(9) Shift effect	(10) Shift effect	(11) Shift effect	(12) Shift effect
manufacturing*year	0.0271 (1.57)	0.0456* (1.86)	0.0221 (1.24)	0.0743* (1.96)	-0.0003 (0.01)	0.0133 (0.4)	-0.0076 (0.3)	0.0499 (1.56)	0.0299* (1.8)	0.0344 (1.43)	0.0317* (1.9)	0.0264 (1.00)
Δoverall ease of starting a business*exposure	0.0266* (2.05)				0.0309** (2.38)				-0.0047 (0.32)			
Δcost to start a business*exposure		-0.0076 (0.78)				0.0129 (0.91)				-0.0201* (1.93)		
Δnumber of procedures to start a business*exposure			-0.0381* (1.92)				-0.0470** (2.32)				0.0086 (0.46)	
Δtime to start a business*exposure				-0.0176* (1.98)				-0.0179*** (3.63)				0.0004 (0.05)
Constant	-33.15 (1.57)	-55.77* (1.86)	-27.03 (1.24)	-90.96* (1.96)	0.44 (0.01)	-16.19 (0.42)	9.42 (0.27)	-60.99 (1.56)	-36.55* (1.80)	-42.09* (1.43)	-38.86* (1.9)	-32.29 (1.00)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	184	184	184	184	184	184	184	184	184	184	184	184
R-squared	0.16	0.14	0.16	0.16	0.19	0.15	0.19	0.18	0.06	0.07	0.06	0.06
Number of NACEDivision	23	23	23	23	23	23	23	23	23	23	23	23
F	3.02	2.61	2.96	2.65	6.94	5.14	6.56	6.63	2.4	2.99	2.45	1.72

*** p<0.01, ** p<0.05m * p<0.10.

Note: t-statistics in parentheses. The regressions include industry and year fixed effects and standard errors clustered at the industry level.