



REPUBLIC OF LITHUANIA

SELECTED ISSUES

May 2015

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May 12, 2015

Approved By
European Department

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FROM EXPENDITURE CONSOLIDATION TO EXPENDITURE EFFICIENCY: ADDRESSING PUBLIC EXPENDITURE PRESSURES IN LITHUANIA¹

A. Introduction

1. Fiscal consolidation over the past five years has reduced Lithuania's public expenditure as a share of GDP to among the lowest in the region. Prior to the 2008/09 financial crisis, Lithuania's public spending was already well below the European average. Fiscal consolidation efforts in the wake of the crisis relied heavily on expenditure measures, which accounted for approximately two-thirds of the overall effort (Figure 1; Geng, 2013; Geng and Poirson, 2014).² As a result, public spending fell from a peak of 45 percent of GDP in 2009 to around 35 percent of GDP in 2013, although the steep fall of GDP in 2009 somewhat inflated the ratio in this year (Table 1).³ Current spending accounted for the bulk of the spending adjustment, with reductions in social benefits and public sector wages contributing the most (Table 1, top panel). In terms of spending by functional category, social protection, education, and health contributed the most (Table 1, bottom panel).

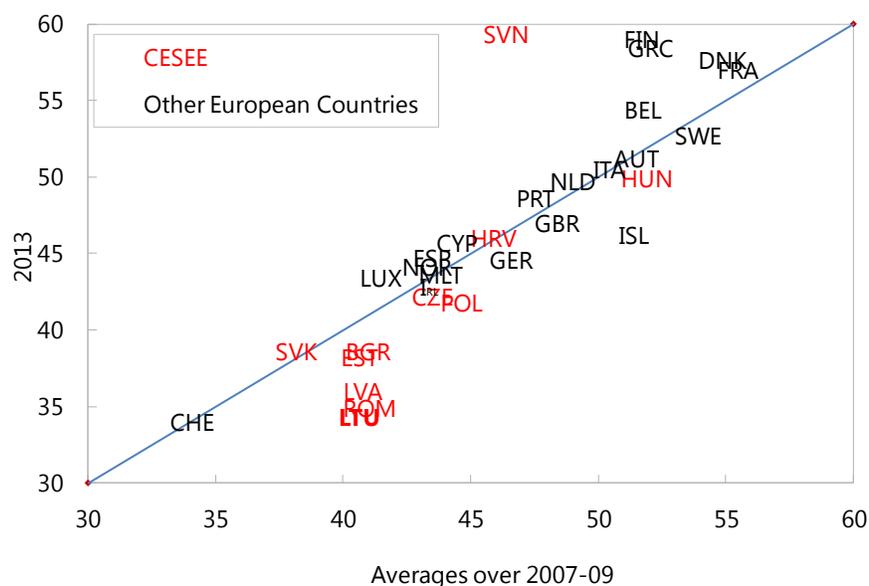
2. While expenditure reductions have so far been sustained, spending pressures are likely to emerge. These pressures come from four main sources. First, to the extent that expenditure consolidation measures have been of low quality, such as postponed capital spending or crude across-the-board freezes and cuts, these often tend to unwind. Second, if low spending leads to social outcomes that compare very unfavorably to those in other European countries, society will demand higher spending to attain more acceptable outcomes. Third, Lithuania will experience even larger long-term spending pressures related to population ageing than the rest of Europe because of its particularly challenging demographics. Annual public pension and health spending is projected to increase by 3.9 percent of GDP by 2050 (European Commission, 2012). Fourth, international experience suggests that the demand for public services as a share of GDP rises with growing incomes. Moreover, in the absence of revenue increases, additional expenditure consolidation will be needed to reach Lithuania's medium-term fiscal objectives and to offset committed increases of defense spending.

¹ Prepared by David Coady and Nan Geng. The authors would like to thank Louis Sears for excellent research assistance, and the Lithuanian authorities, and the participants of a seminar at the Ministry of Finance of the Republic of Lithuania, Csaba Feher, Christoph Klingen, Baoping Shang, and Mauricio Soto for helpful comments and suggestions. The authors alone are responsible for remaining errors and omissions.

² Appendix Table 1 summarizes the main expenditure consolidation measures adopted from 2009.

³ Nominal public spending contracted by 0.3 percent during 2009-13 while nominal GDP grew by 29.9 percent.

Figure 1. General Government Public Spending in European Countries, 2007–13
(Percent of GDP)



Source: Eurostat.

Note: CESEE comprises Bulgaria, Czech Republic, Estonia, Croatia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, and Slovakia.

Table 1. Lithuania: General Government Spending by Economic and Functional Classifications

	2008	2009	2010	2011	2012	2013	Difference (2013-2009)	
	(percent of GDP)						(ppts of GDP)	(share of total exp consolidation (%))
<i>Economic classification</i>								
Total expenditure	37.9	44.9	42.3	38.7	36.1	34.4	-10.5	100.0
Current spending	32.9	41.0	37.8	34.6	32.6	31.1	-9.9	94.6
Compensation of employees	10.7	12.8	11.0	10.3	9.8	9.6	-3.2	30.6
Goods and services	5.7	5.8	6.4	5.2	5.1	4.7	-1.1	10.2
Interest payments	0.7	1.3	1.8	1.8	1.9	1.7	0.4	-3.9
Subsidies	0.7	0.6	0.5	0.4	0.3	0.3	-0.3	2.9
Grants	0.8	1.0	0.7	0.7	0.7	0.9	-0.1	0.6
Social benefits	13.3	18.4	16.4	14.6	13.9	13.0	-5.3	50.9
Other expense	1.0	1.1	1.0	1.6	0.9	0.8	-0.3	3.3
Capital spending	5.0	3.9	4.5	4.1	3.5	3.3	-0.6	5.4
<i>Functional classification</i>								
Total expenditure	37.9	44.9	42.3	38.7	36.1		-8.8	100.0
General public services	3.9	4.3	4.5	4.5	4.3		0.0	0.0
Defence	1.4	1.4	1.2	1.1	1.0		-0.4	4.5
Public order and safety	1.9	1.9	1.9	1.9	1.8		-0.1	1.1
Economic affairs	4.7	4.0	4.5	3.9	3.3		-0.7	8.0
Environment protection	0.8	1.2	1.4	0.9	0.9		-0.3	3.4
Housing and community amen	0.4	0.5	0.3	0.3	0.2		-0.3	3.4
Health	5.6	6.7	7.0	6.7	5.9		-0.8	9.1
Recreation, culture and religior	1.1	1.2	1.0	1.0	0.8		-0.4	4.5
Education	5.8	6.8	6.1	5.8	5.6		-1.2	13.6
Social protection	12.3	16.8	14.4	12.6	12.1		-4.7	53.4

Sources: Eurostat (ESA95 methodology) and IMF staff calculations.

3. This paper reviews public expenditure in Lithuania with a view to identifying areas where deeper reforms may be warranted to improve spending efficiency and contain future spending pressures. The paper benchmarks spending levels and spending composition in Lithuania against those in other European countries. The 31 European countries covered in the benchmarking exercise include the EU-28 plus Iceland, Norway, and Switzerland. Reflecting the tendency for public spending to increase with income, Lithuania's spending as a share of GDP is compared with the EU average spending controlling for GDP per capita. For simplicity, the term EU average is used throughout the paper. The paper also tries to assess spending relative to outcomes to get a sense of spending efficiency. Since it is important to evaluate public spending levels in relation to their objectives, rather than just their relative size, a functional perspective is required, with a particular focus on social protection, education, and health.⁴ However, useful insights into the efficiency of public spending can also be gleaned from an analysis of spending by economic classification, especially regarding the split between current and capital spending and the size and composition of the wage bill.⁵

B. Public Expenditure by Economic Classification

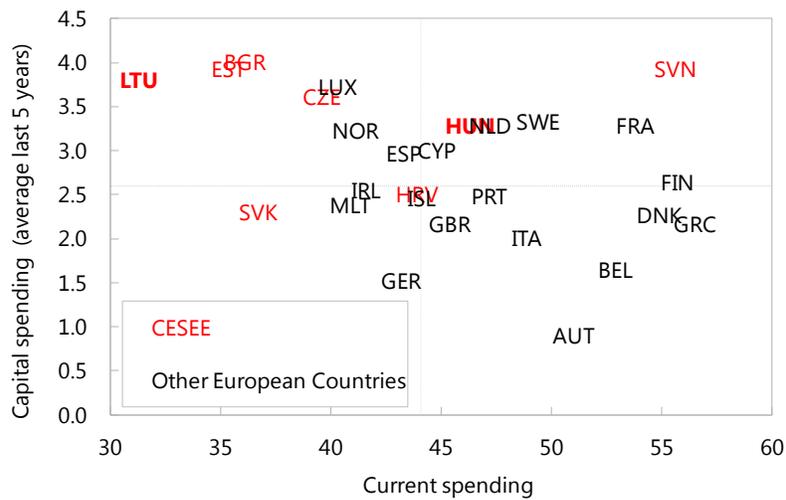
4. Lithuania largely resisted the temptation to achieve fiscal consolidation at the expense of investment. Notwithstanding international evidence that consolidating current spending is typically more growth friendly and sustainable (IMF, 2014a), postponing or cutting capital spending is often politically more palatable. In the case of Lithuania, while capital spending as a share of GDP has fallen slightly since the 2008/09 crisis, it has been a less important source of expenditure consolidation than in other countries. This reflects in part the government's decision to shield EU-funded projects from cuts, which account for a large share of public investment. Consequently, Lithuania's capital spending exceeded the European average in the last five years, which is appropriate considering its comparatively low stock of public capital (Figures 2 and 3).

5. Instead, wage bill reductions contributed greatly to consolidation. Within current primary spending, the public sector wage bill typically accounts for a relatively high share. Crude wage bill consolidation measures, such as freezing wage and employment levels, are often one of the few avenues open to governments under pressure to achieve quick results. Lithuania's wage bill had increased sharply prior to 2009—by 50 percent in real terms between 2005 and 2008, including by nearly 20 percent in 2008 alone. All public sector groups benefited from rapidly growing wages, but medical doctors and judges fared best, seeing their real wages double over the period. Unsurprisingly, much of the consolidation effort in the crisis was directed at the wage bill, including employment and nominal wage reductions and freezes, elimination of unfilled vacancies, and suspension of bonuses and promotions (Box 1).

⁴ These three functional areas account for about two-thirds of total spending. The rest one-third of public spending is dominated by wage spending, which is discussed under economic classification.

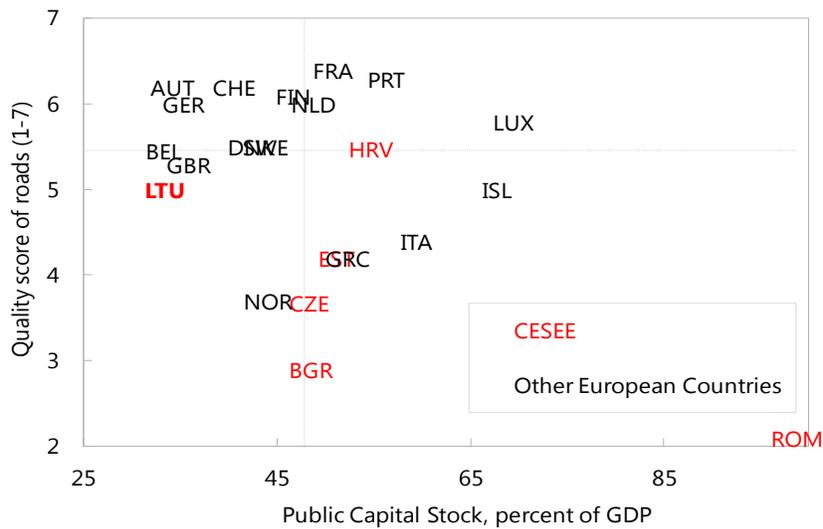
⁵ The heterogeneity of goods and services spending across functions means that it is better analyzed from a functional perspective.

Figure 2. Public Capital and Current Spending in CESEE and EU Countries, 2013
(Percent of GDP)



Source: Eurostat.
Note: Dashed lines indicate medians.

Figure 3. Public Capital Stock and Quality in European and CEE Countries, 2012



Source: Eurostat.
Note: Dashed lines represent EU medians. Public capital stock was constructed using the perpetual inventory method (Collier, Hoeffler, and Pattillo, 2001; Kamps, 2006; Arslanalp and others, 2010). The “quality of roads” index is based on the executive opinion survey from the World Economic Forum’s Global Competitiveness Report (2011-12).

Box 1. Wage Bill Consolidation Measures in Lithuania Since 2009

Public wage bill consolidation has been a key component of expenditure consolidation since 2009. It has been achieved through freezing and reducing employment and wages, elimination of unfilled vacancies, and suspension of bonuses and promotions.

Measures introduced in 2009 included:

- **A hiring freeze** was introduced and the existing 600 public administration vacancies were eliminated. The freeze is still in effect.
- **Parametric changes** of the wage system included: From January, the civil service base wage was decreased from LTL 490 to LTL 475 (a 3 percent reduction) and in August to LTL 450 (a 8 percent cumulative reduction). Bonus payments were also decreased in August from 15, 30 and 50 percent of service pay (the product of base wage and an individual-specific factor) to 10, 15, and 30 percent, respectively—this expired on October 1, 2013. In May, a progressive downward adjustment in base wages led to an average 25 percent gross cut for high-paid civil servants (excluding teachers, police and medical workers). These disproportionate cuts for high-paid civil servants were reversed on October 1, 2013, to comply with a Constitutional Court ruling of July 2013.
- **Further reduction of overall wage bill** by 12 percent. To achieve it, the number of full-time civil service positions was cut by 4,000 (approximately 6,700 civil servants) in October, but managers were given discretion to meet reduction targets by cutting working days. Bonuses and promotions were also suspended.

Measures introduced after 2009 included:

- In 2010, a further reduction of the wage bill of about 0.6 percent of GDP was achieved through a 10 percent wage bill cut for civil servants, a 2 percent cut for statutory civil servants and a 5 percent cut for cultural and social workers and teachers.
- Public sector wages were frozen during 2011–13, delivering annual budget savings of 0.3–0.5 percent of GDP.

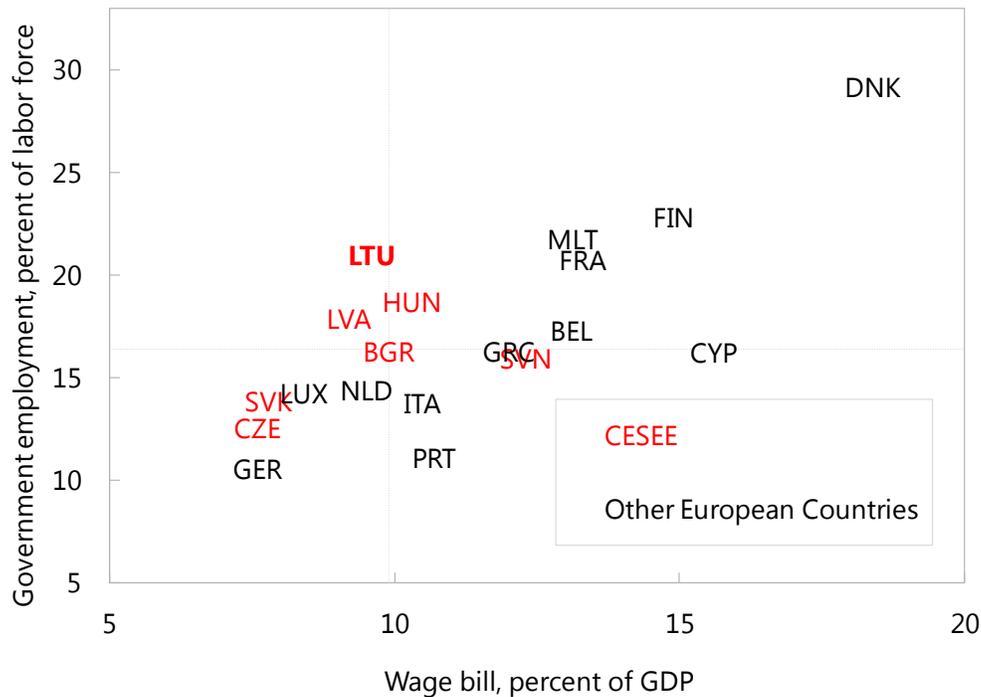
Even though the consolidation measures in 2009 delivered an estimated full-year savings of 1.5 percent of GDP, some measures were introduced later in the year and therefore did not yield their full impact in 2009. In addition, teachers' wages increased by 18 percent because teaching hours were increased (and despite a decline in their basic wage in September 2009 from LTL 128 to LTL 122). These factors, coupled with a dip in GDP, meant that the total public wage bill still increased by 2 percentage points of GDP from 2008 to 2009 (Table 1).

6. The size of the wage bill in Lithuania is close to the European average, but there are important differences in its composition. At 9.6 percent of GDP in 2013, the wage bill is not excessive by regional standards. However, general government employment levels are relatively high, consistently exceeding the EU median of around 17 percent of the labor force over the last decade, despite recent decreases (Figure 4). Based on available data on international comparisons, the education sector seems chiefly responsible although the health sector and "other" employment components also contribute (Figure 5A).⁶ The flipside of relatively high employment is relatively low average wages, which could make it challenging for the public sector to attract and retain qualified

⁶ Within the "others" employment seems high in the sub-categories transportation and storage; arts, entertainment, and recreation; and professional, scientific, and technical activities.

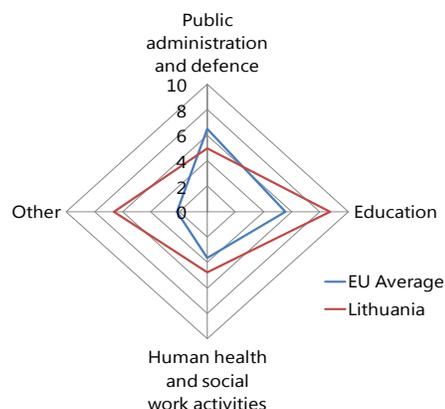
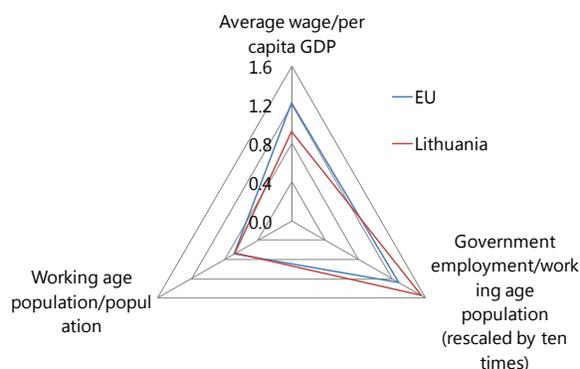
staff (Figure 5B). A comprehensive evaluation of public-private wage differentials, as well as wage differentials within the public sector to ensure horizontal equity, would usefully shed further light on this issue.

Figure 4. General Government Employment and Wages in Europe, 2013 or Latest



Source: Eurostat.

Note: Care needs to be taken when comparing public employment levels since certain important categories (such as doctors) may be classified as private in some countries.

Figure 5. Decomposition of General Government Employment and Wage Bill, 2012**A. General Government Employment by Function (Percent of labor force)****B. Factor Decomposition of General Government Wage Bill (Ratio)**

Sources: Eurostat, and Statistics Lithuania.

Note: EU average in 5A is calculated based on 7 countries with available breakdown data of general government employment (Belgium, Bulgaria, Cyprus, Finland, Italy, Lithuania, and Netherlands).

7. Further public sector reforms should focus on structural measures. To date, consolidation of the wage bill has relied mostly on blunt measures such as freezing wage and employment levels. While these can be effective at addressing short-term consolidation needs, they can quickly become inefficient and unsustainable as the skill composition becomes unbalanced, putting pressure on the quality of public services and making it difficult to attract and retain qualified staff.⁷ International evidence suggests that structural measures, such as linking public sector pay to productivity, improving hiring processes, and improving service efficiency can be more effective at sustainably achieving consolidation objectives (IMF, 2014a). But reducing employment levels can take time and may require additional spending in the short term, e.g., to cover severance and redundancies payments.⁸ However, incentives for reform can be enhanced through linking future wage increases to the adoption of structural measures. Similarly, there is evidence that promoting social dialogue and public support can improve the chances for successful reform.

⁷ In the short term, some measures aimed at reorganizing services (such as consolidating common support services) and targeting specific positions and functions for downsizing are often possible. Indeed, the 2009 Public Employment Commission recommended that employment should decrease through the consolidation of duplicating public institutions.

⁸ Reliance on voluntary redundancies can be self-defeating since it often results in a loss of more skilled staff with attractive private sector employment alternatives.

C. Public Spending by Functional Classification

8. Relatively low total public spending in Lithuania translates into relatively low spending in most functional categories (Table 2).⁹ At 36 percent of GDP in 2012, spending in Lithuania was 7 percentage points below the EU average of 43 percent of GDP. Spending was lower in most functional categories, but there are exceptions: education spending is substantially above the EU average and spending on health is slightly above. The analysis below focuses on three key functions: social protection, education, and health, which together account for about two-thirds of total spending.¹⁰

Table 2. Lithuania: General Government Spending by Function, 2012
(Percent of GDP, unless otherwise indicated)

	Lithuania (1)	EU average* (2)	Diff (3)=(1)-(2)	(3)/(2), in %	% share of total difference
Total spending	36.1	43.1	-7.0	-16%	100%
General public services	4.3	6.6	-2.3	-35%	33%
Defence, public order and safety	2.8	3.2	-0.4	-14%	6%
Economic affairs	3.3	4.8	-1.5	-31%	21%
Health	5.9	5.8	0.1	2%	-1%
Education	5.6	4.9	0.7	13%	-10%
Social protection	12.1	14.9	-2.8	-19%	41%
Others	2.1	2.8	-0.7	-25%	10%

Sources: Eurostat General Government Statistics (ESA 95), and IMF staff calculations.

* EU average here and throughout the rest of the paper is defined as EU average controlled for GDP per capita by regressing logarithm of spending-to-GDP ratio on GDP per capita.

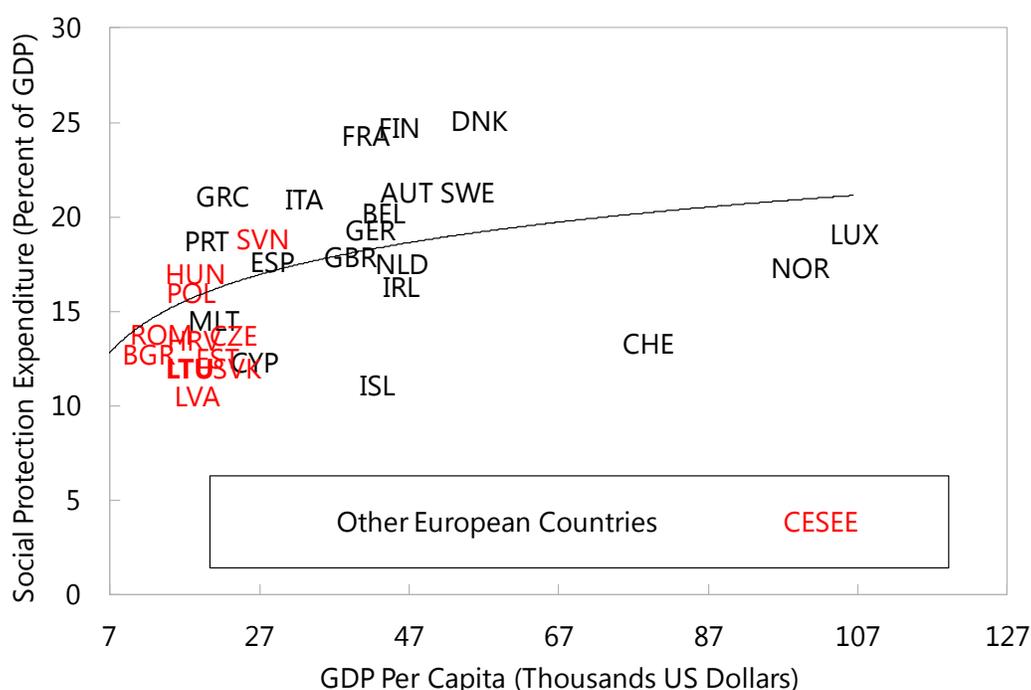
Social Protection

9. Social protection spending in Lithuania is among the lowest in Europe. At 12.1 percent of GDP in 2012, social protection spending is well below the European average of 14.9 percent (Figure 6). This partly reflects the large decrease of 4.7 percentage points in social protection spending since 2009.¹¹ Low social protection spending is primarily driven by low pension spending. However, within this small pension spending envelope, spending on sickness and disability is 22 percent above the EU average (Box 2).

⁹ Whereas spending by economic classification is available from Eurostat for 2013, functional spending is only available up to 2012.

¹⁰ The other functional classifications are dominated by wage spending, which was discussed in Section II.

¹¹ This followed a very large increase in social protection spending from 2006 to 2009 of about 7 percentage points of GDP.

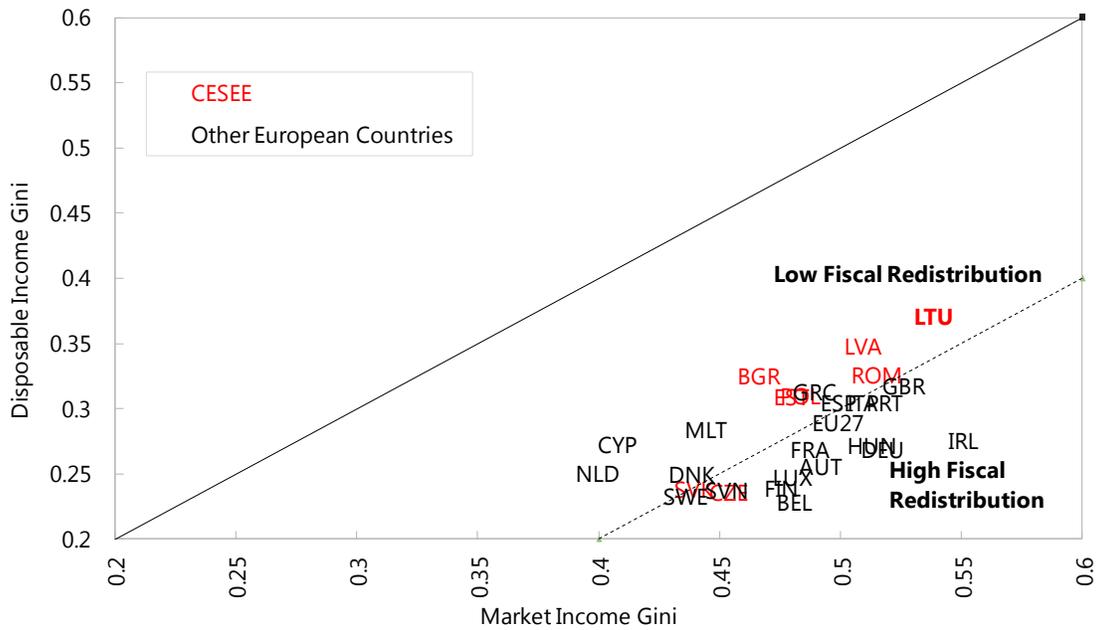
Figure 6. Social Protection Spending in European Countries, 2012

Source: Eurostat General Government Statistics.

10. Low social protection spending is partly responsible for poor social outcomes—a high degree of income inequality and a large share of the population at risk of poverty. Lithuania has one of the highest market (i.e., pre-tax-and-transfer) income inequalities and one of the lowest levels of fiscal redistribution (Figures 7 and 8). The low level of fiscal redistribution reflects the low redistributive impact of both means-tested and non-means-tested non-pension transfers as well as of the direct personal income tax system (Figure 8).¹² As a result, Lithuania recorded the EU's highest inequality of disposable (i.e., post-tax-and-transfer) income in 2013, and over half of the gap with the EU average is explained by the lower redistributive impact of fiscal policy in Lithuania (Figure 7). Moreover, all of the increase in inequality in Lithuania between 2009 and 2013 (the disposable income Gini increased from 0.357 to 0.372) is due to the declining redistributive power of fiscal policy. This contrasts with other EU countries where the smaller increase in market income inequality was more than offset by the increasing redistributive impact of fiscal policy. Meanwhile, Lithuania's at-risk-of-poverty rate after social transfers, an indicator for the most vulnerable households that are at the lower end of the income distribution, is also high compared to levels in other European countries, especially among the non-elderly (Figure 9).

¹² The high redistributive impact of pensions in spite of low spending suggests that pension design emphasizes its redistributive role. This is consistent with reforms to the pension system from 2009, which focused on decreasing generosity of benefits while protecting low-income pensioners through increasing the basic pension and decreasing the earnings-related pension in a progressive manner (Coady, Jousten and Kangur, 2010).

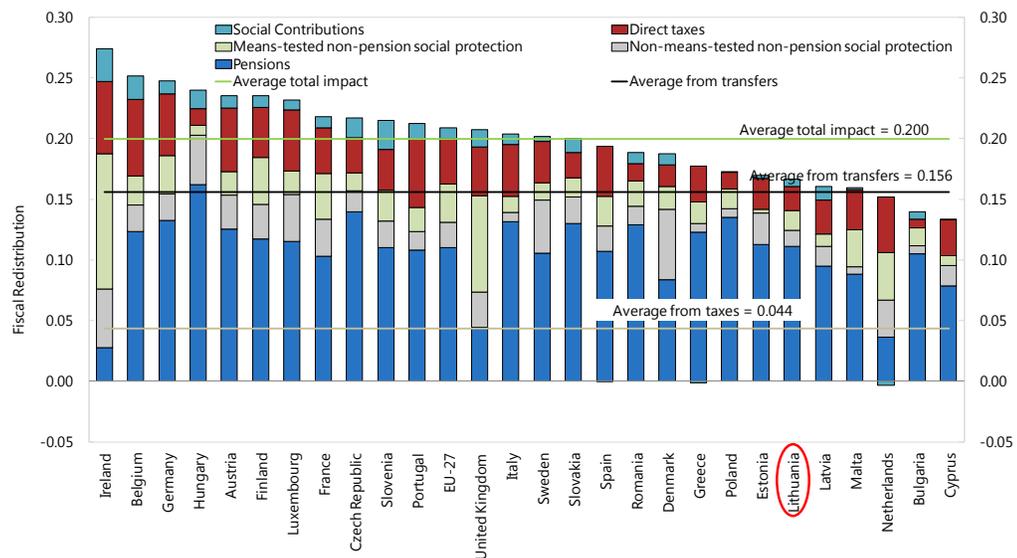
Figure 7. Market and Disposable Income Inequality in European Countries, 2013



Source: Eurostat.

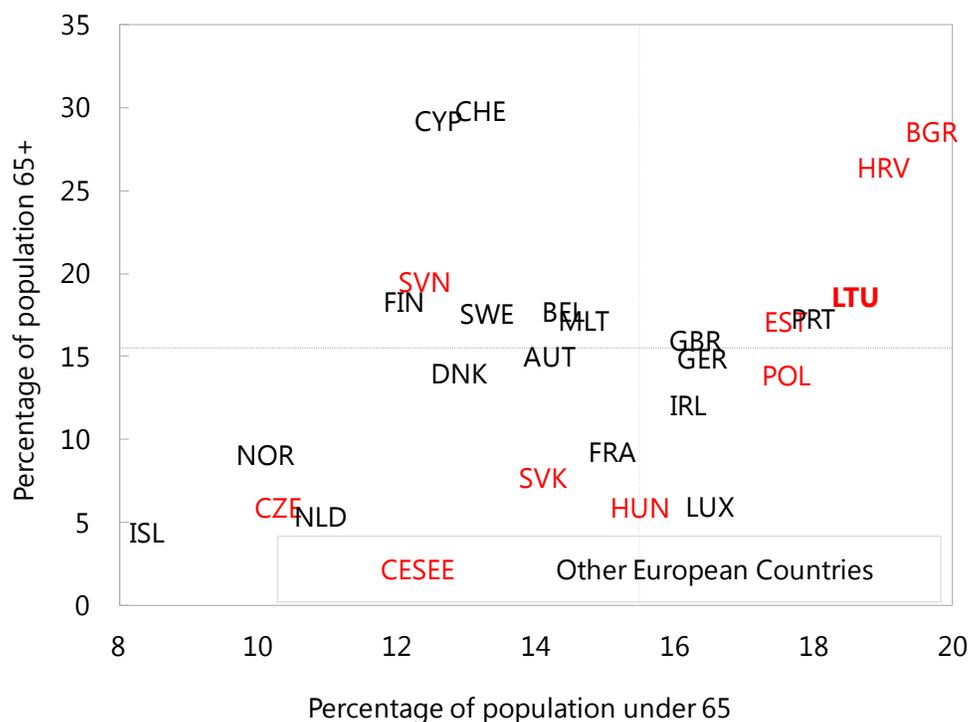
Note: Low (high) fiscal redistribution refers to the difference between market and disposable income Gini being less (greater) than 0.2.

Figure 8. Contributions to Fiscal Redistribution in European Countries, 2013



Sources: Eurostat, and IMF staff calculations.

Note: Fiscal redistribution is calculated as the difference between market income and disposable income Gini.

Figure 9. At-Risk-of-Poverty Rate After Social Transfers and Pensions in Europe, 2012

Source: Eurostat.

Note: Dashed lines represent EU medians.

11. A range of reforms can help make social protection more efficient and thereby also less susceptible to spending pressures. Rising poverty combined with increased EU monitoring of poverty outcomes may increase social and political pressures for higher social protection spending.¹³ There is also evidence of a growing demand for redistribution in Lithuania.¹⁴ The following measures can help to contain these spending pressures and achieve social protection objectives more efficiently:¹⁵

- *Increased use of means-testing of social assistance:* The share of social assistance spending that is means tested is currently low across CESEE countries compared to many other European countries (Figure 10). However, careful design of means-tested benefits is necessary to avoid disincentives to work and welfare dependency. This can be achieved through greater use of in-

¹³ Lithuania's national target for "fighting poverty and social exclusion" (one of the five Europe 2020 targets for EU countries) is to reduce the number of persons at risk of poverty or social exclusion to 814,000 from the current level of 917,000 as of end-2013.

¹⁴ International surveys show that there has been a very large increase in the percentage of the population in Lithuania supporting greater redistribution, from 22 percent in the late 1990s to 54 percent ten years later (IMF, 2014b).

¹⁵ Note that it is important for any reform of specific components of social protection, in particular of pensions, to take account of the objectives and effectiveness of the overall social protection system.

work benefits and by expanding the role of active labor market programs and strengthening their link to social assistance benefits (IMF, 2012).¹⁶ Lithuania's public spending on these programs was only one fifth of the EU average in 2012.

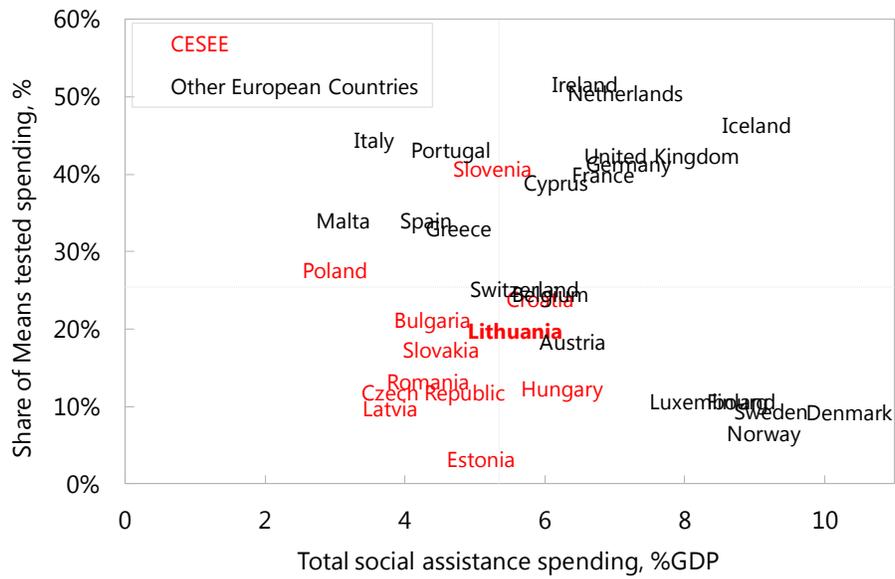
- *Pension measures that protect the poor:* The pension system is likely to come under pressure over the medium term due to population ageing (IMF, 2014a). The EC 2012 Ageing Report projects that population ageing will increase pension spending as a percent of GDP in Lithuania by 3.4 percentage points by 2050, more than twice the projected increase for the EU as a whole. A key policy challenge therefore is how to contain these spending pressures without further exacerbating poverty among the elderly (Clements, Eich, and Gupta, 2014), especially since the pension replacement rate (i.e., average pension divided by average wage) is already low—33.6 percent in Lithuania compared to an average of 46.4 percent for the EU and 56.7 percent for the euro area. Increasing official retirement ages is an attractive option since it does not reduce pension replacement rates in retirement. From 2012, Lithuania started to gradually increase its statutory retirement age to 65 years by 2026 for both men and women, from 62.5 and 60 years, respectively. To be effective, such increases should be accompanied by complementary measures such as tightening opportunities for early retirement, including for disability benefits, and enhancing the employment prospects of older workers. Adopting a built-in mechanism to deal with ageing, such as automatically linking the official retirement age to life expectancy, will also help protect these gains over the longer term.¹⁷
- *Subjecting pension benefits to progressive income taxation.* The effective personal income tax rate is flat beyond the lowest income deciles, because Lithuania's tax schedule applies a constant rate to income above the basic allowance (Figure 11). In addition, there are multiple allowances and exemptions that favor high-income groups (e.g., the largely non-taxation of interest income and certain capital gains).¹⁸ This, together with the very limited taxation of wealth, greatly restricts the redistributive impact of the tax system. Uniformly raising gross pensions and subjecting them to progressive income taxation may help to lower inequality and strengthening the pension system's social sustainability. Depending on the design, it could also reduce the net fiscal cost of pensions and generate savings compared to the status quo.

¹⁶ These active labor market programs (ALMPs) include skills training, subsidized employment in private firms, job rotation (temporary employment to cover temporary leave of employees), public works, as well as programs for the disabled (subsidized employment and vocational training). Currently, in Lithuania, eligibility for social assistance requires registration as a job seeker at the local labor exchange office and availability for suitable employment. To incentivize exit from social assistance and unemployment, municipalities continue to pay social benefits for six months after a person entitled to social benefit finds a job at a level of 50 percent of his/her average social benefit during the 12 months preceding the exit.

¹⁷ Currently social security contributions are calculated as a uniform uncapped proportion of the wage while pension benefits are capped at around 1.7 times the average net wage. Employer contributions are deductible against profits while pensions are exempt from income taxation, resulting in a more favorable treatment of pensions than workers with the same gross income. This can create incentives for greater social contribution evasion, a preference of self-employment over wage-earner status, and later entry into the labor market as well as earlier exit.

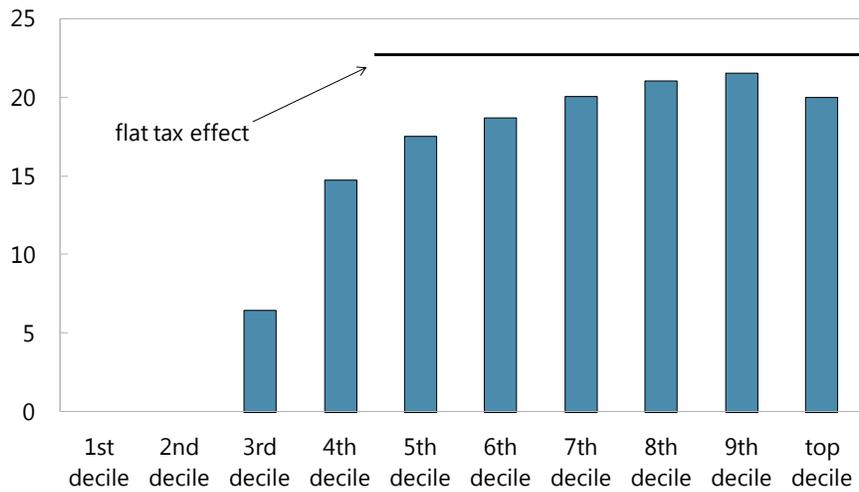
¹⁸ Income from interests and capital gains over 10,000 LTL (2,896 euro) have been subject to PIT starting January 2014.

Figure 10. Means-tested Social Assistance Spending



Source: European & Central Asia - Social Protection & Expenditure Evaluation Database.
 Note: Dashed lines represent medians.

Figure 11. Effective Income Tax Rate (Incl. SSC) by Income Group in Lithuania, 2010
 (Percent)

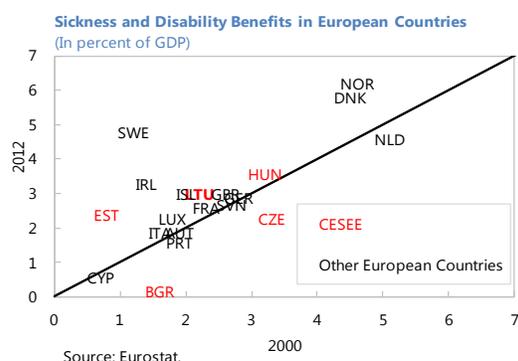


Sources: Income and Living Conditions Survey (2010); and IMF staff estimates.

Box 2. Disability Benefits in Lithuania

Spending on disability benefits is high relative to other EU countries and has been rising over the last decade. In 2012, sickness and disability spending stood at 3 percent of GDP compared to an EU average of 2.45 percent of GDP (Box Figure). High spending partly reflects high disability rates, especially among the working-age population above 45 years of age. Approximately a quarter of the population aged 55 to 59 years is receiving disability benefits (Box Table). In addition, according to World Bank (2009), the number of claims for special needs more than doubles immediately after reaching retirement age.* Disabled and old-age pensioners are also eligible for other subsidies, e.g. transport subsidies administered by the Ministry of Transportation.

Although recent reforms have tried to address high disability spending through tightening the certification system, the number of disabled beneficiaries has continued to increase. The certification process has undergone substantial reform since 2005, with the introduction of an Agency for the Assessment of Loss of Working Capacity, which has expanded the criteria for determining disability and the capacity to work to include social as well as physical factors. New entrants into the system are subjected to the new criteria, while existing entitlements and benefit flows were grandfathered. The assessment of special needs has been centralized in the same agency since July 2009. Nonetheless, the number of beneficiaries of disability pensions has continued to increase after 2009, suggesting that an evaluation of the effectiveness of these changes is warranted.



Disability Benefit Claims by Age Groups

	Number of disabled per 1000				
	20-64	20-34	35-44	45-54	55-59
OECD14 Average, 1999	64	15	33	73	144
Lithuania, 2005	89	11	46	113	233
Lithuania, 2009	86	8	43	108	226
Lithuania, Jan. 2014	91	10	47	119	241

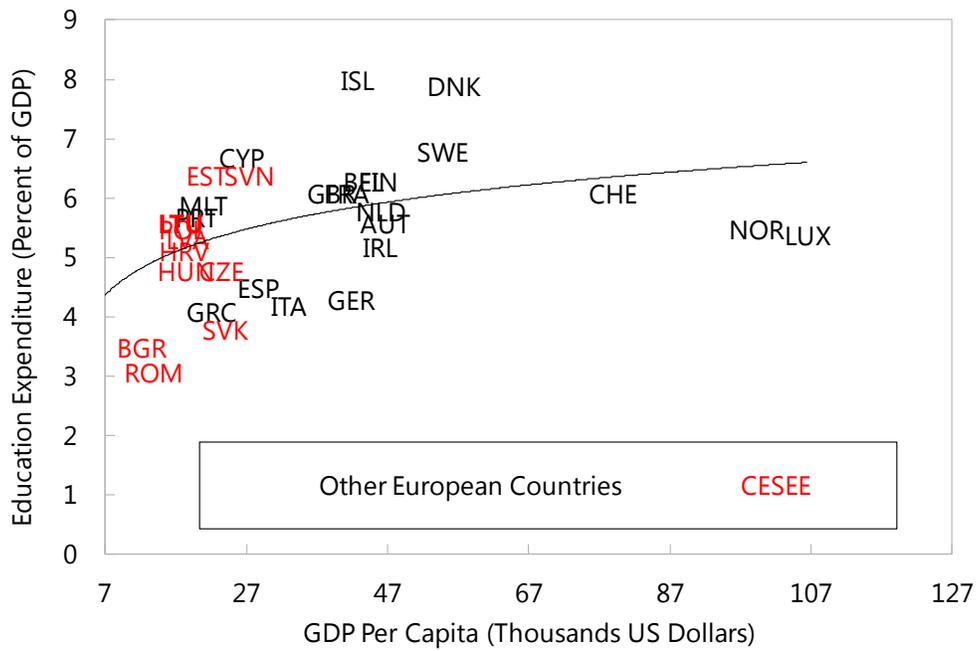
Sources: OECD database on programs for disabled persons; Lithuanian SoDra; and Statistics Lithuania.

* The disabled can also be eligible for special needs covering (i) constant care, (ii) constant nursing, (iii) assistance, (iv) compensation of transport expenses, or (v) compensation of expenses on purchase of a passenger car.

Education

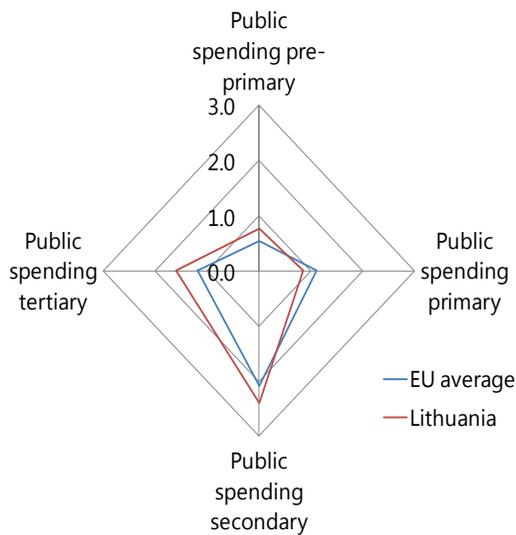
12. Public education spending in Lithuania is high relative to that in other EU countries. In most advanced economies public education spending has risen despite declining school-age populations. However, the increase in Lithuania has been larger than elsewhere, resulting in spending of 5.6 percent of GDP in 2012, which is 13 percent above the EU average of 4.9 percent and the CESEE average of 4.8 percent (Figure 12). Higher spending on secondary and tertiary education is mainly responsible for this gap (Figure 13).

Figure 12. Education Spending in Lithuania and Europe, 2012



Source: Eurostat General Government Statistics.

Figure 13. Education Spending in Lithuania and Europe, by Level of Education, 2011
(Percent of GDP)

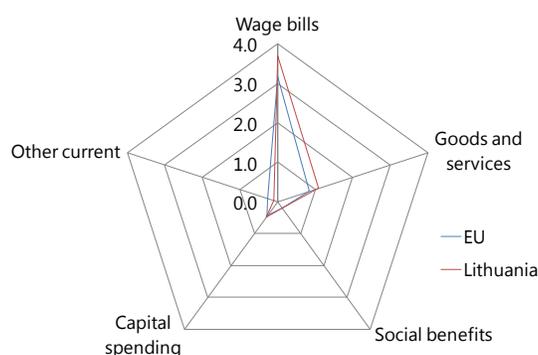


Source: Eurostat.

13. High education spending is driven by both a high wage bill and high spending on goods and services (Figure 14). This indicates an over-sized education system that has not been reformed to reflect demographic trends:

- *Student-teacher ratios are low, especially in secondary and tertiary education:* As in many EU countries, student teacher ratios have fallen over the past decade as the decline in the number of teachers has failed to keep pace with the falling school-age population (Figure 15A). Student-teacher ratios in general education started to decline steadily since 2005, while ratios in tertiary decreased sharply after 2009. As a result, ratios in secondary and tertiary education are now below the average of EU countries (Figure 15B). In particular, the student-teacher ratio in tertiary education in Lithuania was just 11 compared to the EU average of 15 in 2012. If Lithuania had the same student-teacher ratio as the EU average, it would need 8.5 percent fewer educators in general education and 12.9 percent fewer in tertiary education than is currently the case.
- *Class sizes in general education are small:* Class sizes have also been decreasing over time, consistent with a school infrastructure in general education that has not been reduced commensurately with the decline in the school-age population. Class sizes are currently below the EU average, especially in primary education (Figure 15B). An oversized infrastructure results in high spending on goods and services (including operating costs such as electricity and maintenance) relative to the EU average.
- *There is an intensifying oversupply of higher education:* The enrollment ratio in tertiary education is higher than in any other European country. Lithuania has a very large number of universities—14 state universities and 13 state colleges in a country with a population of just three million. This number has been stable notwithstanding a sharp decline in the tertiary-age population after 2009, which is projected to continue to decline over the next decades (Figure 16).

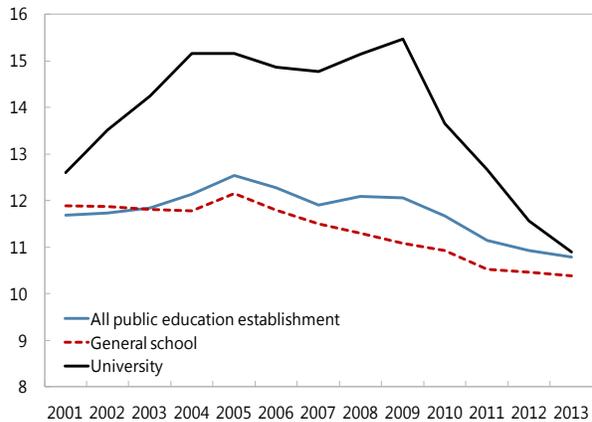
Figure 14. Education Spending by Economic Classification, 2012



Source: Eurostat.

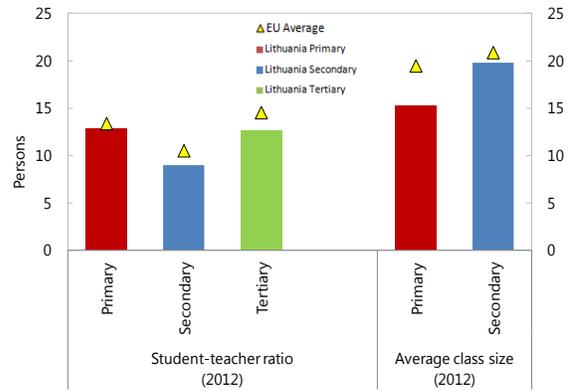
Figure 15. Student-Teacher Ratio and Class Size

A. Student-Teacher Ratio in Lithuania Public Education Establishments



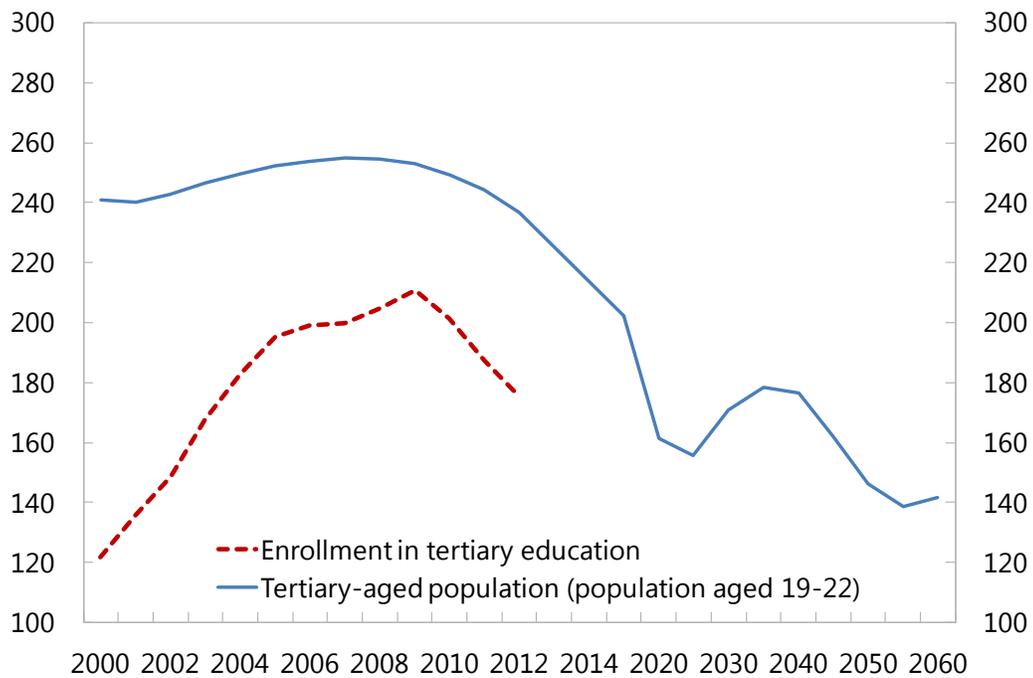
Source: Statistics Lithuania.

B. Student-Teacher Ratio and Class Size, Lithuania vs. EU Average, 2012 or latest



Source: UNESCO.

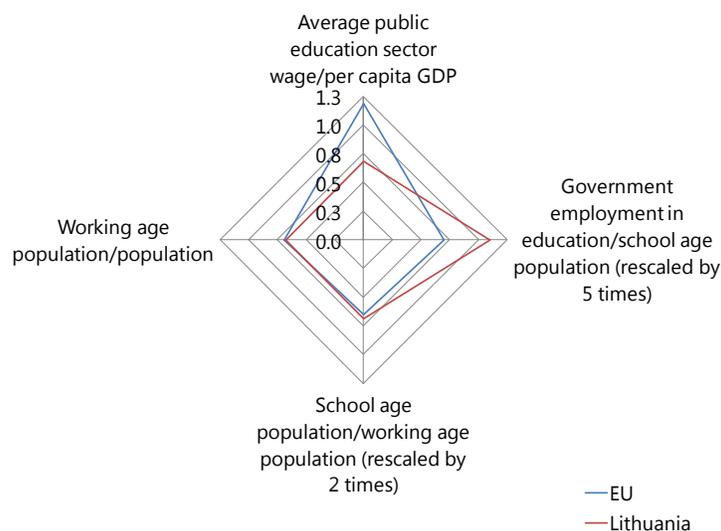
Figure 16. Tertiary-Age Population and Tertiary Education Enrollment
(Thousands of people)



Source: United Nations.

14. High employment levels appear to have resulted in low wages, especially for young teachers. The wage bill of 3.7 percent of GDP is higher than the European average of 3.2 percent (Figure 14) due to high employment levels in the education sector (Figure 17).¹⁹ Moreover, the share of older teachers with relatively high wages is large, with those aged 50 years and above accounting for nearly half of the total.²⁰ High severance payments, which are also due to teachers reached the official retirement age, create incentives to keep employing existing teaching staff. Overstaffing results in low effective teacher pay, which is based on hours worked that have declined to an average of just 25.8 hours per week. This combination of low hours and low wages may undermine morale and makes it particularly difficult to attract young teachers, ultimately harming the quality of education.

Figure 17. Decomposition of General Government Education Wage Bill, 2012



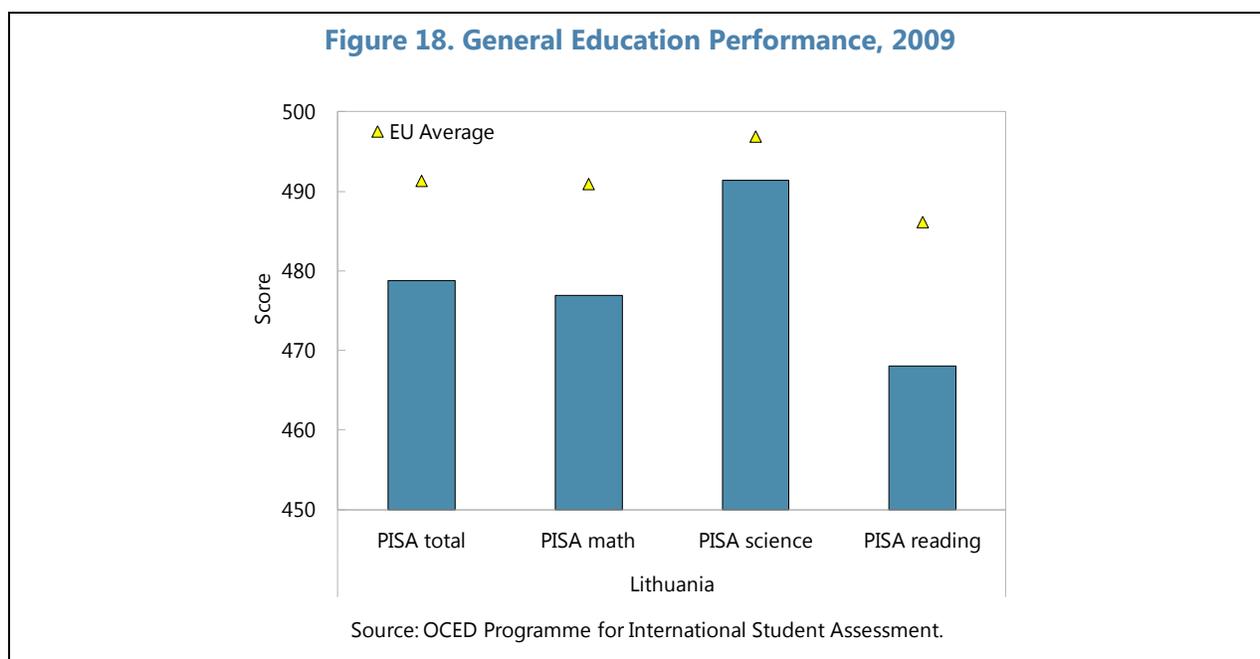
Sources: Eurostat, and IMF FAD dataset.

15. Despite high education spending, education outcomes fall short of those achieved in many other EU countries. Education outcomes in general education (i.e., primary and secondary) are subpar. For example, PISA scores in mathematics, science, and reading are all below EU averages (Figure 18). Despite the large number of universities, none of these universities gets into the top 500 best universities in world rankings. The recent tertiary education reform has also led to a mismatch between course provision and market needs. The 2008/09 tertiary education reform tied state funding to students instead of institutions, with funding now going to state institutions and

¹⁹ For general education, the wage bill for teachers is determined by the government based on the level of students, an agreed wage structure, and contracted hours. The government allocates budgets to municipalities (the student basket) based on the number of enrolled children, which determines the number of teaching hours required, and an agreed structure of wages. Municipalities must finance most of non-wage expenditures and school heads have wide discretion over the number of teachers employed and teacher contracts, which are determined annually.

²⁰ In Lithuania, teachers' salaries can rise from the minimum statutory salary to the maximum salary after just 15 years, compared with the European median of 24 years.

programs of study chosen by enrolling students who have completed the secondary education with the best results, without exceeding state funding established for each study program.²¹ About half of the full-time students are funded from the state budget while the rest pay full tuition fees. The tuition cost in each study area is standardized, but varies across study areas with social science being the lowest and aircraft pilot training the highest. Higher education institutions are no longer budgetary institutions after 2009 and have autonomy in deciding course enrollment levels, creating financial incentives to admit as many self-paying students as possible by catering to the high demand for low-cost study fields from the declining pool of tertiary-age students. Compared with the best European performers in terms of youth employment, Lithuania has a significantly larger share of tertiary graduates from social sciences, business and law while producing fewer graduates in physical sciences (Figure 19A).²² This has contributed to the mismatch between fields of study and labor market needs, especially since information about labor market needs is unavailable or poorly disseminated. The mismatch of education and occupation choices in most study fields seems more severe in Lithuania than in the comparator group (Figure 19B).

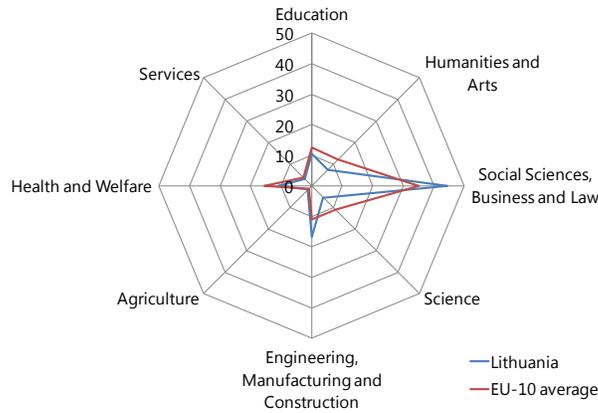


²¹ There are six broad study fields, social science, humanities, physical science, arts, biomedicine, and information technology. They are further subdivided into 20 study programs, within each of which, students with the best academic performance compete for state funding. The distribution of funding by area of study is established by the government, giving priority to areas deemed necessary for national economic, social and cultural development, and taking the state's financial capability into account.

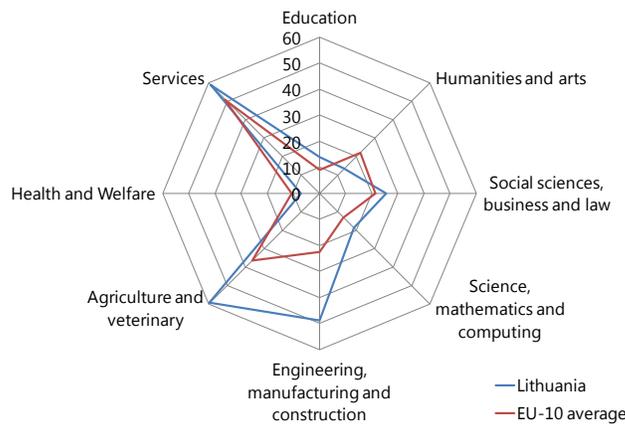
²² In 2014/15, 58 percent of self-paying students majored in social science while only 29 percent of students receiving state funding chose to study social science.

Figure 19. Relative Demand and Supply by Tertiary Study Field, 2012 or Latest

A. Percentage of Graduates from Tertiary Programs by Study Field (Percent)



B. Education-Occupation Mismatch (ISCED 5-6) of Persons aged 25-34 by Study Field (Percent)



Source: UNESCO.

Note: EU-10 average includes countries in the bottom quartile of average youth unemployment during 2000-2012. (Austria, Cyprus, Denmark, Germany, Greece, Iceland, Ireland, Luxembourg, Netherlands, and Norway).

Education-occupation mismatch is calculated as the percentage of persons aged 25-34 employed in a field that they did not graduate in.

16. Addressing the above inefficiencies will require reforms on a number of fronts. The expected continued decline in the school-age population by 6.5 percent over the next two decades reinforces the need for action. Many of the measures outlined below have been introduced in other European countries (European Commission and Economic Policy Committee, 2012).

- *Reduction in the number of teachers.* This can be achieved through a number of channels including attrition, redundancies, and early or mandatory retirement. However, the latter can involve up-front severance payments and thus higher short-term spending, and transfers costs to elsewhere in the budget (e.g., pension spending). The potential for successful reforms in this area can be enhanced through adopting a number of complementary reforms. For example, the number of teachers could be linked to the number of students so that it declines with school-age population, requiring careful projection and workforce planning. Strengthening these spending norms over time can signal a commitment to further reducing spending, e.g., adjusting financing formulas to reflect lower target student-teacher ratios and class sizes, as well as changes in teaching loads and reforms in support of multi-grade classrooms.
- *Consolidation of the school infrastructure.* This can help reduce both operating and capital costs, and provide the basis for a more cost-effective upgrading of other school infrastructure such as technology and internet access. However, it also typically requires an increase in spending on complementary services such as transport (especially for primary school consolidation). Lithuania has made some progress in this respect since 2000, with the number of general schools cut by 48 percent. However, this reduction largely reflects school mergers rather than closures so that infrastructure and teacher numbers have not been commensurately scaled back.
- *Decentralization of decision-making and increased choice.* If properly implemented, increasing the choices available to schools and families has been found to improve learning outcomes (Hanushek and Woessmann, 2011). This involves giving schools with good performance more autonomy over the formulation and implementation of education decisions and providing students with a wider choice of schools to promote competition among schools.²³ To be effective, these reforms require increased transparency, accountability, and competition, e.g., through the publication of school performance indicators and allowing school choice by students and teachers. Although Lithuania's system is decentralized, this has resulted in excessive teacher employment and subpar education outcomes. It is therefore important to link decentralization of spending to education performance in order to improve spending efficiency.
- *An in-depth review of the nexus between the large number of universities, financial incentives, quality standards, and guidance for future students.* Further reform of the higher education system is called for to address the mismatch between skills taught by the higher education system and those sought by the labor market. Recognizing the political difficulties in this area, some quick and easy measures, such as improving information collection and dissemination on market needs and university graduates' job placement, could help better guide students in choosing their fields of study.

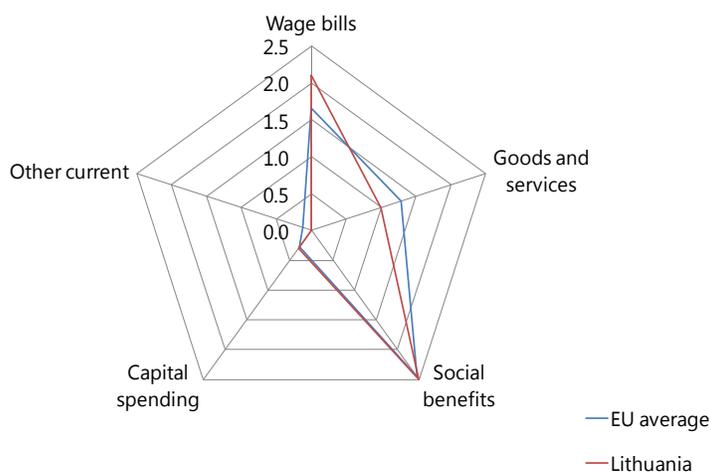
²³ Greater decentralization has been introduced in a number of countries with some success, including Australia, El Salvador, and the UK.

Health

17. While the current level of public health spending is similar to that in comparator countries, an ageing population and rising incomes will likely lead to mounting spending pressures. In 2012, public health spending stood at 5.9 percent of GDP compared to an EU average of 5.8 percent. However, the projected increase in the old-age dependency ratio from 23 percent to 44 percent by 2050 is likely to exert upward pressure on spending considering the high cost of treating the elderly. Increases in incomes can be expected to generate additional cost pressures since health care demand is typically very responsive to income growth, and this could be further reinforced by continued advancements in health-care technology that introduces better but more costly treatment options. Accordingly, spending is projected to increase by over 4 percentage points of GDP by 2050, with about one fifth attributable to ageing alone (Coady, Jousten, and Kangur, 2010; EC, 2012). This underscores the importance of having a health system in place that is capable of containing future cost pressures while delivering quality outcomes.

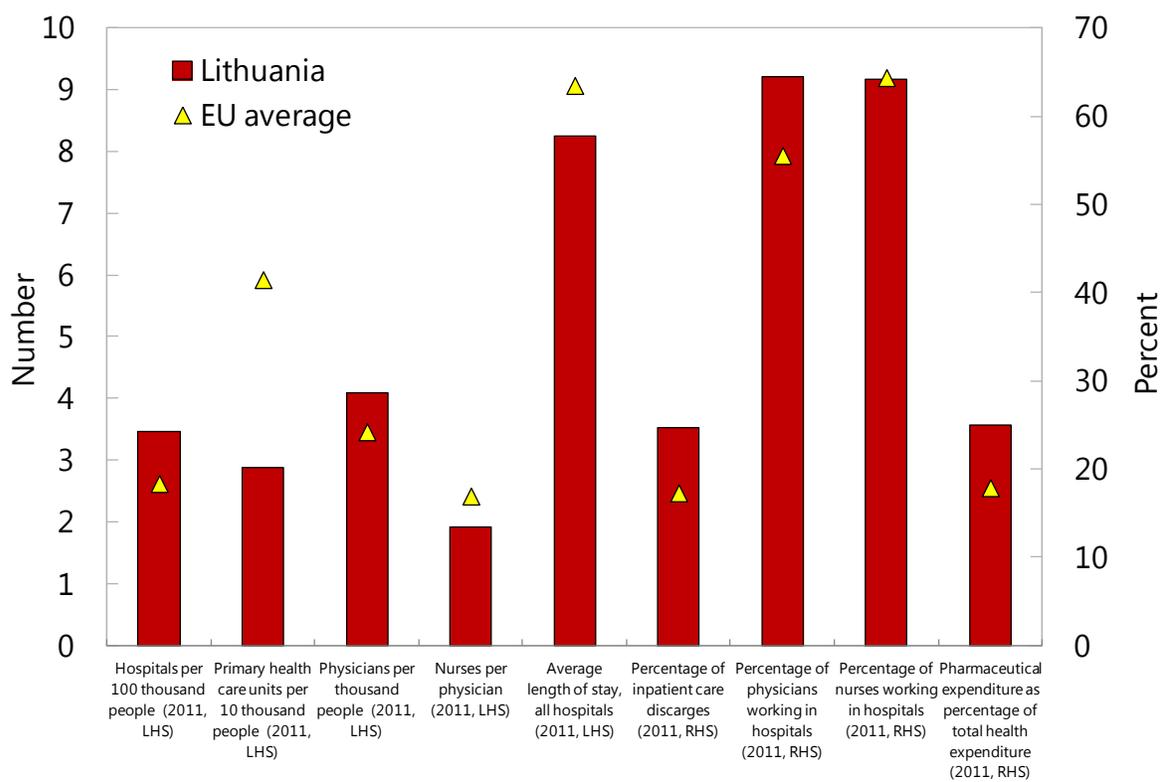
18. The composition of health spending appears skewed towards wages. At 2.1 percent of GDP in 2012, the health wage bill is well above the EU average of 1.7 percent (Figure 20). This is partly driven by the large number of doctors, especially specialist doctors working in hospitals (Figure 21). At the same time, spending on health goods and services seems relatively low despite pharmaceutical spending accounting for a higher share of health spending than in the EU on average. The privatization of supply and delivery of pharmaceuticals in the 1990s led to an improved supply of drugs but also to growing expenditure on pharmaceuticals. In response to the economic crisis, the 2009 Plan for the Improvement of Pharmaceutical Accessibility and Price Reductions led to a reduction in public and out-of-pocket spending on pharmaceuticals (in particular through reference pricing and price-volume agreements for new pharmaceuticals), and improved access to medicines. However, there is still room for incentivizing greater use of generic drugs through differentiating copayment percentages.

Figure 20. Health Spending by Function in Lithuania and Europe, 2012



Source: Eurostat.

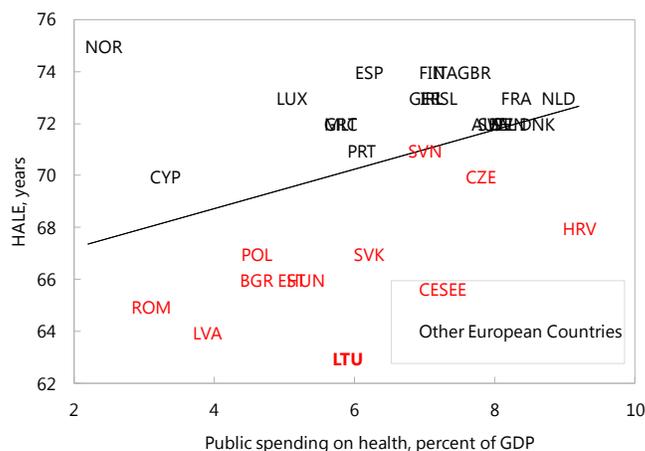
Figure 21. Health System Characteristics in Lithuania, 2011



Sources: WHO and OECD.

19. Despite health spending levels similar to the EU average, health outcomes in Lithuania are among the poorest in the EU (Figure 22). For example, Health-Adjusted Life Expectancy (HALE) in Lithuania stands at 63 years compared to the EU average of over 70 years.²⁴ The age-standardized mortality from all causes was the second highest among the EU in 2013. According to World Bank (2009), the incidence of tuberculosis is 70 percent above the regional average. Data from the WHO show that mortality from diseases of the circulatory system (especially ischemic heart disease), from external causes, and from suicide, is among the highest in the EU. Alcohol- and smoking-related mortalities are more than twice their EU averages (Figure 23).

²⁴ HALE adjusts standard life-expectancy measures for severity of illnesses and quality of life factors. Other factors, such as the quality of the health care environment and financial risks, are not taken into account.

Figure 22. Health-Adjusted Life Expectancy (HALE) and Public Spending

Sources: Eurostat, and WHO.

20. Although addressing these health system inefficiencies can be difficult in practice, the evidence suggests a number of key reform areas based on accepted good practice. These include:²⁵

- *Expansion and strengthening of the role of the primary and preventive health care system:* Many of the causes of poor health outcomes can be addressed by strengthening the primary health care system and through an effective public health intervention and prevention agenda.²⁶ Technological progress means that many of the health services previously carried out in hospitals can now be more cost effectively delivered in primary health care facilities on an outpatient basis. Available evidence for Lithuania suggests that the primary health care system is indeed underdeveloped with a heavy reliance on an oversized hospital infrastructure. The number of hospitals and of physicians working in hospitals per capita are among the highest in the EU and the same is true for the inpatient admission rate into hospitals (Figure 21). On the other hand, there are only 1.9 nurses per physician in Lithuania when 2 is considered a minimum, 4 is considered to be a cost-effective benchmark, and the average in OECD countries is above 3. Unequal distribution of medical personnel throughout the country is another challenge.²⁷ Recent policies have focused on the strengthening and expansion of primary health

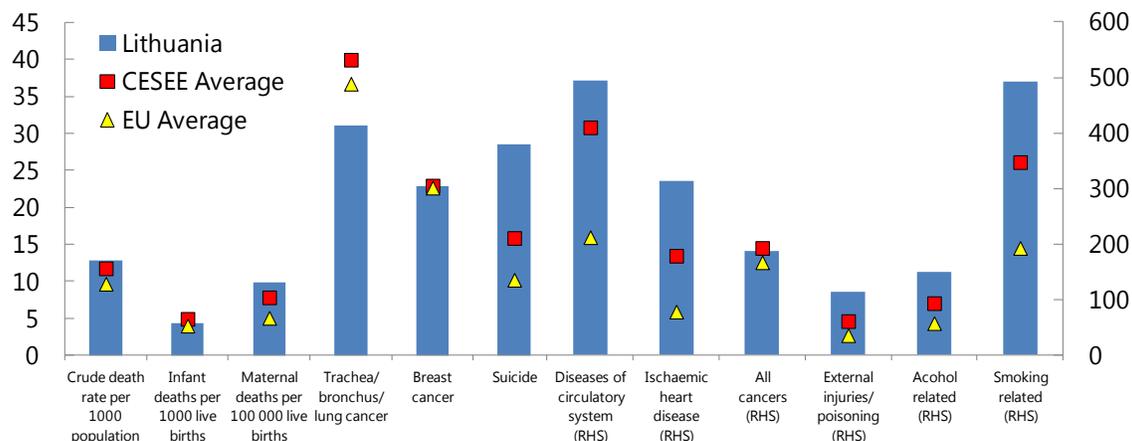
²⁵ For a discussion of system inefficiencies in Lithuania, see World Bank (2009) and Coady, Jousten, and Kangur (2010).

²⁶ Many of the recorded premature deaths in Lithuania from tuberculosis, heart disease, alcohol-related disease, smoking-related disease, and external causes can be avoided through public health interventions, changes in lifestyle, prevention, and early detection and treatment in a primary care setting. Yet these services are often underprovided and underutilized.

²⁷ Murauskiene and others (2013) shows that countrywide in 2010, the density of practicing physicians ranged from 906 to 54 per 100 000 population, but even within regions density varies by up to a factor of 7, and similarly for nurses and midwives.

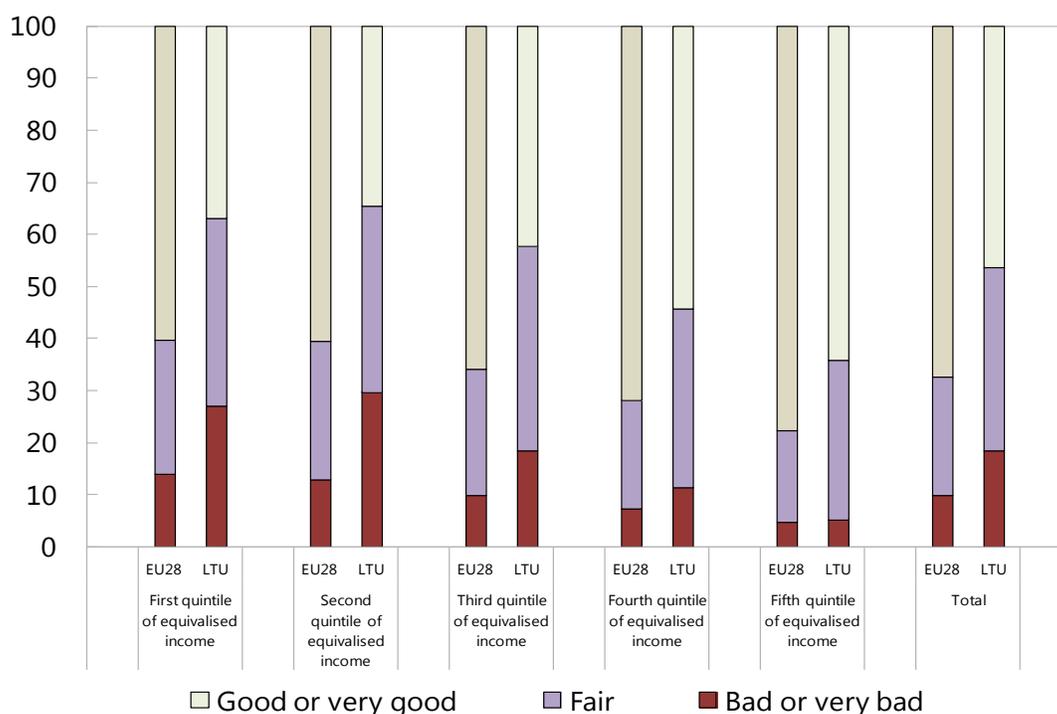
care services, the decentralization of primary care, the development of same-day surgery, and the consolidation of hospitals in the largest cities.²⁸ However, there still appears to be scope for deepening these reforms to further streamline and optimize health resource allocation according to population needs and from hospital to primary care to further increase spending efficiency.

Figure 23. Health Status in Lithuania, CESEE and the EU, 2012 or Latest



Source: WHO.

²⁸ In the 1990s many health administration functions were decentralized from the Ministry of Health to municipalities, including organizing the provision of primary and social care, and public health activities at the local level. Municipalities also own the majority of polyclinics and small-to-medium sized hospitals, yet there are concerns about their capacity to effectively govern these facilities. Although the role of the private sector has been increasing it is still limited, particularly in inpatient care—since 2008, the National Health Insurance Fund has increasingly been contracting private providers for specialist outpatient care. The private sector does play a substantial role in dental care, cosmetic surgery, psychological therapy, some outpatient specialties, and primary care.

Figure 24. Self-Perceived Health Status in Lithuania, CESEE and the EU, 2012 or Latest

Source: EU-SILC (2013).

- Development of efficient provider payment systems for hospitals and primary care:** It is generally accepted that shifting from fee-for-service to case-based payments can provide stronger incentives for more efficient provision and use of health care services. For hospitals, this requires the expanded use of a more detailed Diagnostic Related Group (DRG) payment system based on an appropriate costing system and introducing some competition among insurance and service providers. Although there is extensive use of case-based payments in Lithuania, according to the World Bank (2009), in many cases the administrative prices do not accurately reflect the true cost of services, which introduces opportunities for the hospitals to “play the system.”²⁹ For primary health care, it requires greater reliance on payments linked to treatments rather than a narrowly defined capitation system based simply on age as is currently the case in Lithuania. However, this in turn requires steps to ensure the primary health care system’s capacity to provide cost-effective quality health care and measures to enhance the “gate-keeping” role of primary care by reducing incentives for unnecessary referrals.

²⁹ A combination of payment methods exist in Lithuania for publicly funded health services. Three quarters of primary care is financed through capitation, with the remainder financed through fee-for-service and performance-related payments. Outpatient care is financed mainly through case payment, and through fee-for-service for diagnostic tests. Inpatient care is financed mainly through case payment.

- *Appropriate use of copayments:* A well designed system of copayments can help prevent overuse of the health care system and direct patients to more cost-effective treatments, such as outpatient health services or use of generic drugs. Lithuania's compulsory health insurance provides a standard benefits package for all beneficiaries. There exists both a positive and a negative list of health services provided in state financed health-care facilities. There is no copayment for primary care and hospital health services that are on the positive list, and emergency care is provided free of charge to all permanent residents. There is a positive list of drugs approved by the Ministry of Health with preferential copayment rates available for certain groups of the population (e.g. children, pensioners, and the disabled), as well as for patients suffering from certain diseases. However, there is no preferential copayment to promote the use of generic drugs. Some facilities charge patients for treatment, most often for diagnostic tests, although there is no legal base for some of these charges. There therefore seems to be some scope for developing a more coherent system of copayments focused on directing patients and providers to more cost-effective treatments and behaviors.
- *Development of an effective health information system:* Improving the incentives that providers face for providing cost-effective health care services and for containing costs requires continued investments in the software and hardware systems to collect, store and process information on provider costs, service quality, and health outcomes. This information is crucial for developing strong clinical guidelines and monitoring systems needed for case-based systems to be effective.³⁰ One important aspect of health information systems is a systematic application of health technology assessment (HTA), which is currently lacking in the country. Starting in 2013, two three-year projects financed by the EU Social Fund have been under implementation to develop a strategy for HTA in Lithuania.
- *Development of an effective system of global expenditure ceilings:* Health expenditure ceilings for health care providers can further incentivize providers to deliver cost-effective health care services. This is part of the future reform envisaged up to 2020, and should be supported by explicitly linking spending to a well-defined package of services backed by appropriate costing mechanisms. Budgets should also be clearly linked to local and regional health risks, e.g., based on age, income, gender, and location.

D. Summary and Conclusions

21. In Lithuania, deeper expenditure policy reforms will be required to ensure that recent expenditure consolidation achievements are sustained and to contain new spending pressures that are likely to emerge. When short-term expenditure consolidation measures are of low quality, renewed spending pressures are likely to emerge eventually. They will likely be compounded by demands of society to achieve better social outcomes that are more in line with European standards, by the tendency of the demand for public services to increase more than proportionally with rising incomes, and by population aging.

³⁰ Improved information is also crucial to generating an informed policy debate around the appropriate allocation of health resources and can often act as a very effective catalyst for change.

22. This paper identifies a range of reforms that can improve the efficiency of spending and help contain these spending pressures. The analysis is based on a comprehensive approach of benchmarking spending in Lithuania against other European countries focusing on spending levels, social outcomes, and the composition and quality of spending. The main findings include the following:

- *Wage bill:* Although the wage bill is in line with European standards, Lithuania's general government employment levels appear to be on the high side, largely reflecting high public employment in education. This suggests that average wages may be on the low side, which could make it challenging to attract and retain qualified staff, especially younger teachers whose wages appear to be relatively low. Instead of the blunt measures adopted in the past, future reforms should focus on structural measures that are more effective at achieving sustainable consolidation, such as linking public sector pay to productivity, improving hiring processes, and improving service efficiency through infrastructure consolidation and reductions in employment levels. Incentives for adopting structural reforms can be enhanced by linking future wage increases to the adoption of structural measures.
- *Social protection:* Mainly reflecting low old-age pensions, social protection spending is among the lowest in Europe. Low spending contributes to poor social outcomes, e.g., the highest inequality level in the EU and a relatively high at-risk-of-poverty rate. To address the growing spending pressures from both ageing and poor social outcomes, a range of reforms can be helpful, including increased use of means-testing of social assistance and pension reforms that protect the poor.
- *Education:* Education outcomes lag behind average EU levels in spite of high spending, suggesting significant spending inefficiencies. An oversized education structure is reflected in low and declining student-teacher ratios in secondary and tertiary education, small class sizes in primary education, and large number of institutions and distorted financial incentives in higher education. Improving efficiencies will require reducing the number of teachers, consolidating school infrastructure, linking decentralization of spending and decision-making to education performance, and providing the right financial incentives and better guidance to students in choosing study fields. Furthermore, education resources should be linked to the school-age population and education performance to allow education quality to improve and spending to adjust automatically to new demographic norms.
- *Health:* Although public health spending is similar to the EU average, health outcomes are among the worst in the EU, suggesting substantial scope for improving the efficiency of public spending. Poor health outcomes, coupled with an ageing population and rising incomes, are likely to significantly increase future spending pressures. Cost pressures can be reduced by improving spending efficiency through expansion and strengthening of the role of the primary and preventive health care system, strengthening the use of copayments, and the adoption of more efficient provider payment systems.

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Appendix

Table 1. Lithuania: Expenditure Consolidation Measures by Economic Classification, 2009–13

Measures	Year taken	Estimated full-year savings in the reform year (percent of GDP)*
Across the board cut in government spending	2011	0.5
Across the board cut in government spending	2012	0.6
Current Expenditure		
15 percent reduction in government current expenditure	2009	0.8
Reduction of current expenditure of municipalities and state budget (further cut in May supplement budget)	2009	1.0
Wage		
12 percent reduction of wage bill	2009	1.0
25 percent cut on average for high paid civil servants including SoDRA payments and via adjustments in base wage coefficients (excluding teachers, police, medical workers etc.), with inproportional cuts in base wage coefficient restored on Oct 1, 2013	2009	0.2
Parametric changes in civil servants wage system through 8 percent cut in base wage and adjustment in bonus payment categories	2009	0.2
Reduction of wage bill (10% civil servants, 2% statutory civil servants, 5% cultural and social workers and teachers)	2010	0.6
Wage Freeze	2011-13	0.3-0.5
Expenditure on G&S		
Reduction in immediate government consumption	2010	1.1
Subsidies		
Cut in transportation subsidies to municipal budget	2009	0.1
Reduction in subsidies for agriculture and spending on land reform	2009	0.3
Social benefits		
Lowered social spending and transfers on childcare, including school lunch payments	2009	0.1
Reform of sickness payments to lower state share of payment in first 3 days, and savings on medical services, investment and purchases. (SoDRA 170 (sickness payments) + HIF 298.6 (medical services 200, investment and purchases 98.6)	2009	0.4
Progressive reduction of social benefits, including old age pensions, state pensions; disproportional part restored in 2012.	2010	1.0
Cut in Child benefits: Eligibility reduced from 18 to 7 years, more comprehensive move towards means-testing. Duplication with maternity benefits removed.	2010	0.4
Cut in maternity benefits: Compensated wage shares reduced from 100 to 90 for the first year and 85 to 75 for the second year, with reduction of ceiling from 5 to 4 times the insurable income. Reform	2010	0.1
Further Maternity/parental benefits' cuts (Compensated wage shares reduced from 90 to 70 for the first year and 75 to 40 for the second year. Reform takes effect from July 1, 2011 and affects both old and new beneficiaries.)	2011	0.4
Reduction in social benefits, mainly health care and maternity benefits	2012	0.5
Increase in retirement age for both men and women to 65	2012	0.1
Capital expenditure		
Cancelling or scaling back of state investment project (part of it to be replaced by EU funds)	2009	1.5
Total savings from all expenditure measures in the reform year		11.2-11.4

Sources: Lithuanian authorities and staff calculations.

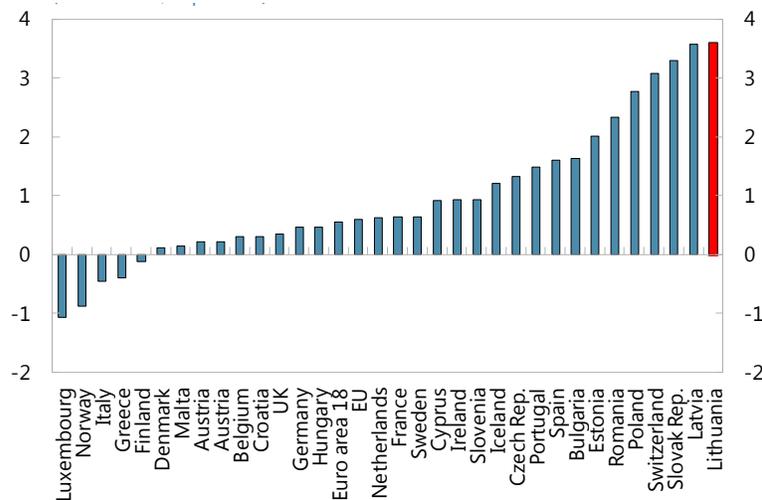
* The estimated full-year savings in percent of GDP is calculated based on the GDP in the year when reform was taken.

IT TAKES TWO TO TANGO: WAGES AND PRODUCTIVITY IN LITHUANIA¹

A. Motivation

1. Lithuania's productivity track record over the past decade is impressive. Lithuania's labor productivity, measured as real output per worker, expanded by about 35 percent between 2005 and 2014—the highest in the EU. The majority of this increase was due to real GDP growth of 25 percent, while the demographically induced decline in the number of employees by 8 percent made only a small contribution.² Labor productivity growth was stronger during the boom years 2006–08 at 6.9 percent annually than during the post-crisis recovery years 2010–14 at 3.5 percent, but in both subperiods Lithuania ranked among the top performers in Europe. In the crisis year 2009, labor productivity fell by 7.8 percent.

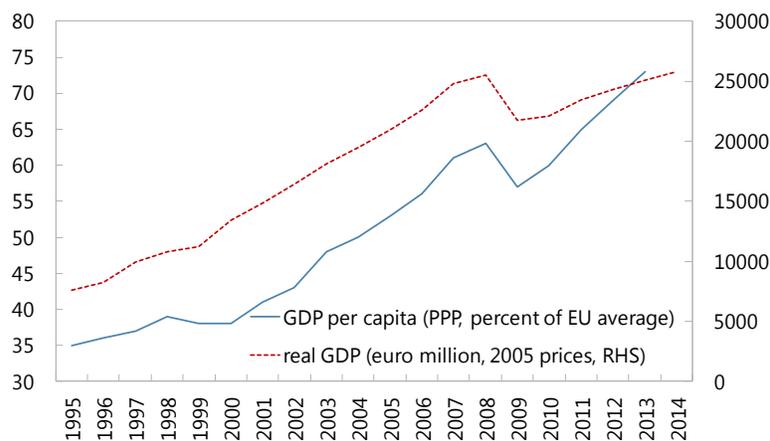
Figure 1. Labor Productivity Growth, 2005–13
(Annualized, in percent)



Sources: Haver Analytics and IMF staff calculations.

¹ Prepared by Qianying Chen and Greetje Everaert. The authors wish to thank officials from the Lithuanian Ministry of Finance and Bank of Lithuania, Nan Geng, Philip Gerson, and Christoph Kligen for valuable comments and suggestions. Research assistance from Nhu Nguyen and Janyne Quarm is gratefully acknowledged. Special thanks are due to Nir Klein who generously shared his thoughts and ideas ahead of this project.

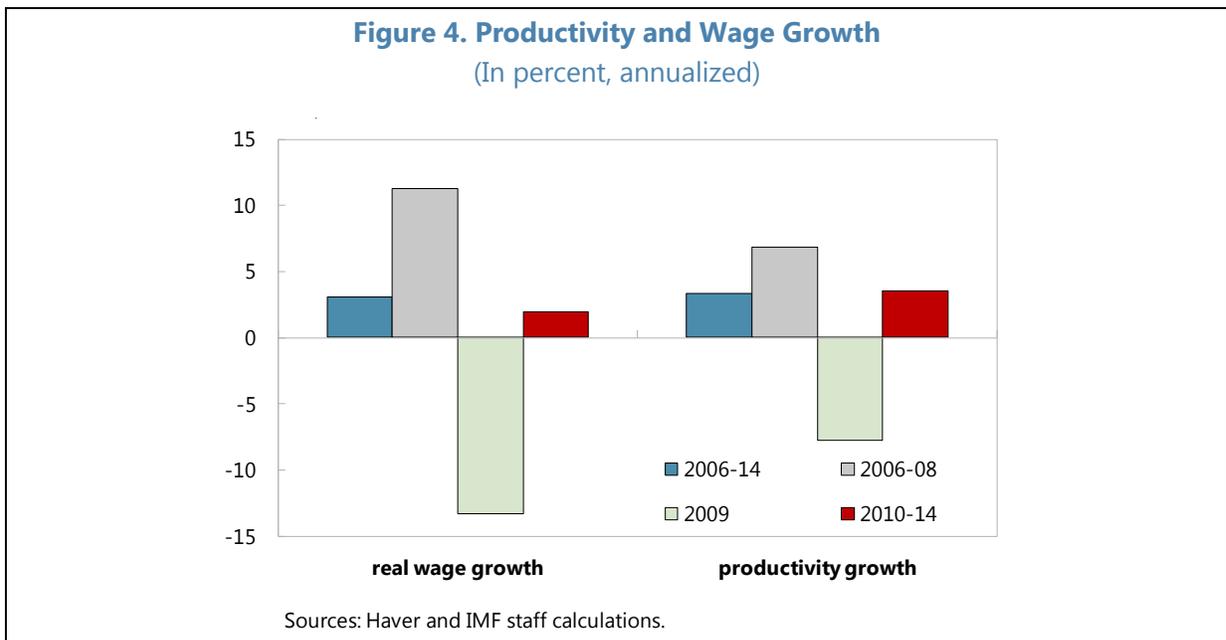
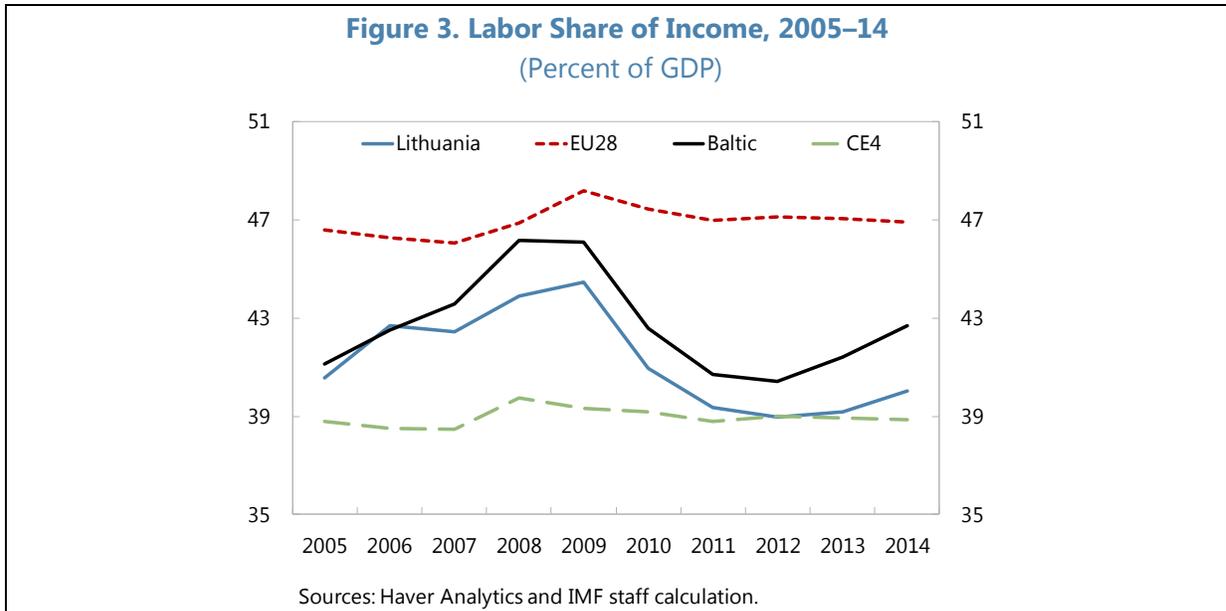
² The unemployment rate in 2014 was 2.4 percentage points higher than in 2005 as well. Hence, the decline in employment during 2005–14 (-8 percent) was larger than the decline in the labor force (-5.6 percent).

Figure 2. Real GDP per Capita and Real GDP

Source: Eurostat.

2. Rapidly rising productivity underpinned strong competitiveness and impressive strides in income convergence. Living standards in Lithuania have improved markedly, with GDP per capita, measured in PPP terms, reaching 73 percent of the EU average in 2013, up from 50 percent a decade earlier. Real average wages have risen robustly—by 32 percent between 2005 and 2014 as measured in the national accounts statistics and by 29 percent according to the index of real gross earnings.

3. However, Lithuania’s labor share of income appears low compared to other countries and wage growth fell far short of productivity growth in the wake of the 2008/09 crisis. The labor share of income in the national accounts denotes the part of value added that compensates labor as a factor of production. The labor share of income in Lithuania has been consistently lower than that of other EU countries, although it has been even lower in the CE-4 countries (Czech Republic, Hungary, Poland, and Slovak Republic) on average. Over time, the labor share of income had been quite stable for the EU as a whole and for the CE-4 countries, but not in Lithuania and the Baltics: it rose sharply in the boom years, fell steeply in the wake of the crisis, and remains below the 2005 level as of 2014. The post-crisis decline is the mirror image of productivity growth that exceeded wage growth by a considerable margin.



4. This leads to the question whether wage determination works properly in Lithuania, whether labor gets its “fair share,” and, if not, whether policy intervention is warranted.

The key questions are whether structural features of the Lithuanian economy can or cannot explain the relatively low labor share of income and whether divergence between wage and productivity developments washes out or does not wash out over time. Policy intervention may or may not be useful in addressing any shortcomings or serve to improve real labor income more generally in a sustainable fashion.

5. This paper analyzes the relationship between wages and productivity in Lithuania using a variety of approaches to shed light on these questions. Section one examines the

labor share of income, focusing on whether its relatively low level can be explained by fundamentals. This exercise relies on panel data for the 28 EU countries. In section two, the long-run relationship between wages and productivity is analyzed using co-integration and error correction models to test for their co-movement and mean-reverting properties. The third section draws attention to the large disparities in wages and productivity across firms and sectors. The fourth and fifth sections explore the economic impact of policy interventions—an ad-hoc wage increase and support of innovation, respectively. A final part concludes with policy implications.

B. Wages and Productivity

(1) Panel Regression Analysis of the Labor Share of Income

6. Analyzing the labor share of income is one way of looking at the relationship between productivity and wages. The labor share of income is derived from the income side of the national accounts and denotes the share of total value added that is used to compensate labor for its contribution to production.³ The labor share of income (lsy) is equivalent to the ratio of real wages and real labor productivity:

$$lsy = \frac{w * L}{p * Y} = \frac{\left(\frac{w}{p}\right)}{\left(\frac{Y}{L}\right)} = \frac{\text{real wage}}{\text{real output per worker}}$$

where w stands for nominal wages and salaries including employers' social security contributions, L for the number of employed, p for the price index, and Y for real output. Accordingly, the labor share of income rises whenever real wages grow faster than real labor productivity and declines whenever real wage growth falls short of real labor productivity growth.

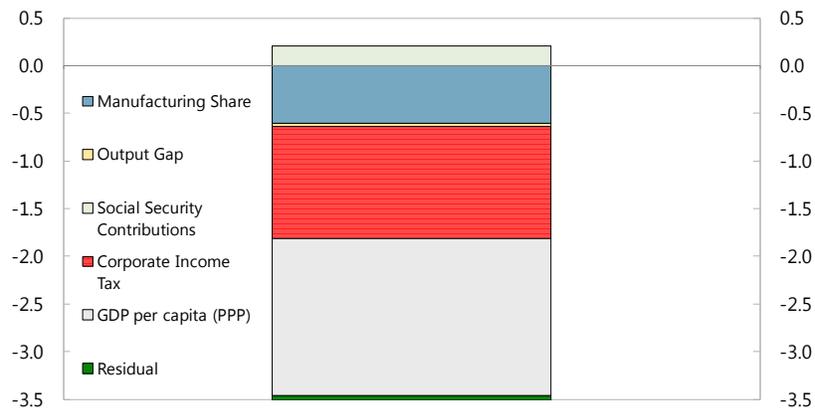
7. Whether Lithuania's relatively low labor share of income is explained by fundamentals can be tested statistically. A first step exploits the variation in the labor share of income in a panel of countries to determine the role played by 'fundamentals' in explaining differences across countries and time. 'Fundamentals' in this context refer to the structural and institutional characteristics of an economy that can affect the distribution of value added between labor and other factors of production, such as income per capita, the share of manufacturing in total output, the structure of taxation, and the cyclical position of the economy (Box 1). In a second step, the panel regression results are used for calculating to what extent Lithuania's low labor share of income is justified by the fundamentals of the Lithuanian economy.

8. Lithuania's relatively low labor share of income is mostly due to fundamentals according to the results from the panel regression. On average over the period 2005-13, a full

³ Value added is also shared with capital, through profit shares and depreciation, and to the government, through taxes on production and imports net of subsidies.

98½ percent of the total difference between Lithuania’s labor share of income and that of other countries can be accounted for by its lower income level, relatively large manufacturing sector, and relatively low implicit taxation of capital. The effective taxation of labor is also significant in the regression, but its average value for Lithuania is very close to the sample average and hence contributes very little to explaining cross-country differences. The unexplained component is very small for Lithuania. This suggests that its low labor share of income is due to structural factors and tax policy, and cannot be considered an aberration.

Figure 5. Difference Between Labor Income Share in Lithuania and the EU
(Contributions by different economic fundamentals in percent of GDP)

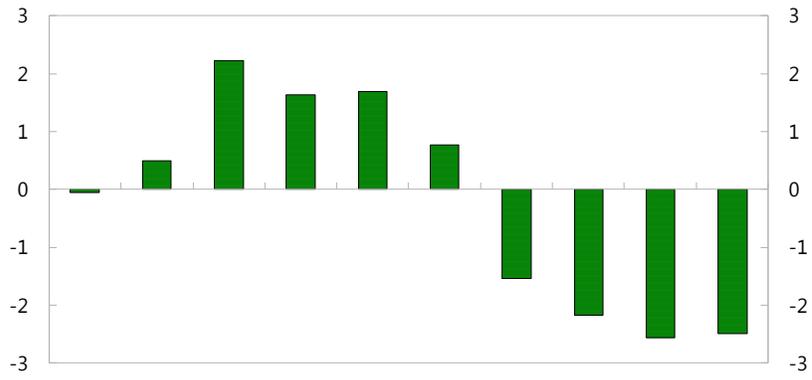


Sources: Haver; and IMF staff calculations.

Note: Figure depicts the contributions of factors to the difference between the labor income share in Lithuania and the labor income share in the other 27 EU countries (average across countries and 2005-13). The contributions of macroeconomic fundamentals are calculated as the difference between the value of the fundamental in Lithuania and that in other countries multiplied by the estimated coefficient from the cross-country fixed-effect panel regression.

9. Despite averaging zero, deviations of Lithuania’s labor share of income from levels implied by fundamentals in particular years can be sizable, but they appear to correct over time. Including dummies in the regression to test whether the post-crisis period is characterized by a downward bias in the labor share of income shows that this is indeed a significant factor for all countries in the sample, that the effect is larger in Central and Eastern and Southeastern Europe (CESEE)—where most countries experienced a boom-bust cycle—and that the effect in Lithuania is even larger than that on CESEE generally. The decomposition of the labor share of income into the part explained by fundamentals and the unexplained residual by year confirms significant positive and negative residuals. In particular, the boom period was characterized by positive residuals, suggesting that the labor share of income rose above what can be explained by fundamentals, while residuals were negative in the post-crisis adjustment period, suggesting a labor share smaller than that justified by fundamentals. Overall, there seems to be a pattern of deviations from fundamentals correcting over time, although the post-crisis correction seems to have been larger than justified and is itself in the process of correcting from 2013 onward.

Figure 6. Unexplained Residual
(Percent of GDP)



Sources: Haver and IMF staff calculations.

Box 1. Explaining the Labor Share of Income

The basic regression uses the following specification: the labor share of income (lsy_i) in country i at time t is regressed on country-specific fixed effects (c_i), per capita income expressed in US\$ purchasing power parity terms ($PPPPC_{i,t-1}$), the share of manufacturing in total GDP ($manuf_{i,t-1}$), the implicit taxation of labor ($SSCI_{i,t-1}$), the implicit taxation of capital ($CTI_{i,t-1}$), and the output gap ($ygap_{i,t}$):

$$lsy_{i,t} = c_i + \beta_1 * PPPPC_{i,t-1} + \beta_2 * manuf_{i,t-1} + \beta_3 * SSCI_{i,t-1} + \beta_3 * CTI_{i,t-1} + \beta_4 * ygap_{i,t} + \varepsilon_{i,t}.$$

Explanatory variables capture ‘fundamentals’, i.e., the structural characteristics that determine the labor share of income. Data cover 28 EU countries and the period 2005-13. Most explanatory variables are included with lags to avoid potential endogeneity. Data are sourced from Eurostat and the IMF’s World Economic Outlook (WEO) database.

- The **per capita income** variable captures the level of economic development of a country, which is expected to coincide with a higher degree of formality of labor relations, lower self-employment, and a higher degree of sharing of value added between the factors of production. Hence, the prior is for a positive relation to the lsy . As variables of institutional strength are likely highly correlated with the per capita income, no such additional variables are included in the regression.
- The **share of manufacturing in total output** should be negatively related to the lsy , since the manufacturing sector is relatively more capital intensive compared with the services sector.
- The **implicit taxation on labor** is constructed as actually collected personal income tax and social security contributions, divided by the tax base, hence taking exemptions from the general tax rate and imperfections in tax collection into account. There is no clear prior as to the effect of the implicit tax rate labor: on the one hand, higher employers’ social security contributions should, *ceteris paribus*, lead to a higher lsy , but on the other hand, a high tax burden on labor, by increasing the tax wedge, may lead to higher informal economy employment and higher structural unemployment, and therefore to a lower lsy .
- The **implicit taxation on capital** is expected to be positively associated with lsy , as higher taxation of capital tends to favor labor as a factor of production.
- The **output gap** is expected to be positively related to the labor share of income, as wage growth may temporarily outpace productivity growth during an economic upswing as labor market shortages improve workers’ wage bargaining position and *vice versa* in downturns.

The results of the fixed-effects panel regression confirm most of the priors. Most coefficients are significant with the expected signs (Table 1), except for the one on the output gap variable, which is negative and significant. But this appears to be driven by the strong negative relation between (falling) output gaps and (rising) lsy in the crisis year 2009, driven by the fall in the denominator with wages not immediately adjusting downward to the same extent (see column 7). A higher tax burden on labor incomes is negatively associated with lsy , pointing to the dominance of informality and structural unemployment channels. The results are robust to using random effects estimators instead of fixed effects (column 8).

Building on the results from the panel regression, it can be shown that ‘fundamentals’ explain Lithuania’s labor share of income rather well. Lithuania’s lsy is decomposed into what is explained by fundamentals and a residual. Specifically, the contribution from fundamentals is calculated by multiplying the coefficients of regression (1) and the differences between values of the explanatory variables for Lithuania and those for the other countries in the sample. The remainder of the difference between the lsy in Lithuania and in the average of the other countries is the residual (*resid*). Formally:

$$\overline{lsy}_{LTU} - \overline{lsy}_{nonLTU} = \sum \beta_i * (\overline{X}_{LTU,i} - \overline{X}_{nonLTU,i}) + resid$$

Box 1. Explaining the Labor Share of Income (concluded)

This exercise shows that fundamentals do a fine job in explaining the lsy in Lithuania and the residual is accordingly small.*

Testing for the alignment of the lsy with fundamentals for subperiods reveals that temporary deviations occur, but that they are largely self-correcting. To test whether the lsy changed in the post-crisis period, an augmented version of the basic regression also includes a 'post-crisis' dummy for 2009-13 (D_{crisis}). In addition, to see whether the lsy of income in Lithuania and in other countries in Central, Eastern and Southeastern Europe (CESEE) changed more than in the sample average, the post-crisis dummy is interacted with Lithuania-specific and CESEE-specific dummies, respectively ($D_{crisis} * D_{LTU}$ and $D_{crisis} * D_{CESEE}$). The augmented regression is hence:

$$lsy_{i,t} = c_i + \beta_1 * PPPPC_{i,t-1} + \beta_2 * manu_{i,t-1} + \beta_3 * SSCI_{i,t-1} + \beta_3 * CTI_{i,t-1} + \beta_4 * ygap_{i,t} + \beta_5 * D_{crisis} + \beta_6 D_{crisis} * D_{LTU} + \beta_7 D_{crisis} * D_{CESEE} + \varepsilon_{i,t}.$$

The labor shares of income fell in general in the post-crisis recovery period and more so in Lithuania than in the other CESEE countries. In the augmented regression, the coefficients of the crisis dummy and the interaction of the crisis dummy with the Lithuania and CESEE dummies are all significant and negative. However, Lithuania's particularly low post-crisis lsy seems to be the flipside of an especially high lsy in the preceding boom period. Repeating the above decomposition exercise of Lithuania's lsy compared to the one of the sample average into contribution from fundamentals and residual on a year-by-year basis yields positive residuals in the boom period and negative residuals in the post-crisis period. On average, they are close to zero.

Explaining the Labor Share of Income									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Manuf. Share (t-1)	-0.2241 ** (-2.56)	-0.1513 * (-1.79)	-0.2802 *** (-3.29)	-0.22502 *** (-2.70)	-0.2482 *** (-3.19)	-0.1738 ** (-2.22)	-0.3351 *** (-3.97)	-0.2635 *** (-3.23)	
Outputgap	-0.0654 *** (-2.64)	-0.0527 ** (-2.4)	-0.1846 *** (-5.80)	-0.1713 *** (-5.55)	-0.2355 *** (-7.80)	-0.21133 *** (-7.12)	0.0027 (0.10)	-0.1800 *** (-5.72)	
SSC (t-1)	-0.2533 (-3.55)	-0.36477 *** (-6.29)	-0.318 *** (-4.90)	-0.4288 *** (-7.91)	-0.3792 *** (-6.33)	-0.50127 *** (-9.58)	-0.151 ** (-2.18)	-0.2723 *** (-4.43)	
CIT (t-1)	0.0879 *** (2.8)	...	0.04717 (1.58)	...	0.0518 * (1.91)	...	0.06 ** (2.00)	0.0521 ** (1.80)	
PPP GDP per capita (t-1)	0.0001 *** (3.98)	0.00014 *** (4.22)	0.0002 *** (6.49)	0.00026 *** (6.62)	0.00031 *** (7.91)	0.00029 *** (7.63)	0.00011 *** (3.16)	0.0002 *** (6.83)	
CrisisD	...	...	-1.311 *** (-3.89)	-1.284 *** (-4.11)	-1.037 *** (-3.35)	-0.8844 *** (-2.94)	...	1.2483 *** (-3.81)	
CrisisD*LTU	...	...	-4.0509 *** (-5.58)	-4.158 *** (-5.20)	-3.227 *** (-4.78)	-3.4274 *** (-4.52)	...	-3.9503 *** (-5.48)	
CrisisD*CESEE	...	...	...	...	-1.80011 *** (-5.96)	-1.7002 *** (-5.68)	...	...
D2009	...	...	...	...	...	...	0.6346 (1.65)	...	
D2009*ygap	...	...	...	...	...	...	-0.2079 ** (-2.42)	...	
constant	51.0130 *** (-15.99)	54.69 *** (20.25)	51.76 *** (18.14)	54.74 (22.03)	52.436 *** (20.17)	55.86 *** (23.96)	50.7706 *** (17.08)	49.8072 *** (17.52)	
Fixed/Random effects	fixed	fixed	fixed	fixed	fixed	fixed	fixed	random	
Nu. of countries	22	28	22	28	22	28	22	22	
Nu. of years	9	9	9	9	9	9	9	9	
Observations	196	252	196	252	196	252	196	196	

Note: T-statistics in parentheses. *** p<0.01, ** p<0.05, and * p<0.1.

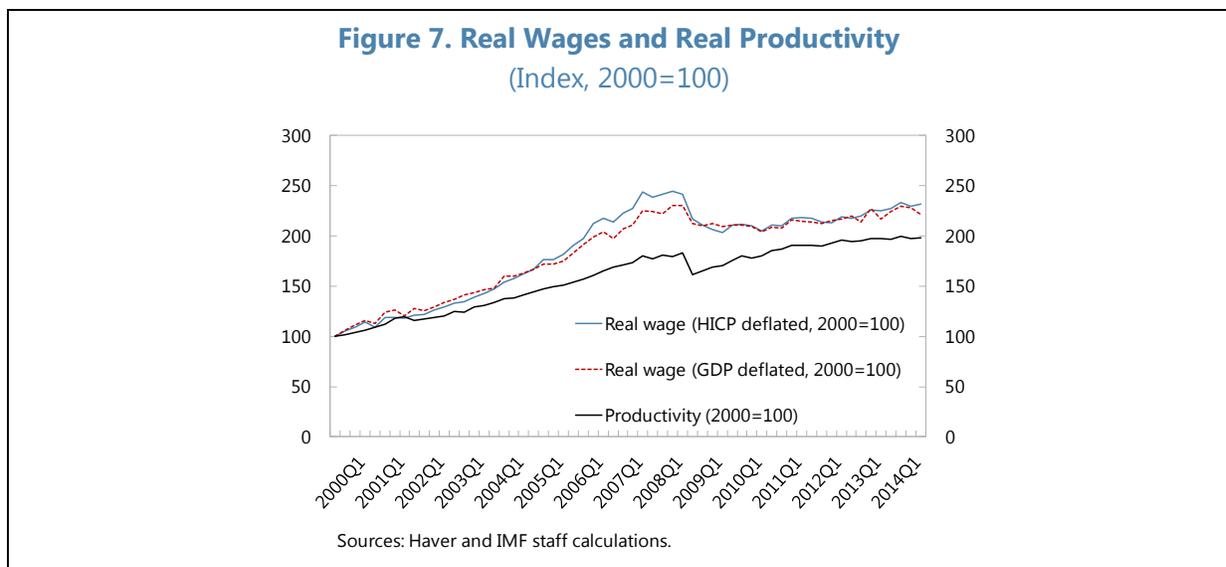
Source: IMF staff calculations.

* The fixed effects component for Lithuania is also one of the smallest in the sample.

(2) Co-integration and Error Correction Analysis of Wages and Productivity

10. Economic theory suggests a positive link between real wages and labor productivity. In the absence market imperfections and frictions, real wages should equal the units of output a worker produces at the margin. If wages were below (above) productivity, competitive firms would find it profitable to hire more (fewer) workers, thereby putting upward (downward) pressure on wages, and because of diminishing returns, downward (upward) pressure on productivity until equality is restored.⁴ In a growing economy with technical progress and capital accumulation through investment, labor productivity and wages should therefore grow at a roughly similar rate, at least in the longer run when adjustment processes have run their course. Formally, there should be a long-term co-integration relationship between wages and labor productivity. The existence of such a relationship has recently been empirically demonstrated for a number of countries, such as Israel, Australia, United States, Malaysia, and South Africa (Klein, 2012).

11. A first glance at the evolution of wages and productivity in Lithuania suggests a close link, though with some deviations at times.⁵ In the long run wages and productivity seem to have co-moved. Regarding sub-periods, wages and productivity appear to move closely in tandem in the early 2000s; followed by a period of wage growth increasingly outpacing productivity growth during 2004-07. In the wake of the 2008/09 crisis both wages and productivity fell sharply, but productivity recovered quickly while wages stagnated until 2011, while after 2011 wage growth started to catch up with productivity.



⁴ The more recent literature indicates that higher wages could also put upward pressure on labor costs and then pushes firms to invest in innovation or substitute capital for labor (Wakeford, 2004; and Marc and Engelbert, 2014).

⁵ The real wage is defined as real compensation per thousand of employees; labor productivity is defined as real value added per thousand of employees deflated either by the HICP or the GDP deflator.

Box 2. Co-Integration and Error Correction of Wages and Productivity

To test whether real wages and labor productivity co-move in the long-run, co-integration techniques are applied. Co-integration tests aim to statistically identify whether two series co-move over longer periods by examining if a linear combination of two series is stationary over that time horizon. Specifically, the Engle-Granger's two-step test of co-integration is used here. The advantages of this technique are that it fits well a single equation approach, performs well for a sample with limited observations, and allows the flexibility to include dummy variables to account for structural breaks. In the first step, real wages (defined as compensation per thousand employees deflated by HICP or GDP deflator), $\log(\text{wage_hicp})$ or $\log(\text{wage_gdpd})$ are regressed on labor productivity (real value added per thousand employees), $\log(\text{prod})$. Both variables are expressed in natural logarithm. The sample covers quarterly data from 2000Q1 to 2014Q4. A dummy variable for 2007Q1-2009Q4 (dum_crisis) is included to account for a possible structural break during the crisis period. Formally:

$$\log(\text{wage_hicp})_t = c + \alpha \cdot \log(\text{prod})_t + \beta \cdot \text{dum_crisis}_t + u_{\text{hicp}_t}. \quad (1)$$

In the second step, the residual from the first step, u_{hicp} , is tested against a null hypothesis of non-stationarity using the Augmented Dickey-Fuller (ADF) Test, i.e., $\rho = 1$ in the following equation:

$$\Delta u_{\text{hicp}_t} = (\rho - 1)u_{t-1} + \sum_{j=1}^p \delta_j \Delta u_{t-j} + v_t, \quad (2)$$

where p is the optimal lag selected by the Schwarz Info Criterion (SIC). If the null hypothesis is rejected, the two series are cointegrated. The Philips-Perron (PP) nonparametric method is also used as a robustness check for the unit root test. The same test is also carried out for real wages deflated by the GDP deflator, wage_gdpd_t .

The basic estimation results show that wage and productivity co-move with a transmission scale close to one. Both unit root tests reject the null hypotheses that the residual from the long-term regression is I (1) at least at the 5 percent level, meaning that labor productivity and real wage per worker in Lithuania co-move in the long-run (Table 1). Furthermore, the coefficient of productivity growth is close to one, both when using HICP and GDP deflators to derive real wages. Interestingly, the coefficient of dum_crisis is also significant, indicating that a structural break occurred during 2007-09. In particular, robustness tests suggest that it is important to include the end of the boom period (the year 2007) in the crisis dummy to pass the residual test and that co-movement does not seem to hold in 2007, implying that wage growth outpaced productivity growth during that period.

Augmented regressions show that the transmission was much lower in the recovery period than in the crisis period. To further explore the time-varying relationship between productivity and wage, a dummy variable for the recovery period (2010Q1-2014Q4) and its interaction with productivity are added to the regressions:

$$\log(\text{wage_hicp})_t = c + \beta_1 \cdot \log(\text{prod})_t + \beta_2 \text{dum_recovery}_t + \beta_3 \text{dum_recovery}_t \cdot \log(\text{prod})_t + \beta_4 \text{dum_crisis}_t + u_{\text{hicp}_t}.$$

Columns (3) and (4) of Table 1 show that the magnitude of the transmission differs between before and after the crisis. In particular, a one percent increase in productivity tends to be associated with a 1.33-1.5 percent increase in wages, depending on the definition of real wages during the boom period. However, during the recovery period, only part of the productivity gains are transmitted to wage growth (66 to 80 percent), which appears to counterbalance the higher-than-one transmission during the boom.

Box 2. Co-Integration and Error Correction of Wages and Productivity (continued)**Box Table 1. Labor Productivity and Real Compensation, Long-Term Estimation 2000Q1-2014Q4**

Dependent Variables:	log(wage_hicp)		log(wage_gdpd)		log(wage_hicp)		log(wage_gdpd)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Explanatory Variables:	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	-5.95	0.00	-5.80	0.00	-6.35	0.00	-6.09	0.00
log(prod)	1.18	0.00	1.10	0.00	1.50	0.00	1.33	0.00
dum_recovery					1.03	0.00	1.00	0.00
dum_recovery*log(prod)					-0.71	0.00	-0.66	0.00
<i>log(Prod)_recovery (derived)</i>					0.80		0.66	
dum_crisis	0.12	0.00	0.09	0.00	0.01	0.59	0.01	0.49
Adjusted R-square	0.97		0.98		0.99		0.99	

Unit Root test of the Residual from the Long-Term Estimation

	<i>u_hicp</i>		<i>u_gdpd</i>	
	residual of (1)		residual of (2)	
	Test-Statistic	Prob.	Test-Statistic	Prob.
ADF test	-3.239	0.02	-4.713	0.00
PP test	-3.167	0.03	-4.756	0.00

Source: IMF staff calculations.

An error-correction model sheds further light on the short-run dynamics of wages and the self-correcting properties of deviations from the long-run relationship with productivity. Wage growth is regressed on the error-correction terms (EC_CPI and EC_GDPD, respectively), which are the residuals of the long-run regressions (1) and (2) in Table 1, as well as on lagged productivity and lagged wage growth. The exercise is carried out for the full sample (2000Q1-2014Q4) and the recovery period separately. In particular, the regression using HICP deflation is the following (the same exercise is repeated for *wage_gdpd*):

$$\Delta \log(wage_hicp)_t = c + \gamma \cdot \frac{(\log(wage_hicp)_{t-1} - c - \alpha \cdot \log(prod)_{t-1} - \beta \cdot dum_crisis_{t-1})}{EC_HICP_{t-1}} + \sum_{j=1}^q \Delta \log(wage_hicp)_{t-j} + \sum_{i=1}^h \Delta \log(prod)_{t-i} + \varepsilon_hicp_t.$$

The coefficient of the error-correction term denotes the speed of adjustment of wages to the deviation from the long-run level implied by productivity. The negative coefficient before the error-correction term in Table 2 indicates that wages tend to decline if they are above their long-run level. Such adjustment is much stronger after the crisis and statistically significant (Table 2, columns (6) and (8)). These findings suggest that wage growth is self-correcting, especially after the crisis.

Box 2. Co-Integration and Error Correction of Wages and Productivity (concluded)**Box Table 2. Short-Term Dynamics of Real Wage**

Explanatory Variable:	Dependent Variable: $\Delta(\log(\text{wage_hicp}))$				Dependent Variable: $\Delta(\log(\text{wage_gdppd}))$			
	2000Q1-2014Q4		2010Q1-2014Q4		2000Q1-2014Q4		2010Q1-2014Q4	
	(5)	(6)	(7)	(8)				
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
EC_HICP (-1)	-0.07	0.47	-0.32**	0.05				
EC_gdppd (-1)					-0.15	0.28	-0.52**	0.01
$\Delta(\log(\text{prod} (-1)))$	0.23	0.34	0.54	0.16	0.35	0.12	0.60*	0.09
$\Delta(\log(\text{prod} (-2)))$	0.19	0.45	-0.12	0.72	0.10	0.68	-0.10	0.77
$\Delta(\log(\text{prod} (-3)))$	0.02	0.95			-0.01	0.96		
$\Delta(\log(\text{prod} (-4)))$	-0.17	0.46			-0.03	0.89		
$\Delta(\log(\text{wage_hicp} (-1)))$	-0.04	0.86	-0.43	0.11				
$\Delta(\log(\text{wage_hicp} (-2)))$	0.12	0.55	-0.03	0.90				
$\Delta(\log(\text{wage_hicp} (-3)))$	0.21	0.26						
$\Delta(\log(\text{wage_hicp} (-4)))$	0.23	0.20						
$\Delta(\log(\text{wage_gdppd} (-1)))$					-0.32*	0.10	-0.73***	0.00
$\Delta(\log(\text{wage_gdppd} (-2)))$					-0.03	0.88	-0.32	0.19
$\Delta(\log(\text{wage_gdppd} (-3)))$					0.31*	0.09		
$\Delta(\log(\text{wage_gdppd} (-4)))$					0.27	0.10		
Adjusted R-square	0.16		0.43		0.24		0.64	

Significant level: * significant at 10 percent, ** significant at 5 percent, *** significant at 10 percent.

Source: IMF staff calculations.

12. Formal analysis confirms that wages and productivity in Lithuania are indeed co-integrated. Several co-integration tests are run to determine the statistical relationship between real wages (deflated by the HICP or the GDP deflator) and real productivity during 2000Q1-2014Q4 (Box 2). They show that labor productivity and wages co-move over the full sample period, once a structural deviation during the crisis period 2007–09 is controlled for. The late boom and early crisis years are hence characterized by a temporary deviation from the long-term co-integration relationship. The coefficients of the regressions show that over the full sample period, a one percent increase in labor productivity is associated with an increase in real wages of slightly above one percent.

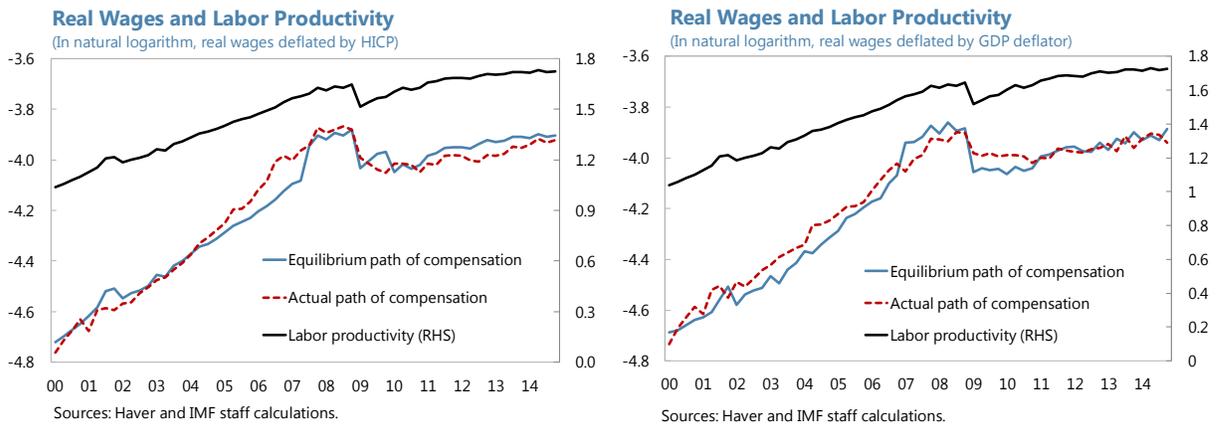
13. Formal analysis also confirms the existence of temporary deviations from this long-term relationship that are however self-correcting (Boxes 2 and 3). While there is clear evidence of co-movement in the long run, the relationship does not necessarily hold at every single point in time. Indeed, the transmission from productivity to wages was significantly above one-to-one in the boom years and much below one-to-one in the wake of the crisis, according to augmented co-integration analysis. This points not only to short-run deviations from the long-run relationship, but also to the presence of a self-correction mechanism whereby faster-than-normal wage growth is subsequently unwound in a period of slower-than-normal wage growth. Formal error-correction techniques confirm the self-correcting nature of deviations. No major gap between wages and productivity is detected at the end of the sample period in 2014Q4, suggesting that adjustments to the boom-bust cycle have largely played out.

Box 3. Equilibrium Paths of Real Wages

The coefficients from the long-run regression (Table 1, column (1) in Box 2) can be used to derive the equilibrium, or predicted, path for real wages:

$$\log(\widehat{wage_hicp})_t = c + \alpha \cdot \log(prod)_t + \beta \cdot dum_crisis_t.$$

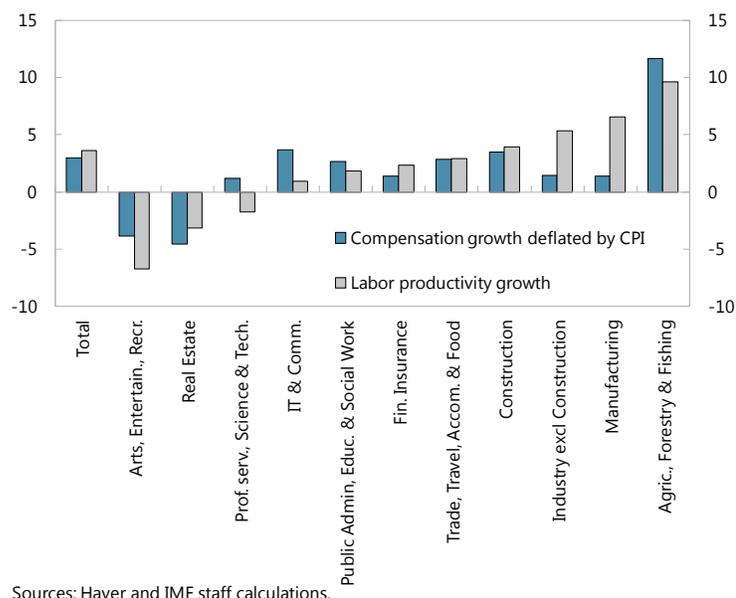
In 2014, HICP-deflated wages are close to their equilibrium level after catching up during 2013-14. Similar results are obtained when using GDP-deflated wages instead. In that case, wage deviations from equilibrium and self-correction happened earlier and wages have returned to their equilibrium level already in 2011.



(3) Disparities of Wage and Productivity Across Sectors and Firms

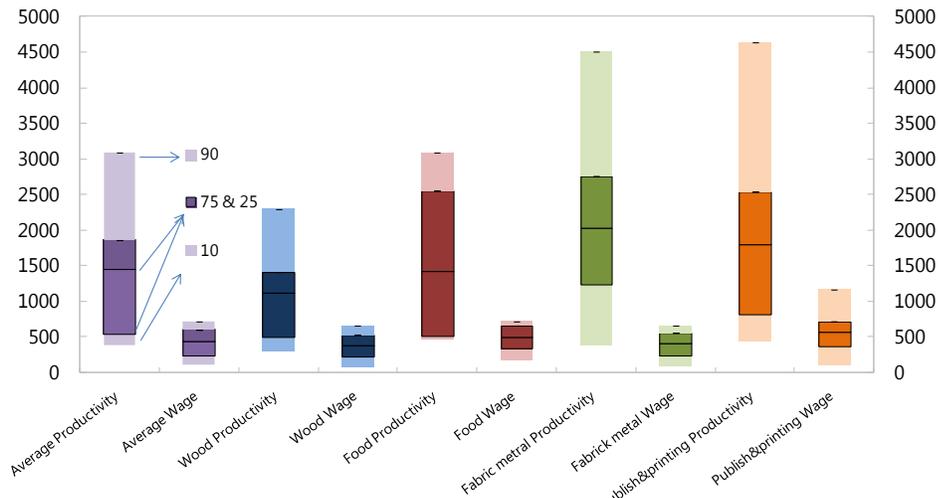
14. While on the aggregate level, wages and productivity tend to grow in tandem over the long-run, this is not the case sector-by-sector. Looking at data for the 2005–13 period for Lithuania, sectors such as information and communication, as well as public administration and education and social work, display wage growth in excess of productivity growth. In manufacturing, on the other hand, wage growth remained well below productivity growth.

Figure 8. Growth of Real Wages and Labor Productivity
(Annualized, in percent, 2006–13)



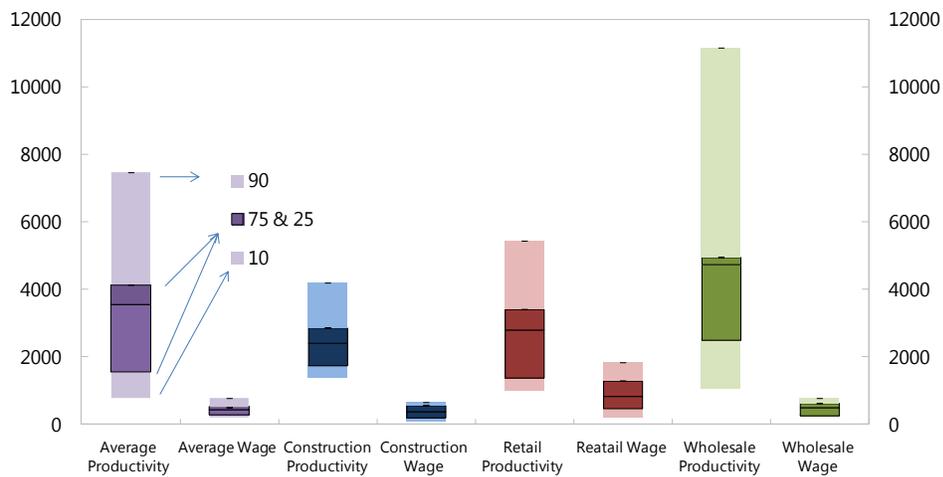
15. Wage-productivity gaps also differ widely across firms. This analysis is based on data from the 2012/13 vintage of the Business and Enterprise Environment Survey (BEEPS) conducted by the European Bank of Reconstruction and Development (EBRD), covering 30 countries in the CESEE region as well as CIS countries. The focus is on productivity and wage levels across Lithuanian firms. Unfortunately, as data do not go back in time, panel estimations are not possible and confine the analysis to a comparison of wage and productivity levels. But the information is highly granular and allows comparing firms within similar sectors and even subsectors. The data indicate that productivity varies widely across sectors and that substantial heterogeneity also exists across firms within the same sector or subsector.

Figure 9. Distribution of Productivity and Wage in Manufacturing Sector, 2012–13
(In EUR per month)



Sources: EBRD and World Bank, BEEPS database; and IMF Staff Calculations. Note: rectangles in each bar denotes percentiles of the distribution, the borders of rectangles from the bottom to the top indicates the 10, 25, 75, and 90 percentiles. The black line in the rectangle with darker color denotes mean level of the respective group. Productivity in manufacturing firms are defined as total annual value added per employee and productivity in service firms are defined as total annual sales per employee in the previous fiscal year. The survey was conducted in 2012-13.

Figure 10. Distribution of Productivity and Wage in Service Sector, 2012–13
(In EUR per month)



Sources: EBRD and World Bank, BEEPS database; and IMF Staff Calculations. Note: rectangles in each bar denotes percentiles of the distribution, the borders of rectangles from the bottom to the top indicates the 10, 25, 75, and 90 percentiles. The black line in the rectangle with darker color denotes mean level of the respective group. Productivity in manufacturing firms are defined as total annual value added per employee and productivity in service firms are defined as total annual sales per employee in the previous fiscal year. The survey was conducted in 2012-13.

(4) Implications of a Wage Shock

16. To gauge the effects of possible policy interventions, this section considers the macroeconomic implications of an ad-hoc wage increase. Specifically, the following experiment is conducted: wages are subjected to a positive shock but there are no

commensurate productivity improvements or subsequent self-correcting wage dynamics. What are the macroeconomic consequences?

17. The results from a Vector Autoregressive Model suggest that an ad-hoc increase in wages would harm competitiveness and growth (Box 4). Impulse response functions show that over a horizon of three years, a one-time ad-hoc increase in wages leads to lower output and a lower employment rate in the medium term, though it boosts the employment rate in the very short-run. In particular, a 2.4 percent increase in wages brings real exports down by 2 percent and the employment rate by 0.2 percentage points, likely reflecting weakened competitiveness. Industrial production contracts right after the shock materializes, implying that the manufacturing sector could be more sensitive to a loss of wage competitiveness than other sectors.

Box 4. Impact of a Wage Shock in a Vector Autoregressive Model

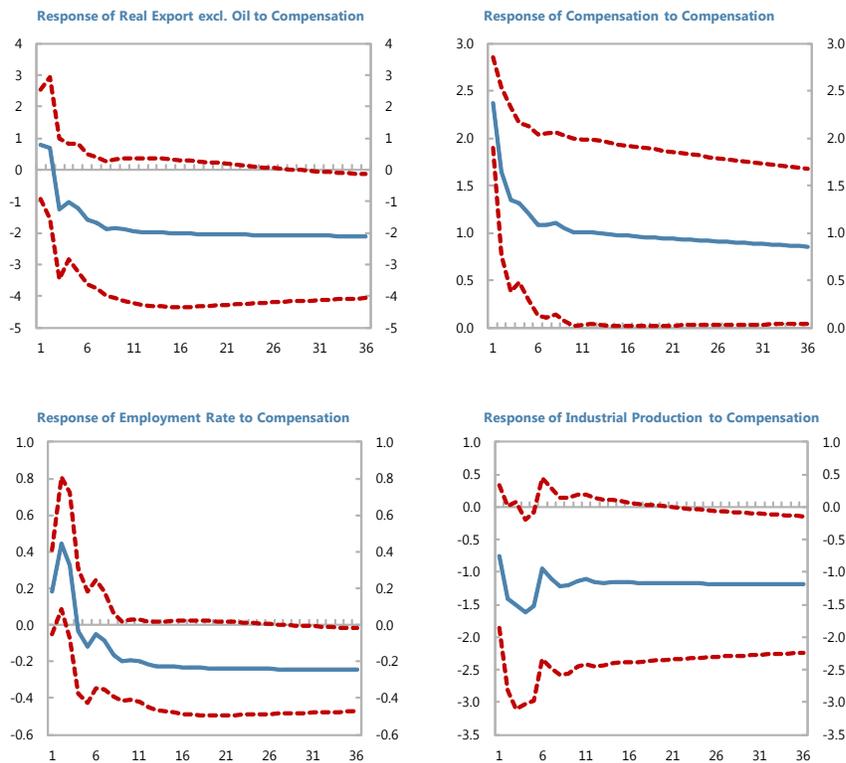
Joint dynamics of wages and other macroeconomic variables are estimated using a Vector Autoregressive Model (VAR). A VAR model represented by the following equation is estimated:

$$y_t = A_1y_{t-1} + \dots + A_p y_{t-p} + Bx_t + \epsilon_t, \tag{1}$$

where y_t is a vector containing wages, defined as real compensation per thousand employees deflated by the HICP; industrial production; real exports excluding oil exports; and the employment rate, measured by employment relative to the labor force. x_t is a vector of exogenous variables including dummies for the periods 2007Q1-2009Q4 and 2010Q1-2014Q4. The sample covers the period 2000Q1-2014Q4. Three lags are used—the maximum possible for the data at hand.

An ad-hoc wage increase would weaken competitiveness and growth according to the impulse response functions of the VAR. The size of the real compensation shock considered here is 2.4 percent, corresponding to one standard deviation of the residual in the wage equation. The impulse response functions suggest that real export and employment would contract about 4 months after the wage shock. Given the absence of a commensurate productivity increase, a positive wage shock hence harms competitiveness. Moreover, industrial production falls immediately after the shock, indicating that Lithuania’s manufacturing sector may be especially sensitive to a loss of competitiveness.

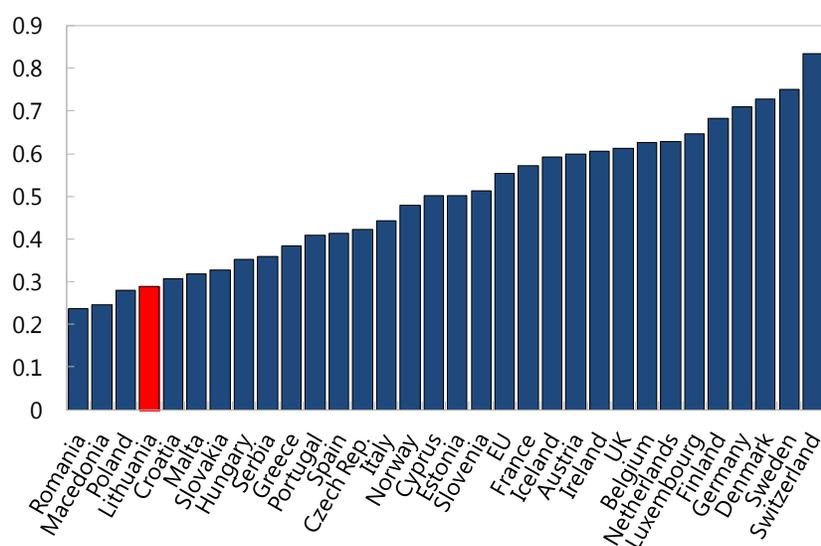
Impulse Responses to a Compensation Shock



Sources: Haver and IMF staff calculations. Each chart shows the generalized impulse responses to a shock to the residual of the equation of real compensation per employee. Shock size is 2.37 percent, and the error bands are the point estimates plus/minus 2 standard deviations. Results are robust to different types of error bands.

(5) Productivity and Innovation

18. This section explores policies that boost productivity, which would also give rise to higher wages considering their long-run relationship with productivity. A wide range of policies affect productivity. Education policies, for instance, can play a role in raising economy-wide productivity through boosting levels of education or better matching of educational training with labor market needs. Higher investment and capital intensity can also raise labor productivity. An overall favorable business environment and good infrastructure helps reduce costs. Flexibility in labor and product markets is important to promote allocative efficiency. Lithuania scores well on many of these factors in international indices. In the area of innovation, however, Lithuania has typically lagged behind other EU and CESEE countries.

Figure 11. Innovation Index, 2013

Source: European Commission.

19. Innovation is a powerful driver of productivity growth, underscoring the importance of policies that promote new technologies, products, and processes (Box 5).

Analysis is again based on the BEEPS database of the EBRD. A proxy for productivity can be calculated from data on sales, intermediate inputs, and the number of employees. A rich set of indicators capturing different aspects of innovation is available: new products, new marketing methods, or new organizational processes. Data on firm age, size of the firm, and other firm characteristics such as ownership structure are used as controls. The lack of a time dimension in the dataset limits inferences regarding causality, but innovation is positively associated with higher firm-level productivity at least in the services sector.

Box 5. The Role of Innovation in Firm Productivity

The analysis of whether firm productivity is positively related to innovation variables is based on the EBRD's BEEPS dataset. To enhance data quality, outliers (data in the upper 95th and lowest 5th percentile) on total wages, average wage per employee, and sales are eliminated and micro firms with less than five employees are also excluded. Data on wages and sales are expressed in euros. The resulting data on average wages accord well with available data on minimum wages in EU countries, giving comfort about the quality of the data used. Productivity in the manufacturing sector firms is calculated as sales minus outlays for intermediate inputs, divided by the number of employees. Since data on intermediate inputs were almost uniformly zero for firms in the services sector, productivity in the service sector is proxied simply by sales per employee. This reduces the sample to slightly over 7,500 observations, out of which 130 are Lithuanian firm data.

The basic regression is the following:

$$prod = a + \beta_1 * age + \beta_2 * size + \beta_3 * forownsh + \beta_4 * stateownsh + \beta_5 * inno + D_i + \varepsilon,$$

where firm productivity (*prod*) is regressed on the age of the firm (*age*), the size of the firm proxied by the number of employees (*size*), the share of foreign ownership of the firm (*forownsh*), the share of state ownership (*stateownsh*), and an innovation dummy (*inno*), which equals one if the firm engages in any type of innovation (product innovation, process innovation, or marketing innovation) and zero otherwise. Country dummies (*D_i*) are also included. Given the differences in the calculation of the productivity variable across sectors, regressions are performed separately for manufacturing and services firms.

Innovation is strongly positively associated with higher productivity. For firms in the services sector, the coefficient of the innovation dummy is positive and significant, with non-product related types of innovation the apparent main driver. For firms in the manufacturing sector, the coefficient is also positive but insignificant, perhaps because many manufacturing firms are foreign-owned and innovation mostly takes place in parent firms' headquarters. Most other explanatory variables have the expected sign: foreign ownership has a positive impact on productivity and state ownership also has a positive but insignificant sign. Age of the firm and firm size are negatively related to productivity.

Determinants of Labor Productivity, BEEPS 2012-13, 29 Countries in Central and Eastern European, and Central Asia

	Labor Productivity					
	Manufacturing and Service		Manufacturing		Service	
	Coef	P>t	Coef	P>t	Coef	P>t
Share of Foreign Ownership	18.73	0.00	16.41	0.01	19.57	0.05
Share of State Ownership	8.60	0.56	28.78	0.10	2.24	0.92
Innovation	486.36	0.05	292.67	0.25	662.75	0.08
Control Variables:						
Age	-35.64	0.00	-8.21	0.44	-64.97	0.00
Employee	-7.30	0.00	-5.31	0.00	-11.99	0.00
Capital City	-594.25	0.05	-349.09	0.30	-518.22	0.11
Share of Skilled Labor in Pro	-7.13	0.14	-5.78	0.10	-29.24	0.21
Manufacturing	-1613.03	0.00				
Constant	13421.22	0.00	12812.06	0.00	12886.48	0.00
Observations	7647		4452		3195	

C. Policy Implications and Conclusions

20. The analyses of the labor share of income and of the relationship between wages and productivity come to similar conclusions: wages and productivity move in tandem in the long run; short-term deviations occur but tend to correct of time; Lithuania's labor share of income is in line with fundamentals; and wages and the labor share are currently close to equilibrium levels. Both approaches indicate that the longer-term relationship between wages and productivity in Lithuania, either expressed through their co-integration or the labor share of income, follow fundamental economic principles. In this respect, the low labor share of income in Lithuania does not appear to be an aberration but rather primarily reflective of Lithuania's relatively low per capita GDP, its high share of manufacturing, and the relatively low taxation of capital income. While short-term deviations have occurred at times, these have shown a tendency to correct subsequently. The dust on the Lithuania's boom-bust cycle, which drove a wedge between productivity and wage developments, seems to have largely settled with wages and labor share close to their equilibrium levels at end-2014.

21. Policies that seek to directly boost general wage levels are found to be superfluous and could even be counterproductive. The self-correcting behavior of wages suggests that policy intervention on wages is unnecessary. Wages in Lithuania have largely been market determined in the past and gaps between productivity and wage developments that have opened up at times typically corrected subsequently. Indeed, attempts to increase wages without commensurate progress on the productivity front risk crimping growth and competitiveness. In addition, one-size-fit-all wage policies would take insufficient account of the large differences in productivity across sectors and firms, pushing low productivity jobs out of business or into the informal economy.

22. Policies that foster the productivity growth needed to underpin strong wage growth offer a more promising avenue for promoting higher incomes. As wages tend to align with productivity trends over time, the focus of policies should be on steps that help raise productivity. A raft of mostly structural reforms is important in this context, ranging from further improving the business climate and securing appropriate high-quality educational training to fostering investment and innovation. Firm-level data clearly speak to the positive link between innovation and productivity.

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