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SSE RIGA

SHADOW ECONOMY INDEX for the Baltic countries 2009 – 2016

The Centre for Sustainable Business
at SSE Riga

SHADOW ECONOMY INDEX

for the Baltic countries

2009 – 2016

by Tālis J. Putniņš & Arnis Sauka

STOCKHOLM SCHOOL OF ECONOMICS
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Acknowledgments

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Executive summary

The SSE Riga Shadow Economy Index is estimated annually based on surveys of entrepreneurs in the Baltic countries. It combines misreported business income, unregistered or hidden employees, and 'envelope' wages to estimate the shadow economies as a proportion of GDP.

Following the trend since 2015, there has been a modest increase in the size of the shadow economies in Estonia and Lithuania during 2016. In contrast, the shadow economy in Latvia has continued to contract, following its long-term trend. Despite these changes, the shadow economy in Latvia remains larger than in the other Baltic countries. Our estimates indicate that the Estonian and Lithuanian shadow economies now account for around 15.4% and 16.5% of GDP (after increasing by 0.5% and 1.5% in 2016), respectively, whereas in Latvia, after contracting by approximately 1.0% in 2016, the shadow economy is now estimated at around 20.3% of GDP. Thus, the difference in the sizes of the three shadow economies has further decreased in 2016.

The contraction of the shadow economy in Latvia has been driven mainly by decreases in underreporting of business income and underreporting of the number of employees. In 2016, the level of underreporting of envelope wages is similar in all three Baltic countries, whereas underreporting of business income (which makes up around 42% of the total Latvian shadow economy) explains most of the difference in the size of the shadow economies across the three countries.

Unregistered companies make up 5% to 8% of all enterprises. Lithuania stands out as having the highest level of bribery, despite recent decreases – the amount of general business bribery in Lithuania has decreased from 12.7% to 9.8% of revenue in 2016 and government bribery from 11.5% to 8.1% of the value of a government contract. The construction sector still has the highest level of shadow activity, in particular in Latvia. Small companies tend to operate 'in the shadows' more than large companies, however, the differences across company size categories are not large.

Companies continue to be relatively satisfied with the State Revenue Service and relatively dissatisfied with the government's tax policy and support for entrepreneurs. Latvian companies are less satisfied than Estonian and Lithuanian companies. Dissatisfaction in 2016 in general has increased, going against the long-term trend of gradually improving satisfaction.

Our results highlight the need for continued reforms and actions that combat the shadow economy; in Latvia, to close the gap compared to the neighbouring countries, and for Estonia and Lithuania, to reverse the modest increases in the size of the shadow economies recently. Our findings suggest a number of approaches to combatting the shadow economy.

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Foreword

With the seventh report on the Shadow Economy Index for the Baltic Countries being presented, it is fair to say that the Index has established itself as an important indicator and contributor to an informed debate on the size of the respective countries' shadow economies. I am convinced that the current Report will be no exception – on the contrary. While being explicitly addressed by Baltic policy makers, the size of the of the respective counties' shadow economies is still relatively high. This in turn means that the national economies actually perform below their potential resulting in a waste of scarce resources. Our hope is therefore that this Report, like the previous ones, will play an important role in terms of improved policy-making and thereby eventually to increased national well-being.

The Report is written within the Centre for Sustainable Business at the Stockholm School of Economics in Riga as part of a broader research agenda addressing various aspects of the shadow economy – in particular its impact on entrepreneurs and entrepreneurship.

Riga, May 2017

Anders Paalzow
Rector, SSE Riga

1. Introduction

The aim of the SSE Riga Shadow Economy Index for the Baltic countries is to measure the size of the shadow economies in Estonia, Latvia, and Lithuania, as well as to explore the main factors that influence participation in the shadow economy. We use the term "shadow economy" to refer to all legal production of goods and services produced by registered firms that is deliberately concealed from public authorities.[1] The Index is published annually since 2010 to provide policy makers with information for making justified policy decisions, as well as to foster a deeper understanding of entrepreneurship processes in the Baltic countries. This report analyses the dynamics of the shadow economy in Estonia, Latvia, and Lithuania during the period 2009-2016. It also provides evidence on the main factors that influence entrepreneurs' involvement in the shadow economy and provides some policy recommendations. We also measure the amount of unregistered businesses in the Baltic countries.

The SSE Riga Shadow Economy Index is based on annual surveys of entrepreneurs in the three countries. This approach is based on the notion that those most likely to know how much production/income goes unreported are the entrepreneurs that themselves engage in the misreporting and shadow production. The Index combines estimates of misreported business income, unregistered or hidden employees, as well as unreported 'envelope' wages to obtain estimates of the size of the shadow economies as a proportion of GDP. The method used in this report for estimating the size of the shadow economy requires fewer assumptions than most existing methods, in particular compared to methods based on macro indicators. Furthermore, the SSE Riga Shadow Economy Index can be used through time or across sectors and countries and thus is a useful tool for evaluating the effectiveness of policy designed to minimise the shadow economy.

Survey-based approaches face the risk of underestimating the total size of the shadow economy due to non-response and untruthful response given the sensitive nature of the topic. Our method minimizes this risk by employing a number of survey and data collection techniques shown in previous studies to be effective in eliciting more truthful responses.[2] These include confidentiality with respect to the identities of respondents, framing the survey as a study of satisfaction with government policy, gradually introducing the most sensitive questions after less sensitive questions, phrasing misreporting questions indirectly, excluding inconsistent responses, and, in the analysis, controlling for factors that correlate with potential untruthful response such as tolerance towards misreporting (see Putniņš and Sauka (2015) for more detailed discussion).

The next section describes how the Index is constructed, starting with the survey and then the calculations. The third section of this report presents estimates of the Index and analyses the various forms of shadow activity. Section 4 analyses the determinants of entrepreneurs' involvement in the shadow sector and their attitudes towards shadow activities. Finally, section five discusses the conclusions that we can draw from the results and identifies some policy implications.

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[1] This definition corresponds to what the Organisation for Economic Co-operation and Development (OECD) in their comprehensive 2002 handbook "Measuring the Non-observed Economy" as well as the System of National Accounts (SNA 1993) refer to as "underground production". It is also consistent with definitions employed by other researchers (e.g., the World Bank study of 162 countries by Schneider, Buehn and Montenegro (2010)). We elaborate further on the components of the unobserved economy in Section 2.

[2] For example, Gerxhani (2007), Kazemier and van Eck (1992), and Hanousek and Palda (2004).

2. Methods used in constructing the Index

2.1. The survey of entrepreneurs

The SSE Riga Shadow Economy Index is based on an annual survey of company owners/managers in Estonia, Latvia, and Lithuania, following the method of Putniņš and Sauka (2015). The surveys are conducted between February and April of each year and contain questions about shadow activity during the previous two years. For example, the survey conducted in March-April 2017 collects information about shadow activity during 2015 and 2016. The overlap of one year in consecutive survey rounds (e.g., collecting information about 2015 shadow activity in both the 2016 and 2017 survey rounds) is used to validate the consistency of responses.

We use random stratified sampling to construct samples that are representative of the population of firms in each country. Starting with all active firms in each of the three Baltic countries (obtained from the Orbis database maintained by Bureau Van Dijk), for each country we form size quintiles (using book value of assets) and take equal sized random samples from each size quintile. In total a minimum of 500 phone interviews are conducted in each of the three Baltic countries in each survey round. The 2017 survey collected responses from 500 company owners/managers in Estonia, 502 in Latvia and 509 in Lithuania. The survey is conducted in cooperation with SKDS.

The questionnaire form (see Appendix 1) contains four main sections: (i) external influences and satisfaction; (ii) shadow activity; (iii) company and owner characteristics; and (iv) entrepreneurs' attitudes. To increase the response rate and truthfulness of responses the questionnaire begins with non-sensitive questions about satisfaction with the government and tax policy, before moving to more sensitive questions about shadow activity and deliberate misreporting. This 'gradual' approach is recommended by methodological studies of survey design in the context of tax evasion and the shadow economy (e.g., Gerxhani, 2007; and Kazemier and van Eck, 1992). Further, the survey is framed as a study of satisfaction with government policy, rather than a study of tax evasion and misreporting (similar to Hanousek and Palda, 2004). We also guarantee respondents 100% confidentiality with respect to their identities.

In the first survey block, 'external influences', respondents are asked to express their satisfaction with the State Revenue Service, tax policy, business legislation and government support for entrepreneurs in the respective country. The questions use a five point Likert scale, from "1" ("very unsatisfied") to "5" ("very satisfied"). The first section of the questionnaire also includes two questions related to entrepreneurs' social norms: entrepreneurs' tolerance towards tax evasion and towards bribery. The measures of tolerance serve a second important role as control variables for possible understating of the extent of shadow activity due to the sensitivity of the topic.

The second section of the questionnaire, 'informal business', is constructed based on the concepts of productive, unproductive and destructive entrepreneurship by Baumol (1990), assessment of 'deviance' or 'departure from norms' within organisations (e.g., Warren, 2003) and empirical studies of tax evasion in various settings (e.g., Fairlie, 2002; Aidis and Van Praag, 2007). We assess the amount of shadow activity by asking entrepreneurs to estimate the degree of underreporting of business income (net profits), underreporting of the number of employees, underreporting of salaries paid to employees and the percentage of revenues that firms pay in bribes.

We employ the 'indirect' approach for questions about informal business, asking entrepreneurs about 'firms in their industry' rather than 'their firm'.[3] This approach is discussed by Gerxhani (2007) as a method of obtaining more truthful answers, and is used by Hanousek and Palda (2004), for example. The study conducted by Sauka (2008) shows that even if asked indirectly entrepreneurs' answers can be attributed to the particular respondent or company that the respondent represents.[4] Furthermore, experience from Sauka (2008) suggests that phone interviews are an appropriate tool to elicit information about tax evasion.[5] The second section of the questionnaire also elicits entrepreneurs' perceptions of the probability of being caught for various forms of shadow activity and the severity of penalties if caught deliberately misreporting.

We use the overlapping years (e.g., answers in both the 2017 survey and 2016 survey about the level of shadow activity in 2015) to filter out inconsistent responses. This is only possible in instances where a respondent participates in repeated survey rounds. In particular, our filter drops responses when the same respondent in two different survey rounds answers the same shadow activity questions about the same reference year with a difference of +/- 20%. This filtering helps increase the reliability of survey responses used in calculating the Index.

In addition to measuring the shadow economy involvement of registered businesses, we include a question that measures the amount of unregistered business. We ask owners/managers of registered businesses the following question (see question 12 in Appendix 1): "In some industries, in addition to registered companies such as yours, unregistered enterprises also operate but do not report any of their activity to authorities. In your opinion, what percentage of your industry's total production of goods/services is carried out by unregistered enterprises …?" Even though we ask this question to owners/managers of registered businesses, we believe that being experts in their industry they are likely to know approximately how many unregistered businesses operate in their industry. Registered companies compete with unregistered ones and therefore should be aware of such companies.

We do not include the production of unregistered businesses in the shadow economy index as their activity does not fit within our definition of the shadow economy. Yet, by including question 12, we are able to provide a more in depth picture of the unobserved economies in the Baltic States. As illustrated in Appendix 2, key parts of unobserved economy are:

1. Unreported income of registered producers. This is what we refer to as the 'shadow economy' and measure with our annual Index since 2010.

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[3] Even when asked indirectly, some entrepreneurs choose not to answer sensitive questions about shadow activity. One way to avoid providing truthful answers to such questions is by simply answering "0" to all of the shadow activity questions, suggesting that no shadow activity of any kind has taken place during the past two years. We view it as much more likely that these responses reflect avoidance of sensitive questions than truthful opinions and therefore treat these cases as non-responses, in order to minimise the downward bias in estimates of shadow activity.

[4] Sauka (2008) used the following approach: in the follow up survey (one year after the initial survey), respondents are 'reminded' that in the initial survey they stated that, for example, the degree of involvement in underreporting business income by 'their firm' (not by 'firms in their industry' as formulated in the initial survey) was, for example, 23%. Each respondent is then asked whether the degree of underreporting in their companies is the same this year and if not, to what extent it has changed. The conclusion from using this method is that respondents tend to state the amount of underreporting in 'their firm' when asked about 'firms in their industry'.

[5] Sauka (2008) uses both face-to-face and phone interviews and concludes that willingness to talk about sensitive issues like tax evasion in Latvia does not differ significantly between the two methods.

2. Unreported income of unregistered producers. This component is measured since 2013 and is not included in the Index.

3. Income from production of illegal goods/services. We do not measure this component of unobserved economy since it requires different methods.

The third section of the questionnaire asks entrepreneurs about the performance of their companies (percentage change in net sales profit, sales turnover and employment during the previous year), company age, industry and region.

The fourth section of the questionnaire elicits entrepreneurs' opinions and attitudes towards tax evasion. This year we have included additional questions relating to entrepreneurs' tax morale. We draw on Torgler and Schneider (2009) who define tax morale as a moral obligation to pay taxes and "a belief in contributing to society by paying taxes" (Torgler and Schneider 2009: 230). Similar to the approach we take for other questions relating to tax evasion, we phrase the tax morale question indirectly, asking company managers to what extent they would agree or disagree with the statement: "Companies in your industry would think it is always justified to cheat on tax if they have the chance" using scale from 1 ('strongly disagree') to 5 ('strongly agree'). We also include a question on community belonging (Q22c) and question on perceived contribution to the growth of economy and society in general (Q22a), both of which are factors associated with tax morale.

In this year's survey we also include questions from the Business Environment and Enterprise Performance Survey (BEEPS) run by the World Bank/European Bank for Reconstruction and Development (EBRD) to measure environmental influences such as institutions. We ask respondents to what extent factors such as tax administration, tax rates, trade and custom regulation, business licensing and permits, functioning of the judiciary/courts, uncertainty about regulatory policies, corruption, anti-competitive practices of other competitors and political instability affect the current operations of a business (Q23).

2.2. Calculation of the Index

The Index measures the size of the shadow economy as a percentage of GDP.[6] There are three common methods of measuring GDP: the output, expenditure and income approaches. Our Index is based on the income approach, which calculates GDP as the sum of gross remuneration of employees (gross personal income) and gross operating income of firms (gross corporate income). Computation of the Index proceeds in three steps: (i) estimate the degree of underreporting of employee remuneration and underreporting of firms' operating income using the survey responses; (ii) estimate each firm's shadow production as a weighted average of its underreported employee remuneration and underreported operating income, with the weights reflecting the proportions of employee remuneration and firms' operating income in the composition of GDP; and (iii) calculate a production-weighted average of shadow production across firms.

In the first step, underreporting of firm *i*'s operating income, $UR_i^{OperatingIncome}$, is estimated directly from the corresponding survey question (question 7). Underreporting of employee remuneration, however, consists of two components: (i) underreporting of salaries, or 'envelope wages' (question 11); and (ii)

[6] Two caveats are worth noting: (i) because we do not measure shadow activity in the state (public) sector, our estimates refer to private sector shadow activity as a percentage of private sector domestic output; and (ii) we do not measure the "black economy", i.e., the illegal goods and services.

unreported employees (question 9). Combining the two components, firm *i*'s total unreported proportion of employee remuneration is:[7]

$$UR_i^{EmployeeRemuneration}=1-(1-UR_i^{Salaries})(1-UR_i^{Employees})$$

In the second step, for each firm we construct a weighted average of underreported personal and underreported corporate income, producing an estimate of the unreported (shadow) proportion of the firm's production (income):

$$ShadowProportion_i= \alpha_c UR_i^{EmployeeRemuneration}+(1-\alpha_c)UR_i^{OperatingIncome}$$

where α_c is the ratio of employees' remuneration (*Eurostat* item D.1) to the sum of employees' remuneration and gross operating income of firms (*Eurostat* items B.2g and B.3g). We calculate α_c for each country, *c*, in each year using data from *Eurostat*. Taking a weighted average of the underreporting measures rather than a simple average is important to allow the Shadow Economy Index to be interpreted as a proportion of GDP.[8]

In the third step we take a weighted average of underreported production, $ShadowProportion_i$, across firms in country *c* to arrive at the Shadow Economy Index for that country:

$$INDEX_c^{ShadowEconomy} = \sum_{i=1}^{N_c} w_i ShadowProportion_i$$

The weights, w_i, are the relative contribution of each firm to the country's GDP, which we approximate by the relative amount of wages paid by the firm. Similar to the second step, the weighting in this final average is important to allow the Shadow Economy Index to reflect a proportion of GDP.[9]

As a final step, we follow the methodology of the *World Economic Forum* in their *Global Competitiveness Report* and apply a weighted moving average of $INDEX_c^{ShadowEconomy}$ calculated from the most recent two survey rounds. There are several reasons for doing this, including: (i) it increases the amount of available information and hence precision of the Index by providing a larger sample size; and (ii) it makes the results less sensitive to the specific point in time when the survey is administered. The weighting scheme comprises two overlapping elements: (i) more weight is given to the more recent survey round as that contains more recent information (past information is "discounted"); and (ii) more weight is placed on larger sample sizes as they contain more information.[10] Following the approach of the *World Economic Forum*, for years in which there are no previous surveys (the 2009 and 2010 results, which are based on the first survey round conducted in 2011) the Index is simply based on the one survey round.

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7 In deriving the formula we make the simplifying assumption that wages of unreported employees are on average equal to those of reported employees.

8 For example, suppose in an economy wages sum to 80 and corporate income 20, giving true GDP of 100. Suppose that wages are underreported by 50% and corporate income by 10% giving an official reported GDP of 40+18=58. In this example the shadow economy is 42% of true GDP, i.e. (100-58)/100. A weighted average of the two underreporting proportions accurately estimates the size of the shadow economy: (0.8)(50%)+(1-0.8)(10%)=42%. However, neither of the two underreporting proportions themselves correctly represent the size of the shadow economy (50% and 10%), nor does an equal weighted average: (0.5)(50%)+(1-0.5)(10%)=30%.

9 For an example, consider the previous footnote's example replacing the two sources of income with two firms: a large one that produces income of 80 and a smaller one that produces income of 20.

10 For details on this procedure see the *Global Competitiveness Report 2011-2012* (Box 3, p. 64), which is available at: http://www3.weforum.org/docs/WEF_GCR_Report_2011-12.pdf

Consequently, the first two annual Index estimates (2009 and 2010) are more prone to sampling error than subsequent annual estimates, which benefit from larger samples via the moving average. To allow comparisons across countries we apply consistent methodology in calculating the Shadow Economy Index for each of the Baltic countries.

3. Shadow Economy Index for the Baltic countries 2009-2016

Table 1 and Figure 1 report the aggregate size of the shadow economies in the Baltic countries during 2009-2016. The table shows that the shadow economy is still largest in Latvia (20.3% of GDP in 2016), followed by Lithuania (16.5%) and Estonia (15.4%). Even though all three countries have experienced contraction in the relative size of their shadow economies since 2009, Latvia is the only country among the Baltic countries where the size of the shadow economy declined in 2016. The decline is estimated at around 1.0 percentage point, but is not statistically significant. In contrast, the estimates suggest that the shadow economy in Estonia and Lithuania grew modestly in 2016: by around 0.5 and 1.5 percentage points, respectively (the increase in Lithuania is marginally statistically significant).

Figure 2 illustrates the relative size of the components of the shadow economy in each of the three countries in 2016. The largest components of the shadow economy in Latvia and Lithuania are unreported business income (42.1% and 38.3%, respectively) and envelope wages (40.2% and 42.4%), followed by unreported or unregistered employees (17.7% and 19.3%). In Estonia, however, the main component of the shadow economy is envelope wages, which accounts for 53.6% of the total shadow economy in 2016.

Table 1. Size of the shadow economies in the Baltic countries 2009-2016

This table reports point estimates and 95% confidence intervals (in parentheses) for the size of the shadow economies as a proportion of GDP using the method of Putniņš and Sauka (2015). The first row reports the change in the relative size of the shadow economy from 2015 to 2016.

	Estonia	Latvia	Lithuania
2016-2015	**+0.5%** **(-1.9%, 2.9%)**	**1.0%** **(-3.4%, 1.3%)**	**+1.5%** **(-0.1%, 3.0%)**
2016	**15.4%** **(13.1%, 17.8%)**	**20.3%** **(18.0%, 22.6%)**	**16.5%** **(14.8%, 18.3%)**
2015	14.9% (12.4%, 17.4%)	21.3% (19.0%, 23.7%)	15.0% (13.8%, 16.3%)
2014	13.2% (11.3%, 15.1%)	23.5% (20.5%, 26.6%)	12.5% (11.0%, 13.9%)
2013	15.7% (13.5%, 17.9%)	23.8% (20.7%, 26.9%)	15.3% (13.6%, 17.1%)
2012	19.2% (16.6%, 21.9%)	21.1% (18.5%, 23.6%)	18.2% (16.4%, 20.1%)
2011	18.9% (16.8%, 20.9%)	30.2% (27.6%, 32.7%)	17.1% (15.2%, 19.0%)
2010	19.4% (18.0%, 20.8%)	38.1% (35.9%, 40.3%)	18.8% (16.9%, 20.6%)
2009	20.2% (18.7%, 21.7%)	36.6% (34.3%, 38.9%)	17.7% (15.8%, 19.7%)

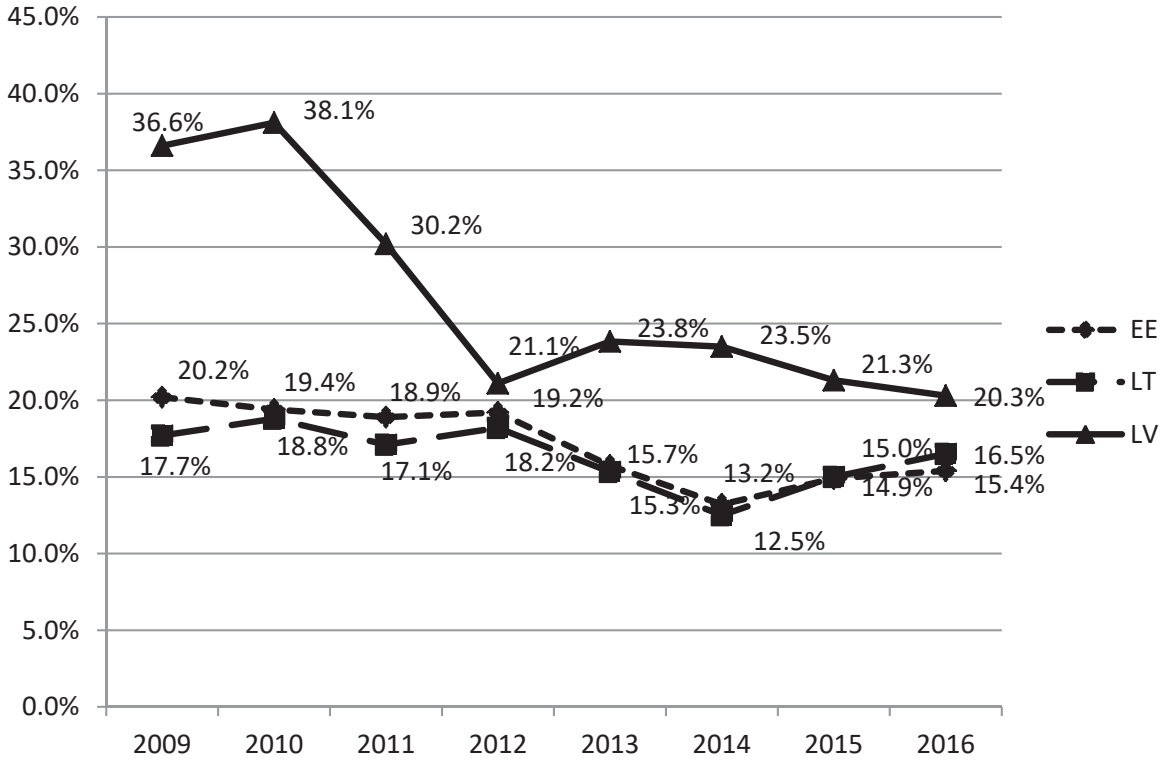

Figure 1. SSE Riga Shadow Economy Index for the Baltic countries 2009-2016.

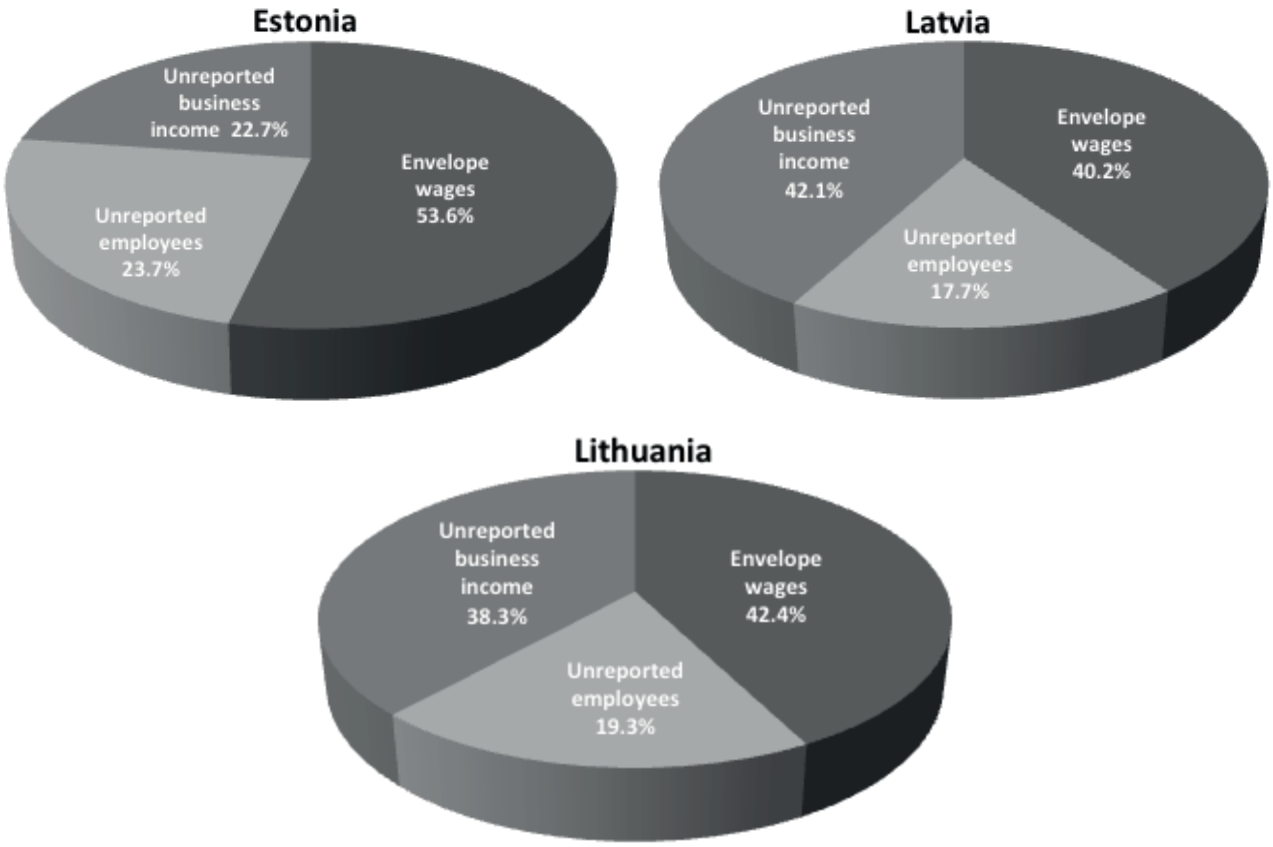

Figure 2. Components of the shadow economies in the Baltic countries in 2016.

Figures 3 and 4 illustrate the degree of underreporting of business income (profits). Figure 3 shows the dynamics of underreporting profits from 2009 to 2016, whereas Figure 4 shows the distribution of underreporting levels. Figure 3 shows that all three countries have since 2009 experienced a decline in the proportion of profits that are intentionally concealed from authorities. Latvia, however, is the only Baltic country in which underreporting of business income has decreased since 2014. In Estonia, underreporting of business income in 2016 is estimated as 8.3% (7.5% in 2015), whereas in Lithuania it is 11.7% (10.5% in 2015). Regardless of the decrease, underreporting of business income is still considerably higher in Latvia at 18.5% in 2016 (19.9% in 2015 and 21.7% in 2014).

Approximately 40% of respondents from Estonia state that underreporting 'in the industry' in 2016 is 0%, i.e., that companies report 100% of their actual profits (see Figure 4). In Latvia and Lithuania, however, only 21.0% and 12.5% of respondents, respectively, state that 100% of actual profits are reported to authorities.

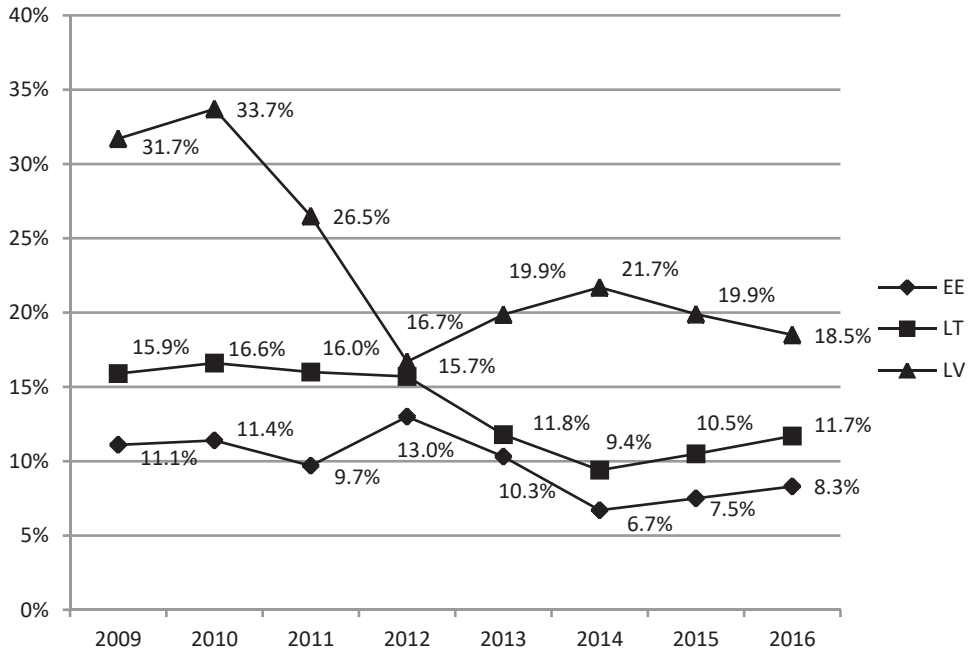

Figure 3. Underreporting of business income (percentage of actual profits) between 2009-2016.

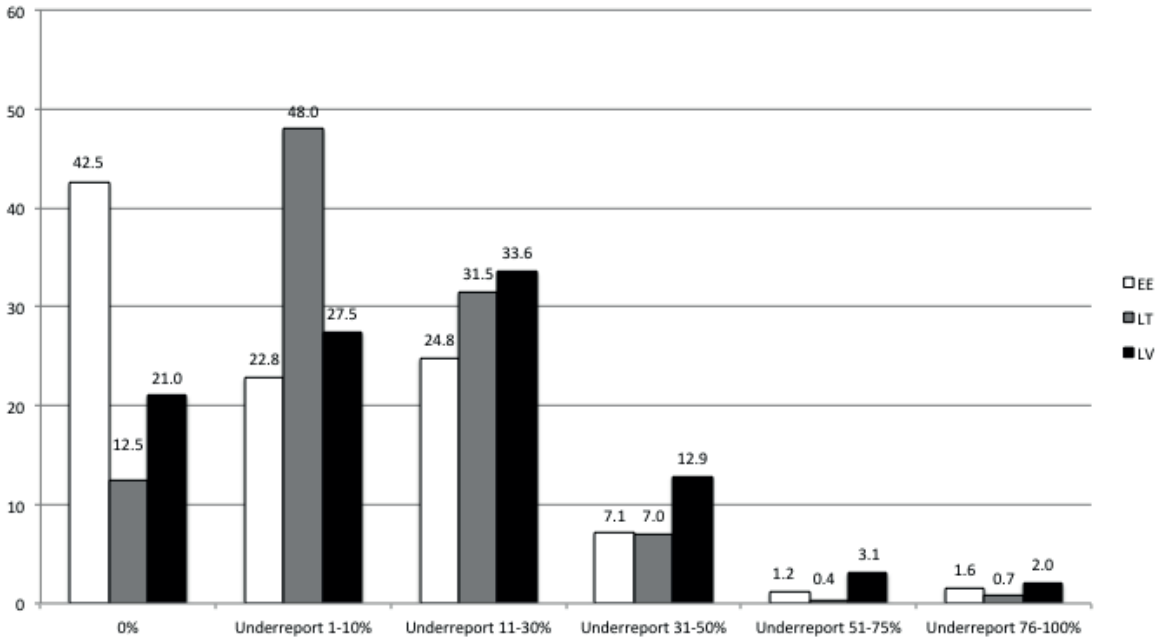

Figure 4. Underreporting of income (percentage of actual profits) in 2016. The vertical axis measures the percentage of each country's respondents underreporting within the range given on the horizontal axis.

Figures 5 and 6 illustrate the level of underreporting of the number of employees. Figure 5 shows that the estimated underreporting of employees in Estonia has increased from 5.7% in 2015 to 6.7% in 2016, and is now at the same level as in Lithuania (6.7% in 2016 as compared to 6.6% in 2015). According to our estimates, underreporting of the number of employees has decreased by 2.0 percentage points in Latvia to 7.6% of employees in 2016. Similar to previous years, a relatively low proportion of respondents claim that underreporting of employees in 2016 represents more than 50% of employees (Figure 6).

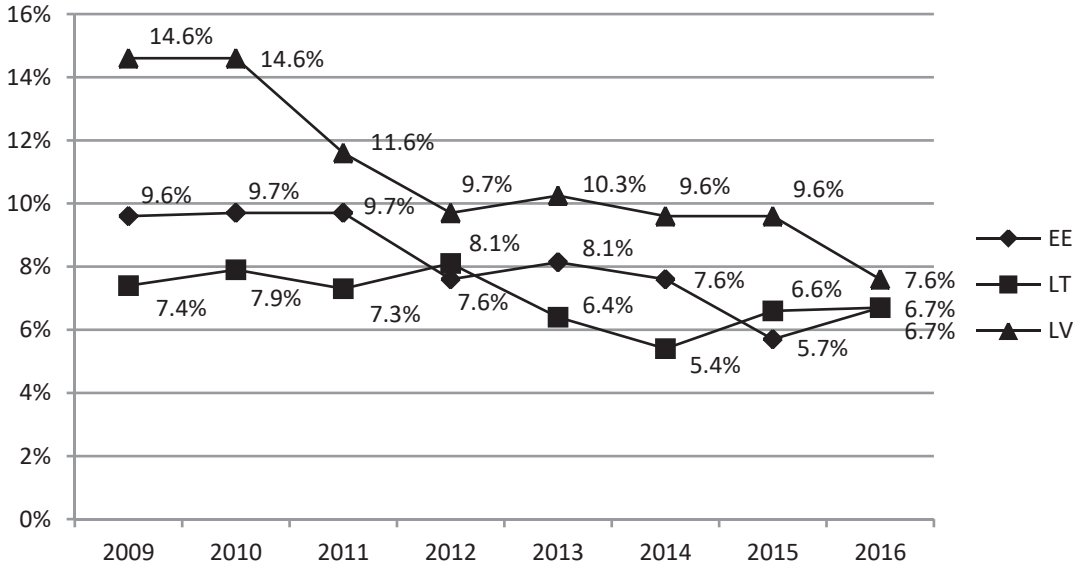

Figure 5. Underreporting of the number of employees (percentage of the actual number of employees) between 2009-2016.

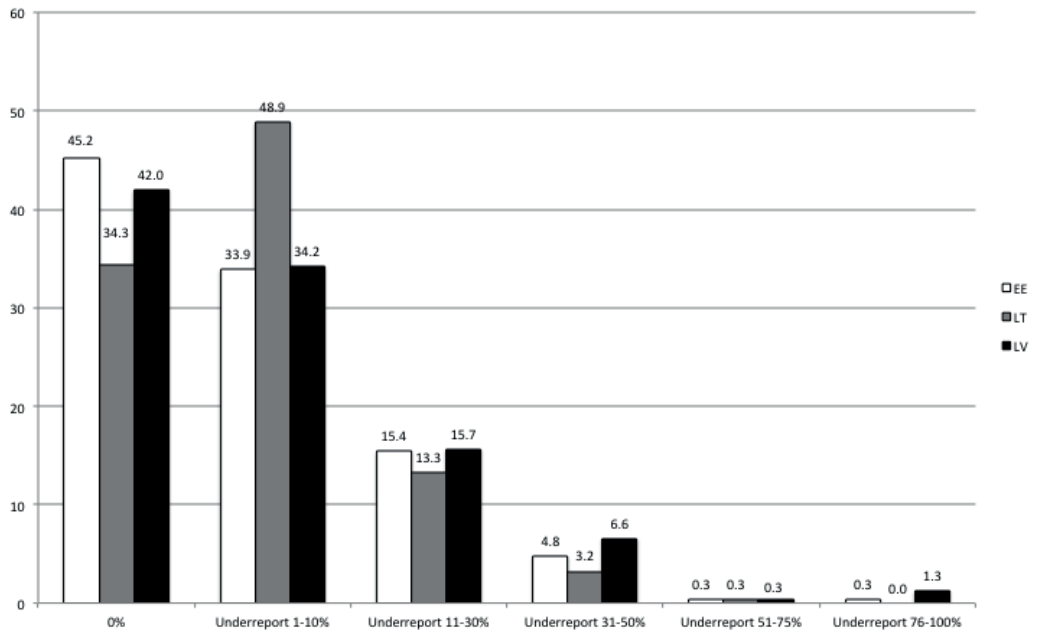

Figure 6. Underreporting of the number of employees in 2016. The vertical axis measures the percentage of each country's respondents underreporting within the range given on the horizontal axis.

Figures 7 and 8 report estimates of underreporting of salaries or so called 'envelope wages' as a proportion of the true wage. Figure 7 indicates that after steadily decreasing in the period from 2010-2015, the tendency to pay envelope wages in Latvia has slightly increased in 2016 as compared to 2015 and now accounts for 18.1% of wages (17.9% in 2015). Envelope wages in 2016 in all three Baltic countries are at a relatively similar level (in the range of 15.4%-18.1% of wages). Figure 8 shows that companies in all three Baltic countries most often underreport 11%-30% of actual salaries.

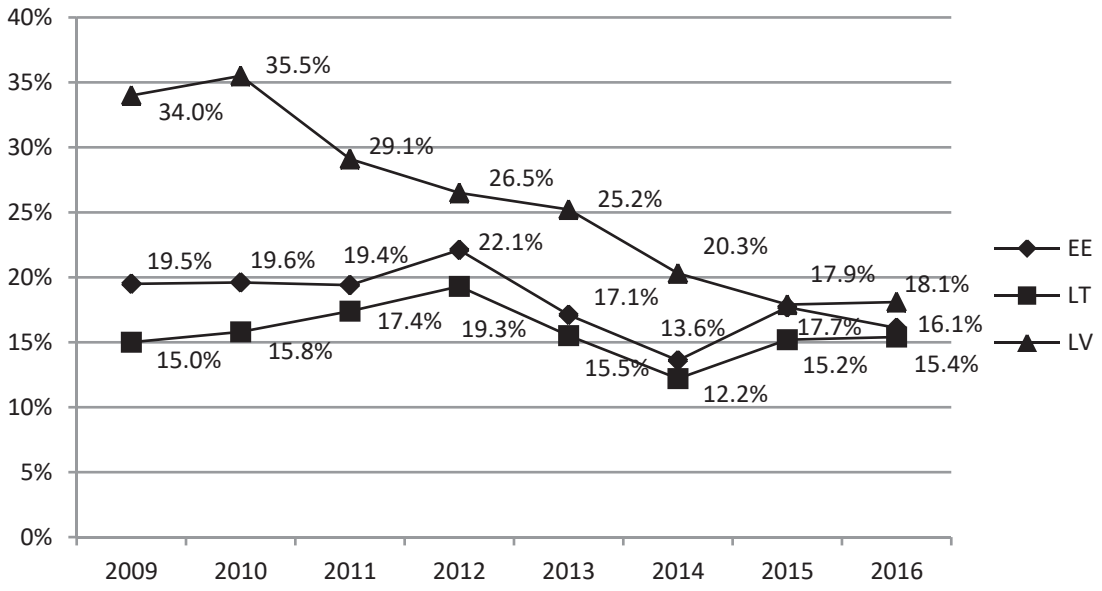

Figure 7. Underreporting of salaries (percentage of actual salaries) between 2009-2016.

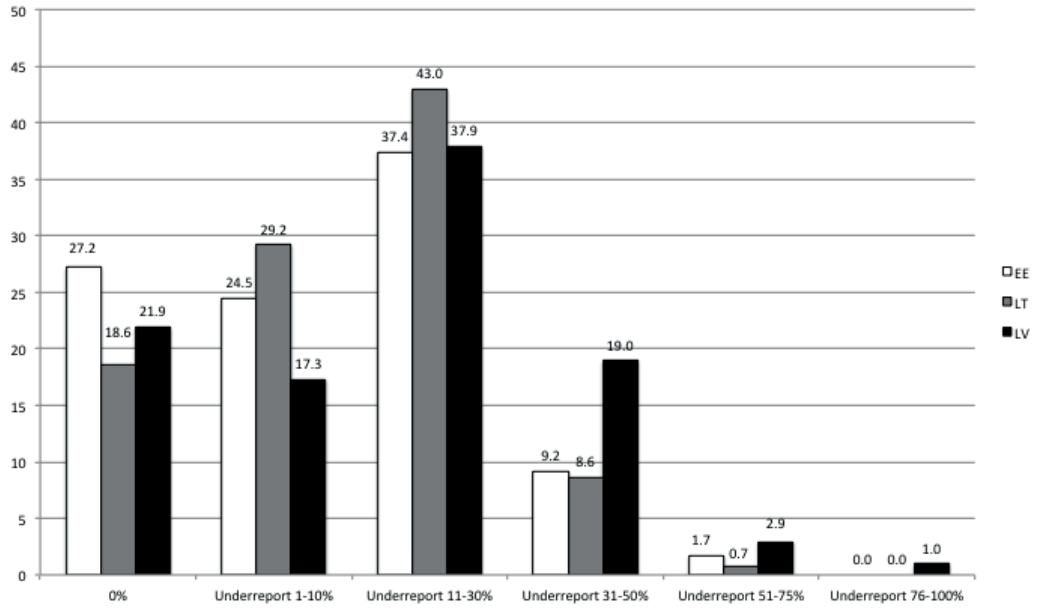

Figure 8. Underreporting of salaries in 2016. The vertical axis measures the percentage of each country's respondents underreporting within the range given on the horizontal axis.

Altogether, the findings reported in Figures 3 to 8 lead to the conclusion that the levels of envelope wages and unreported employees are relatively similar in the three countries in 2016, and the main reason for the larger shadow economy in Latvia is more underreporting of business income. This is an area in which policy makers should continue to focus their attention in developing and implementing strategies to decrease the size of the shadow economy in Latvia.

Figure 9 indicates that the magnitude of bribery (percentage of revenue spent on "getting things done") has decreased considerably in Lithuania during 2016, down to 9.8% of revenue. Bribery in Lithuania nevertheless remains more widespread (greater percentage of revenue) than in the other Baltic countries. Bribery is also estimated to have decreased in Latvia (from 7.6% in 2015 to 6.5% in 2015), but slightly increased in Estonia (from 3.0% in 2015 to 3.6% in 2016).

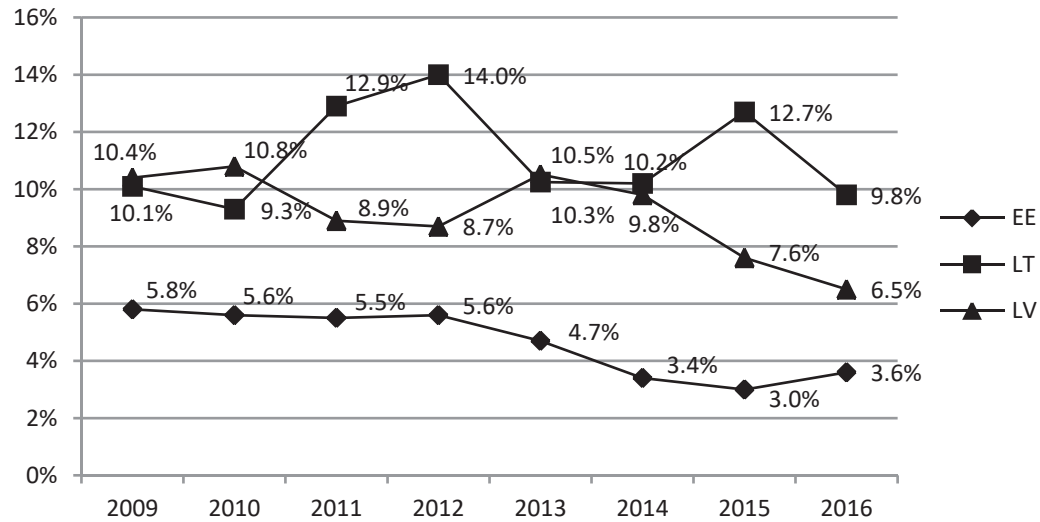

Figure 9. Bribery (percentage of revenue spent on payments 'to get things done') between 2009-2016.

Figure 10 illustrates trends in the percentage of the contract value that firms typically offer as a bribe to secure a contract with the government. Similar to the general level of bribery reported in Figure 9, the level of government bribery has decreased considerably in Lithuania (8.1% in 2016 as compared to 11.5% in 2015) but remains higher than in Latvia and Estonia. The estimated level of the government bribery has decreased also in Latvia (3.9% in 2016 as compared to 4.5% in 2015), but increased slightly in Estonia (4.8% in 2016 as compared to 4.5% in 2015). Thus, the overall conclusion is that while Latvia stands out from the three countries as having the largest shadow economy, Lithuania stands out as having the most bribery.

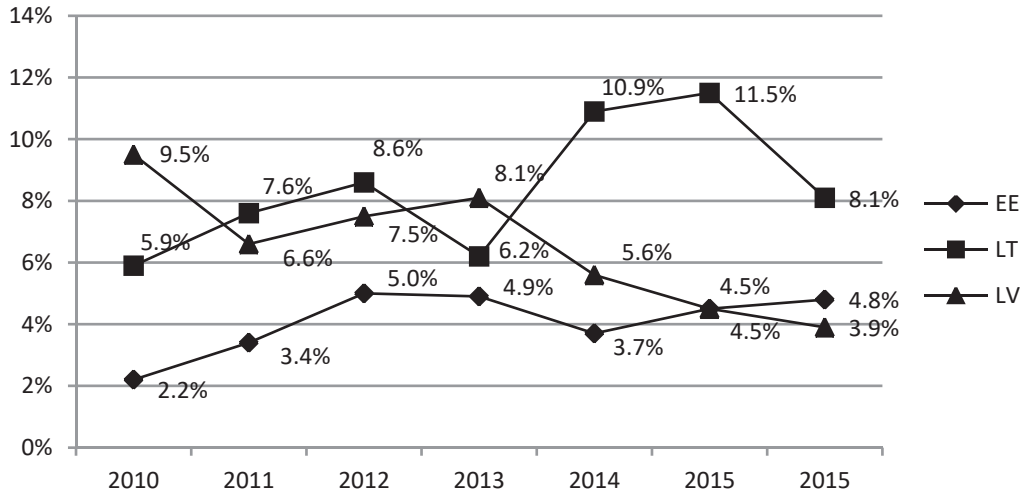

Figure 10. Percentage of the contract value paid to government to secure the contract, 2010-2016.

Finally, we also measure the proportion of unregistered enterprises in the Baltic countries (since 2013). Unregistered businesses are not included in the Shadow Economy Index. According to our data (Table 2), the proportion of unregistered enterprises in 2016 is largest in Lithuania (8.4% of all enterprises), followed by Estonia (6.1%) and Latvia (5.3%).

Table 2. Proportion of unregistered enterprises in the Baltic countries 2013-2016

This table reports point estimates and 95% confidence intervals of unregistered enterprises as a percentage of all enterprises in Estonia, Latvia, and Lithuania.

	Estonia	Latvia	Lithuania
2016	**6.1%** **(5.1%, 7.1%)**	**5.3%** **(4.1%, 6.5%)**	**8.4%** **(7.5%, 9.4%)**
2015	5.8% (4.5%, 7.1%)	5.2% (4.1%, 6.3%)	7.3% (6.5%, 8.1%)
2014	6.3% (4.5%, 8.2%)	5.6% (4.5%, 6.7%)	5.2% (4.5%, 6.0%)
2013	7.6% (5.4%, 9.9%)	5.4% (4.2%, 6.6%)	6.2% (5.3%, 7.1%)

4. Determinants of shadow activity

In this section we examine the factors that influence firms' decisions to participate in the shadow economy. We start by reporting the size of the shadow economy by company characteristics including operating region, sector and firm size. Next, we report descriptive statistics of how the size of the shadow economies varies with attitudes and perceptions towards tax evasion. We explore entrepreneurs' tax morale, perceived probability of being caught and potential consequences, entrepreneurs' satisfaction with the government and tax authority, social identity, as well as strength of institutional environment in all three Baltic countries. Finally, we use regression analysis to identify the drivers of firms' involvement in the shadow economy, while controlling for a range of factors.

4.1. Company characteristics

To examine how the size of the shadow economy varies by sector, region, and company size, we pool data from the past three years and calculate average levels of shadow economy in several categories. This is done to obtain a sufficient number of observations in each category to ensure that the shadow economy estimates within categories are relatively reliable and not overly affected by outliers.

Figures 11-13 report the size of the shadow economy by region, in Estonia, Latvia, and Lithuania. Figure 11 shows that the highest levels of shadow activity in Latvia during the period of 2014-2016 are in the Kurzeme and Riga regions (27.2% and 27.1%, respectively), followed by Latgale. In Lithuania, there is less variation across regions and in contrast to Latvia, the Lithuanian capital (Vilnius) has a relatively low level of shadow activity compared to other regions in Lithuania (Figure 12). In Estonia, the Voru region in the country's south-east (bordering with Latvia and Russia) stands out as having the highest level of shadow activity (40.8%) (Figure 13).

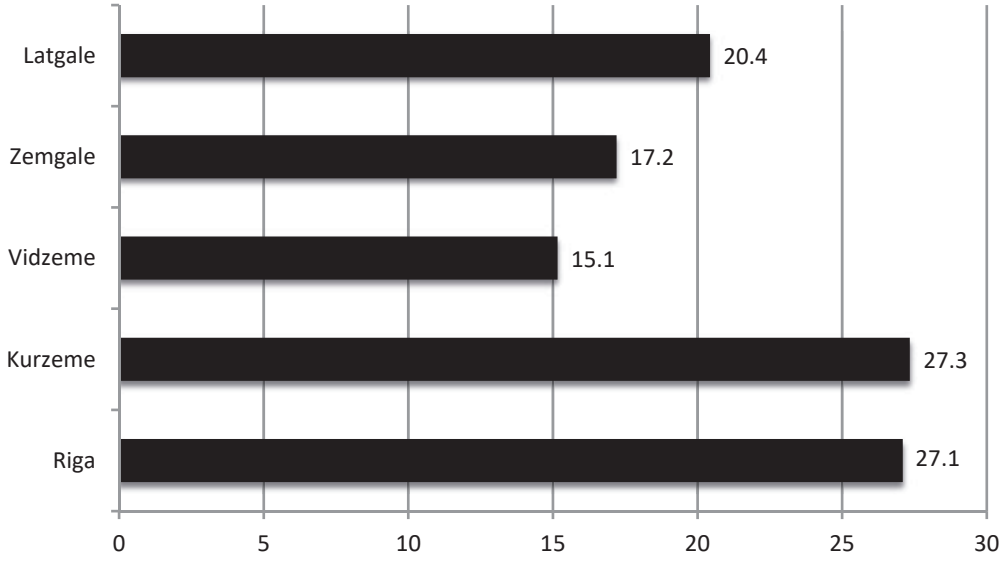

Figure 11. Size of the shadow economy (% of GDP) by region in Latvia (average 2014-2016).

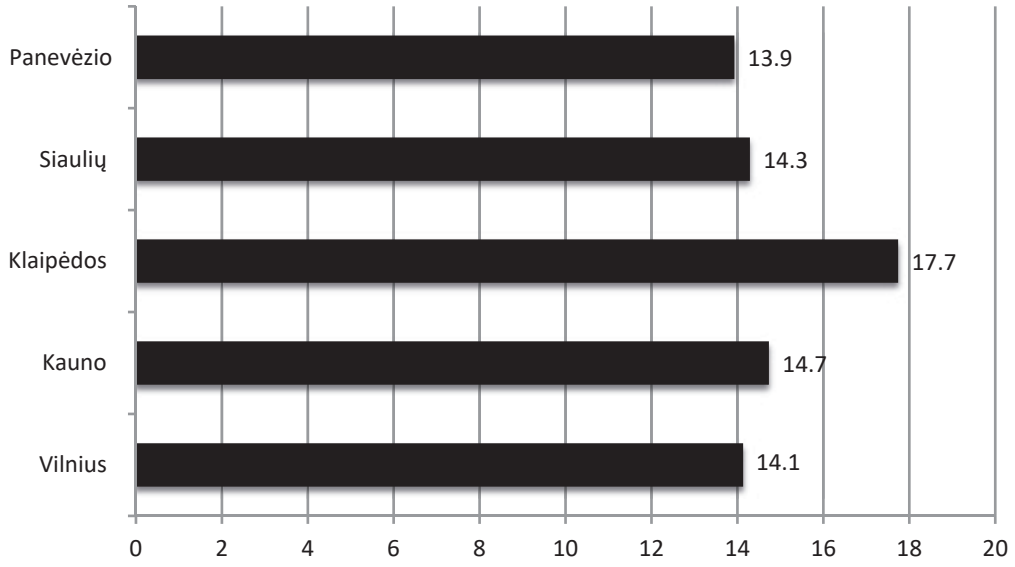

Figure 12. Size of the shadow economy (% of GDP) by region in Lithuania (average 2014-2016).

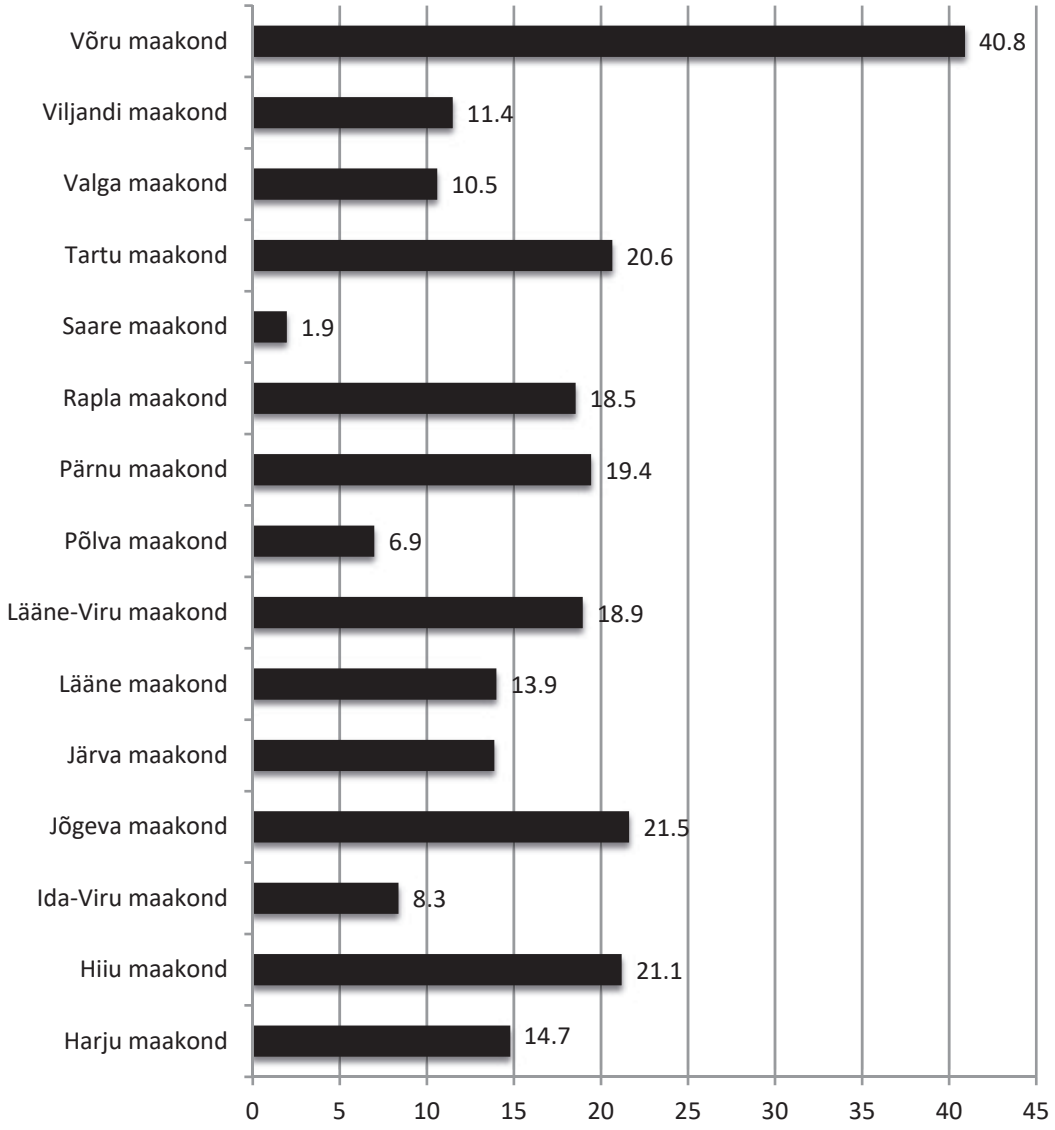

Figure 13. Size of the shadow economy (% of GDP) by region in Estonia (average 2014-2016).

Figure 14 summarizes how the size of the shadow economy varies by sector. Figure 14 shows that during the period of 2014-2016, in Latvia by far the highest level of shadow activity is in the construction sector (40.0%), followed by retail (24.9%). In Lithuania and Estonia the highest levels of shadow activity is also in the construction sector, although at a level that is only about half that of the Latvian construction sector (i.e., approximately 20%). The construction sector overall and in Latvia in particular stands out as a significant contributor to the shadow economy.

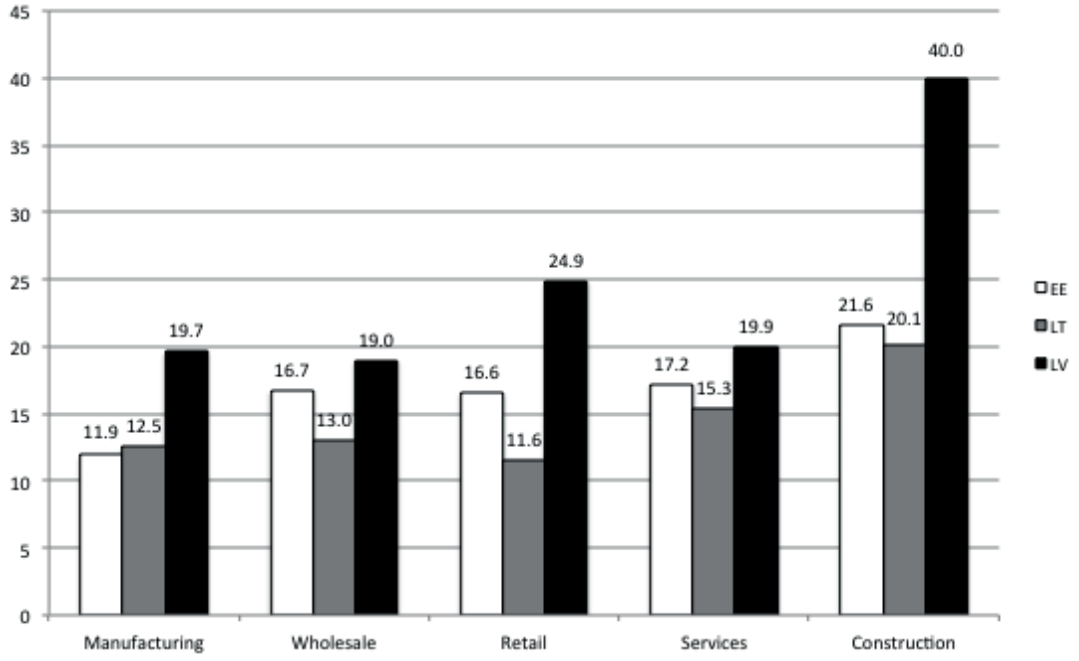

Figure 14. Size of the shadow economy (% of GDP) by sector (average 2014-2016).

Figure 15 shows that although there is a tendency for the level of shadow activity to be higher in smaller companies, shadow activity is not a phenomenon that can only be observed in relatively small companies. In all three Baltic countries a relatively high level of shadow activity occurs in companies that employ 51-200 employees and 200+ employees. Figure 15 also shows that the level of shadow activity is relatively similar across size categories, with a modest tendency for higher levels in smaller companies.

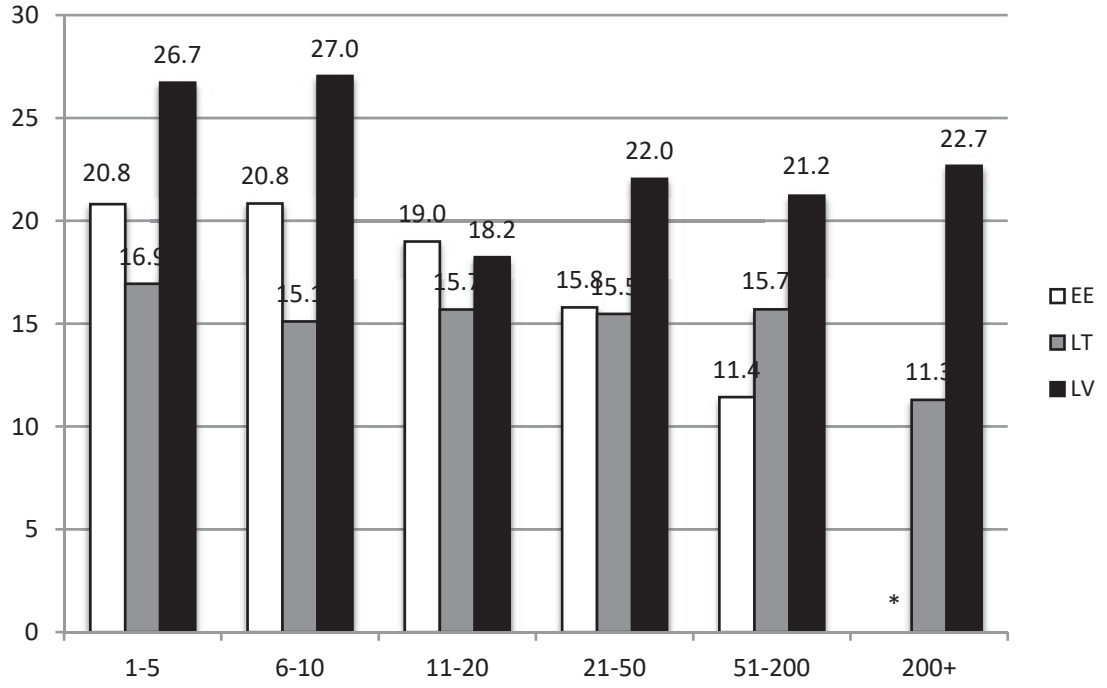

Figure 15. Size of the shadow economy (% of GDP) by firm size (number of employees), average 2014-2016.

** Insufficient observations for Estonia in the category 200+*

4.2. How attitudes and perceptions affect shadow activity

According to the tax evasion literature, the decision to evade taxes and participate in the shadow economy is affected by the detection rates, the size and type of penalties, tax morale, firms' attitudes towards risk-taking, strength of the institutional framework, and so on. We measure these factors in the survey. In this section, we report how they vary across the Baltic countries and through time.

4.2.1. Probability of being caught and potential consequences

Rational-choice theory of crime (e.g., Becker, 1968), applied to tax evasion, argues that individuals make decisions about whether or not to evade taxes by weighing up the expected benefits of not paying taxes on one hand against the risk of being caught and the penalties if caught on the other (e.g., Allingham and Sandmo, 1974; Yitzhaki, 1974).

To measure such influences, we include questions about entrepreneurs' perceptions of the likelihood of being caught for underreporting business profits, number of employees, and salaries, as well as involvement in bribery. We also ask entrepreneurs to evaluate potential consequences for the firm if it were caught for deliberate misreporting. Figures 16-20 summarise the results on perceived probabilities of being caught and expected consequences.

The results suggest that entrepreneurs in all three Baltic countries perceive the risk of being caught when underreporting income, salaries and employees is relatively high (Figures 16-19). As many as 46.5% of respondents in Lithuania and 44.1% of respondents in Latvia report that the probability of being caught for underreporting profits is 76-100% (Figure 16). These numbers were even higher in 2015 and 2014 for Lithuania when 52.6% and 65.8% reported such a high detection probability, respectively. A relatively high number of respondents in Lithuania and Latvia also perceive a very high probability of being caught

for underreporting employees (52.9% and 47.7%, respectively, Figure 17). In contrast, in Estonia only approximately 30% respondents report such a high probability of being caught while underreporting business profits or number of employees in 2016. 42.1% of respondents in Lithuania, 34.1% in Latvia, and 29.6% in Estonia report that the probability of being caught for underreporting salaries is 76-100% (Figure 18). The probability of being caught bribing is perceived to be lower in Latvia, where 34.6% of respondents claim that the likelihood to be caught is 1-10% (Figure 19).

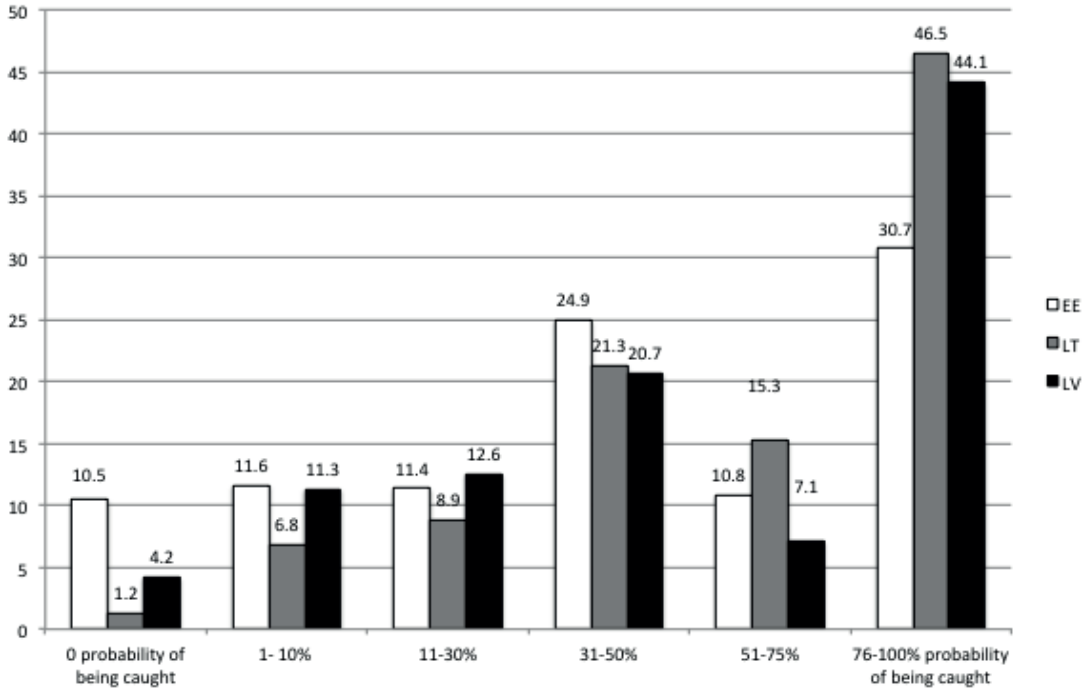

Figure 16. Probability of being caught for underreporting business profits, 2016. Vertical axis measures percentage of each country's respondents in each category.

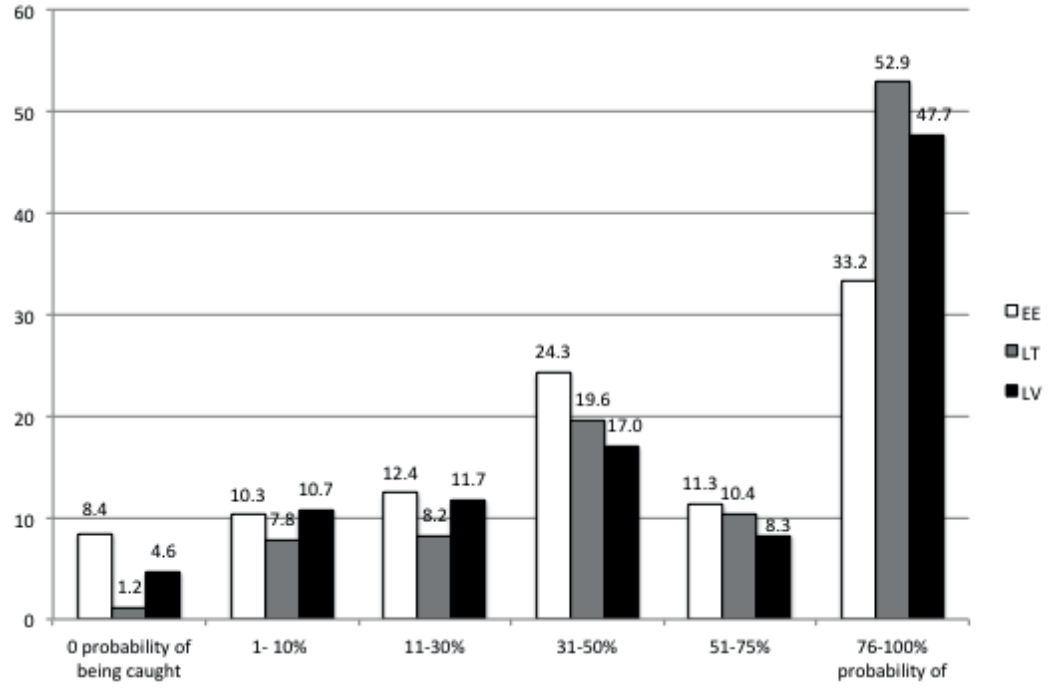

Figure 17. Probability of being caught for underreporting number of employees, 2016. Vertical axis measures percentage of each country's respondents in each category.

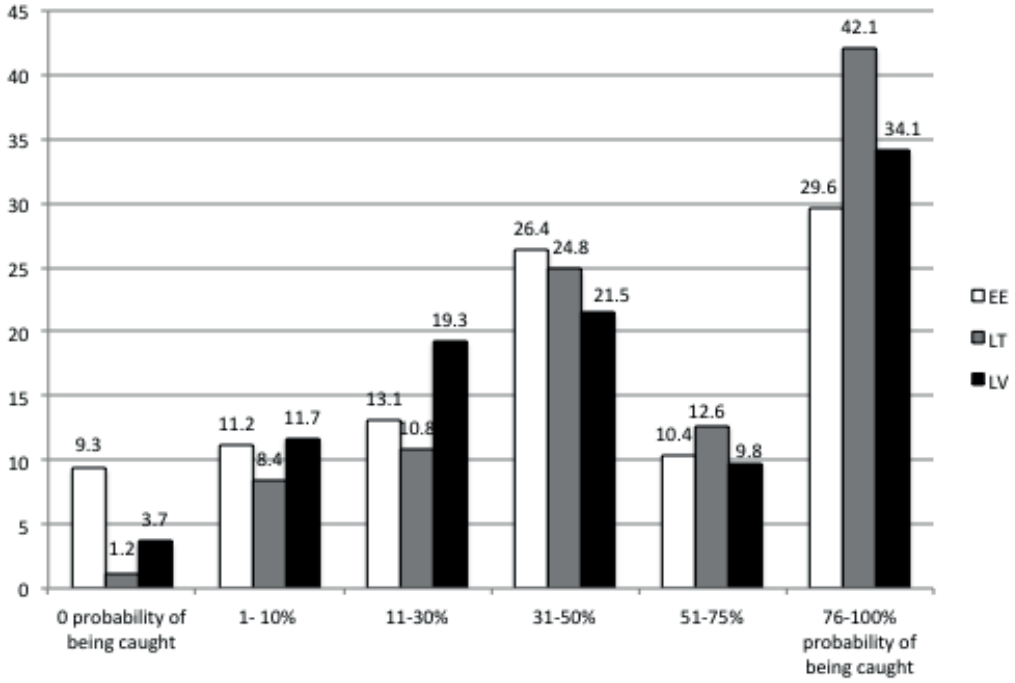

Figure 18. Probability of being caught for underreporting salaries, 2016. Vertical axis measures percentage of each country's respondents in each category.

Figure 20 shows that the expected penalties for deliberate misreporting are similar in Latvia and Lithuania, where approximately 40% of respondents (as compared to 31.6% in Estonia) expect that the penalty would be a serious fine that would impact on competitiveness. In 2016, similar to 2015, almost one third of respondents in Estonia claim that 'nothing serious' or only small fine can be expected. The proportion of responses from entrepreneurs in Latvia and Lithuania within those categories is lower. A similar proportion of respondents in each of the Baltic countries (approximately 20%) perceive the penalty for tax evasion to be so severe that the company will have to cease operations if caught deliberately underreporting.

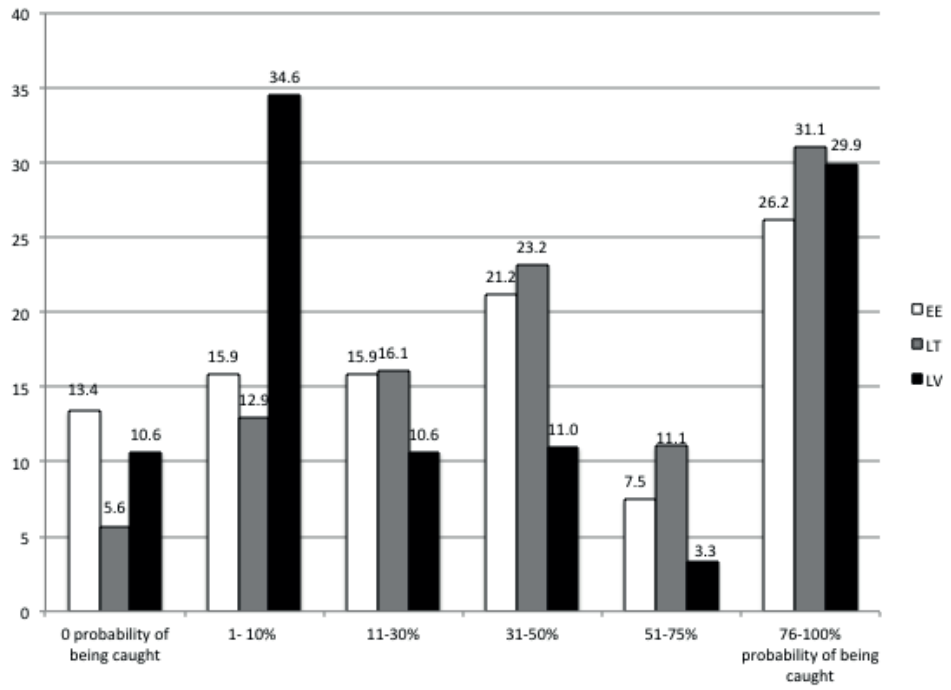

Figure 19. Probability of being caught for making payments to 'get things done', 2016. Vertical axis measures percentage of each country's respondents in each category.

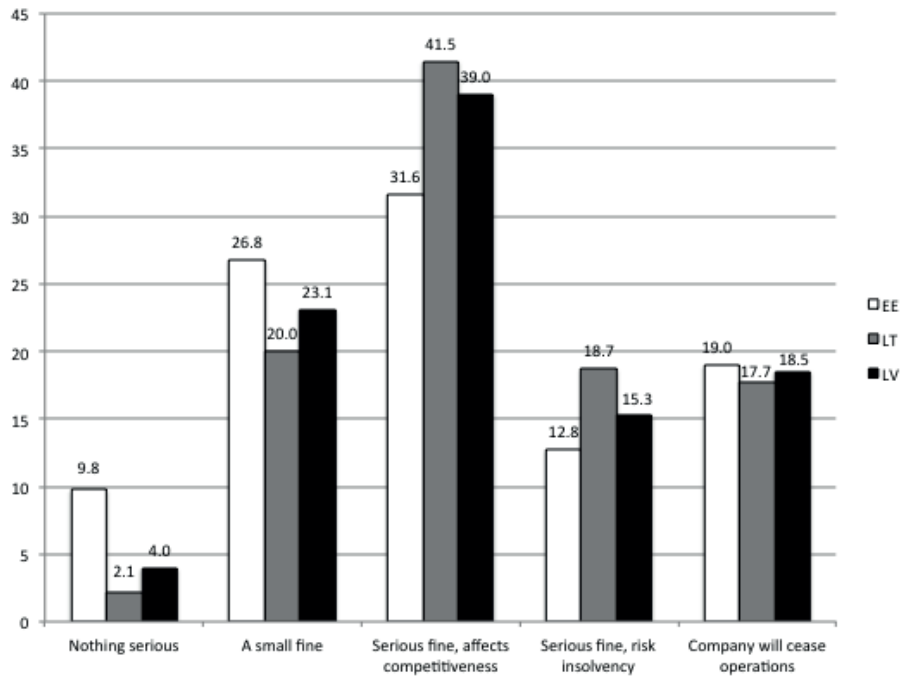

Figure 20. Most likely consequences if caught deliberately underreporting, 2016. Vertical axis measures percentage of each country's respondents in each category.

4.2.2. Tax morale

Existing empirical evidence suggest that higher levels of tax morale lead to less involvement in tax evasion (Blanthorne and Kaplan, 2008; Wenzel, 2005) thus smaller shadow economies at the aggregate level (Torgler and Schneider, 2009; Halla, 2012). Tax morale is usually defined as a moral obligation to pay taxes and "a belief in contributing to society by paying taxes" (Torgler and Schneider 2009: 230). Overall, tax morale has been recognized as a complement to conventional rational choice explanations of tax evasion (e.g., Allingham and Sandmo, 1974; Yitzhaki, 1974). Empirical studies find that the actual amount of tax evasion is considerably lower than predicted by rational choice models. The difference is often attributed to the second, broader, set of tax evasion determinants—attitudes and social norms, including tax morale. According to Alm and Torgler (2011: 636): "… it is not possible to understand fully an individual's compliance decisions – or indeed, an individual's choices more broadly – without considering in some form these ethical dimensions and their implications for behaviour."

We measure tax morale through a series of questions that elicit company managers' views about tax evasion. The first of these questions asks managers to what extent they would agree or disagree with the statement: "Companies in your industry would think it is always justified to cheat on tax if they have the chance" (Q22b in Appendix 1) using scale from 1 ('strongly disagree') to 5 ('strongly agree'). This question is an adjusted version of the World Values Survey (WVS) question that has been used widely in research on tax evasion (Torgler, 2016).[11]

Figures 21 and 22 report the results, with country means in Figure 21 and response distributions in Figure 22. Our estimates suggest that level of tax morale is relatively high in all Baltic countries. Estonia has the highest level of tax morale (1.60, on scale from 1-5 where '1' is very high tax morale and '5'

[11] Instead of asking the question directly, i.e., whether respondent think it is justifiable to cheat on tax if one has the chance (as it is done in the WVS survey), we phrase question indirectly, for the same reasons as we phrase the other questions relating to tax evasion indirectly.

is very low tax morale), followed by Latvia (1.81), and then Lithuania (2.17). Accordingly, Figure 22 shows that proportionally more respondents in Estonia and Latvia answered the question with '1' (very high tax morale) as compared to respondents in Lithuania.

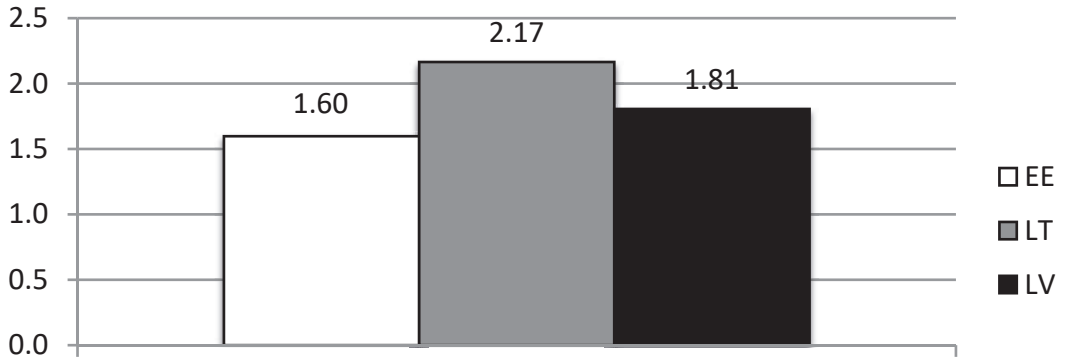

Figure 21. Tax morale, justification to cheat on taxes if there is a chance, 2016.

This Figure displays country averages measured from 1-5, where '1' is very high tax morale and '5' is very low tax morale.

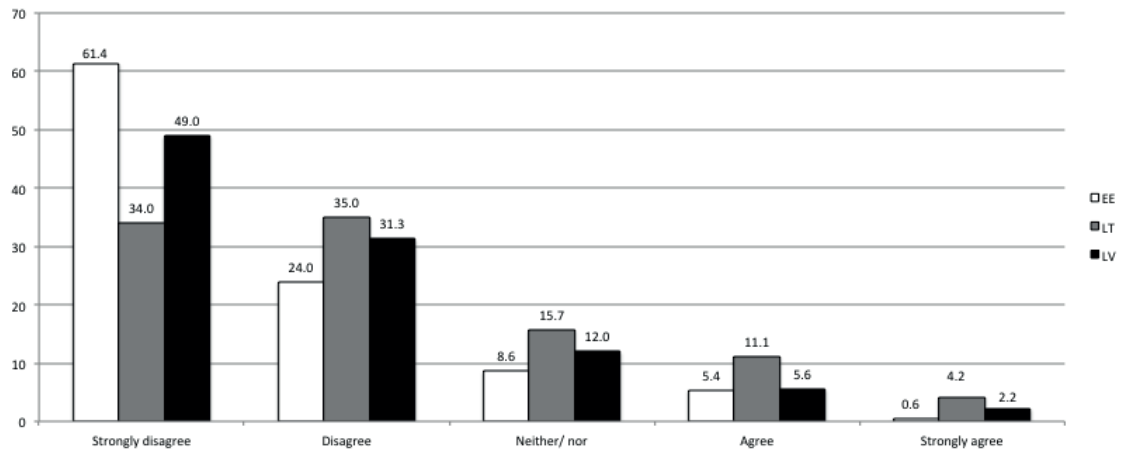

Figure 22. Tax morale: justification to cheat on taxes if there is a chance, 2016. Vertical axis measures percentage of each country's respondents in each category.

Another, somewhat more general way of measuring the level of the tax morale, is by assessing the extent to which entrepreneurs tolerate involvement in the shadow economy (Luttmer and Singhal, 2014). Since 2010, we measure this aspect of tax morale by asking respondents whether they believe that tax avoidance is tolerated behaviour in their country (Q5 in Appendix 1). According to this measure, tax morale is higher in Estonia and Latvia, as compared to Lithuania (similar to the previous measure). Yet, the results suggest that Latvian managers believe that tax evasion is less tolerated than do Estonian managers (2.16 and 2.47 in 2016, respectively, measured on 1-5 point scale where '1' means less tolerance and thus higher tax morale). Tolerance towards tax evasion in Lithuania is 2.87 in 2016 (Figure 23). Figure 25 also shows that the level of tax morale in all three Baltic countries has increased in 2016 compared to 2015. The distribution of responses to the statement "tax avoidance is tolerated behaviour" is presented in Figure 24.

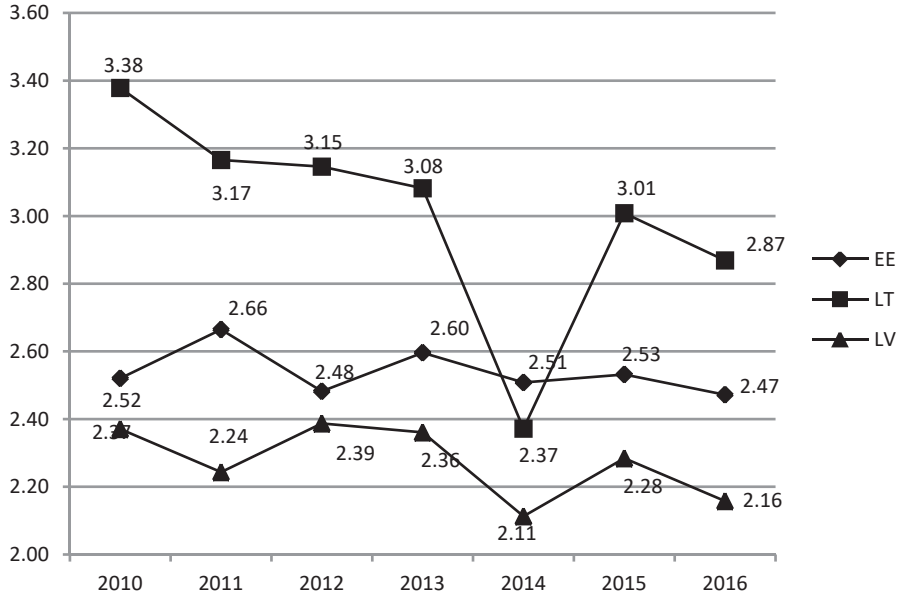

Figure 23. Tax morale: tolerance towards tax avoidance, 2016.

This Figure displays country averages measured from 1-5, where '1' means that the respondent strongly disagrees that tax avoidance is tolerated behaviour (higher tax morale), and '5' means that the respondent strongly agrees that tax avoidance is tolerated behaviour (lower tax morale).

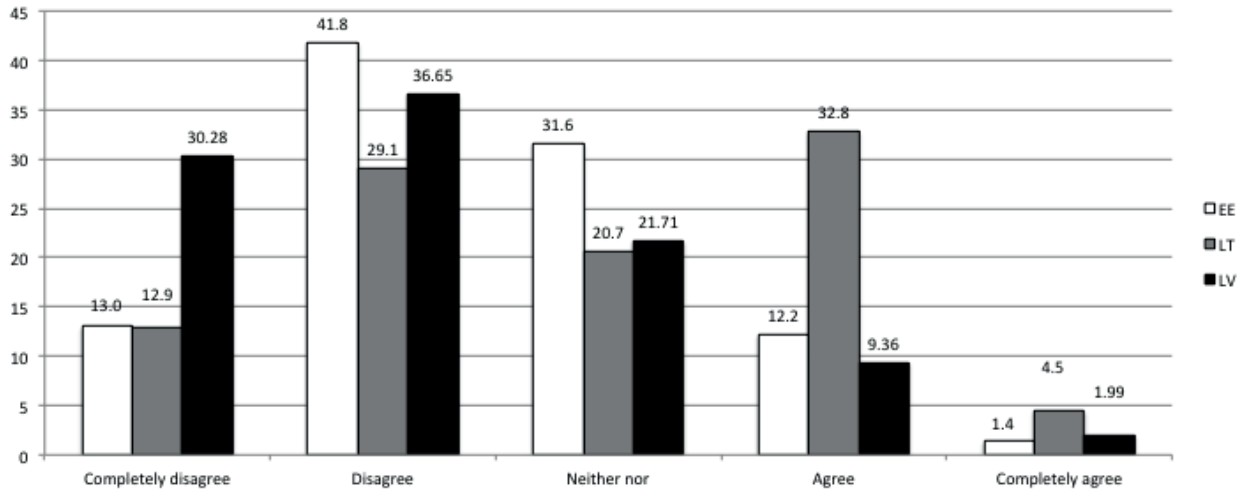

Figure 24. Tax morale: tolerance towards tax avoidance, 2016. Vertical axis measures percentage of each country's respondents in each category.

We also ask respondents whether they believe that bribery is tolerated behaviour in their country using the same measurement scale as in the previous question. Even though tolerance towards bribery might not be directly related to tax morale as defined above, it can still have an influence on the shadow economy. Figures 25 and 26 present the results, with country means in Figure 25 and the distributions of responses in Figure 26. Similar to tolerance of tax evasion, bribery is also less tolerated in Latvia and Estonia than in Lithuania. In Lithuania, consistent with a higher overall level of bribery (Figure 9), bribery is also more tolerated (3.01, on a scale where '1' means least tolerance, compared to 2.30 in Estonia and 1.84 in Latvia).

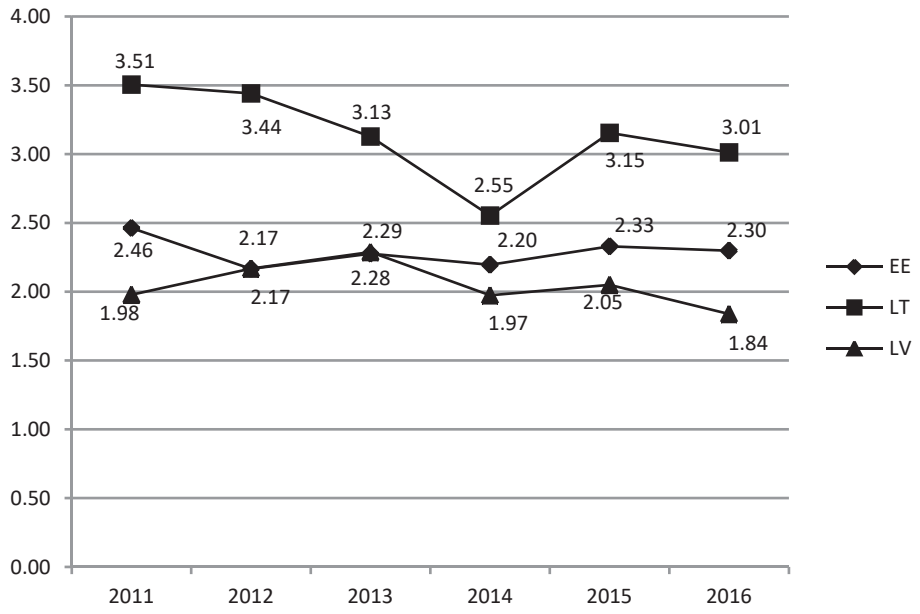

Figure 25. Responses to statement, "bribery is tolerated behaviour", 2016.

This Figure displays country averages measured from 1-5, where '1' means that the respondent strongly disagrees that bribery is tolerated behaviour (higher tax morale), and '5' means that the respondent strongly agrees that bribery is tolerated behaviour (lower tax morale).

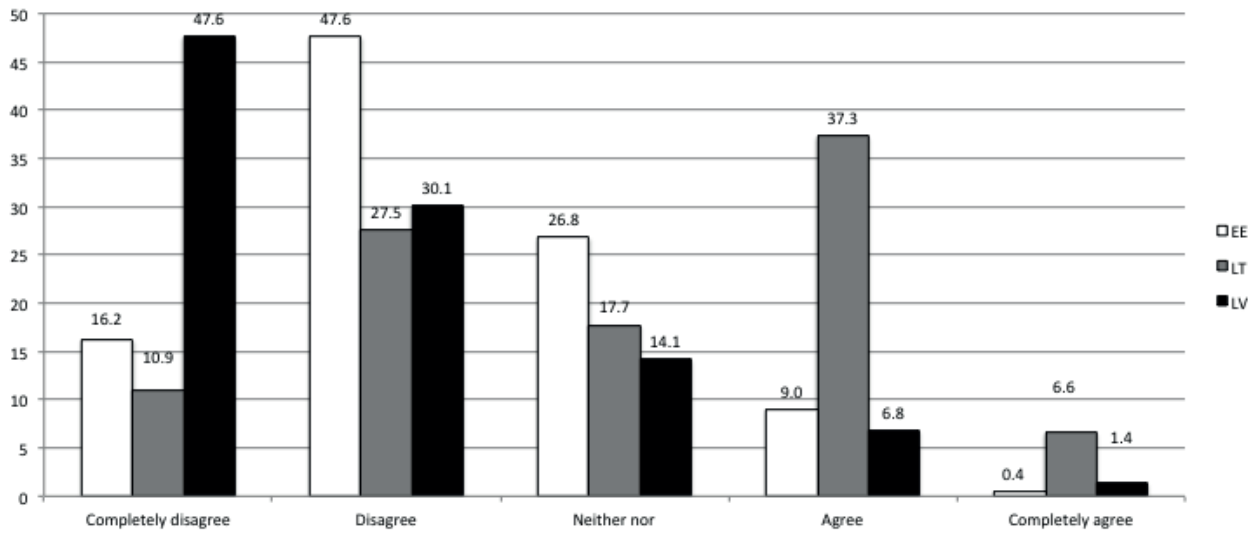

Figure 26. Responses to statement, "bribery is tolerated behaviour", 2016. Vertical axis measures percentage of each country's respondents in each category.

In summary, the results suggest Latvia and Estonia have higher tax morale than Lithuania. Yet, the size of the shadow economy in Latvia is larger than in Estonia and Lithuania. This finding suggests that several other factors have a (more) significant influence on the level of shadow activity. These factors are further explored in the following subsections.

4.2.3. Satisfaction the government and tax authority

An increasing number of studies show that trust in public officials (e.g., Torgler, 2003) as well as entrepreneurs' satisfaction with tax policies and business legislation (e.g. Marien and Hooghe, 2011;

Scholz and Lubell, 1998; Torgler, Schaffer and Macintyre, 2010) are among the factors that foster higher tax compliance. Distrust and dissatisfaction are associated with higher levels of shadow activity. We measure firms' attitudes using four questions about their satisfaction with the State Revenue Service, the government's tax policy, business legislation, and the government's support for entrepreneurs (Q1-Q4 in Appendix 1). The dynamics of satisfaction for the years 2010-2016 (country averages, measured on the scale from 1-5, where '1' is very low satisfaction and '5' is very high satisfaction) are presented in Figures 27-30. The distributions of responses in 2016 are shown in Figures 31-34.

Following the pattern observed since 2010, across all three countries, firms in 2016 tend to be more satisfied with the State Revenue Service (SRS) than the government's tax policy, business legislation, and the government's support for entrepreneurs. As illustrated in Figures 27 and 31, satisfaction with the SRS in Latvia has decreased in 2016 as compared to the period from 2012- 2015. Following an increase in 2015, satisfaction with the SRS has also decreased in Lithuania in 2016. In Estonia, satisfaction with the SRS in 2016 remains on similar level as in 2015.

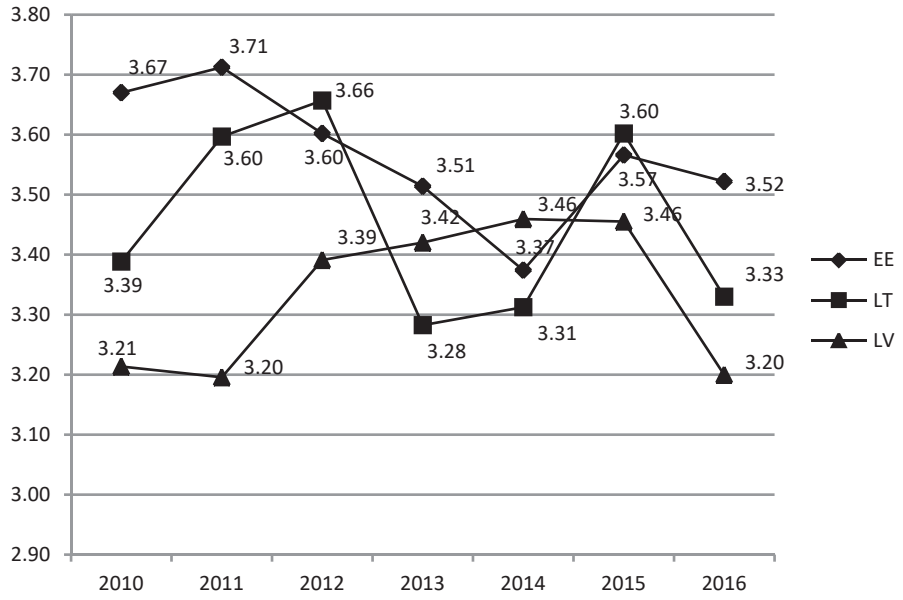

Figure 27. Satisfaction with State Revenue Service, 2010-2016.

This Figure displays country averages through time, measured on a scale from 1-5, where '1' is very low satisfaction and '5' is very high satisfaction.

Following the trend since 2014, company managers' satisfaction with tax policy in Latvia has also considerably decreased (2.08 in 2016, compared with 2.43 in 2015) and is the lowest among the Baltic countries (Figure 28). Satisfaction with tax policy has also decreased in Estonia to 2.57, whereas in Lithuania this indicator has slightly increased, reaching 2.81 in 2016 (Figure 28). More than 75% of respondents in Latvia stated that are either very unsatisfied or unsatisfied with tax policy and, compared to only 40% in Lithuania and 45% in Estonia. This result should provide a clear signal for policymakers in Latvia that company managers are relatively dissatisfied with tax policy. This is also likely to be one of the factors that contributes to the relatively larger size of the shadow economy in Latvia.

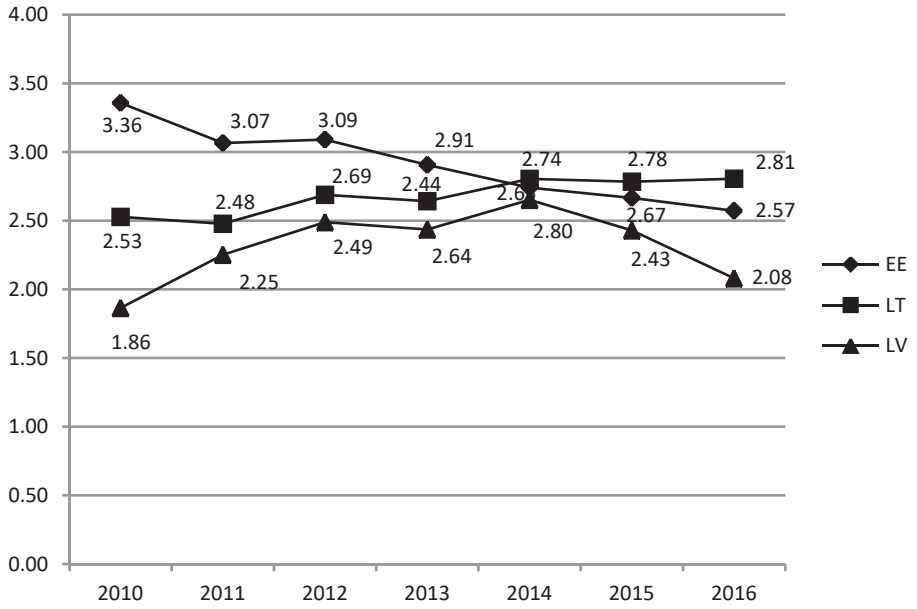

Figure 28. Satisfaction with tax policy, 2010-2016.

This Figure displays country averages through time, measured on a scale from 1-5, where '1' is very low satisfaction and '5' is very high satisfaction.

Satisfaction of company managers with business legislation is higher than with tax policy (Figure 29). Its average in 2016 is 2.72 in Latvia and 2.84 in Lithuania, with both countries having experienced a decrease in 2016. Satisfaction with business legislation in Estonia has slightly increased in 2016, reaching an average of 3.10. As further reported in Figure 33, more respondents in Latvia and Lithuania fall in the categories of 'unsatisfied' and less in 'satisfied' as compared to Estonia.

Figure 34 shows that in all countries, a larger number of firms are dissatisfied with the government's support to entrepreneurs than are satisfied, somewhat mirroring the general dissatisfaction with tax policy. Compared with previous years, this dissatisfaction with government support in 2015 and 2016 has become particularly strong in Estonia (Figure 30) and Latvia.

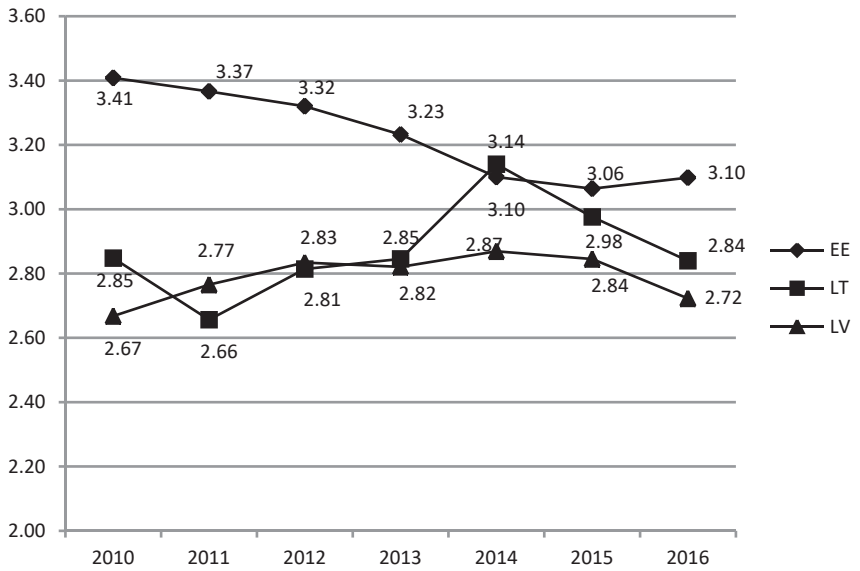

Figure 29. Satisfaction with business legislation, 2010-2016.

This Figure displays country averages through time, measured on a scale from 1-5, where '1' is very low satisfaction and '5' is very high satisfaction.

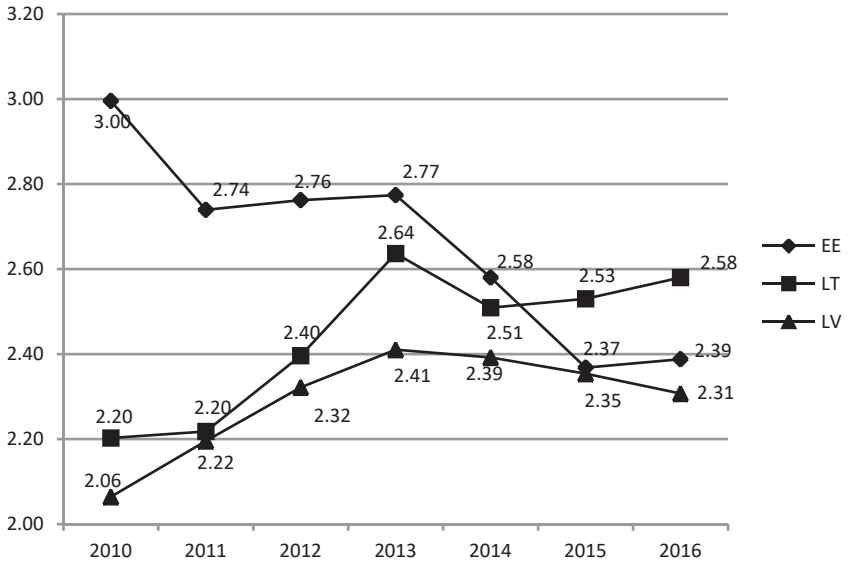

Figure 30. Satisfaction with government support, 2010-2016.

This Figure displays country averages through time, measured on a scale from 1-5, where '1' is very low satisfaction and '5' is very high satisfaction.

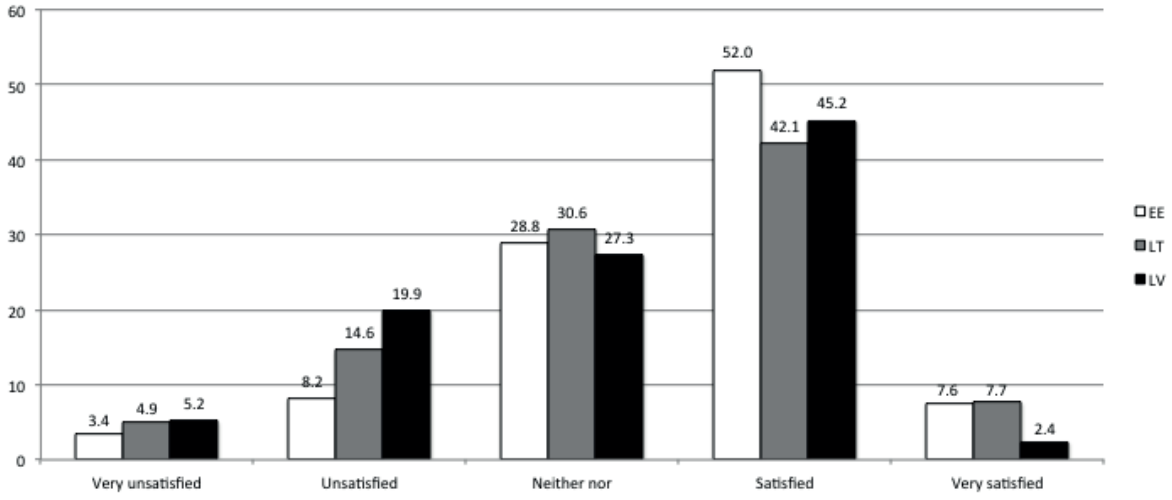

Figure 31. Satisfaction with State Revenue Service, 2016. Vertical axis measures percentage of each country's respondents in each category.

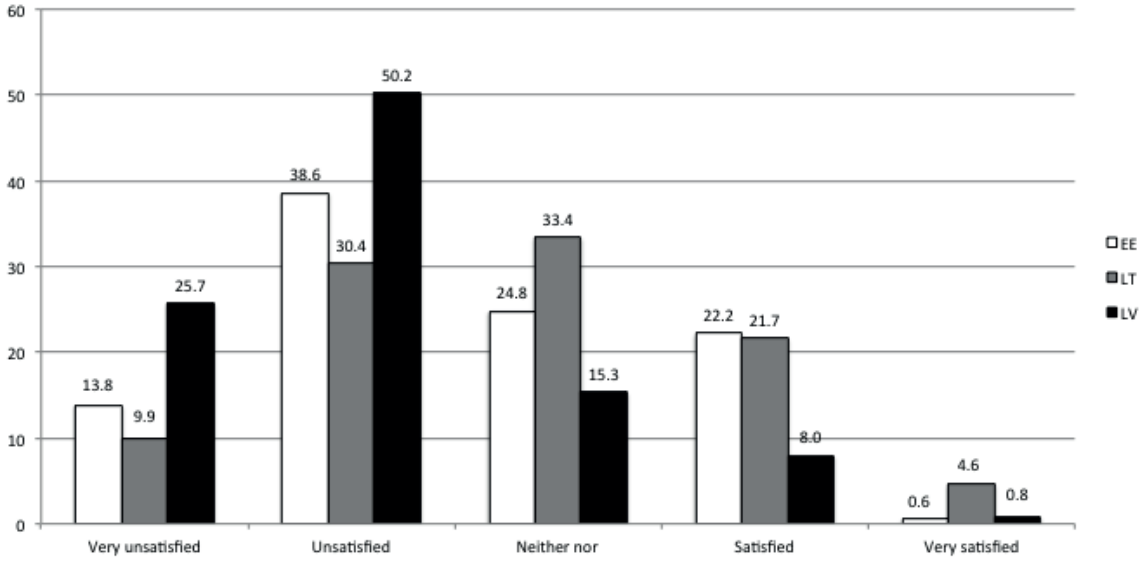

Figure 32. Satisfaction with the government's tax policy, 2016. Vertical axis measures percentage of each country's respondents in each category.

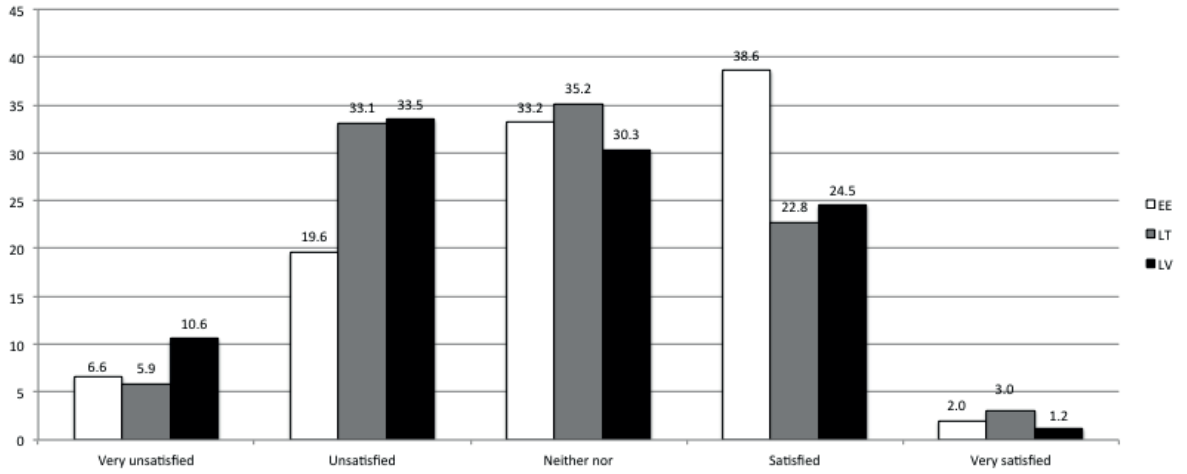

Figure 33. Satisfaction with the quality of business legislation, 2016. Vertical axis measures percentage of each country's respondents in each category.

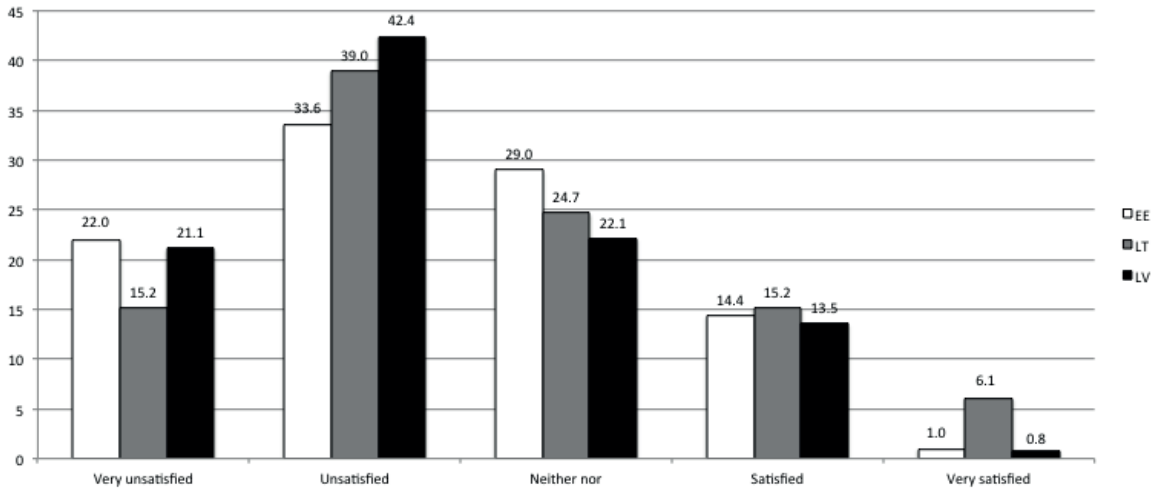

Figure 34. Satisfaction with the government's support to entrepreneurs, 2016. Vertical axis measures percentage of each country's respondents in each category.

4.2.4. Social identity

According to the cultural/cognitive perspective put forward by Scott (2014), involvement in the shadow economy may be driven by social identity, i.e., how entrepreneurs identify themselves within the country in which they pay taxes (Ashforth and Mael, 1989; Hogg et al., 1995). Several studies have found a direct link between stronger social identity, such as 'belonging to the state', and higher tax morale, leading to lower involvement in shadow economy activities (Heinemann, 2011; Konrad and Qari 2012; Martínez-Vázquez and Torgler 2009).

To measure social identity, we ask respondents to evaluate the extent to which they agree/disagree with the following statement: "Being a member of the local community is important to me." Their responses are measured on a scale of 1 to 5, where '1' is 'completely disagree' (low social identity) and '5' is 'completely agree' (high social identity). The results in Figures 35 and 36, show that community belonging is high in all three Baltic countries and in particular in Latvia, where 43.8% of respondents answered with 'completely agree' (Figure 36).

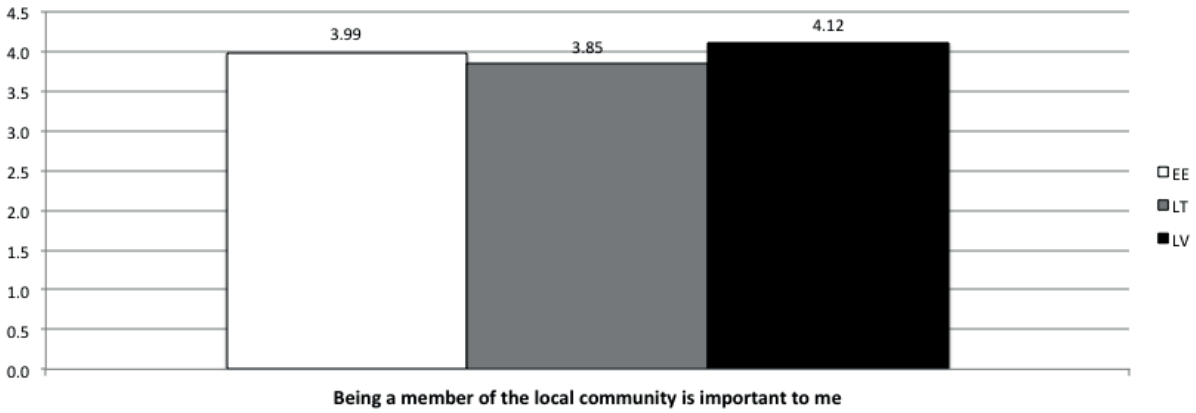

Figure 35. Perceived community belonging, 2016.

This Figure displays country averages measured from 1-5, where '1' is 'completely disagree' (low social identity) and '5' is 'completely agree' (high social identity).

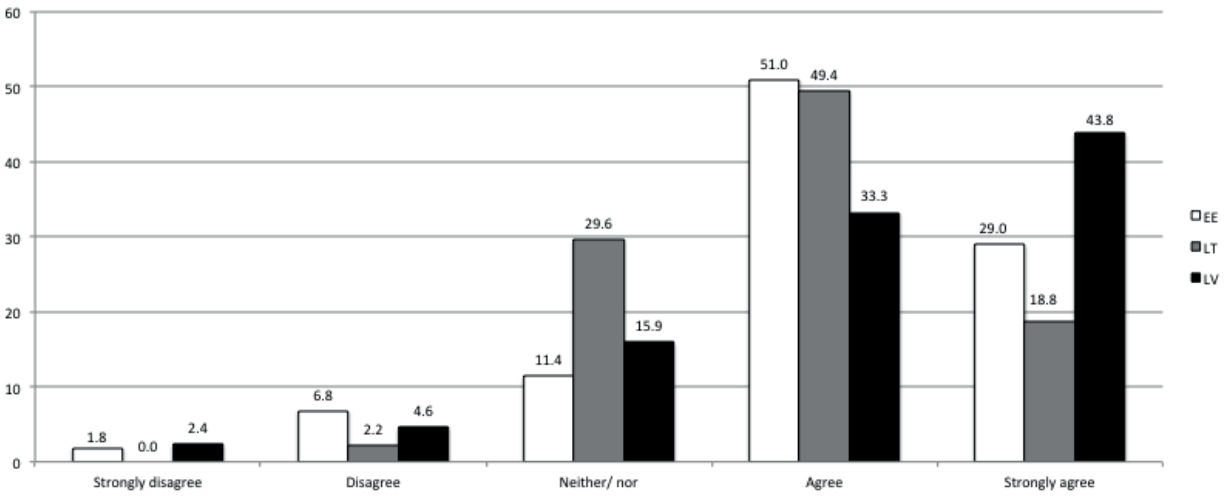

Figure 36. Responses to the statement "Being a member of the local community is important to me", 2016. Vertical axis measures percentage of each country's respondents in each category.

We also ask company managers to evaluate the extent to which they agree/disagree with the following statement: "Businesses such as yours contribute a lot to growth of the (Latvian/Estonian/Lithuanian) economy and society in general", using the same five-point scale. This question, despite being very generally, still sheds some further light on how entrepreneurs perceive their belonging to the community. The results summarised in Figures 37 and 38 are very similar to the results for perceived community belonging (Figures 35 and 36).

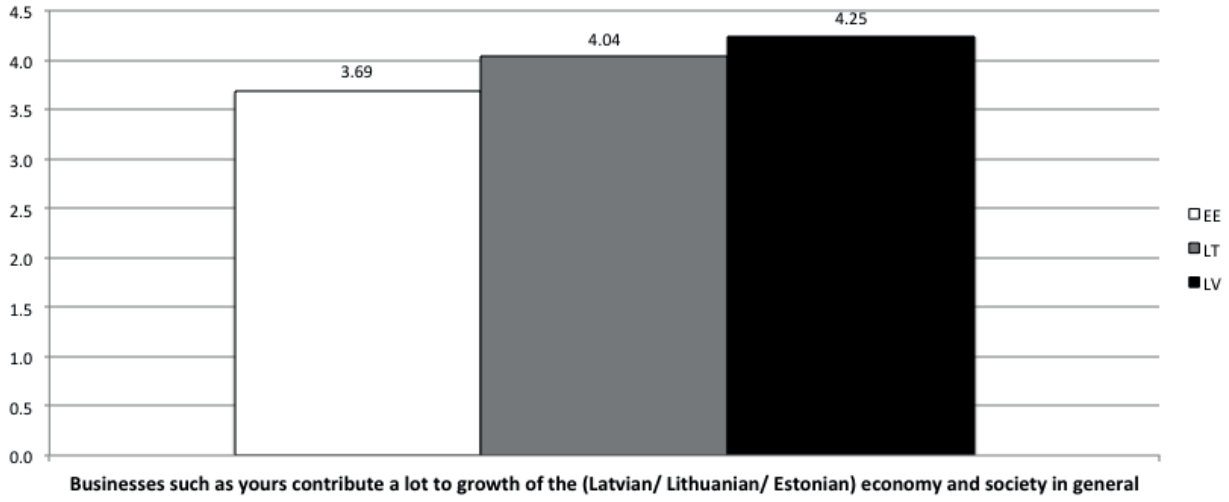

Figure 37. Perceived contribution to the growth of the economy and society in general, 2016. *This Figure displays country averages measured from 1-5, where '1' is 'completely disagree' and '5' is 'completely agree'.*

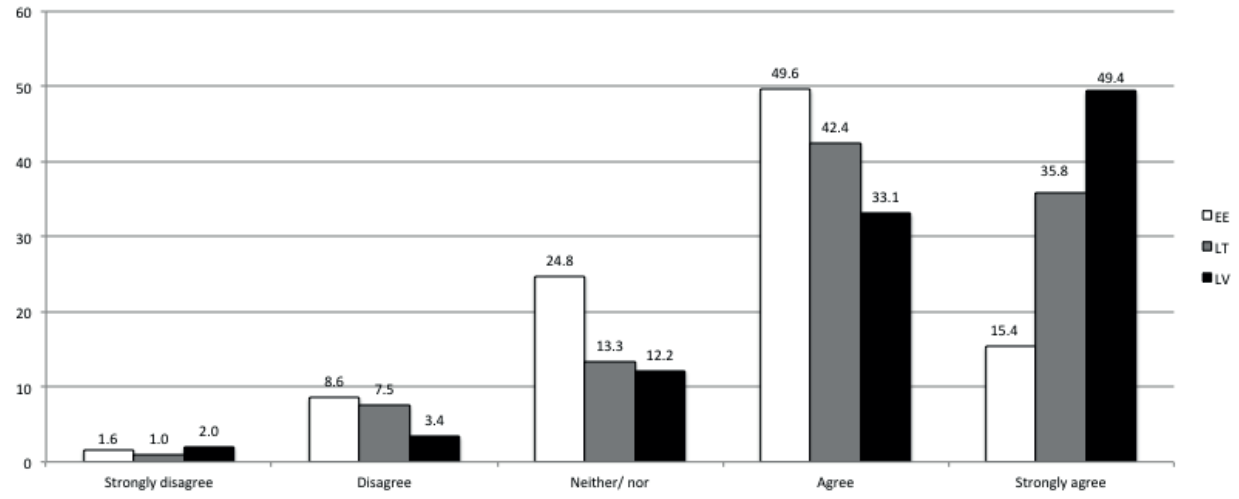

Figure 38. Response to the statement "Businesses such as yours contribute a lot to growth of the (Latvian/Lithuanian/Estonian) economy and society in general", 2016. Vertical axis measures percentage of each country's respondents in each category.

4.2.5. Institutional environment

According to Baumol (1990), the context within which companies operate determines what they can do and find profitable to do. Namely, the allocation of resources to either productive or unproductive activities varies depending on the strength and stability of laws and regulations, as well as norms and societal values. The institutional perspective (North, 1990; Scott, 2014) has been recognized as a useful theoretical framework for analysing the influences of both formal (e.g., laws and regulations) and informal (e.g., attitudes and culture) institutions on productive and unproductive entrepreneurship

(Feige, 1997; Van de Mortel, 2002). North emphasises that the incentive structures provided through the institutional environment directly affect outcomes: "If the institutional framework rewards piracy then piratical organizations will come into existence; and if the institutional framework rewards productive activities then organizations and firms will come into existence to engage in productive activities." (North, 1994: 361).

To assess the strength of formal and informal institutions in the Baltic countries we ask company managers to evaluate whether a range of formal and informal institutions are of 'no obstacle' (0), 'a minor obstacle' (1), 'a moderate obstacle' (2), 'a major obstacle' (3), or 'a very severe obstacle' (4) to the current operations of their company. We draw on the World Bank BEEPS questions in asking about the following factors: tax administration, tax rates, trade and custom regulation, and business licensing and permits (all formal institutions), functioning of the judiciary/courts, uncertainty about regulatory policies, corruption, anti-competitive practices of other competitors, and political instability (Q23 in Appendix 1). Figure 39 summarises the results.

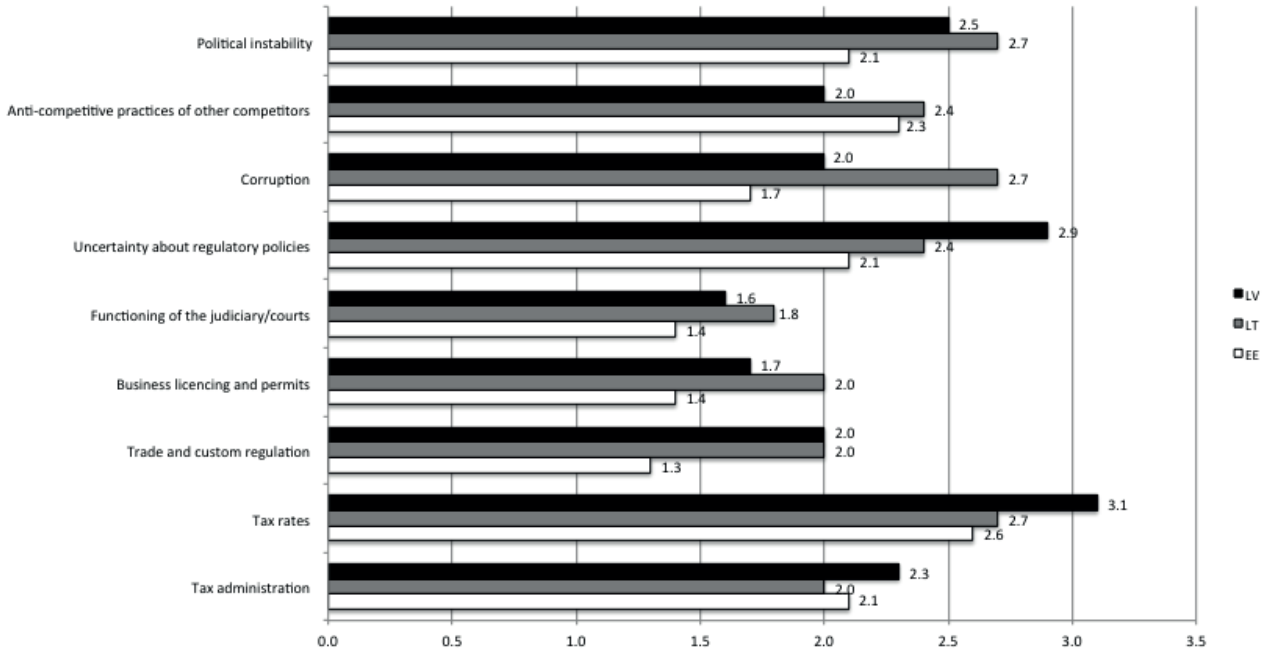

Figure 39. Strength of formal and informal institutions in the Baltic countries

According to the results, tax rates seem to be one of the main obstacles for entrepreneurs in Latvia (3.1 from 4, in comparison to 2.6 in Estonia and 2.7 in Lithuania). Entrepreneurs in Latvia are also considerably affected by uncertainty about regulatory policies (2.9 in Latvia, 2.1 in Estonia and 2.4 in Lithuania). Political instability seems to be a major problem both in Lithuania and also Latvia, and corruption is a major problem in Lithuania. Tax administration is reported as quite a severe obstacle in Latvia as well as other Baltic countries. Anti-competitive practices of other competitors seem to be bigger concern for entrepreneurs in Lithuania and Estonia than Latvia.

4.3. Multivariate tests of the determinants of shadow activity

We use regression analysis to identify the statistically significant determinants of firms' involvement in the shadow economy. For the regressions, we use pooled data from the past seven survey rounds, which gives a panel that spans the years 2010-2016 and has a cross-section of approximately 1,500 firms per year. The dependent variable in all regressions is the level of the firm's involvement in the shadow

economy. The independent variables are various firm-level characteristics, attitudes, sector dummy variables, region and year fixed effects.

The regression results are reported in Appendix 3. Model 1 includes most of the measured determinants of shadow activity and dummy variables for Estonian and Lithuanian firms (Latvian firms are the base case). It excludes variables that measure the firm's perceived probability of being caught for involvement in the shadow economy (*DetectionProbability*) and the firm's perceived penalties for being caught (*PenaltyForDetection*) in order to make use of data from 2010 (the variables *DetectionProbability* and *PenaltyForDetection* are only collected from 2011 onwards). Model 2 includes the full set of determinants of shadow activity and thus restricts the sample to 2011-2016. Model 3 replaces the country dummy variables with region dummy variables (with Kurzeme, Latvia, as the omitted category). Model 4 adds year fixed effects. Model 5 replaces *Satisfaction* with a dummy variable for whether the interview is conducted in Russian language.

The country dummy variables suggest that during the sample period, the size of the shadow economy is smaller in Estonia and Lithuania relative to Latvia after controlling for a range of explanatory factors, and the differences are statistically significant. Tolerance towards tax evasion is positively associated with the firm's stated level of income/wage underreporting, i.e., entrepreneurs that view tax evasion as a tolerated behaviour tend to engage in more informal activity. The measures of tolerance also serve the important role of controlling for possible understating of the extent of shadow activity (untruthful responses) due to the sensitivity of the topic.[12]

The regression coefficients indicate that the effect of perceived detection probabilities and penalties on the tendency for firms to engage in deliberate misreporting is consistent with the predictions of rational choice models, i.e., the higher the perceived probability of detection and the larger the penalties, the lower the amount of tax evasion and misreporting. The effect of detection probability in particular stands out as being a particularly strong deterrent of shadow activity. This evidence suggests a possible policy tool for reducing the size of the shadow economies, namely increasing the probability of detection of misreporting. This could be done via an increased number of tax audits, whistle-blower schemes that provide incentives to report information to authorities about non-compliant companies, and investment in tax evasion detection technology.

The regression results also indicate that a firm's satisfaction with the tax system and the government is negatively associated with the firm's involvement in the shadow economy, i.e. dissatisfied firms engage in more shadow activity, satisfied firms engage in less. This result is consistent with the descriptive statistics and with previous research on tax evasion, and offers an explanation of why the size of the shadow economy is larger in Latvia than in Estonia and Lithuania; namely that Latvian firms engage in more shadow activity because they are more dissatisfied with the tax system and the government. Analysing each of the four measures of satisfaction separately we find that shadow activity is most strongly related to dissatisfaction with business legislation and the State Revenue Service, followed by the government's tax policy and support for entrepreneurs.

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[12] For example, consider two firms that underreport income/wages by 40% each, but the first operates in an environment in which tax evasion is considered highly unethical and is not tolerated, whereas the second operates in an environment in which tax evasion is relatively tolerated. The first firm might state that its estimate of underreporting is around 20% (a downward biased response due to the more unethical perception of tax evasion) whereas the second firm might answer honestly that underreporting is around 40%. This example illustrates that failure to control for the sensitivity of tax evasion (proxied here by tolerance) can lead to biased comparisons.

A natural question to ask is why Latvian companies are more dissatisfied. One explanation is that the business environment (actions of the government and SRS) is less favourable to companies in Latvia. It may also be that the ethnic composition of the country plays a role, as minority groups may feel less engaged in society and involved in the country-level decision making. To test this hypothesis, specifically with respect to the Russian-speaking population in each of the countries, in Model 5 we replace the *Satisfaction* variable with a dummy variable for whether the interview is conducted in Russian language. The sign of the point estimate of *D_RU* in Model 5 is consistent with this hypothesis, but is not statistically significant. The point estimate suggests that the companies of Russian-speaking respondents tend to be involved in a slightly higher (1.7 percentage points) level of shadow activity, controlling for other factors. This effect is statistically significant if the sample is constrained to pre-2015 data. Given that Latvia has a proportionally larger Russian-speaking population than Estonia and Lithuania, the mix of ethnicities may contribute to the difference in the size of the shadow economies in the Baltic countries.

Another strong (and statistically significant) determinant of involvement in the shadow economy is firm size, with smaller firms engaging in more shadow activity than larger firms, although the descriptive statistics suggest the relation may be non-monotonic. The statistically significant coefficient on firm age suggests that younger firms engage in more shadow activity than older firms. A possible explanation for these two relations is that small, young firms use tax evasion as a means of being competitive against larger and more established competitors. The sector dummy variables suggest that firms in the construction sector and services tend to engage in more shadow activity than firms in other sectors such as retail. The association between shadow activity and the average wage paid by a firm or a firm's change in profits (or employees or turnover) is not significant across all specifications.

5. Discussion and conclusions

The SSE Riga Shadow Economy Index is estimated annually based on surveys of entrepreneurs in the Baltic countries using a number of surveying and data collection techniques shown in previous studies to be effective in eliciting relatively truthful responses. The Index combines estimates of misreported business income, unregistered or hidden employees, as well as unreported 'envelope' wages to obtain estimates of the shadow economies as a proportion of GDP. This report is the seventh in the series and focuses on the shadow economy estimates for the year 2016, as well as trends during the years 2009-2016.

Our first key finding is about trends in the Baltic shadow economies. We estimate that there has been a modest increase in the size of the shadow economies in Estonia and Lithuania in 2016, which goes against the long-term trend of gradually reducing the size of the shadow economies in all three Baltic countries. In Latvia, we estimate there has been a slight decrease in the size of the shadow economy in 2016, continuing the long-term trend. Despite these changes, the shadow economy in Latvia remains larger than in the other two neighbouring Baltic countries. Our estimates suggest that the Estonian and Lithuanian shadow economies now account for around 15.4% and 16.5% of GDP (after increasing by 0.5% and 1.5% in 2016), respectively, whereas in Latvia, after contracting by around 1.0% in 2016, the shadow economy is now estimated at approximately 20.3% of GDP. Thus, the difference in the sizes of the three shadow economies has further decreased in 2016.

The contraction of the shadow economy in Latvia has been driven mainly by decreases in underreporting of business income and underreporting of the number of employees. The level of underreporting of

envelope wages is similar in all three Baltic countries, whereas underreporting of business income (which makes up around 42% of the total Latvian shadow economy) explains most of the difference in the size of the shadow economies across the three countries. This should be taken into consideration when implementing further policies in order to fight the shadow economy, especially in Latvia. In Estonia, the major component of the shadow economy is still unofficial 'envelope' wages, which make up as much as 53.6% of the total shadow economy. We separately estimate the prevalence of unregistered companies. According to our data, unregistered companies make up around 5% to 8% of all enterprises.

Lithuania stands out as having the highest level of bribery of all three Baltic countries. Consistent with having the highest level, bribery is also perceived by company managers as more tolerated in Lithuania than in Estonia and Latvia. Encouragingly, the amount of general business bribery in Lithuania has decreased from 12.7% of revenues in 2015 to 9.8% in 2016. The highest levels of shadow economy are observed in the Kurzeme and Riga regions of Latvia, and the Voru region in Estonia's south-east. The construction sector still has the highest level of shadow activity, in particular in Latvia. Small companies tend to operate 'in the shadows' more than large companies, however, the differences across company size categories are not large and some large companies contribute considerably to the shadow economy.

When it comes to attitudes, companies continue to be relatively satisfied with the State Revenue Service and relatively dissatisfied with the government's tax policy and support for entrepreneurs. Latvian companies are less satisfied than Estonian and Lithuanian companies, which is likely to contribute to Latvia having a larger shadow economy. Dissatisfaction in 2016 in general has increased, going against the long-term trend of gradually improving satisfaction.

We identify several factors that make Baltic entrepreneurs more likely to operate in the shadow sector. Firms that are dissatisfied with the tax system or the government tend to engage in more shadow activity; satisfied firms engage in less. This result is consistent with previous research on tax evasion, and has implications for policy measures to reduce the size of the shadow economy. We also find that smaller, younger firms engage in proportionally more shadow activity than larger, older firms, consistent with the anecdotal evidence that tax evasion is used by firms to gain a competitive edge, and that having an edge is important in competing in an established market. Finally, the level of tax evasion and deliberate misreporting among Baltic companies is responsive to the perceived probabilities of being caught and to the expected penalties for being caught. In particular, companies that perceive the probability of being caught as being higher tend to engage in less shadow activity.

Our results highlight the need for continued reforms and actions that combat the shadow economy; in Latvia, to close the gap compared to the neighbouring countries, and for Estonia and Lithuania, to reverse the modest increases in the size of the shadow economies recently. Our findings suggest a number of approaches to combatting the shadow economy.

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Appendix 1. Questionnaire used in 2017 survey round.

ENTREPRENEURS' SATISFACTION WITH BUSINESS CLIMATE / INFORMAL ENTREPRENEURSHIP IN THE BALTIC COUNTRIES

My name is ... from … . We are conducting a survey aimed at understanding entrepreneurs' satisfaction with entrepreneurship climate in ***(insert country)***. The main interest of the study is to find out how various policy initiatives implemented within the country and entrepreneurs satisfaction with business climate influences entrepreneurial behaviour, including tax avoidance.

I would like to emphasize that we are only interested in your expert opinion and in no way are we indicating, for instance, that your company is involved in any type of tax avoidance activities.

The interview will last approximately 15 minutes. We guarantee 100% confidentiality as neither your name nor your company's name will appear in the data analysis. Data will be analysed using a computer program without any reference to the data source. If you are interested, we can also send you the summary of the survey results once the survey is complete.

If respondent hesitates or says 'no':

This survey is very important to foster the knowledge about the entrepreneurship in ***(insert country***. By participating in this survey you are helping to improve such knowledge. All your answers will be 100% confidential and no one will be able to track you or your company. Moreover we are interested in your expert opinion and what you say will be attributed to the industry or your competitors, not your firm.

Questionnaire Form

External influences

1. Please evaluate your satisfaction with the performance of the State Revenue Service with regards to tax administration.

1	2	3	4	5
Very unsatisfied	Unsatisfied	Neither satisfied nor unsatisfied	Satisfied	Very satisfied

2. Please evaluate your satisfaction with the government's tax policy in *(insert country)*.

1	2	3	4	5
Very unsatisfied	Unsatisfied	Neither satisfied nor unsatisfied	Satisfied	Very satisfied

3. Please evaluate your satisfaction with the quality of business legislation in *(insert country)*.

1	2	3	4	5
Very unsatisfied	Unsatisfied	Neither satisfied nor unsatisfied	Satisfied	Very satisfied

4. Please evaluate your satisfaction with the government's support to entrepreneurs in *(insert country)*.

1	2	3	4	5
Very unsatisfied	Unsatisfied	Neither satisfied nor unsatisfied	Satisfied	Very satisfied

5. Tax avoidance is tolerated behaviour in *(insert country)*.

1	2	3	4	5
Completely disagree (Entrepreneurs do not tolerate involvement in tax avoidance)	Disagree	Neither agree nor disagree	Agree	Completely agree (Entrepreneurs highly tolerate involvement in tax avoidance)

6. Bribing is tolerated behaviour in *(insert country)*.

1	2	3	4	5
Completely disagree	Disagree	Neither agree nor disagree	Agree	Completely agree

Government policy and amount of informal business

7. Please estimate the degree of underreporting business income (in percent) by firms in your industry in 2016_____ % and in 2015 _____ %.

8. Please estimate the degree of underreporting number of employees (% of actual number of employees) by firms in your industry in 2016_____ % and in 2015 _____ %.

9. Please estimate the degree of underreporting salaries paid to employees by companies in your industry (for instance, if in reality an employee receives EUR 400, but the reported salary is EUR 100, then underreporting is 75%; if EUR 400 and EUR 200, then underreporting is 50%). Firms underreported actual salaries by approximately ____ % in 2016 and ____ % in 2015.

10. On average, approximately what percent of revenue (turnover) did firms in your industry pay in unofficial payments to 'get things done' in in 2016_____ % and in 2015 _____ %.

11. When other firms in your industry do business with the government, approximately how much of the contract value would firms typically offer in unofficial payments to 'secure' the contract? (year 2016)_____%

12. In some industries, in addition to registered companies such as yours, unregistered enterprises also operate but do not report any of their activity to authorities. In your opinion, what percentage of your industry's total production of goods/services is carried out by unregistered enterprises in 2016?_____% in 2015? _____%

13. For a typical company in your industry, what would you say is the approximate probability (0-100%) of being caught if the company were to:

(i) underreport its business income? _____%
(ii) underreport its number of employees? _____%
(iii) underreport the amount it pays to employees in salaries? _____%
(iv) make unofficial payments to 'get things done'? _____%

14. If a company in your industry were caught for deliberate misreporting, what would typically be the consequence to that company?

Nothing serious	A small fine	A serious fine that would affect the competitiveness of the company	A serious fine that would put the company at risk of insolvency	The company would be forced to cease operations
1	2	3	4	5

Company / Performance / Value Creation

15. What is the approximate percentage change in your operating profit, turnover and total employment in 2016 compared to 2015?

	1 Operating profit	2. Turnover	3 Total employment
Change (increase or decrease in %) as compared to 2015. For example: +20%, -15%, 0 (no change)			

16. Approximately, what was the operating profit of your company in 2016?

EUR _____

17. Approximately, what was the turnover of your company in 2016?

EUR _____

18. Approximately, how many employees are currently employed in your company (full time equivalent, including you)?

_____ employees

19. In which year did your company start operation?

Year_____

20. What is the main activity (i.e. sector) that your company is engaged in?

- ☐ Manufacturing
- ☐ Wholesale
- ☐ Retail
- ☐ Services (please specify_____)
- ☐ Construction
- ☐ Other (please specify_____)

21. In which region does your company conduct most of its business?

- ☐ Rīga
- ☐ Kurzeme
- ☐ Vidzeme
- ☐ Zemgale
- ☐ Latgale

Attitudes / tax morale / barriers to business

22. For each of the following statements, please indicate on a scale of 1 to 5 whether you agree (1 means you completely disagree, 5 means you completely agree):

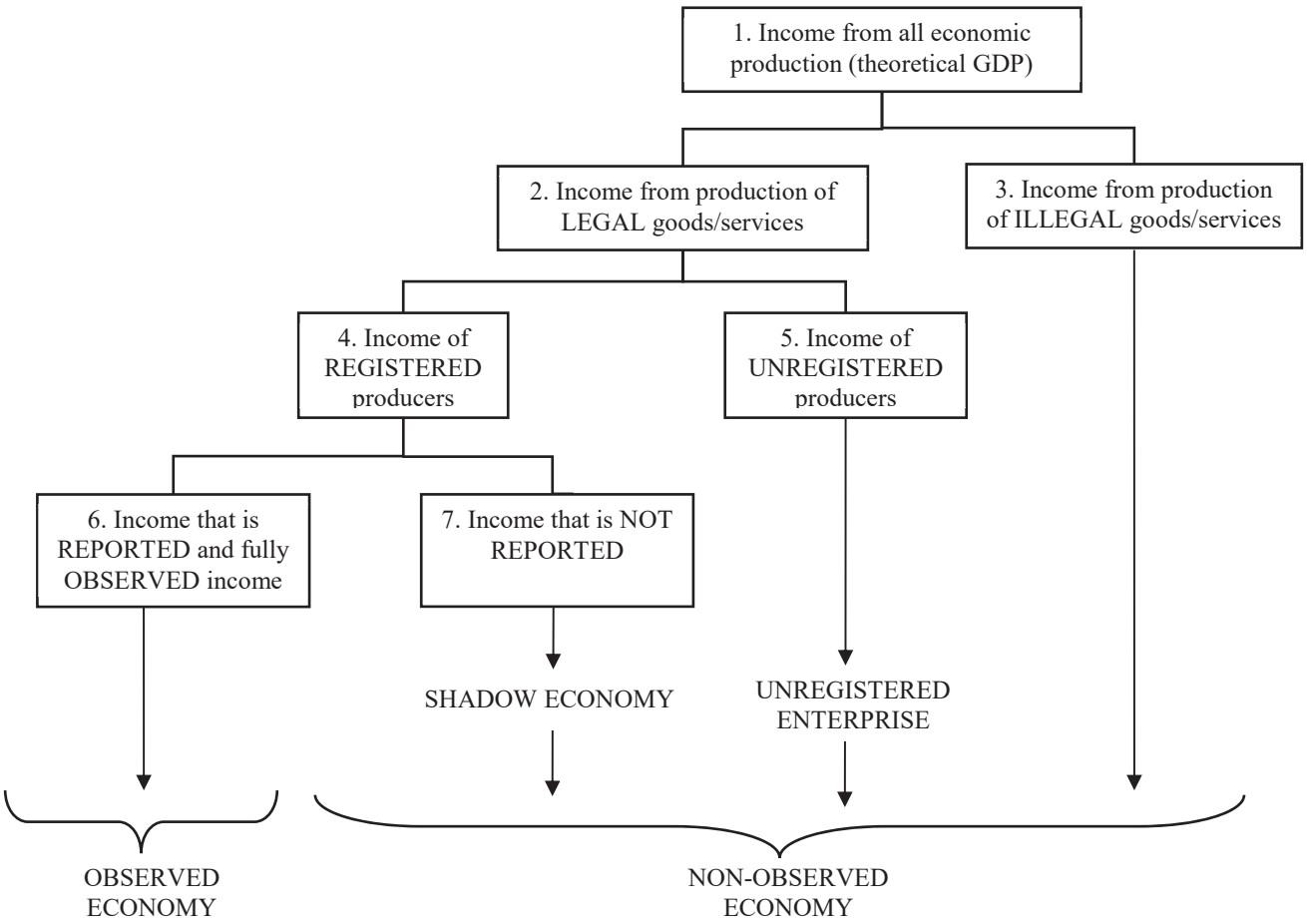
	Strongly disagree	Disagree	Neither/ nor	Agree	Strongly agree
a) Businesses such as yours contribute a lot to growth of the *(insert country)* economy and society in general	1	2	3	4	5
b) Companies in your industry would think it is always justified to cheat on tax if they have the chance	1	2	3	4	5
c) Being a member of the local community is important to me	1	2	3	4	5

23. As I list some factors that can affect the current operations of a business, please tell me if you think that each factor is No Obstacle, a Minor Obstacle, a Moderate Obstacle, a Major Obstacle, or a Very Severe Obstacle to the current operations of this establishment.

	No obstacle	Minor obstacle	Moderate obstacle	Major obstacle	Very severe obstacle
a) Tax administration	0	1	2	3	4
b) Tax rates	0	1	2	3	4
c) Trade and custom regulation	0	1	2	3	4
d) Business licencing and permits	0	1	2	3	4
e) Functioning of the judiciary/courts	0	1	2	3	4
f) Uncertainty about regulatory policies	0	1	2	3	4
g) Corruption	0	1	2	3	4
h) Anti-competitive practices of other competitors	0	1	2	3	4
i) Political instability	0	1	2	3	4

Thank you!

Appendix 2. Observed and non-observed components of GDP.



Notes on some of the components 1-7 follow. Income refers to both business income and employee income. Illegal production (3) includes production of goods/services that are illegal regardless of who produces them (e.g., narcotics, prostitution) and production of goods that themselves are legal but the production is illegal because it is carried out by an unauthorised producer (e.g., unlicensed surgeons, unlicensed production of alcohol). Goods/services that are produced legally (2) can still involve breaches of the law at the registration or reporting stage (e.g., intentional underreporting of profit to evade taxes). Most of the income generated from producing legal goods is reported by registered firms and therefore fully captured in official GDP (6). However, some proportion of income is intentionally hidden from authorities either by not registering the enterprise (5) or by misreporting wages or company earnings (7). Following other studies, we refer to the latter (7) as the 'shadow economy', and use the term 'non-observed' economy in a broader sense referring to illegal goods/services, activities of unregistered enterprises and the shadow economy.

Appendix 3. Regression results

Table 3. Determinants of firms' involvement in shadow activity.

This table reports coefficients from regressions of firms' unreported proportion of production (dependent variable; see Section 2 for details of calculation) on various determinants of shadow activity, using the pooled sample of Estonian, Latvian, and Lithuanian firms, between 2010-2016. *D_EE*, and *D_ LT* are dummy variables for Estonian and Lithuanian firms, respectively (Latvian firms are the omitted

category). *Tolerance_TaxEvasion* is the firm's response to Question 5, with higher scores indicating more tolerance. *Satisfaction* is the first principal component of the firm's responses to Questions 1-4, with higher scores indicating higher satisfaction with the country's tax system and government. *DetectionProbability* and *PenaltyForDetection* measure the firm's perception of the probability of being caught for shadow activity and the severity of penalties conditional on being caught (calculated as the first principal component of responses to Questions 13(i)-13(iv), and the response to Question 14, respectively). *ln(FirmAge)* and *ln(Employees)* are the natural logarithms of the firm's age in years and its number of employees. *ChangeInProfit* is the firm's percentage change in net sales profit relative to the previous year. *D_Wholesale* to *D_OtherSector* are sector dummy variables with manufacturing as the omitted category. *D_RU* is a dummy variable that takes the value one if the respondent elected to answer the questionnaire in Russian language. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels. T-statistics are reported in parentheses.

	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	32.166*** (17.72)	34.711*** (15.29)	34.341*** (12.36)	31.863*** (11.03)	30.571*** (10.68)
D_EE	-6.479*** (-8.52)	-6.304*** (-7.08)			
D_LT	-10.531*** (-15.49)	-7.846*** (-10.17)			
Tolerance_TaxEvasion	2.039*** (7.96)	1.728*** (5.92)	1.702*** (5.80)	1.629*** (5.58)	1.893*** (6.69)
Satisfaction	-1.495*** (-5.26)	-1.793*** (-5.47)	-1.779*** (-5.35)	-1.795*** (-5.44)	
DetectionProbability		-2.740*** (-7.56)	-2.697*** (-7.43)	-2.684*** (-7.41)	-2.709*** (-7.60)
PenaltyForDetection		-1.066*** (-3.34)	-1.006*** (-3.17)	-0.875*** (-2.76)	-0.704** (-2.26)
ln(FirmAge)	-3.352*** (-5.83)	-3.286*** (-4.99)	-3.184*** (-4.79)	-3.023*** (-4.54)	-2.888*** (-4.38)
ln(Employees)	-0.535** (-2.25)	-0.881*** (-3.39)	-0.920*** (-3.51)	-1.270*** (-4.72)	-1.270*** (-4.85)
ChangeInProfit	0.011*** (3.31)	0.014* (1.93)	0.014* (1.89)	0.011 (1.49)	0.011 (1.47)
D_Wholesale	0.486 (0.51)	-0.332 (-0.32)	-0.660 (-0.62)	-1.245 (-1.18)	-1.262 (-1.22)
D_Retail	1.247 (1.29)	1.213 (1.13)	1.003 (0.94)	0.946 (0.89)	1.230 (1.18)
D_Services	1.165 (1.44)	1.007 (1.14)	0.696 (0.78)	0.857 (0.96)	0.904 (1.03)
D_Construction	5.170*** (4.91)	5.075*** (4.47)	4.956*** (4.33)	5.150*** (4.54)	5.327*** (4.72)
D_OtherSector	-1.308 (-1.05)	0.159 (0.11)	-0.087 (-0.06)	-0.100 (-0.07)	-0.044 (-0.03)
D_RU					1.703 (1.14)
Region fixed effects	No	No	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes
Data	2010-2016	2011-2016	2011-2016	2011-2016	2011-2016
R-squared	9.8%	12.1%	13.0%	14.3%	13.4%

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