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Unregistered Production and Employment in Estonia: Measurements and Developments

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Abstract

This paper present data on unreported production and employment in Estonia, tracks developments over time and compares Estonia with other countries. According to official exhaustiveness calculations, unreported GDP amounted to around 4% of "true" or total GDP in 2012, having declined since 1995. Studies based on various indicator variables and surveys of the perceptions of business managers provide estimates for unreported GDP of 14-24% of true GDP in 2007-2012. Survey evidence suggests that informal employment has declined over time; in 2012 around 10-12% of the active people surveyed stated that they had undertaken unreported employment within the past year. This estimate is likely to be a lower bound and other studies provide somewhat different results. The extent of unreported activities in Estonia appears to be smaller than in many other EU countries from central and eastern Europe. Events such as the Russian crisis, the prolonged boom from 2000 to 2007 and the global financial crisis do not appear to have had a discernible impact on unregistered activities in Estonia.

Keywords

Shadow economy; Unreported production; Unreported employment; Transition; Global financial crisis

Introduction

The public and private sectors are closely intertwined in all market economies, and a well-functioning public sector is important for welfare and development in society. This in turn requires that the authorities have access to precise data on production, income, employment etc. Such data are important for the collection of taxes from individuals and businesses, for the provision of social benefits to individuals and for support measures targeting businesses. Reliable data are also vital for policy formulation and evaluation.

Unregistered economic activities go by many names and have prefixes such as informal, grey, black, unrecorded, underground, hidden and shadow. The abundance of labels reflects the many dimensions of unregistered activities as well as the complexities of defining and measuring such activities. Unregistered production or employment does not always entail evasion of taxes, as there may be cases where the activities are not subject to taxation, but there is nevertheless a close relationship. The main motive for individuals and companies to hide data on economic activities like production or employment from the authorities is typically to evade taxation.[3]

This paper provides an overview of developments in the extent and distribution of unregistered production and employment in Estonia since the mid-1990s. The paper brings together hitherto unpublished data from Statistics Estonia, official data from a range of data sources and results from a number of academic studies on unreported economic activities in Estonia.

The paper focuses on unreported production and

[3]By not reporting production, a firm or a self-employed person can evade not only value-added and excise taxes, but also social security contributions, personal income tax and corporate income tax.

employment as these are among the most important manifestations of the shadow economy. The paper is largely descriptive and does not link the empirical findings to any particular theory or overarching conception. Changes in unreported production and employment are, however, linked to broader societal, administrative, economic and social developments, including the rapidly changing macroeconomic situation in Estonia since the mid-1990s. The paper updates and extends the survey [16] on unregistered activities in Estonia. Recent surveys discussing both theoretical and empirical aspects of unregistered activities and tax evasion include [2], [27] and [15].

Issues concerning unregistered activities and tax evasion are complex and it is, sui genesis, difficult to obtain a reliable and comprehensive picture of the extent and distribution of such activities. This also applies for Estonia. The complex nature of unregistered activities and tax evasion means that no single measure will provide a comprehensive representation of the extent and distribution of unreported activities, so it is expedient to consider different measures and to contrast them with each other. In any case, all measures of unreported activities are estimated with great uncertainty; a discussion of the uncertainty and its policy implications is provided in [34].

There are several reasons why individuals and companies may be choose not to report activities to the authorities [2], [27]. First, the activities may be illegal and therefore typically cannot possibly be reported, which applies to the production and sale of narcotics and to theft, robbery, smuggling, etc. Second, the activities may be subject to regulation or red tape that would increase costs or otherwise inhibit the activity if it were reported to the authorities. Such regulations could be labour laws, health and safety regulations, technical norms, etc. Third, the activities may be subject to taxation which may be evaded if the activity is not reported to the authorities. Fourth, underreporting of income or other activities may benefit individuals if they become entitled to social benefits in this way (social fraud). Taken together, individuals and companies have a host of reasons for leaving economic activities unreported, reasons that are associated with lower costs and higher income or a reduction in various inconveniences.

A main factor discouraging non-reporting is an effective administrative and legal system that makes detection and subsequent punishment a real possibility. This particularly applies to the requirements for reporting to the tax authorities, but it also applies to reporting to the statistics authorities, as statistics authorities typically use tax records for computing production and value added data. It also holds that "… the size of the shadow economy is a core input for estimating the extent of tax evasion…" [10] (p. 2). Another discouraging factor is a sense of moral obligation or the civic duty to obey laws and regulations. This may again depend on deeper societal norms, the general level of unlawful behaviour in society and the extent to which individuals and companies perceive that the government is working for their benefit [11], [19]. Overall, the balance of incentives and disincentives depends on the characteristics of the particular individual or business, but also on the surrounding administrative and societal structure.

The consequences for social welfare of taxpayers leaving economic activities unreported are not straightforward to ascertain. The taxpayer might seek to reduce a tax in several ways: a) Substitution, i.e. the taxpayer changes behaviour and substitutes away from the activities leading to the tax obligation. b) Tax evasion, i.e. the taxpayer evades taxes by not reporting the taxable activity to the relevant authorities. c) Tax avoidance: i.e. the taxpayer reclassifies or alters, within the law, income and deductions in order to reduce the tax payment.

It is not immediately clear which one of these alternatives that is preferable from the viewpoint of society. First, substitution brings about an excess burden, whereas tax evasion and tax avoidance only cause a resource loss insofar as tax rates or other taxes have to be increased to compensate for the loss of revenue (Slemrod 2007). Second, steps to reduce the extent of tax evasion will not necessarily lead to a corresponding increase in tax revenue, as individuals or firms may substitute away from the activity with the higher implicit tax burden. This also implies that more effective auditing may lead to an increased excess burden in some cases [27]. Third, taxes always affect distribution and it follows for that reason that evasion of tax also has distributional effects and hence important welfare consequences.

The rest of the paper is organised as follows: Section 2

provides brief background information on Estonia, the economy and the tax system. Section 3 gives an overview of the extent of unregistered production activities. Section 4 discusses the extent and distribution of unregistered employment and labour income Finally, Section 5 concludes the paper.

The Estonian Economy

Estonia is the northernmost of the Baltic States and lies to the south of Finland, across the Gulf of Finland. The country became independent in 1918, but was occupied by the Soviet Union during the Second World War and stayed under Soviet rule until August 1991, when it regained independence along with the other Baltic States. In January 2013 the population was 1.3 million, of whom 70% were ethnic Estonians, 25% ethnic Russians and the remainder mainly Belarussians, Ukrainians and Finns (Statistics Estonia 2013, code: PO0222).

Estonia has undergone rapid political and economic changes since the beginning of the 1990s [29]. The planned economy has been replaced by a market economy with free enterprise and private ownership. Early in the transition process Estonia set out on a radical and market-oriented reform strategy [13]. Estonia abolished all import duties in the mid-1990s, though it later reinstated some as part of the early trade agreements with the EU. It was the first country in Europe to introduce a flat personal income tax. In recognition of the country's limited administrative capabilities after it regained independence, regulations and standards were generally kept to a minimum. Estonia has obtained high rankings for economic freedom and for efforts to reduce bureaucratic interference in business.[4]

Fig. 1 shows the dynamics of GDP and the unemployment rate from 1993 until 2012. Like other post-communist countries, Estonia experienced a deep recession in the early 1990s, followed by rapid growth until the downturn in 1999 following the Russian crisis. The period 2000 to 2007 saw rapid economic growth. Negotiations on EU and NATO membership improved confidence and substantial capital inflows financed booming consumption and investment [3]. Economic growth had already turned negative in 2007, but this development worsened after the bankruptcy of Lehman Brothers in autumn 2008. The economy contracted by 14.3% in 2009, but growth returned in 2010. Purchasing power adjusted GDP per capita amounted to 31.2% of the average in the EU15 in 1995 and 62.5% in 2012 [8] (code: nama_gdp_c). The convergence process has entailed large structural changes; agriculture and manufacturing have declined in relative terms since the early 1990s while services have gained importance.

Fig. 1 shows the survey-based unemployment rate among working-age individuals (15-64 years) from 1993 to 2012. The dynamics of unemployment have in large part mirrored those of GDP. The unemployment rate increased in the early 1990s due to the transition process, stabilised in 1995-1998 as growth resumed and increased temporarily after the Russian crisis. The rapid decline in unemployment from 2000 until 2008 is striking, but so is the peak it reached after the outbreak of the global financial crisis. The employment rate has generally been high; in 2012 the employment rate of the population of working age (15-64 years) was 67.1%, almost 2%-points above the EU15 average [8] (code: lfsi_emp_a).

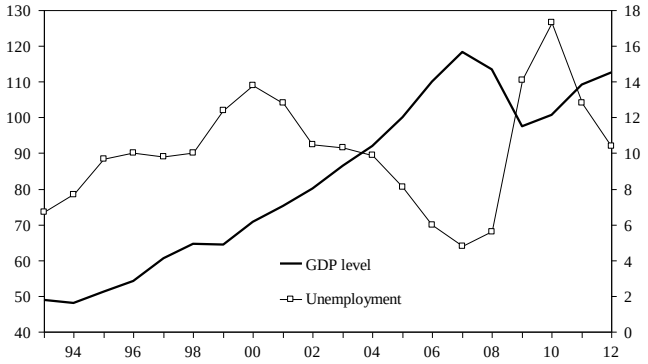

FIG. 1: GDP LEVEL, INDEX 2005 = 100. UNEMPLOYMENT RATE, 15-64 YEARS, % OF LABOUR FORCE

Sources: [8] (code: nama_gdp_k), [31] (code: ML35)

The transition has influenced the welfare of people in Estonia in numerous ways. Some marginalisation problems have affected the elderly and non-Estonian speakers in particular [17]. Absolute poverty is limited, while relative poverty is more pronounced. A frequently used measure of relative poverty is the risk

[4]See for instance the surveys of economic freedom by the Heritage Foundation (http://www.heritage.org) and the rankings of business friendliness published by the International Bank for Reconstreuction and Development (http://www.doingbusiness.org/rankings).

of poverty measured as the share of the population with equivalised disposable income after social transfers below 60% of the national median. In 2011 in total 23.1% of the Estonian population was at risk of falling into poverty. This is comparable to the EU27 average of 24.2, but substantially above the levels found in the welfare states in neighbouring Nordic countries (Eurostat 2013, code: tsdsc100).

Survey-based studies of values and beliefs from the late 1990s bear out suggest that people in Estonia are generally individualistic but also "survival oriented", i.e. concerned about their own material well-being [32]. They share the individualistic beliefs with their Northern neighbours, but the orientation towards survival is akin to that found in other post-communist countries. The survival orientation is likely to reflect the difficult economic situation experienced by many Estonians during the early stages of the transition process, but may also reflect a breakdown of collective responsibility and civic norms during 50 years of Soviet rule or even deeper cultural traits stemming from centuries of suppression by foreign rulers.[5]

The government sector has undergone deep structural and institutional change since Estonia regained independence in August 1991. Estonia established independent political institutions and reformed administrative structures. In many cases, entirely new administrative systems were established, while others were thoroughly remodelled. It should be underscored, however, that government authority never collapsed in Estonia; the public administration, courts, police force and tax collection bodies retained authority.

The tax system in Estonia is simple. It has been a key objective to keep laws and regulations simple in order to reduce bureaucratic burdens and increase compliance [14]. The basic structures were put in place at an early stage, but a major reform in 1994 simplified the system, removed the progressive steps for personal income tax and increased reliance on indirect taxes [21], [20]. Appendix A describes the main taxes in Estonia.

The 1994 tax reform resulted in a substantial simplification of the taxation of income. Relatively few deductions are allowed and they are capped, which reduces the scope for overstatement of deductions, at least for taxpayers that are employed. The VAT system is similarly simple and comprehensive with essentially one rate levied on all products.

Estonia was one of the first countries in Europe to introduce a three pillar old-age pension system. The specific design chosen has very "high powered" incentives with pension payouts broadly proportional to the income registered during the lifetime of the individual. During the preparations for the pension reform, it was explicitly stated that the higher degree of self-financing of pensions was meant to increase the amount of registered income [25]. Other laws introduced since the turn of the century have reduced the incentives to hide personal income from the authorities, with a revised unemployment insurance system and a vastly improved parental-leave scheme where payouts are closely tied to earlier reported income in both cases.

Unregistered Production

Following guidelines from Eurostat and the, Statistics Estonia includes estimates of the production in the shadow or unregistered economy in the official GDP figures [21]. These exhaustiveness calculations provide estimates of otherwise unregistered legal and illegal production. However, since the exhaustiveness calculations only include production for which the statistics authorities have some direct verifiable information, the estimates of the shadow economy based on these calculations constitute lower estimates of the actual size.

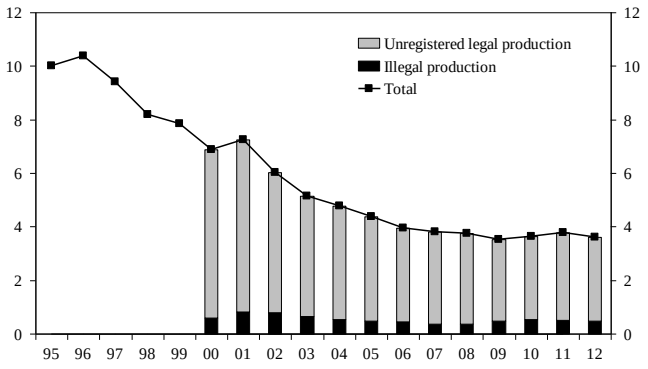

FIG. 2: OFFICIAL ESTIMATES OF INFORMAL PRODUCTION, % OF TRUE GDP IN MARKET PRICES

Source: Data provided by Statistics Estonia.

Fig. 2 shows the official exhaustiveness estimates of unregistered production as a share of the true GDP for the period 1995-2012, where the term true GDP denotes registered GDP plus estimated unregistered

[5]The importance of tax ethics for tax compliance across different countries has been confirmed in empirical studies [1].

GDP. The GDP measures are in market prices, i.e. include value-added and excise taxes. The overall picture is that informal or unregistered production has exhibited a marked fall from around 10% of true GDP in 1995 to less than 4% in 2012. As discussed in Section 2, the Estonian economy grew rapidly in 2000-2007. The reduction in the share of unregistered GDP from 2000 to 2007 came about as the unregistered economy has grown less rapidly than the registered economy [30]. It is noticeable that no apparent change took place in 2008-2009, when Estonia was most affected by the global financial crisis. The conclusion is that the official estimates of the informal GDP in Estonia have been only little affected by broader macroeconomic developments.

It is possible to distinguish between unregistered legal production and illegal production from 2000. Illegal production comprises the value-added from prostitution, drugs production and delivery, and the illegal trade in alcohol, tobacco and petrol. The official estimate is quite stable at around 0.4-0.8% of GDP during the 12 years for which data are available. The sources for these estimates are police reports, sociological studies, newspaper articles, court rulings and the Estonian Tax and Customs Board. Estimates of drugs production and trade, and the illegal tobacco and alcohol trade are based on confiscation data. The prostitution market is estimated from police reports and sociological studies, while estimates of the illegal petrol trade use confiscation data and data from the Statistics Estonia energy balance.

The legal but unregistered production included in official GDP estimates has declined markedly since 1995 and amounted to around 3% of GDP in 2012. It is estimated from several data sources [30]. The largest part of unregistered production is computed from estimations of unregistered employment and unregistered wage income. Unregistered employment is obtained by comparing employees' self-reported employment in the labour force survey with employers' reporting of their number of employees. For sole proprietors the estimate is taken from their reports to the Tax and Customs Board. The number of full-time jobs underreported by employers is used to create a proxy for the unregistered economy. The unregistered production due to underreporting of employment amounted to 1.5% of true GDP in 2012. Unregistered wages for employed persons constitutes another part of unregistered production. The unregistered wages are estimated from the wages reported by firms. If the wages reported by a firm are considerably lower than those of other firms in the same activity and size stratum, an adjustment is made. The unregistered production due to underreporting of wage income amounted to 1.1% of true GDP in 2012.

The remainder of unregistered legal production is attributed to tipping and abuse of special tax treatments of fringe benefits and other sources of non-monetary income. The tipping estimates are drawn from expert assessments, while the abuse of special tax treatments is estimated by comparing declarations of non-monetary income to the Tax and Customs Board with data from the household budget survey. These components of unregistered activities amounted to around 0.5% of true GDP in 2012.[6]

The sectoral breakdown of the exhaustiveness estimates shows that unregistered production comprises a particularly large share of the production in fishing and agriculture, construction, retail and wholesale business, the repair of vehicles and other machines, and hotels and restaurants [30]. It is reasonable to assume that the nature of the business activities in these sectors makes it particularly easy to underreport production and income.

A cross-country study of unreported economic activities in the EU around the year 2000 is presented in [26]. The study concludes that the range of estimates of unreported activities in individual countries is typically very wide and the range is particularly wide for those countries that have the most unreported activities. Despite this, the study provides central estimates of the size of unregistered production in the 10 central and eastern European countries that joined the EU in 2004 or 2007. The estimate for Estonia is the estimate from the exhaustiveness calculations for 2001, which at the time was estimated to be a bit less than 10% of true GDP. The conclusion in [26] is that the prevalence of unregistered production in Estonia is the lowest among the 10 central and eastern European countries. The estimates for the extent of unregistered production in Estonia were also substantially below the estimates for most Southern European countries,

[6] Some underreporting of income can also be detected through underreporting of value-added taxation. Estimates become available with long time lags and are therefore not included in Fig. 2. However, the informal produc-tion originating from these frauds is relatively small, 0.4% of GDP on average during 2000-2008 according to data provided by Statistics Estonia.

but above the levels of the neighbouring Nordic countries.

The official estimates of unregistered production based on the exhaustiveness methodology in all likelihood constitute a lower bound of the actual or true unregistered production. First, unreported employment cannot be ascertained if both employees and employers choose to leave employment unreported. Second, the extent of unregistered wage income of employed individuals is probably also underestimated as the estimate is based on simple comparisons across different firms. Third, it is particularly difficult to estimate the potentially very substantial underreporting of income from self-employment and other business activities.

The conclusion is that the results from the exhaustiveness calculations must be supplemented with results from methods that are more comprehensive and use data from other sources. While there are numerous empirical studies focusing on particular components of the shadow economy, relatively few studies seek to estimate the extent of the entirety of shadow production.

A latent estimator approach is used in [28]. Different causal and indicator variables like tax rates, state regulation, unemployment, corruption and income in individual countries are used to estimate the extent of informal production. The study provides data for Estonia for 2000-2007 and these data are in principle comparable with results for countries all over the world. The shadow production is estimated to to 30-32% of official production or, equivalently, to 23-24% of true production in [28]. There seems to be only a very modest downward movement from 2000 to 2007. The estimates for most of the 10 central and eastern European countries that joined the EU in 2004 and 2007 are also in the vicinity of 30% of official GDP, but the estimates for the Czech Republic, Slovakia and Hungary are lower.

The latent estimator approach is also used in [33] and [10] but these studies include other variables in the analysis and use regional instead of country-level data. The more elaborate approach leads to much lower estimates of the informal economy for Estonia. [33] report results for 2004 and find that the national average of the shadow economy in Estonia amounted to 16-17% of reported GDP or 14-15% of true GDP. This makes the Estonian shadow economy one of the smallest in central and eastern Europe and in the middle of the group of EU countries. Data for 2007 and 2008 are also provided in [10] and obtain results that are very close to those for 2004 in [33], which suggest that the shadow economy has not changed much in the period of rapid structural and institutional change from 2004 to 2008.

Another way to obtaining estimates of the informal economy is to ask managers in companies to provide estimates of the unreported or informal production in the sector(s) in which their companies operate. This methodology is used in [23] and [24] to obtain estimates of perceived unreported employment, wages and profits in the three Baltic States for 2009-2012. The data on the size of unreported wages and profit income in each sector are accumulated over all the private sectors in the economy. The resulting perceived underreporting of GDP refers to the private sector only and does not include production of illegal goods and services. Unreported private GDP in Estonia was perceived to be 19-20% of true private GDP in 2009-2012 [24]. The same magnitude was perceived for Lithuania, while the Latvian unreported private GDP was perceived to be very large in 2009-2011, but fell in 2012 to the level found in the other two Baltic States.

A breakdown of the data on perceived underreporting of private GDP is provided in [24]. Underreporting is perceived to be most prevalent in services, construction and retail and less prevalent in manufacturing. Small companies are perceived to leave more of their activities unreported than larger companies. Data from the 2009 and 2010 surveys documented in [23] are used in [19] and a number of factors that may explain perceived underreporting are analysed. It is found that a narrow individualistic profit motive is of importanced, but so are broader non-individualistic motives such as satisfaction with government performance and a perception of responsibility for societal developments. The interpretation of these results is hampered by the fact that the analysis cannot ascertain the direction of causality.

Private consumption amounts to around half of GDP and, although not directly comparable, the share of household spending that is not registered may therefore shed light on the overall development of the shadow economy. Each year, the Estonian Institute of Economic Research (EKI) conducts a telephone survey with the purpose of recording the prevalence of different types of unregistered activity in Estonia. The sample is relatively small with around 700 persons

included in each round (of which some decline to answer), but the survey provides results that are broadly comparable across years.

Respondents to the EKI survey are asked to estimate the share of their income spent on purchases that they assess not to have been reported to the authorities. The survey does not ask the respondents to assess the reasons for the lack of registration, and it is thus unclear whether the purchases are unregistered to avoid paying various taxes, to elude regulation or to hide illegal production or sales (e.g. moonshine alcohol). Fig. 3 shows the developments for all the years 1999-2012 except for 2009.)

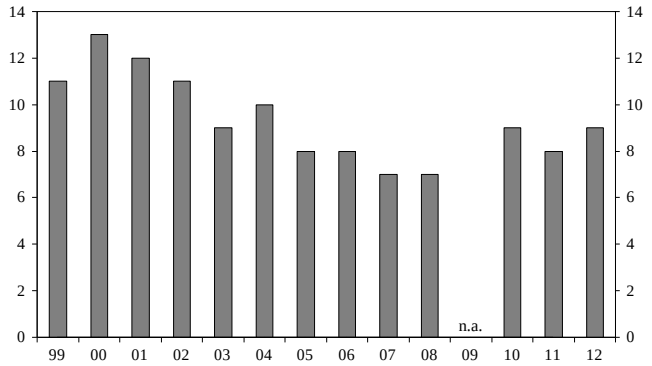

FIG. 3: SPENDING ON PURCHASES ASSESSED TO BE UNREGISTERED, % OF INCOME

Source: [4],[5]

The spending on unregistered purchases exhibits a downward trend from 2000-2002, but subsequently hovers around 8% of income. These developments are broadly in line with developments in the exhaustiveness estimates of unregistered GDP presented in Fig. 2 and arguably also with estimates of informal production in studies using the latent estimator approach and in surveys of the perceived size of the informal economy.[7] The survey also asks the respondents to ascertain the fractions of their purchases that are unregistered within different spending categories. Spending on unregistered purchases is especially prevalent on housing repairs, computer service, tobacco, audio and video media and car repairs.

[7] A special Eurobarometer survey used a survey methodology comparable to the one used by EKI and found that in 2007 around 14% of the respondents in Estonia had bought goods or services embodying unreported work within the last 12 months (European Commission 2007).

Unregistered Employment and Labour Income

A very important part of the shadow economy is unregistered employment and labour income. The most direct way to measure such activities is to ask individuals if they have received unregistered labour income, known in Estonia as "envelope wages", within a given period. The drawback of this methodology is a possible downward bias of the results as some recipients may not answer truthfully; receipt of envelope wages normally means evasion of social security and income taxes and hence implies that national tax laws have been broken.

The survey by the Estonian Institute of Economic Research discussed in Section 3 also includes questions on unregistered labour income. Fig. 4 shows the share of respondents stating that they had received envelope wages during the last year. The share of respondents stating that they received envelope wages regularly or occasionally amounted to 19% in 1999 and to 12% in 2012. The reduction in the share of individuals receiving unregistered labour income broadly follows the trend in the share of unreported GDP found by the exhaustiveness calculations.

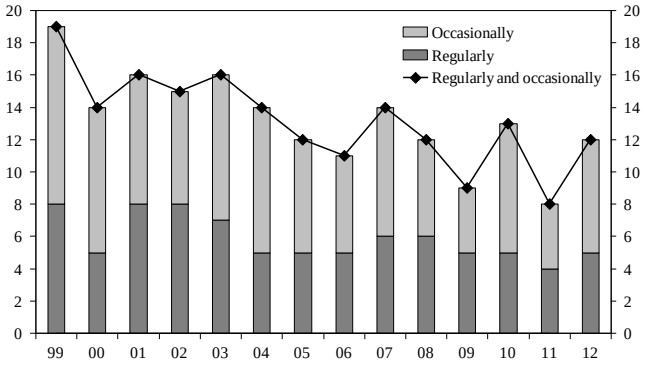

FIG. 4: SHARE OF RESPONDENTS RECEIVING ENVELOPE WAGES WITHIN LAST YEAR, %, 1999-2012

Note: % of all respondents for 1999-2001, % of respondents with labour income for 2002-2012, Source: [4],[5]

The share of respondents stating that they received envelope wages occasionally varies substantially after the outbreak of the global financial crisis; the share is small in 2009 and in 2011, but comparatively large in 2010 and 2012. The rapid changes in the share of respondents receiving envelope wages occasionally may reflect changes in the labour market or the

macroeconomic situation, but no clear picture is apparent.

Respondents who answered that they had received unregistered income were subsequently asked how large a share the unregistered labour income comprised of their total registered and unregistered labour income. The results shown in Fig. 5 indicate that around 40% of the income of these respondents comes from envelope wages. Although the share varies considerably from year to year, it is clear that for recipients of unregistered income, such income is of great importance.

A sectoral breakdown of the receipt of envelope wages produces results in line with the findings from the exhaustiveness calculations, i.e. envelope wages are particularly prevalent in the agricultural, construction and service sectors [4],[5]. Data from the survey on envelope wages for 2004 from the Estonian Institute of Economic Research and two other datasets are used in [12]. In all cases, it is found that unregistered employment is most prevalent among individuals that: i) are men; ii) work in the construction, service or agricultural sectors; iii) work in small firms; iv) do not work full time; v) have lower education; vi) are young or elderly; vii) report low income; and viii) are resident in the relatively rich northern region of Estonia.

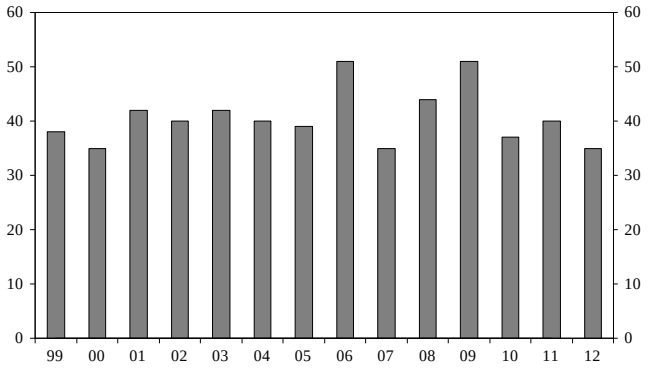

FIG. 5: UNREGISTERED LABOUR INCOME AMONG RECIPIENTS OF ENVELOPE WAGES, % OF TOTAL INCOME

Source: [4],[5]

Overall, [12] conclude that relatively marginalised people often work in the informal sector in Estonia. In this sense, informal employment can be seen to provide a safety net for individuals who might have problems finding well-paid formal employment. Evidence of the exclusion hypothesis has also been found in other transition countries where a relatively low income level and large structural changes have exposed many individuals to hardship [12]. The finding may also help explain the apparent drop in unregistered work during the period 2000-2007 when the Estonian economy grew rapidly, but it cannot explain why informal employment did not increase in 2009-2010 when the Estonian economy was in recession and unemployment increased to very high levels.

A special Eurobarometer survey of unreported work undertaken in the middle of 2007 makes it possible to compare the extent of unreported work across the EU countries [7]. According to the survey 11% of the respondents in Estonia stated that they had carried out unreported work during the past 12 months. This result is not far from the 2007 result in the EKI survey, cf. Fig. 4, but is substantially above the EU27 average of 5%. It is noticeable, however, that the share of respondents who admit to having carried out unreported work varies a lot across the EU countries and often in unexpected ways; Denmark have largest share of unreported work, while Cyprus and Malta at the other extreme have essentially no unreported work.

The surveys of company managers presented in [24] includes questions regarding the perceived prevalence of unreported employment and envelope wages in the Baltic States. The interviewed managers conjecture that in the case of Estonia around 10% of the true number of employees are not reported in 2009-2011, while the share is somewhat lower in 2012. These results are broadly consistent with the EKI results. The managers also estimate that around 20% of the true wage income is not reported in 2009-2011, while the share is around 22% in 2012. These estimates appear rather high compared to the EKI results, cf. Figs. 4 and 5, but the EKI results might be downward biased. The possible bias in the estimates in [24] is more uncertain given that they are based on the perceptions of managers.

Another way to measure the extent of informal employment is by looking at whether or not an individual has worked with a valid employment contract. Data from the European Social Survey have been used to compute data on informal employment for a large number of European countries for 2008 or 2009 [9]. The result is that 9.8% of the respondents had worked without a formal employment contract within the last 12 months. It is noticeable that most of the respondents state that the informal work took the form of self-employment, i.e. they did not receive envelope wages from an employer but rather engaged in

business activities for which the income was not registered. Only 3.2% of the respondents stated that they had dependent employment, i.e. worked informally for an employer. This also means that the results are very different from the EKI results in Fig. 4. The results in [9] reveal very large differences in the extent of informal employment across European countries. Surprising, Estonia along with Hungary and the two other Baltic States are found to have some of the lowest shares of informal employment. This result might raise some doubts about the results of the survey methodology.

Results based on data from the Working Life Barometer, a survey undertaken in all three Baltic States in 1998 and 2002, are presented in [18]. Respondents were asked to state whether they had received envelope wages in the recent past. The results vary substantially across the three countries and across the sampling years. For Estonia a total of 19.5% had received envelope wages in 1998, but only 10.3% in 2002. The results are of the same magnitude as those in the EKI survey, but the decline is very substantial. The econometric analysis shows that the characteristics of the stated employer, including the sector, firm size and changes in the number of people employed, have substantial explanatory power, while the effects of the socio-demographic characteristics of the respondent are small and difficult to estimate precisely. An Oaxaca-Blinder decomposition reveals that only a small fraction of the changes in unreported employment between 1998 and 2002 can be explained by changes in the characteristics of the individual and the firm in which the individual works. The upshot is that it is difficult to explain changes in informal employment by easily observable developments in the economic and societal environment and, hence, that explanations must be sought elsewhere.

The share of wage income earned by employed individuals but not reported to the tax authorities in Estonia is estimated in [22]. Data on employment income reported by individuals to the tax authorities are compared with data reported to the European Social Survey in 2007. The innovation of the study is a decomposition of any discrepancy into measurement errors and underreporting to the tax authorities, i.e. genuine tax evasion. The decomposition is made possible by the assumption that public employees who have held the same job throughout the year and who have only held this one job do not engage in underreporting, so any discrepancy must in this case be attributed to measurement error. The overall share of wage income not reported to the tax authorities is found to be approximately 20% of true employment income. It is noticeable that especially high-earning individuals are found to evade a large share of their wage income.

Underreporting of income by Estonian households with income from self-employment or other business activities is considered in [13]. The study uses data from the Estonian Household Budget Survey for the period 2002-2007. The share of unreported income is computed using the assumptions that households with and without business income have the same propensity to consume food, that all households provide correct data on their consumption expenditures, and that households without business income provide correct data on their income. The result is that households who have business income above 20% of their total reported income underreport around 60% of their true income. Households with business income between 0 and 20% of reported income also underreport their income but to a lesser degree. The extent of underreporting is fairly stable across the six sample years. There is evidently substantial uncertainty associated with the results, but they do illustrate that underreporting of business income is a common phenomenon in Estonia. This view is shared by the Estonian Tax and Customs Board, which has taken numerous measures to increase compliance among taxpayers with income from self-employment and other business activities [6].

Conclusions

It is challenging to provide a comprehensive picture of unregistered production and employment. This applies in general and evidently to the case of Estonia. The official exhaustiveness measure of unregistered production has declined gradually from around 10% of true GDP in 1995 to less than 4% of true GDP in 2012, where true GDP denotes registered GDP plus estimated unregistered GDP. According to the official estimates, unregistered production is particularly prevalent in fishing and agriculture, construction, and services. There are reasons to believe that the exhaustiveness calculations only capture a small part of the informal economy.

Studies using the latent indicator methodology suggest that the informal economy has been relatively

stable since the turn of the century. Recent studies provide estimates for the informal economy of 14-24% of true GDP in the middle of the 2000s, where estimates in the lower end of the interval originate from the more elaborate studies. Surveys of managers of Estonian companies conclude that the perceived unreported share of private GDP amounted to around 20% of private true GDP in the years 2009-2012.

Self-reported measures of informal employment have been fairly stable since 1999 when data were collected for the first time, although a weak downward trend appears to be present. Around 10% of individuals stated that they had engaged in such activities in 2010-2012. These results are likely to be downward biased as they rely on self-reported survey data. Other studies of informal employment provide quite ambiguous results, both across studies and often also within a particular study. A study using tax records and survey data suggests that 20% of true wage income was not reported to the tax authorities. Another study suggests that the extent of underreporting of income is much more prevalent among households with income from self-employment or other business activities than in other households.

The overall conclusion is that unreported production and employment does not appear to be of epidemic proportions in Estonia. The extent of unreported activities has been relatively stable since the early 2000s and is probably not larger than in many other EU countries in central and eastern Europe and in southern Europe. There is no discernible link between the broader structural and macroeconomic developments in Estonia and the prevalence of unregistered activities. Membership of the EU, the pronounced boom in 2000-2007 and the deep downturn in 2008-2009 do not appear to have had substantial effects on informal production and unregistered employment in Estonia.

The welfare consequences of informal production and unregistered employment in Estonia are difficult to ascertain. This in part is because the exact size of the unregistered economy cannot be determined with any degree of certainty, cf. the discussion above. Underreporting of production and income typically leads to lower tax revenues, which entail deadweight losses if tax rates are raised. The net effect on tax revenue will, however, generally not be proportional to the extent of unregistered production and employment. Many economic activities would not be economically feasible if they were in the formal economy and all taxes were paid. Moreover, even unregistered production or employment will eventually lead to transactions that are taxed and hence bring in additional revenue from VAT or other taxes [27]. The upshot is that the revenue loss stemming from unregistered economic activities will generally not be proportional to the extent of these activities.

Social welfare is also affected by the implied redistribution of unregistered activities and the picture is contradictionary in this regard. On the one hand, the results summarised in Section 4 suggest that unregistered employment is often undertaken by marginalised or disenfranchised individuals, cf. the exclusion hypothesis. In this way unreported employment acts as a safety net and may be of little concern from a social welfare view. On the other hand, results also suggest that the amount of taxation evaded by the better-off taxpayers is very substantial, potentially redistributing resources toward better-off segments of society.

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Appendix A: The Estonian tax system

Direct taxes in Estonia comprise a social tax (social security contribution), a personal income tax and a corporate income tax. The social tax amounts to 33% of the wage bill with 20%-points going to the national pension fund and 13%-points to the health care fund. A funded pension system has been operating since 2002 with the effect that for participants, 4%-points of the social tax plus an additional 2% of income is transferred to a personal pension account [25].

The personal income tax has since 1994 been levied at a flat rate against all income in excess of a tax free minimum and possible deductions. The tax rate was initially 26%, but was gradually reduced and has been 21% since 2008. Since 2002, contribution to the unemployment insurance fund has been compulsory for both employers and the employed, effectively making the contribution a tax.

The tax rate levied on corporate income is the same as the rate levied on personal income. Thus, the gradual reduction in the personal income tax rate also applied to the corporate income tax rate. Since 2000, reinvested profit, i.e. profit not paid out to the owner, has been tax exempt.

Indirect state taxes in Estonia consist of a value added tax (VAT) and various excise duties. The VAT rate was 18% from 1994 until 2009 and has since been 20%, although a lower rate of 5% applies to a few selected items. The government levies excise duties on alcohol, tobacco, motor fuel, fuel oil and kerosene for heating, and packaging and motor vehicles for the transport of heavy goods.

Import duties are levied on imports from non-EU countries according to EU rules, with the revenue being transferred directly to the European Union budget. Estonia levies a land value tax, decided by the municipalities with the restriction that the rate must be within 0.1-2.5% of the assessed value (maximum 2% for agricultural land). Estonia does not levy taxes on property (except land), gifts, inheritances or wealth. Local government can impose local taxes within certain areas, but this is seldom done and overall local taxes yield very little tax revenue.