



An evaluation of the scale of undeclared work in the European Union and its structural determinants:

estimates using the Labour Input Method

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Table of Contents

Executive summary	1
1. Introduction	3
2. Methodology used for estimating the magnitude of undeclared work: the Labour Input Method	4
2.1 Operational definition of undeclared work	4
2.2 An outline of the Labour Input Method (LIM)	4
2.3 Data sources and variables used.....	5
2.3.1 Data sources	5
2.3.2 Comparable data on covered industries	7
2.4 Analytical approach	7
2.4.1 Labour input from LFS.....	7
2.4.2 Reconciliation of LFS with SBS on labour input.....	9
2.5 Deficiencies of data sources and recommendations for further improvements	10
3. Estimates of undeclared work in the EU using the Labour Input Method (LIM)	13
3.1 The size of undeclared work in the EU	13
3.2 Undeclared work by type of employment	14
3.3 Structure of the undeclared labour market	16
4. Correlations between undeclared work and structural conditions	18
Appendix 1 Data sources of the structural conditions	26
References	29

Executive summary

On average, **11.6% of total labour input in the private sector in the EU is undeclared**, and undeclared work constitutes on average **16.4% of gross value added (GVA)** (the difference due to undeclared labour being concentrated in sectors with higher labour productivity).

These, however, are unweighted averages, and do not take into account the relative size of the labour force in each Member State. The **weighted averages**, therefore, are that **9.3% of total labour input in the private sector in the EU is undeclared**, and **undeclared work constitutes 14.3% of GVA in the private sector**. The reason for the weighted average being lower than the unweighted average is due to the influence of larger countries such as Germany, France and the UK, which have larger labour forces and relatively lower levels of undeclared work.

There are significant differences in the size of undeclared work between Member States:

- **For undeclared work as a proportion of total labour input** – Poland, Romania and Lithuania have the highest levels of undeclared work, and countries exceeding the EU average are largely new EU Member States (NMS). Only the Czech Republic from the NMS has a smaller than EU average undeclared economy, with the lowest share of undeclared work in terms of labour input being found in the UK, Germany and the Netherlands (less than 3% of total labour input being undeclared).
- **For undeclared work as a proportion of GVA** – the distribution is similar to above, with undeclared work as a proportion of GVA being highest in Poland, Romania and Lithuania (all with undeclared work being over 25% of total GVA created in the private sector), and those with undeclared economies above the EU average again being mostly new Member States (Hungary, Latvia, Estonia, Bulgaria, Cyprus, Croatia and Czech Republic) with three older EU members: Greece, Spain and Italy. Only Slovakia and Slovenia from the NMS countries have undeclared economies slightly below the EU average.

There are significant differences in the prevalence of undeclared work amongst different groups of the employed:

- The proportion of **self-employment** which is undeclared by Member State ranges from 77.6% of all self-employment in Latvia, 73.2% in Romania and 70.6% in Cyprus, to just 6.5% in Belgium, 5.3% in Bulgaria, 3.4% in Italy and 2.5% in Poland;
- The proportion of work conducted in the context of an **employment relationship** which is undeclared ranges from 25.3% Poland, 19.3% in Bulgaria and 18.5% in Lithuania, to just 2.1% in Portugal, 1.5% in Germany, 1.4% in United Kingdom and 1.1% in the Netherlands; and
- The proportion of all **family work** which is undeclared ranges from 89.8% in Latvia, 69.4% in Estonia and 68.2% in Romania, to 4.2% in Austria, 2.9% in Italy and 2.1% in Sweden.

Examining the structure of the undeclared labour market in the EU, **61.8% of all undeclared work is work conducted in the context of an employment relationship, 37.3% is self-employment and 0.3% is family work**. This masks considerable national variations – countries where the majority of undeclared work is conducted through self-employment include Cyprus, Netherlands, Portugal, Denmark and Germany; while those where over 90% of all undeclared work is conducted in the context of an employment relationship include Poland, Bulgaria and Italy.

These different structures have significant implications for tackling undeclared work. Policy initiatives to help business start-up on a legitimate basis, such as smoothing the

transition from unemployment to self-employment, will be useful in countries where most undeclared work is conducted as self-employment (e.g. Denmark). Conversely, in countries where most undeclared work is conducted in the context of an employment relationship (e.g. Poland), policy initiatives to address unregistered or under-declared waged employment, such as the use of notification letters to employers to change behaviour, will be most relevant. It is not only the development of tailored policy measures, however, that Member States need to pursue to tackle undeclared work.

Evaluating whether cross-national variations in the size of undeclared work are associated with variations in various structural conditions, there is found to be:

- A **strong** significant relationship with **GDP per capita** in purchasing power standards (the greater the level of GDP in PPS, the lower the prevalence of undeclared work); and the **quality of government** (based on the European Quality of Government Index, where the higher the quality of government the lower the prevalence of undeclared work);
- A **moderate** significant relationship with: the Transparency International Corruption Perceptions index (which ranks countries according to perceived public sector corruption); a trust in authorities index based on World Economic Forum indicators; the impact of social transfers on poverty reduction; public expenditure on labour market interventions to protect vulnerable groups; the migration rate; the Gini coefficient and income inequality. Overall, the higher the perceived level of corruption, the lower the level of trust in public authorities, and the higher the perceived level of inequality, the higher the level of undeclared work; and
- A **weak** but significant relationship with the long-term unemployment rate; and with the very long-term unemployment rate – in both cases the higher the respective rates, the higher the level of undeclared work.
- **No significant relationship** was identified between undeclared work and the job vacancy rate or the implicit tax rate on labour – in the case of the latter, this refutes the common assumption that undeclared work is directly related to taxation levels.

In conclusion, lower levels of undeclared work are found in Member States where there are higher levels of GDP per capita, more modernised systems of government, higher levels of trust in authorities and lower levels of corruption, where social transfers are effective at reducing poverty, there are higher levels of public expenditure on labour market interventions to protect vulnerable groups, and where there is greater equality, lower levels of long-term unemployment, and net in-migration rather than out-migration.

1. Introduction

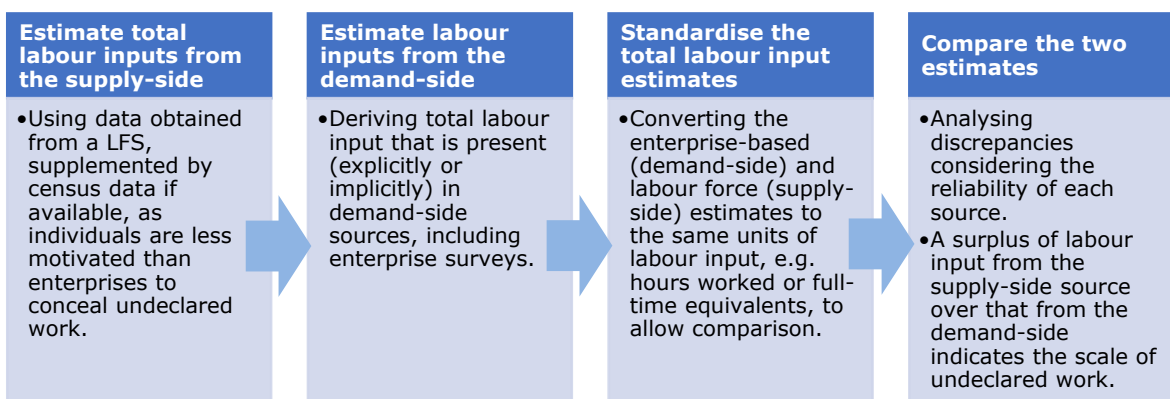
Given that undeclared work by definition is not declared to the authorities, obtaining reliable estimates of its size is difficult. As the European Commission (2007: 4) summarise:

“Undeclared work can be measured both directly and indirectly. Indirect methods are based on the comparison of macroeconomic aggregates (such as national accounts, electricity consumption, cash transactions). Indirect (especially monetary) methods often over-estimate the level of undeclared work and say little about its socio-economic characteristics. Direct methods, on the contrary, are based on statistical surveys and have advantages in terms of comparability and detail, but tend to under-report the extent of undeclared work.”

The resultant consensus has been to use indirect methods, using macroeconomic data collected and/or constructed for other purposes, to measure the size of the undeclared economy, and direct survey methods to identify its characteristics in terms of who engages in undeclared work, what they do and why, so as to inform policy development (Eurofound, 2013; Williams and Schneider, 2016).

Reflecting this consensus, an indirect approach, the Labour Input Method (LIM) is used in this report to measure the size of the undeclared economy. The LIM uses macroeconomic data to measure, for each Member State, the discrepancy between the reported supply of labour inputs (from the Labour Force Survey) and demand side data on recorded labour demand (e.g. from enterprise surveys, company declarations to tax or social security authorities, or national statistical offices). The discrepancy between the two provides an estimate of magnitude of undeclared work. Key steps in the method are summarised below.

Figure 1. Key steps to estimate undeclared work using the Labour Input Method



It is worth noting that the use of the Labour Input Method provides a lower bound estimate, as labour input could be missing from both sources.

In the next section, therefore, the methodology used for estimating the magnitude of undeclared work is described, namely the Labour Input Method (LIM). This is then followed in section 3 by a reporting of the estimates of the size of undeclared work in EU member states. This section also evaluates how the level of undeclared work varies by the employment relationship considered, and how the structure of the labour market varies, across EU member states. Section 4 then evaluates the relationship between cross-national variations in the level of undeclared work and cross-national variations in various economic and social structural conditions.

2. Methodology used for estimating the magnitude of undeclared work: the Labour Input Method

The Labour Input Method (LIM) estimates the scale of undeclared work (UDW) in the EU by measuring the difference/discrepancy between the reported labour supply by workers (as reported in the European Labour Force Surveys i.e. EU-LFS) and the reported use of labour by employers (as reported in enterprise and business surveys - SBS) after generating a harmonised database to make the two key data sources comparable.

To review the methodology used, firstly, the operational definition of undeclared work is explained. Secondly, a description is provided of the Labour Input Method (LIM) used to generate the estimates of undeclared work in the EU. Thirdly, the data sources and variables used are described. Fourthly, the analytical approach, and fifth and finally, the deficiencies of the data sources are noted, with recommendations for future studies.

2.1 Operational definition of undeclared work

Undeclared work is defined as “any paid activities that are lawful as regards their nature, but are not declared to the public authorities, taking into account the differences in the regulatory systems of the Member States” (European Commission, 2007: 1). This definition of undeclared work is closely related to the OECD concept of the non-observed economy, albeit not synonymous with it. According to European System of Accounts (ESA 2010) and OECD (2002), activities that fall under the definition of non-observed economy are as follows:

1. Illegal activities where the parties are willing partners in an economic transaction;
2. Hidden and underground activities where the transactions themselves are not against the law, but are unreported to avoid official scrutiny (e.g. envelope wages) (Williams *et al.*, 2012); and
3. Activities described as “informal”, typically, where no business records are kept. These are typically cash in hand transactions undertaken by service providers to households or individuals (e.g. gardening, plumbing).

Undeclared work includes the activities listed under (b) and (c), but excludes the activities in (a). As such, illegal economic activities (e.g. drug dealing, prostitution, black market alcohol and cigarettes trade) are excluded. However, sometimes what is lawful in one country is illegal in others. For instance, in some countries prostitution is legal (e.g. Germany, Greece and Hungary) but not in others, and in some countries (e.g., the Netherlands) some drugs are legal but not in others. Here, therefore, the definition of undeclared work excludes these transactions that are legal in some countries but not others. As such, undeclared work excludes all activities that are unlawful as regards their nature, but also some lawful activities in some member states, but not others, for which data is not collected in in survey databases (i.e. EU-LFS and SBS).

2.2 An outline of the Labour Input Method (LIM)

The Labour Input Method (LIM) estimates undeclared work by measuring the discrepancy between reported labour supply and labour demand. The Labour Force Survey (LFS) is the source of data on the labour supplied to firms by households or individuals. The LFS is conducted on a regular basis by national statistical offices in the EU member states. Meanwhile, the source of data on the demand for labour (i.e., labour used) by enterprises is based on various statistical and administrative sources (e.g. enterprise surveys or structural business statistics, SBS). The premise of this approach is that firms/companies may deliberately conceal part of their economic activities and therefore part of their labour input into the production of goods and

services, and that by identifying the discrepancies in the labour inputs reported by businesses in enterprise surveys, and the labour inputs reported by individuals, an estimate of the scale of undeclared work can be produced.

The Labour Input Method (LIM), therefore, is based on the following approach (OECD, 2002):

- Estimate the labour input underlying GDP estimates and which are in many countries based on enterprise surveys;
- Estimate the labour input based on household survey data which are obtained from a LFS and supplemented by population registers or census data if those are available;
- Standardise the labour input estimates by converting both sources to the same units of labour input, such as hours worked or full-time equivalent employment units;
- Compare the two sets of estimates and assess potential discrepancies taking into account the reliability of the different sources.

In addition, OECD (2002) define a set of procedures which should be followed when converting the discrepancies in labour inputs into an estimate of this as a percentage of gross value added (GVA). It states that analysts should:

1. Obtain estimates of the labour supply disaggregated on the level of economic activity and size of enterprise or type of labour (work conducted in the context of an employment relationship, self-employment), from a labour force survey and/or other supplementary demographic sources;
2. Obtain estimates of output per unit of labour input and value added per unit of labour input for the same activity and size breakdown from regular statistical enterprise surveys; and
3. Multiply the labour input estimates from (1) by ratios expressed in the per unit terms which results in output and value added for the activity and size categories.

The labour inputs estimated in step 1) are used as weights that should be applied to the enterprise survey output estimates and value added per unit of labour input (derived in step 2). To calculate the undeclared component of the gross value added (GVA), ratios of output and value added per unit of labour input are used, which are taken from enterprise surveys (SBS).

2.3 Data sources and variables used

2.3.1 Data sources

This study compares the labour supplied by individuals as reported in LFS and the labour demanded by firms as reported in structural business statistics (SBS). Data on the employment of individuals derived from the LFS provides an array of information such as employment status (employee, self-employed person or family member), number of hours worked, whether they hold a secondary job, and various socioeconomic characteristics of the respondents. Enterprise/business surveys (e.g. SBS), meanwhile, usually provide employment information in terms of jobs. The same individual in the business surveys can be counted more than once if he/she works for two or more employers. Therefore, data from household and business surveys are not directly comparable and need to be converted into comparable units, such as total hours worked or full-time equivalent employment. Having done this, if the labour input reported from the supply-side (LFS) exceeds the labour input reported as used by employers (SBS), even after procedures which ensure that different data sources are converted to comparable units, then the difference can be interpreted as the level of undeclared work.

The first step, therefore, is to use internationally agreed concepts and definitions to reconcile the two major data sources (i.e. LFS and SBS) so as to estimate the size of undeclared work. ESA (2010) provides a set of definitions, concepts and standards, which are here adopted for analysing LFS data.

Employment includes all persons engaged in productive activity that falls within the production boundary of the national accounts (ESA 2010, p. 11.11). Persons in employment are employees or self-employed persons. Those engaged in work in the context of an employment relationship (**employees**) are persons who, by agreement, work for a resident institutional unit and receive a remuneration recorded as compensation of employees. The definition of employees corresponds to the ILO definition of paid employment. **Self-employed** persons are defined as persons who are the sole owners, or joint owners, of the unincorporated enterprises in which they work, excluding those unincorporated enterprises that are classified as quasi-corporations according to the ESA (2010) definition. Persons having both wage employment and a job as a self-employed person are classified here as self-employed if the self-employed job constitutes their main activity by income. **Unpaid family workers** are persons working in a family business or on a family farm without pay and who are living in the same household as the owner of the business or farm and receive remuneration in the form of fringe benefits or payments in kind.

Total hours worked represents the aggregate number of hours actually worked as an employee or self-employed person during the accounting period. Given the broad definition of employees, which covers persons temporarily not at work but with a formal attachment, and part-time workers, the appropriate measure for productivity calculation is not a head count but total hours worked.

Full-time equivalent employment (FTE), is the number of full-time equivalent jobs, defined as total hours worked divided by the average annual number of hours worked in full-time jobs. Even if total hours worked constitute the best measure of labour inputs, full-time equivalence can be used as an alternative proxy to capture labour input and it can be estimated easily and enables international comparisons to be made.

SBS data provided by member states are published within the Eurostat database. Annual enterprise statistics are broken down by size classes and are available on the detailed level of industry classification (currently NACE Rev 2). However, due to rules on confidentiality, some of the detailed breakdowns by size and industry are not published. The detailed level and breakdowns required starting with the reference year 2008 is defined in Commission Regulation N° 251/2009. The SBS coverage of the business economy is limited to Sections B to N and Division S95 of NACE Rev.2. Data provided for financial activities (credit institutions, insurance services and pension funds) are focused on specific aspects of those services and substantially differ in comparison with data provided for traditional market activities. Labour input in real terms (as FTE or hours worked) is less frequently used in financial services. Thus, an approach such as LIM is not the most appropriate method to capture undeclared work in the financial sector. In this study, both private and public financial institutions are therefore excluded due to lack of data in SBS. However, it is not to be expected to observe a high level of undeclared work in the financial sector because those institutions must keep very reliable business accounts that are overseen by tax authorities, central banks or other regulatory bodies (e.g. insurance or pension funds). Additionally, LIM is not a good method to estimate undeclared activities in financial sector because of a different definition of national accounts aggregates (e.g. Financial Intermediation Services Indirectly Measured-FISIM, net insurance premiums) and productivity differentials between financial and non-financial sectors.

For the purposes of implementing LIM, we use the relevant employment data from SBS on the number of employees in enterprises in terms of full-time equivalents.¹ The number of employed persons excludes labour supplied to the unit by other enterprises, persons carrying out repair and maintenance work in the enquiry unit on behalf of other enterprises, as well as those on compulsory military service. Since employment data in SBS are expressed in terms of the number of jobs one has, conversion into full time equivalent terms provides more precise information on labour input across the enterprises and industries. In the context of LIM, another variable of interest is value added which could be used for construction of a productivity indicator (e.g. value added per labour input). **Value added at factor costs** is the gross income from operating activities after adjusting for operating subsidies and indirect taxes. Value adjustments (such as depreciation) are not subtracted.

2.3.2 Comparable data on covered industries

National accounts (NAs) data and the labour force survey covers all industries in accordance with classification NACE rev 2. On the other hand, structural business statistics (SBS) cover only **the private sector**. Therefore, the comparable component of the databases between LFS and SBS is the private sector and it is therefore for this component that estimates of the size of undeclared work in the EU28 have been provided. Public institutions are excluded, which might be assumed not to engage in tax, social security and labour law non-compliance, such as by providing misleading labour input statistics, in order to hide undeclared work.

The comparable private sector activities that are covered in this study of undeclared work using LIM include: NACE B Mining and quarrying; NACE C Manufacturing; NACE D Electricity, gas, steam and air conditioning supply; NACE E Water supply; sewerage, waste management and remediation activities; NACE F Construction; NACE G Wholesale and retail trade; repair of motor vehicles and motorcycles; NACE H Transportation and storage; NACE I Accommodation and food service activities; NACE J Information and communication; NACE L Real estate activities; NACE M Professional, scientific and technical activities; and NACE N Administrative and support service activities.

2.4 Analytical approach

To measure the size of undeclared work in the EU, and to assess the robustness of the estimates based on available harmonised data at EU-level, the procedures followed and the challenges encountered during the estimation process are here reviewed. This section therefore provides a comprehensive explanation of all the steps taken to allow a systematic comparison of the existing information on labour supply on the one hand and labour demand on the other.

To commence, the adjustments to the LFS datasets are explained. This is followed by an overview of the key variables from the LFSs that are essential for assessing the total labour input in an economy. After explaining the steps taken to summarise information from LFSs, the extent of information provided in SBS is discussed along with the methods applied to reconcile data from these two contrasting data sources.

2.4.1 Labour input from LFS

The LIM method assumes that labour force surveys (LFS) give an accurate depiction of the real state of affairs regarding activities on the labour market in a particular country. For that reason, the accuracy of the estimates of undeclared work is highly dependent on the quality of the information collected via LFS. An initial problem confronted in this respect was that only country residents are considered when constructing a sample for an LFS survey. Such surveys thus fail to capture activities of

¹ Definitions of SBS variables are taken from http://ec.europa.eu/eurostat/cache/metadata/en/sbs_esms.htm.

cross-border workers from other countries working inside the country of interest, various non-resident seasonal workers, and legal immigrants who entered the country within one year prior to survey, as well as of illegal immigrants who participate in a labour force.

This problem was to an extent mitigated in this study due to the fact all EU member states were embraced by the study. Explicitly, every worker participating in a labour force survey was asked in which country they actually/usually work. Those who work abroad, but are still residents of a country in which they were interviewed, are essentially a part of workforce of another country and therefore all information collected from them was moved to the LFS of that particular country. This is possible if the country in question is a member of EU. Therefore, the first step of the estimation procedure was to adjust LFS data of every single country by excluding their residents working abroad and by including residents of other EU member states working in that country.² The datasets from Switzerland, Norway and Iceland (which are all members of the EEA) states were also available, which therefore enabled adjustment for the great part of European workers that do not need a special permit to work in the EU.³ Only once this process was completed was the computation of labour input undertaken. It is, however, important to note that there was also a need to incorporate residents of non-EU countries and illegal immigrants working in each EU member state. However, this required simulations based on the behaviour of foreign nationals and cross-border EU workers to integrate such individuals in the labour force.

Only those respondents working for pay were analysed in both the LFS and SBS.⁴ The central information provided by a LFS from the perspective of the LIM is the number of hours each individual works on a regular basis. This was converted into yearly equivalents.⁵ In the conversion, we control for inherent differences between individuals with respect to their work input or hours worked, which is heavily dependent on the economic sector in which they work, type of employment (self-employed, employees or family workers), type of the contract (full-time vs. part-time) and nature of the job (main job or second job) by having separate analyses. In addition, the distributional characteristics of labour input within every single group of individuals defined by these four features were analysed. The distributional assessment was based on an examination of the mean and standard deviation, as well as normality checks for the average number of hours completed within each subpopulation. There was also a need to integrate the contribution of non-EU/EEA citizens legally working in every country, as well as irregular migrants. Since available information on these two groups is scarce, simulation/statistical techniques were applied to address this issue.

Legally employed non-EU/EEA workers were assumed to resemble EU citizens working abroad regarding the nature of their employment and labour inputs (e.g. in terms of hours worked). As such, activities of a subsample of non-nationals working within a given country (based on the variable NATIONALITY) were first assessed. Based on this, figures for every non-EU citizen working legally in the EU were then simulated. On the other hand, the employment of irregular migrants of working age was assumed to be similar to that of non-nationals living legally inside the country. It was thus

² Akin to all other parts of the estimation process, this was automated using VBA software.

³ However, this procedure did not resolve the problem completely, due to not all EEA members being included (i.e., the LFS from Lichtenstein was missing), and because there was no information on residents of other non-EU countries who can freely work inside certain EU member states (e.g., citizens of Bosnia and Herzegovina in Croatia).

⁴ Such persons were identified using the variable WSTATOR (labour status during the reference week). According the EUROSTAT methodology, active workers are those individuals who answered either '1' - *Did any work for pay or profit during the reference week – one hour or more*; or '2' - *Was not working during a reference week, but had a job or business from which he/she was absent during the reference week*.

⁵ Every respondent was assigned a weighting factor, which enabled to project the results of the survey to the whole population.

assumed that only a part of the irregular migrant population works, and that their employment is not different to other non-nationals (e.g. non-EU legal workers). Based on this, the occupational characteristics of the LFS participants who are not citizens of the country in which they live were first analysed, and then the simulation procedure described above was applied to integrate the contribution of irregular migrants.

The average hours worked in every job (rather than for every worker, given that an individual can have more than one job) existing in the adjusted LFS was calculated in terms of yearly labour input and projected to the total working population based on the assigned weights. The phrase "adjusted LFS" therefore denotes the final dataset on labour input, constructed by removing information on a country's residents who are working abroad from the original LFS and adding in the figures on EU citizens conducting employment within that country (who were detected by LFSs in other member states), as well as adjusting further for the simulated contribution of illegal immigrants and non-residents from countries outside the EU/EEA working legitimately in the country. The resulting values for the main job and supplementary jobs within each group defined by an economic sector and type of employment (self-employed, employees, family workers) were added up. The same applies to the figures for full-time and part-time jobs. This resulted in a matrix of totals from the LFS which was then compared with the information on the labour demand from the SBS. As a robustness control mechanism, labour input from the supply side was also expressed in terms of jobs in full-time equivalents, and later compared with similar information from SBS.

2.4.2 Reconciliation of LFS with SBS on labour input

To produce comparable estimates of undeclared work in the EU, it was necessary to identify a set of SBS data that is available for the greatest number of countries⁶ and to generate yearly labour input (i.e. by aggregating the weekly average hours worked to yearly estimates), as was undertaken for the LFS and for each employment category (i.e. the self-employed, employees and family workers). As SBS routinely report the number of jobs and the type of contract for each job (either full-time or part-time), labour input was also expressed in full-time equivalents for every sector and type of employment. Once these comparable labour inputs (i.e. in yearly hours worked and FTE) were generated, the discrepancy between the labour supply from LFS and labour demand in the SBS was computed and used to compute the proportion of gross value added (GVA) that comes from undeclared work. This is done for each country and the scale of undeclared work is reported both in terms of hours worked and full-time equivalent (FTE) workers.

It is important to note that the harmonised SBS datasets provide information on hours completed during a year only for four sectors: B - Mining and quarrying; C - Manufacturing; D - Electricity, gas, steam and air conditioning supply; and E - Water supply, sewerage, waste management and remediation activities. Moreover, these figures are available for 24 member states only, as there is no such information for Denmark, France, Malta and Slovenia. On the other hand, the total number of jobs in full-time equivalent units is available for 27 countries, but only for employees. Once again, these values are not given for Slovenia. Therefore, the estimates for Slovenia should be taken with caution and in future data collection, there is perhaps a need to target Slovenia in order to enhance the quality of similar exercises. The only comparable data available for most countries are those on the total number of jobs by sectors. Yet, Malta and Cyprus are quite problematic in this respect given that in the case of Malta no information is available for sectors B to E, while for Cyprus this issue is in relation to sectors B and D. Hence, the decision was taken not to provide estimates for Malta. A further problem for these two and all other countries is the fact that separate figures on the total number of jobs are given only for employees (and

⁶ It was not possible to find a satisfying subset of data existing for every single country.

this applies to all sectors), while data for self-employed and family workers are presented together which we believe is reasonable in most cases. Given this substantial lack of information, the only viable approach was to simulate missing values for the labour demand from SBS by utilizing all available information on both the supply and demand side of the equation. Further technical details of the simulation are contained in the long report of this study.

2.5 Deficiencies of data sources and recommendations for further improvements

By analysing the differences between labour supply and demand, an estimate of undeclared work has been produced which covers the labour inputs into the types of undeclared work attributable to labour input. The first deficiency of this method, therefore, is that other types of undeclared work not related to labour input (e.g., non-declared profit generated via other economic inputs such as capital) are outside the scope of this research. Given that overall production is based on labour and capital input, LIM is therefore more effective in estimating undeclared work in sectors with high labour intensity and fewer capital inputs, while concealed income in certain sectors which are more capital-intensive are likely to remain undetected by application of LIM.

There are also problems with using this discrepancy between the supply of labour inputs and the use of labour inputs as an estimate of the scale of undeclared work. A first problem is that there is an assumption that data on the supply of labour inputs is accurate and that by identifying the discrepancy between this and what firms claim are the labour inputs, one can identify the scale of undeclared work. However, labour inputs may also be intentionally misreported from the supply side by individuals who do not wish to report their undeclared work during labour force surveys.

In addition, the misreporting of labour inputs and resulting mismeasurement on the demand side is not always due to employers hiding undeclared work. It can also be the result of survey methods and statistical factors. For instance, in some enterprise/firm surveys, various establishments are not covered in the survey, such as due to firm size cut offs or limits. In recent years, nevertheless, this problem has been reduced greatly due to the efforts of Eurostat and national statistical offices to improve the quality and coverage of business statistics, thus reducing the potential for misreporting or mismeasurement due to statistical factors. Nuanced methods in data collection and processing, moreover, are also now used to reconcile differences between various data sources.

Nevertheless, the most significant obstacle remains the scarcity of information provided by unified SBS datasets. The result is that the estimation process had to be supported by various statistical simulations, whose consistency is strongly dependent on the validity of the underlying assumptions. Hence, the estimates obtained on undeclared work in the EU reported here are based on some assumptions. The simulation exercises undertaken to address the missing data problem required decisions to be taken on the nature of the distribution of hours worked (e.g. either normal or Gaussian). As a result, the stability of estimates and their distribution were checked by making changes to simulation parameters to see how the distribution of hours worked behaves as the cut-off points change. Although a set of predefined steps were applied to determine the most appropriate strategy for transforming SBS data into comparable units, it was not possible to ensure the absolute certainty of the estimation process. Given this, the obtained figures for the share of undeclared work in the EU based on the available harmonised data, should be treated as educated guesstimates, rather than robust and irrefutable facts.

To improve the robustness of these estimates in future exercises, several improvements could be made. If specific additional administrative or statistical data sources which member states hold are made available for future exercises, then the

estimates can be considerably improved. This first and foremost involves providing more information on the demand side of the equation (e.g. having more information on exhaustive list of sectors in SBS). For the effective application of the LIM, one needs detailed information on the number of hours completed for all business sectors and all workers regardless of the nature of their employment, as well as for all EU member states. It would also be beneficial to have reliable figures on employment in terms of full-time equivalent jobs to enable triangulation of the estimates and obtain alternative estimates that can be compared with a reasonable degree of confidence across other data sources on the labour supply side such as LFS.

Moreover, the robustness of the final results could be significantly improved if the labour input of non-EU but legal residents, and of illegal immigrants, are better documented by all EU member states. This would remove bias caused by deficiencies in the labour supply side of the equation. For instance, it was noticed that LFSs in some countries did not capture any residents working abroad.⁷ Some other countries, on the other hand, did include such individuals, but their number was unusually low.⁸ Not only has this influenced the results for other countries (as such individuals would be analysed as a part of the estimation process for some other member state), but it also raises an important question about the validity of the sampling procedures applied.

Some member states also failed to provide information on the country in which a person works for a significant proportion of respondents in the sample⁹, while some did not specify the exact foreign country in which their residents work (i.e. only labels such as "EU28" and "NMS" are provided).¹⁰ As a solution to this problem, it is assumed that such residents worked in the country in which they were interviewed.¹¹

Yet, the difficulties caused by missing values went far beyond the information about the country in which a respondent works. The estimation procedure in some countries was made complicated by a significant number of workers failing to state the exact sector in which they work, while in several countries there was a substantial share of individuals who could not be classified according to the type of their employment.¹² These issues required different types of adjustments, each of which exert various influences on the final estimates.

Indeed, 2013 has been chosen for producing the first EU estimates of the scale of undeclared work using the Labour Input Method because the extent of the problems with the data sources used were lowest for this year. Indeed, the main reason for selecting 2013 was because this year had the minimum proportion of missing values compared with LFS datasets for other years such as 2014 and 2015. Obviously, missing values (i.e. missing answers by LFS respondents on relevant questions for measuring undeclared work) negatively influence the reliability of the overall results. Selection of the reference year for this study is therefore based on analyses of the proportion of missing values in the LFS data. Selection of this year is also based on the analysis of the nature of the distribution of key variables for LIM (e.g. the normality of the distribution of hours worked). The quality of labour force surveys depends on many factors, such as sample design, stratification procedures applied, response rates and other factors.

⁷ This was the case in Greece and Cyprus, as well as in the EEA members Iceland and Norway.

⁸ United Kingdom, Spain and Finland for instance.

⁹ Although existent for many member states, such problems were most pronounced in the LFS of Ireland and Poland.

¹⁰ This problem was encountered in the case of Malta and Slovenia.

¹¹ Despite being quite reasonable, this strategy clearly illustrates the influence of the researchers' decisions on the final results.

¹² Both these issues were detected in the majority of the countries. However, the problems with first of the two were particularly salient in the case of the Netherlands, Ireland, Luxembourg and Sweden, while the second represented an obstacle for Latvia, Sweden, Luxembourg and the United Kingdom.

The selection of 2013 is based not only on the assessment of the quality of LFS data but also of the SBS data. The production of detailed SBS data requires significant resources of national statistical offices in terms of quality assurance of the data. Currently, the latest year for which data are available is for 2014. However, even after reconciling LFS with SBS data on key labour input variables, 2014 could not be taken as a reference year due to the severity of the missing values in the SBS compared with 2013. For these reasons, estimates of undeclared work based on comparable data of the LFS and SBS are here produced for 2013.

3. Estimates of undeclared work in the EU using the Labour Input Method (LIM)

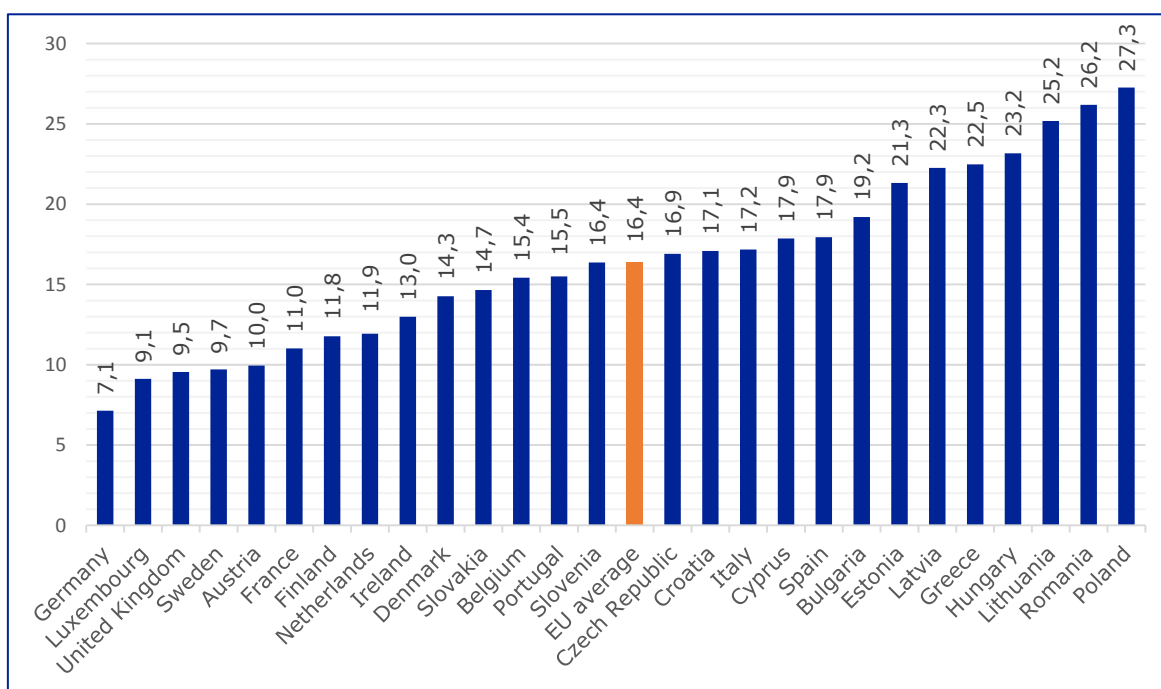
3.1 The size of undeclared work in the EU

Figures 2 and 3 present the resultant estimates of undeclared work in the private sector of the EU. On average across EU member states, 11.6% of total labour input in the private sector is undeclared, and undeclared work constitutes on average 16.4% of gross value added (GVA) in the private sector, this higher figure being because undeclared labour is found to be concentrated in sectors where labour productivity is higher. Moreover, and as Figure 3 reveals, even the most conservative minimum estimate of the size of undeclared work in the EU is that on average 7.7% of total labour inputs in the private sector are undeclared across the member states.

These, however, are unweighted averages, and do not take into account the relative size of the labour force in each member state (Eurostat, 2017)¹³. The **weighted averages**, therefore, are that **9.3% of total labour input in the private sector is undeclared**, and **undeclared work constitutes 14.3% of GVA in the private sector**. The reason for the weighted average being lower than the unweighted average is due to the influence of larger countries such as Germany, France and the UK, which have larger labour forces and relatively lower levels of undeclared work.

Undeclared work is not everywhere of the same magnitude. There are major variations in its size. Those countries with undeclared economies larger than the EU average, when examining its size as a proportion of total labour inputs, are largely new EU member states (NMS) and only Italy is included among the older members. On the other hand, only the Czech Republic from the NMS has a smaller than EU average undeclared economy. The lowest share of undeclared work in terms of labour input is recorded for the United Kingdom, Germany and the Netherlands where less than 3% of the total labour input is undeclared.

Figure 2. Undeclared work in the private sector as % of total GVA, LIM estimates for 2013



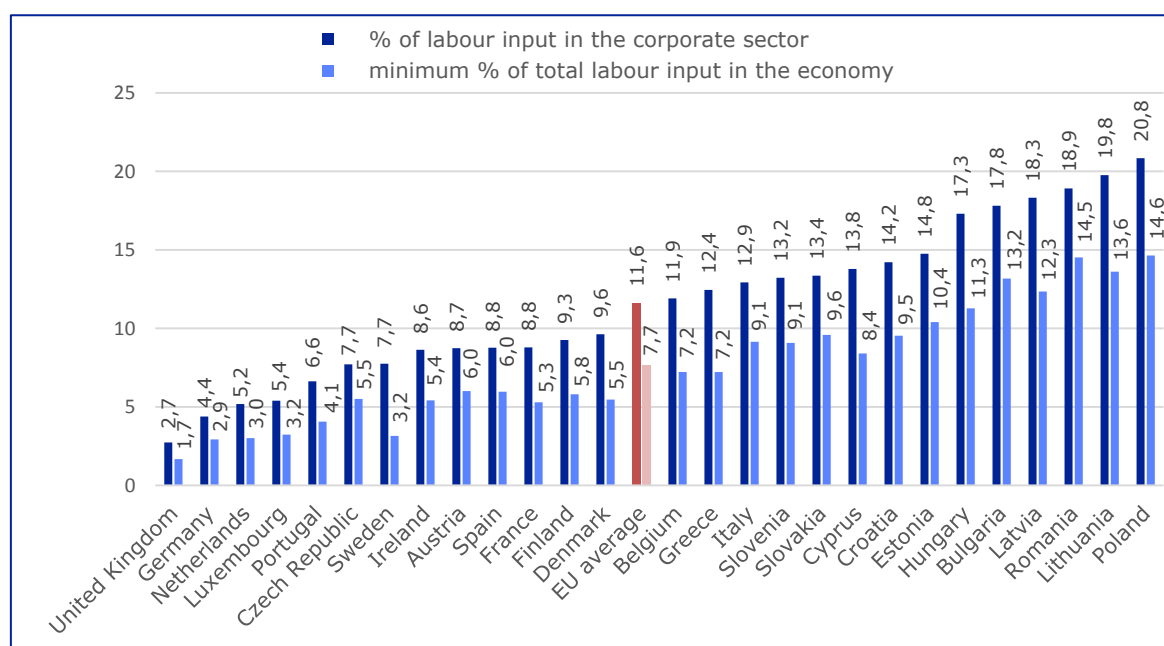
Notes: Estimates for Malta are not provided due to deficiencies of data sources for this member state

¹³ Eurostat (2017). *Employment and activity by sex and age - annual data*. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfsi_emp_a&lang=en

The distribution of countries when undeclared work is measured as a proportion of GVA does not significantly change. Measured as a proportion of GVA, undeclared work is highest in Poland, Romania and Lithuania where it is greater than 25% of total GVA created in the private sector. Those countries with undeclared economies larger than the EU average are again mostly new member states (Hungary, Latvia, Estonia, Bulgaria, Cyprus, Croatia and Czech Republic) along with only three older EU members: Greece, Spain and Italy. Only Slovakia and Slovenia from the group of NMS countries have undeclared economies slightly below the EU average. It is to be noted, that even in the economies with the lowest share of undeclared work, it still constitutes some 7% of private sector GVA.

The different estimates of undeclared work when measured in terms of total labour input and GVA is related chiefly to the sectoral distribution of undeclared work and the varying productivity of sectors. A higher share of undeclared work in terms of GVA compared with total labour inputs suggests the concentration of undeclared work in sectors where labour productivity is higher. This is because undeclared work in terms of GVA is computed after multiplying labour productivity or GVA per employed person in each sector by the size of undeclared work for that sector.

Figure 3. Undeclared work in the EU in terms of the labour input, LIM estimates for 2013¹⁴



Notes: Estimates for Malta are not provided due to the inadequacy of the data for this member state

3.2 Undeclared work by type of employment

Table 1 provides more detailed results on the prevalence of undeclared work amongst different types of employment, namely self-employment, work undertaken in the context of an employment relationship and family work. In doing so, a more in-depth insight is provided into both the extent to which self-employment, work conducted in the context of an employment relationship and family work is conducted on an undeclared basis, as well as the structure of the undeclared labour market in each member state.

¹⁴ The minimum lower bound estimates are driven by the low reporting of actual hours worked in LFS and SBs.

Table 1. Undeclared work in the private sector in the EU, LIM estimates 2013

Country	% of total labour input in the private sector*				% of GVA in the private sector
	Total	Self-employed	Employment relationship	Family workers	
Poland	20,8	2,5	25,3	5,7	27,3
Lithuania	19,8	38,8	18,5	28,7	25,2
Romania	18,9	73,2	15,1	68,2	26,2
Latvia	18,3	77,6	12,1	89,8	22,3
Bulgaria	17,8	5,3	19,3	7	19,2
Hungary	17,3	26,4	16,3	27,7	23,2
Estonia	14,8	65,8	9,2	69,4	21,3
Croatia	14,2	44,5	10,6	40	17,1
Cyprus	13,8	70,6	2,3	64,9	17,9
Slovenia	13,4	9,3	14,3	2,1	14,7
Slovakia	13,2	14,3	13,1	6,2	16,4
Italy	12,9	3,4	17,2	2,9	17,2
Greece	12,5	7,8	14,6	21,2	22,5
Belgium	11,9	6,5	13,2	8,8	15,4
Denmark	9,6	58,9	3	58,9	14,3
Finland	9,3	45,3	3,6	37,5	11,8
France	8,8	34,9	5,2	44,7	11
Spain	8,8	17,2	6,2	18,1	17,9
Austria	8,7	9,9	8,6	4,2	10
Ireland	8,6	31,4	4,7	21,9	13
Sweden	7,8	17,3	5,7	23,1	9,7
Czech Rep	7,7	7,1	7,9	4,8	16,9
Portugal	6,6	21,2	2,1	23	15,5
Luxembourg	5,4	45,6	2,4	33	9,1
Netherlands	5,2	24,2	1,1	17,9	11,9
Germany	4,4	25,8	1,5	24	7,1
UK	2,7	7	1,4	11,5	9,6

Note: *The estimates exclude public sector and non-governmental organisations. Estimates for Malta are not possible due to unreliable data, including a small sample size of the LFS for each sector, and SBS data is labelled as confidential and missing for key activities (e.g. manufacturing, construction, water supply, electricity and gas, mining and quarrying). This is confirmed by the results which show undeclared work in Malta in terms of full-time equivalent employment (FTE) and Gross Value Added (GVA) is negative. In terms of full-time equivalent employment, labour demand by firms in the SBS is higher than labour supply in the LFS by 2.65% and by 2.13% in terms of GVA.

Starting with the extent to which self-employment, work conducted in the context of an employment relationship and family work is conducted in the undeclared economy, this reveals significant differences between member states. Examining the variations in the proportion of all self-employment conducted on an undeclared basis (measured in terms of labour inputs), the finding is that undeclared work ranges from 77.6% of all self-employment in Latvia, 73.2% in Romania and 70.6% in Cyprus through to just 6.5% of all self-employment in Belgium, 5.3% in Bulgaria, 3.4% in Italy and 2.5% in Poland.

Similarly, examining the variations in the proportion of all work conducted in the context of an employment relationship is undertaken on an undeclared basis (measured in terms of labour inputs), the finding is that 25.3% in Poland, 19.3% in Bulgaria and 18.5% in Lithuania is conducted as undeclared work, but just 2.1% in Portugal, 1.5% in Germany, 1.4% in United Kingdom and 1.1% in the Netherlands. Analysing the variations in the proportion of all family work conducted on an undeclared basis (measured in terms of labour inputs), meanwhile, the finding is that undeclared work ranges from 89.8% of all family work in Latvia, 69.4% in Estonia and 68.2% in Romania, through to 4.2% in Austria, 2.9% in Italy and 2.1% in Slovenia.

3.3 Structure of the undeclared labour market

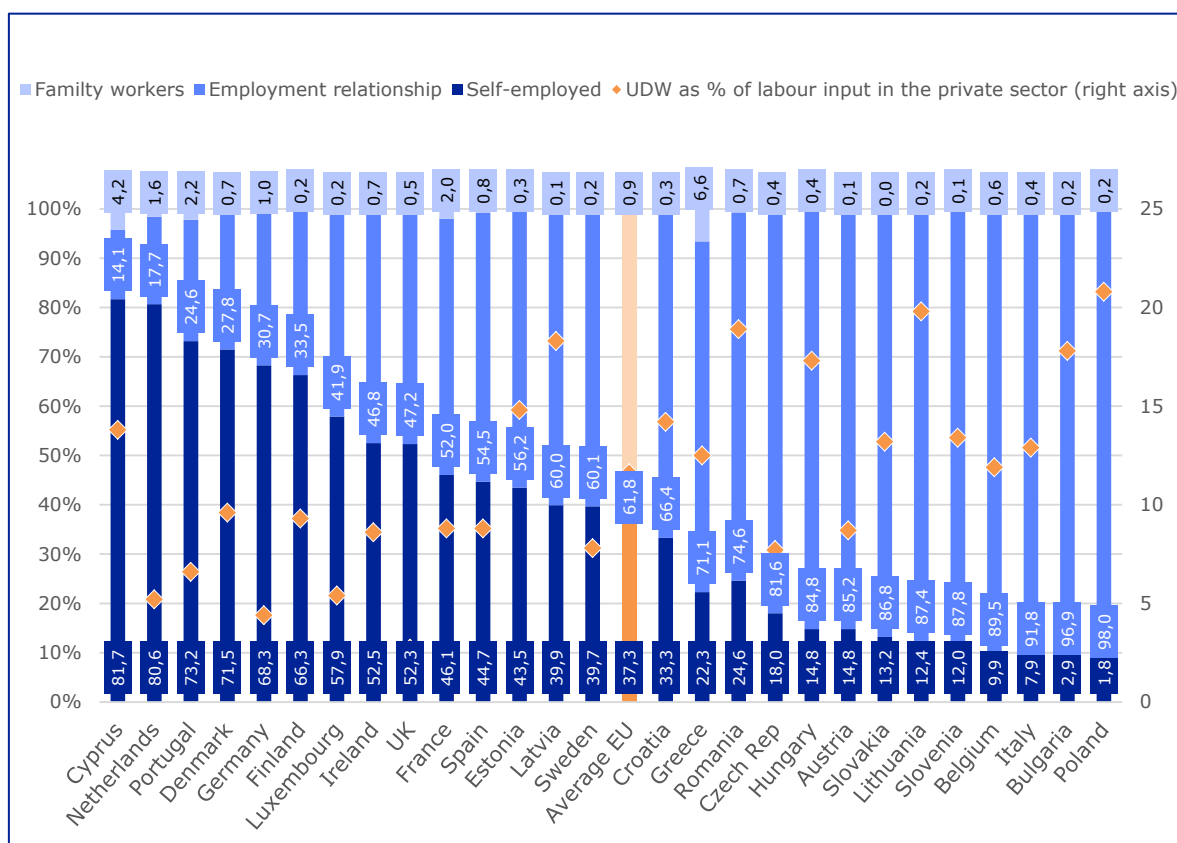
Table 1 also reveals the structure of the undeclared labour market in each member state. For example, in Austria, the undeclared economy is 10.0% of total GVA created in the private sector and that 8.7% of total labour input in the private sector is undeclared labour. This higher share of undeclared work in terms of GVA compared with total labour inputs suggests that undeclared work is concentrated in sectors where labour productivity is higher in Austria. There are also differences in the scale of the undeclared economy across different types of employment in Austria. Some 9.9% of self-employment is conducted on an undeclared basis, but 8.6% of work conducted in the context of an employment relationship and 4.2% of family work. Although undeclared work is more prevalent among the self-employed in Austria, therefore, it is not as concentrated among the self-employed as perhaps might be assumed.

Indeed, the different structures of the undeclared labour market across member states are further revealed by examining whether undeclared work is more prevalent in self-employment, work conducted in the context of an employment relationship or family work across member states. The finding is that the countries where undeclared work is more prevalent in the context of an employment relationship (than in self-employment or family work) are Belgium, Bulgaria, the Czech Republic, Italy, and Poland. The countries where undeclared work is more prevalent in self-employment (than in work conducted in the context of an employment relationship and family work) are Cyprus, Denmark, Finland, Croatia, Ireland, Lithuania, Netherlands, Romania and Slovakia. Undeclared work is more prevalent in family work (than in self-employment or work conducted in the context of an employment relationship), meanwhile, in Denmark, Estonia, Spain, France, Greece, Hungary, Latvia, Portugal and the UK.

In consequence, the structure of the undeclared labour market differs across EU member states. In some member states it is primarily an issue related to self-employment (e.g., Croatia, Denmark, Finland) but this is not the case in others. In a significant number of countries, such as Bulgaria and Italy, it is much more an issue related to work conducted in the context of an employment relationship as either wholly undeclared (i.e., unregistered) or under-declared employment (i.e., with a portion of salary being paid as an undeclared envelope wage).

Figure 4 therefore presents data on the structure of the undeclared labour market across the EU28. This reveals marked differences. In the EU as a whole, **61.8% of all undeclared work is conducted in the context of an employment relationship, 37.3% as self-employment and 0.3% as family work.** The countries where the majority of undeclared work is self-employment include Cyprus, Netherlands, Portugal, Denmark and Germany. In stark contrast, countries where more than 90% of all undeclared work is undertaken in the context of an employment relationship include Poland, Bulgaria and Italy. The structure of the undeclared labour market, therefore, displays very marked differences across the EU28.

Figure 4. Undeclared Work by type of employment, LIM estimates for 2013



These differences in the structure of the undeclared labour market across the EU have significant implications for tackling the undeclared economy. Comparing Poland and Denmark for example, in Poland, 25.3% of work conducted in the context of an employment relationship is undertaken on an undeclared basis (measured in terms of total labour inputs), but only 2.5% of self-employment is undeclared, and 5.7% of the labour inputs into family work are undeclared. The result is that 98% of all undeclared work is conducted in the context of an employment relationship. In Denmark, in stark contrast, only 3.0% of work conducted in the context of an employment relationship is undertaken on an undeclared basis, but 58.9% of self-employment and 58.9% of family work. The result is that 71.5% of all undeclared work is conducted as self-employment.

This has significant implications for how undeclared work is tackled. Policy initiatives to help business start-up on a legitimate basis, such as smoothing the transition from unemployment to self-employment, will be therefore useful in tackling the undeclared economy in Denmark (and other countries where most undeclared work is conducted as self-employment) and less relevant to tackling the undeclared economy in Poland and other countries where most undeclared work is conducted in the context of an employment relationship. Meanwhile, policy initiatives to address undeclared work conducted in the context of an employment relationships (namely unregistered or under-declared waged employment), such as the use of notification letters to employers to change behaviour, will be relevant to tackling the undeclared economy in Poland and other countries where most undeclared work is conducted in the context of an employment relationship, but much less relevant in Denmark and other countries where most undeclared work is conducted as self-employment. It is not only the development of tailored policy measures, however, that Member States need to pursue to tackle undeclared work.

4. Correlations between undeclared work and structural conditions

In recent years, there has been growing recognition that there are various structural determinants of the scale of undeclared work. Previous studies have revealed that undeclared work is higher in Member States with: lower levels of GDP per capita; less modern institutions of governance, displayed by higher levels of public sector corruption and lower qualities of governance; low trust in authorities; lower expenditure as a percentage of GDP on active labour market policies; lower levels of social expenditure; less effective social transfer systems; higher levels of severe material deprivation, and higher levels of inequality.¹⁵

Evaluating whether cross-national variations in the size of undeclared work (using the LIM estimate of the scale of undeclared work as a percentage of total labour inputs in the private sector) are associated with cross-national variations in these structural conditions, there is found to be a "**strong**" significant relationship, ranked in order of the strength of the correlation, with:

- GDP per capita in purchasing power standards ($r_s = -.783^{***}$)
- European Quality of Government Index ($r_s = -.686^{***}$)

There is a "**moderate**" significant relationship between cross-national variations in undeclared work (using the LIM estimates) and the following structural conditions ranked in order of the strength of the correlation:

- Corruption Perceptions index ($r_s = -.597^{***}$)
- Trust in authorities index ($r_s = -.597^{***}$)
- Impact of social transfers on poverty reduction ($r_s = -.570^{***}$)
- Public expenditure on labour market interventions to protect vulnerable groups ($r_s = -.507^{***}$)
- Migration rate ($r_s = -.495^{***}$)
- Gini coefficient ($r_s = .444^{**}$)
- Income inequality ($r_s = .443^{**}$)

There is a "**weak**" but significant relationship between cross-national variations in undeclared work (using the LIM estimates) and the following structural conditions ranked in order of the strength of the correlation:

- Long-term unemployment rate ($r_s = .383^{**}$)
- Very long-term unemployment rate ($r_s = .376^*$)

There is **no significant relationship** between cross-national variations in undeclared work (using the LIM estimates) and the following structural conditions:

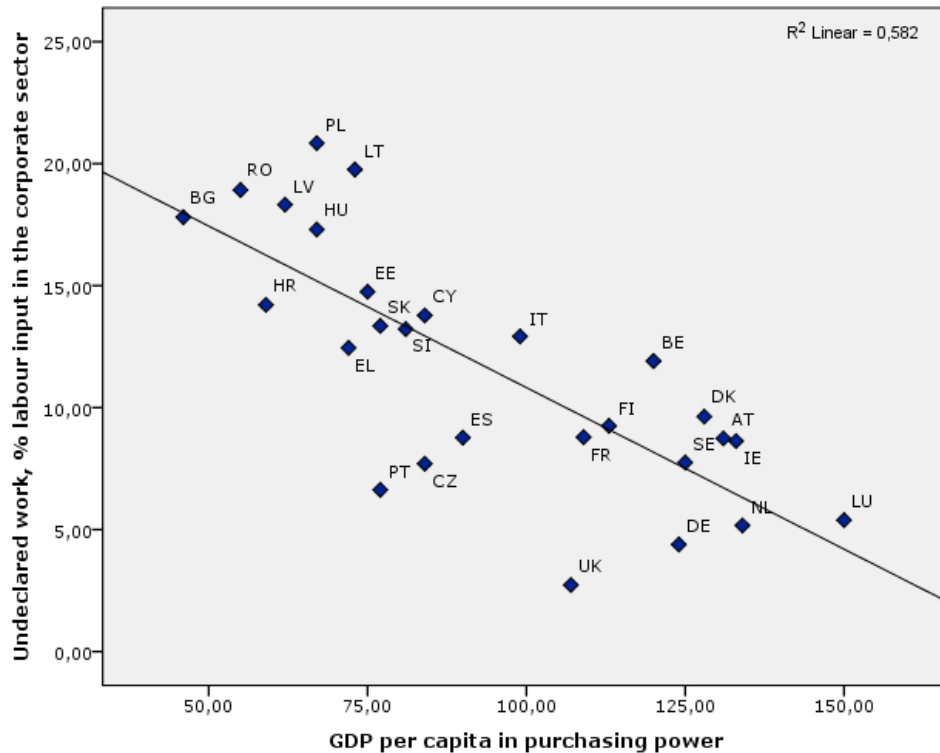
- Job vacancy rate ($r_s = .252$)
- Implicit tax rate (ITR) on labour ($r_s = -.142$)

Starting with the structural condition most strongly correlated with the size of undeclared work, Figure 5 charts the cross-national variations in the size of the undeclared economy (using the LIM estimates of undeclared work as a percentage of total labour inputs in the private sector) and cross-national variations in GDP per capita in purchasing power standards. This reveals a strong correlation between cross-national variations in the level of GDP per capita in PPS and cross-national variations in the prevalence of undeclared work, measured by Spearman's rank correlation coefficient ($r_s = -.783^{***}$). The greater the level of GDP per capita in PPS, the lower is the prevalence of undeclared work. Countries such as BG, RO and LV with relatively low levels of GDP per capita have higher levels of undeclared work, whilst countries

¹⁵ Vanderseyen *et al.*, 2014; Williams, 2014a,b,c; 2015a,b; Williams and Horodnic, 2015, 2016, 2017; Williams *et al.*, 2015.

with relatively high levels of GDP per capita (e.g., LU, NL, IE) have relatively lower levels of undeclared work.

Figure 5. Relationship between undeclared work and GDP per capita, 2013



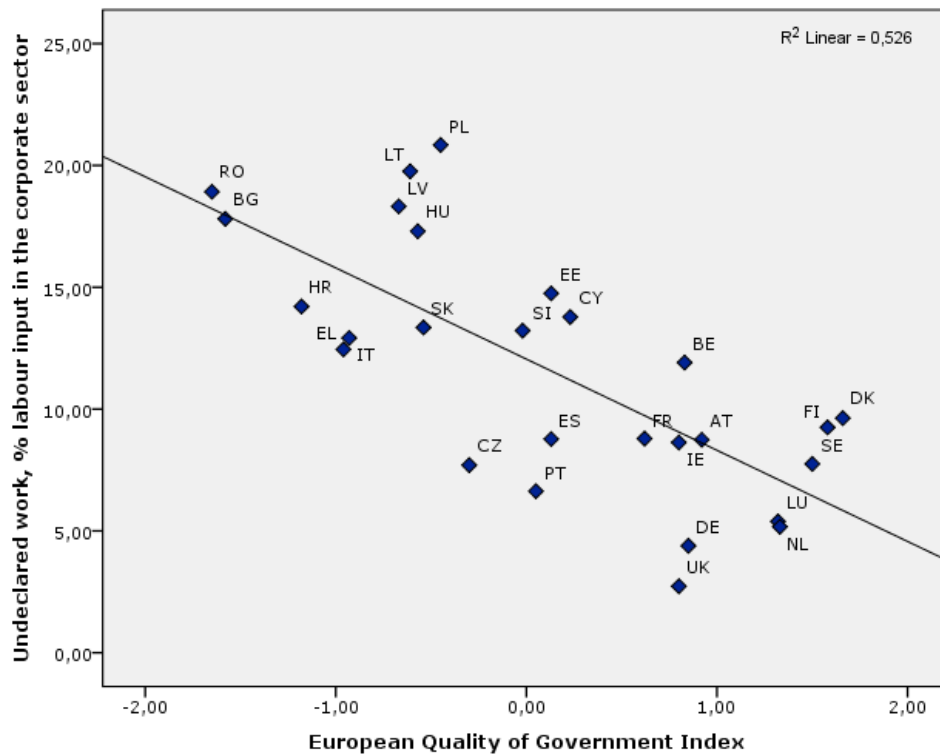
Note: To avoid excessive influence, the GDP of Luxembourg was capped at 150 in the analyses presented here. It should be noted that using the original figure of 262, the correlation coefficient is the same

Source: own calculations based on data from Eurostat database

There is also a strong significant correlation between cross-national variations in the level of undeclared work and cross-national variations in the quality of government as measured by the European Quality of Government Index (EQI). This index includes measures of both perceptions and experiences with public sector corruption, along with the extent to which citizens believe various public sector services are impartially allocated and of good quality.¹⁶ As Figure 6 reveals, the finding is that the higher is the quality of government, the lower is the level of undeclared work ($r_s = -.686$ ***). Countries such as RO and BG with low rankings on the quality of government have higher levels of undeclared work whilst countries such as DK, FI and SE with higher scores on the EQG index have relatively lower levels of undeclared work.

¹⁶ Charron, N., Dijkstra, L. and Lapuente, V. (2015). Mapping the Regional Divide in Europe: A Measure for Assessing Quality of Government in 206 European Regions. *Social Indicators Research*. 122(2): 315-346.

Figure 6. Relationship between undeclared work and European Quality of Government Index, 2013



Source: own calculations based on data from Charron *et al.* (2015)

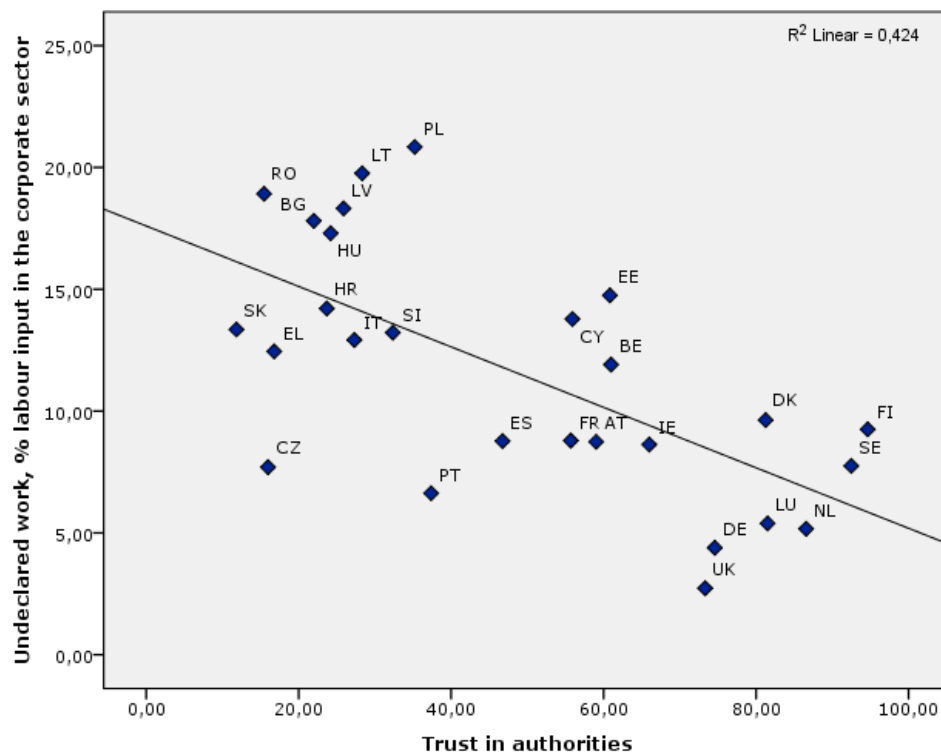
Reinforcing this, there is a significant correlation between the level of undeclared work and perceived level of corruption, as measured by Transparency International's Corruption Perceptions Index. This ranks countries based on how corrupt their public sector is perceived to be. A country's score indicates the perceived level of public sector corruption on a scale of 0 - 100, where 0 means that a country is perceived as highly corrupt and 100 means it is perceived as very clean. A country's rank indicates its position relative to the other countries included in the index. This year's index includes 177 countries and territories. The finding is that the higher is the perceived level of corruption, the higher is the level of undeclared work ($r_s = -.597^{***}$).

To further compound this view that the quality of government is an important determinant of undeclared work, and how perceptions of public sector corruption can lead to higher levels of undeclared work, the relationship between trust in authorities and level of undeclared work can be analysed. To do so, a trust in authorities index is constructed using the following World Economic Forum indicators: public trust in politicians; irregular payments and bribes; judicial independence; favouritism in decisions of government officials; wastefulness of government spending, and reliability of police services.¹⁷ In addition, a tax morale indicator is included measuring the acceptability of participating.¹⁸ All indicators are given equal weighting. As Figure 7 reveals, the finding is that the lower is the trust in authorities, the higher is the level of undeclared work ($r_s = -.597^{***}$). Member States such as NL, LU, FI and SE where trust in authorities is high have relatively low levels of undeclared work, and Member States such as RO, BG and SK where trust is low have higher levels of undeclared work.

¹⁷ <http://reports.weforum.org/global-competitiveness-report-2012-2013/>

¹⁸ Williams, C.C. and Horodnic, I.A. (2017). Evaluating the illegal employer practice of under-reporting employees' salaries. *British Journal of Industrial Relations*. 55(1): 83-111.

Figure 7. Relationship between undeclared work and trust in authorities, 2012-2013



Source: own calculations based on data from Global Competitiveness Report (2012-2013) and Special Eurobarometer 402 (2013)

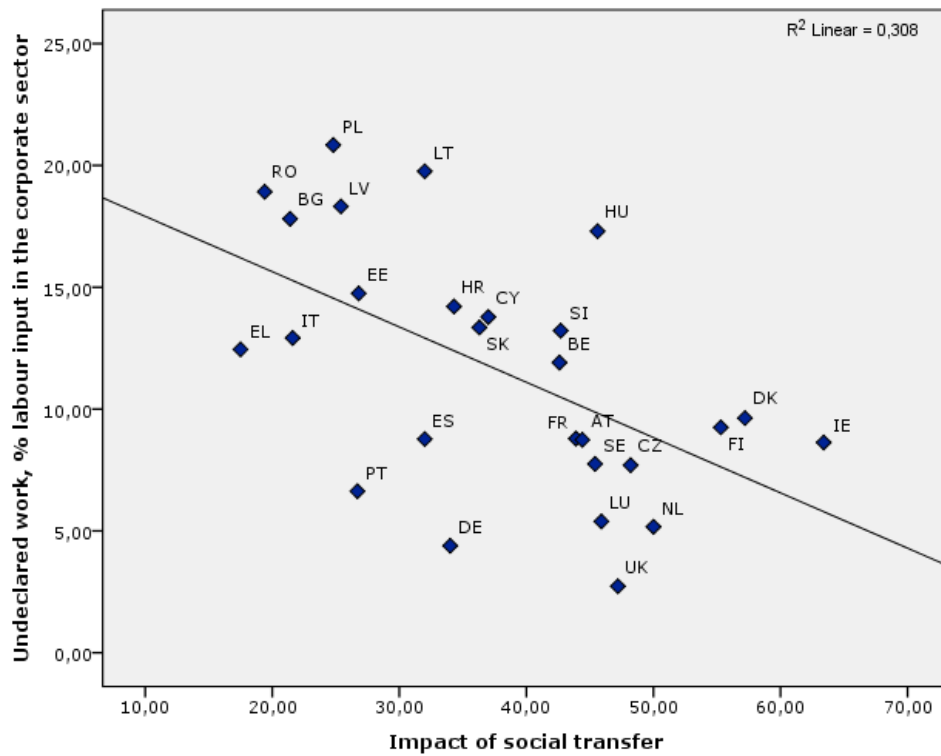
It is also the case that Member States in which there are higher levels of state intervention in work and welfare have relatively lower levels of undeclared work. This is exemplified by analysing the impact of social transfers on reducing poverty, with poverty defined as the proportion of people with an income below 60 percent of the national median income.¹⁹ As Figure 8 reveals, the greater the impact of social transfers on reducing poverty in a member State, the lower is the level of undeclared work ($r_s = -.570^{***}$). Member States such as RO, BG, PL and EL where social transfers have a limited impact on reducing poverty have higher levels of undeclared work than Member States where social transfers have greater impact on reducing poverty, such as IE, DK and FI.

Another example of how Member States in which there are higher levels of state intervention in work and welfare have relatively lower levels of undeclared work can be seen in Figure 9 which examines how levels of public expenditure on labour market interventions to protect vulnerable groups are correlated with levels of undeclared work.²⁰ The finding is that the higher the active labour market policy expenditure (as a % of GDP) on labour market policy (LMP) interventions covering the range of financial and practical supports offered by governments to people who are unemployed or otherwise disadvantaged in the labour market, the lower is the level of undeclared work ($r_s = -.507^{***}$).

¹⁹ <http://ec.europa.eu/social/BlobServlet?docId=14951&langId=en>

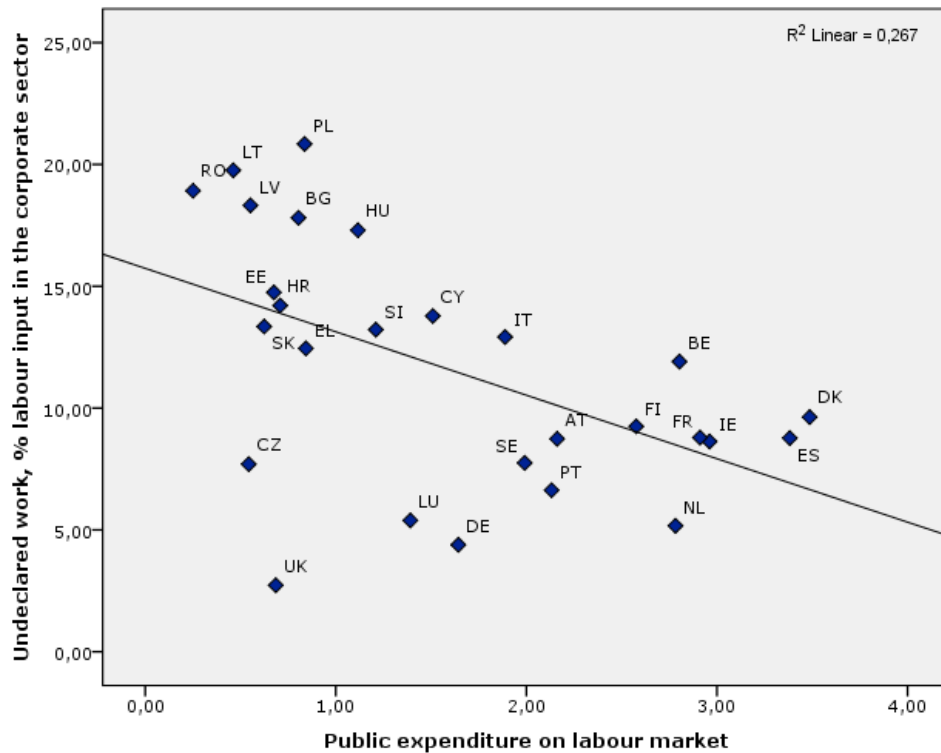
²⁰ <http://ec.europa.eu/eurostat/web/labour-market/labour-market-policy/database>

Figure 8. Relationship between undeclared work and impact of social transfers on reducing poverty, 2013



Source: own calculations based on data from European Commission report *Employment and Social Developments in Europe 2015*

Figure 9. Relationship between undeclared work and public expenditure on labour market, 2013



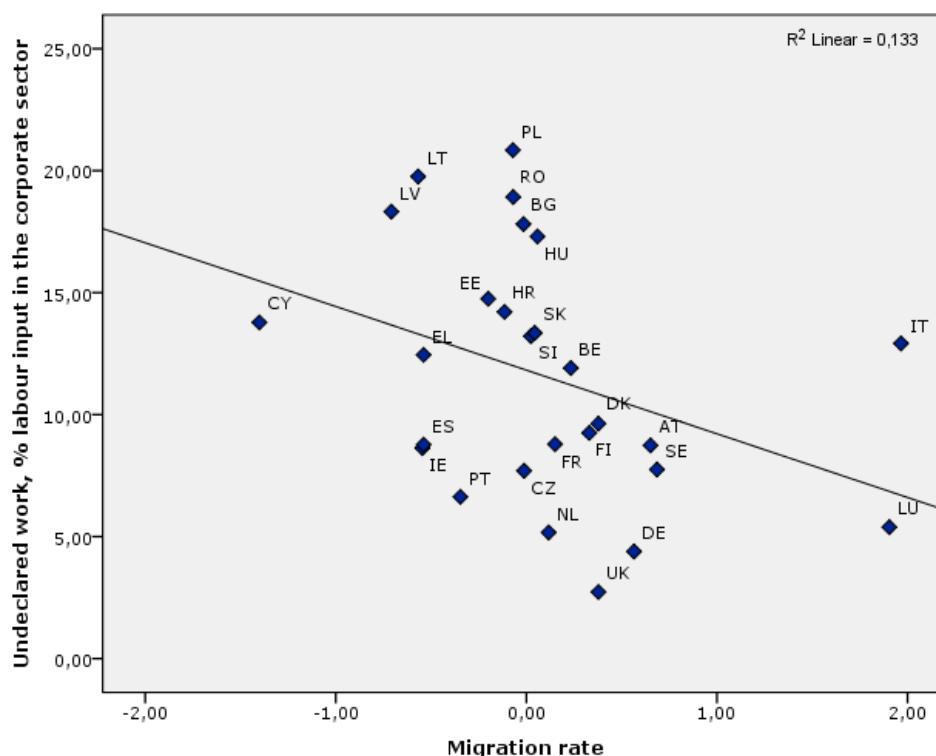
Source: own calculations based on data from Eurostat database

It is also the case that the level of undeclared work is closely associated with not only the level of state intervention in work and welfare but also, and relatedly, the level of inequality in Member States. There is a close association between the level of undeclared work and the level income inequality, measured using the income quintile share ratio S80/S20, which is the ratio of total income received by the 20 per cent of the population with the highest income (the top quintile) to that received by the 20 per cent of the population with the lowest income (the bottom quintile). The greater the income inequality, the higher is the level of undeclared work ($r_s=.443^{**}$).

There is also a close association between the level of undeclared work and the Gini coefficient, which is a common measure of inequality and measures the income or wealth distribution of a nation's residents in terms of equivalised disposable income.²¹ The finding is that the greater the level of inequality, measured by the Gini Coefficient, the higher is the level of undeclared work ($r_s=.444^{**}$).

A significant association also exists between the level of undeclared work and the migration rate, calculated as yearly emigration plus immigration as a percentage of the total population.²² A negative figure thus displays that emigration is greater than immigration, and vice versa, a positive figure means that immigration is greater than emigration. Figure 10 reveals that Member States with more immigration than emigration, such as IT and LU have lower levels of undeclared work, whilst countries with greater emigration than immigration, such as CY, LV and LT have higher levels of undeclared work ($r_s=-.495^{***}$).

Figure 10. Relationship between undeclared work and migration rate, 2013



Source: own calculations based on data from Eurostat database

²¹ http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di12

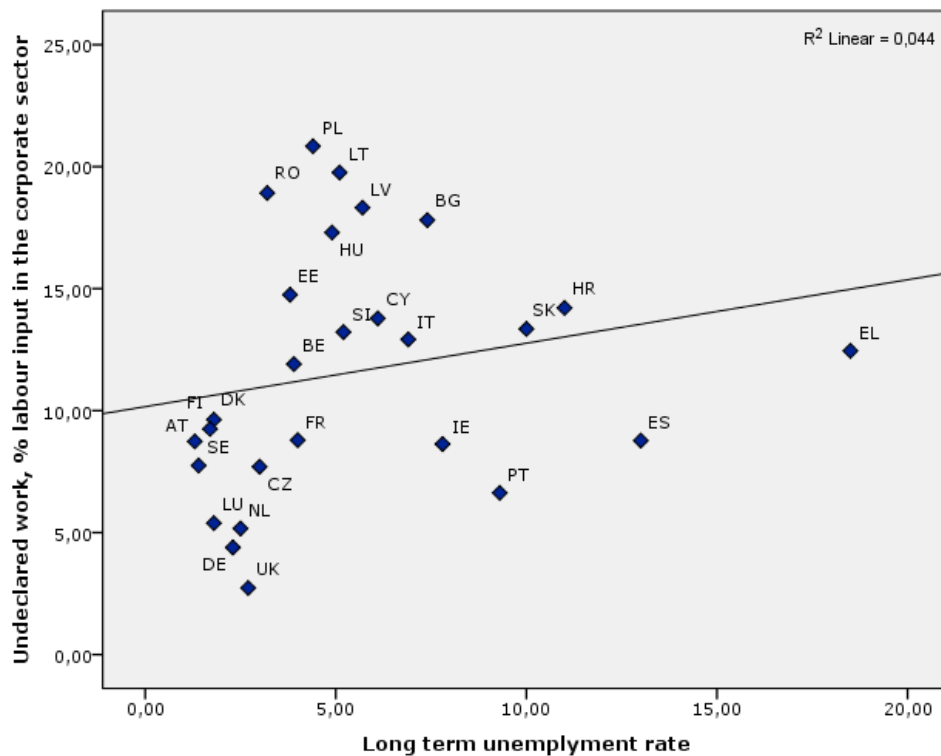
²² http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_gind&lang=en

The long-term (12 months or more) and very long-term (24 months or more) unemployment rates of the active population aged 15-74 years old is also significantly associated with the level of undeclared work.²³ The finding is that level of undeclared work is higher in countries with higher long-term and very long-term unemployment rates ($r_s = .383^{**}$ and $r_s = .376^*$ respectively).

There is no significant association, however, between the level of undeclared work and the job vacancy rate, measured as the proportion of total posts that are vacant ($r_s = -.252$).

Finally, it is often popularly assumed that the level of undeclared work is directly related to the level of taxation. The common belief is that if the level of taxation is reduced, then undeclared work will be lower. However, the finding is that there is no significant association between the level of undeclared work and the implicit tax rate (ITR) on labour, which is a summary measure that approximates an average effective tax burden on labour income in the economy ($r_s = -.142$).

Figure 11. Relationship between undeclared work and long term unemployment rate, 2013



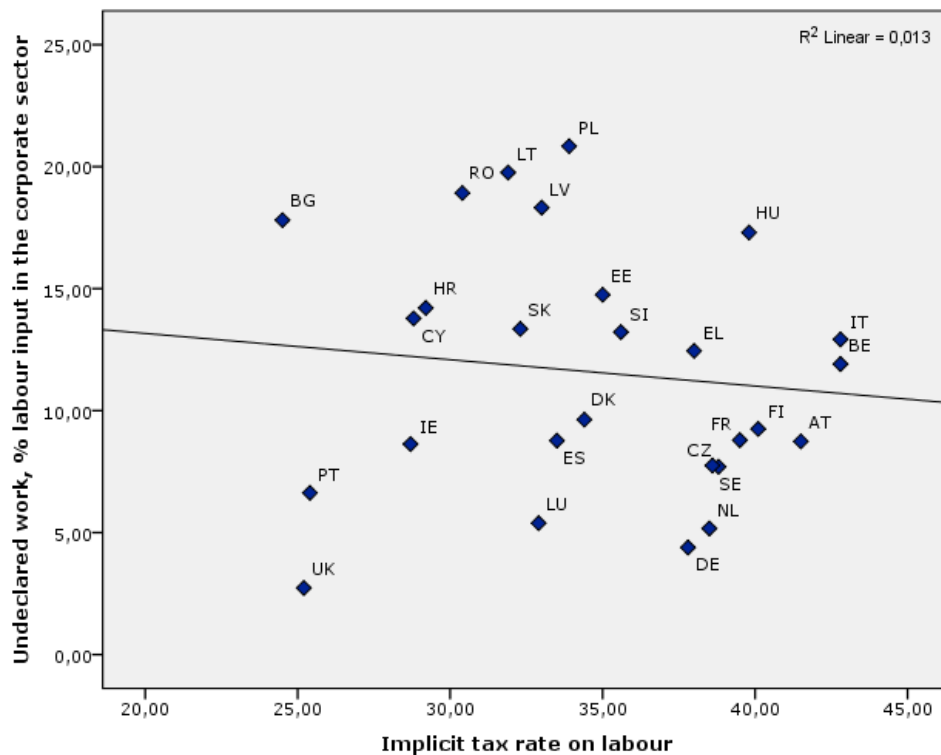
Source: own calculations based on data from Eurostat database

As Figure 12 reveals, although there are considerable variations in the tax burden on labour income across Member States, there is no significant association with the level of undeclared work. Member States with low tax burdens on labour such as the UK, PT and BG have relatively low, medium and high levels of undeclared work, and Member States with high tax burdens on labour do not have higher levels of undeclared work. Indeed, although not statistically significant, the line of best fit is downwards suggesting that as the tax burden increases, the level of undeclared work decreases.

²³ <http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tesem130&plugin=1>

In sum, the structural economic and social conditions that result in lower levels of undeclared work have been here highlighted. This has revealed that undeclared work is lower in Member States with higher levels of GDP per capita, with more modernised systems of government, where there is trust in authorities and lower levels of corruption, and in which social transfers are effective at reducing poverty, there are higher levels of public expenditure on labour market interventions to protect vulnerable groups, and where there is greater equality, lower levels of long-term unemployment and there is net in-migration rather than out-migration.

Figure 12. Relationship between undeclared work and implicit tax rate on labour, 2012



Source: own calculations based on data from Eurostat database

Appendix 1

Data sources of the structural conditions

Table A1. Indicators used and description

Indicator/ Year	Description
GDP per capita in purchasing power standards/ 2013	Gross domestic product (GDP) is a measure for the economic activity. It is defined as the value of all goods and services produced less the value of any goods or services used in their creation. The volume index of GDP per capita in Purchasing Power Standards (PPS) is expressed in relation to the European Union (EU28) average set to equal 100. If the index of a country is higher than 100, this country's level of GDP per head is higher than the EU average and vice versa. Basic figures are expressed in PPS, i.e. a common currency that eliminates the differences in price levels between countries allowing meaningful volume comparisons of GDP between countries. Please note that the index, calculated from PPS figures and expressed with respect to EU28 = 100, is intended for cross-country comparisons rather than for temporal comparisons. <i>Available at:</i> http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tec00114&plugin=1
European Quality of Government Index/ 2013	The European Quality of Government Index (EQI) is the result novel survey data on corruption and governance at the regional level within the EU, conducted in first in 2010 and then again in 2013. The data focus on both perceptions and experiences with public sector corruption, along with the extent to which citizens believe various public sector services are impartially allocated and of good quality. The data is standardized with a mean of zero, and higher scores implying higher quality of government. <i>Available at:</i> https://nicholascharron.wordpress.com/european-quality-of-government-index-eqi/
Corruption Perceptions Index/ 2013	The Corruption Perceptions Index ranks countries and territories based on how corrupt their public sector is perceived to be. A country or territory's score indicates the perceived level of public sector corruption on a scale of 0 - 100, where 0 means that a country is perceived as highly corrupt and 100 means it is perceived as very clean. A country's rank indicates its position relative to the other countries and territories included in the index. This year's index includes 177 countries and territories. <i>Available at:</i> https://www.transparency.org/cpi2013/results#myAnchor1
Trust in authorities index/ 2012-2013	Composite index comprising: <ul style="list-style-type: none"> • Public trust in politicians • Irregular payments and bribes • Judicial independence • Favouritism in decisions of government officials • Wastefulness of government spending • Reliability of police services <i>Available at:</i> http://reports.weforum.org/global-competitiveness-report-2012-2013/ <ul style="list-style-type: none"> • Tax morality Own calculations based on Special Eurobarometer 402 (2013). <i>Available at:</i> http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_402_en.pdf
Impact of social transfers on poverty reduction/2013	Poverty defined as the proportion of people with an income below 60 percent of the national median income. <i>Available at:</i> http://ec.europa.eu/social/BlobServlet?docId=14951&langId=en
Public expenditure on labour market interventions to protect vulnerable groups/ 2013	Labour market policy expenditure (% of GDP): Labour market policy (LMP) interventions cover the range of financial and practical supports offered by governments to people who are unemployed or otherwise disadvantaged in the labour market. <i>Available at:</i> http://ec.europa.eu/eurostat/web/labour-market/labour-market-policy/database
Migration rate/ 2013	The indicator is defined as the ratio of net migration (including statistical adjustment) during the year to the average population in that year. The value is expressed per 1000 persons. The net migration plus adjustment is calculated as the difference between the total change and the natural change of the population. <i>Available at:</i> http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_gind&lang=en
Gini coefficient/ 2013	Gini coefficient (scale from 0 to 100). Gini coefficient of equivalised disposable income - EU-SILC survey.

	<p><i>Available at:</i> http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di12</p>
Income inequality/ 2013	<p>Measured using the income quintile share ratio S80/S20, which is the ratio of total income received by the 20 per cent of the population with the highest income (the top quintile) to that received by the 20 per cent of the population with the lowest income (the bottom quintile). Income must be understood as equivalised disposable income. The indicator is based on the EU-SILC (statistics on income, social inclusion and living conditions).</p> <p><i>Available at:</i> http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tessi180&plugin=1</p>
Long-term unemployment rate/ 2013	<p>Long-term and very long-term unemployment rates of the active population aged 15-74 years in 2013 (in % of active population).</p>
Very long-term unemployment rate/ 2013	<p>The share of long-term unemployment is the share of unemployed persons since 12 months or more in the total active population, expressed as a percentage. The total active population (labour force) is the total number of the employed and unemployed population. The duration of unemployment is defined as the duration of a search for a job or as the period of time since the last job was held (if this period is shorter than the duration of the search for a job).</p> <p>The long-term unemployment rate expresses the number of long-term unemployed aged 15-74 as a percentage of the active population of the same age. Long-term unemployed (12 months and more) comprise persons aged at least 15, who are not living in collective households, who will be without work during the next two weeks, who would be available to start work within the next two weeks and who are seeking work (have actively sought employment at some time during the previous four weeks or are not seeking a job because they have already found a job to start later). The total active population (labour force) is the total number of the employed and unemployed population. The duration of unemployment is defined as the duration of a search for a job or as the period of time since the last job was held (if this period is shorter than the duration of the search for a job). The indicator is based on the EU Labour Force Survey.</p> <p>Long-term unemployment refers to people who have been unemployed for 12 months or more, whilst the very long-term unemployed (VLTU) have not had a job for 24 months or more.</p> <p><i>Available at:</i> http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=une_ltu_a&lang=en</p>
Job vacancy rate/ 2013	<p>The job vacancy rate (JVR) measures the proportion of total posts that are vacant, according to the definition of job vacancy above, expressed as a percentage as follows: $JVR = \text{number of job vacancies} / (\text{number of occupied posts} + \text{number of job vacancies}) * 100$. Job vacancy rates for DK, FR, IT and MT are probably under-estimated due to a partial coverage of the respective economies.</p> <p><i>Available at:</i> http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=jvs_a_rate_r2&lang=en</p>
Implicit tax rate (ITR) on labour/ 2012	<p>Implicit tax rate on labour: approximates to the average effective tax burden on labour, and is the sum of all direct and indirect taxes and employees' and employers' social contributions levied on employed labour income divided by the total compensation of employees.</p> <p><i>Available at:</i> http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tec00119&plugin=1</p>

Table A2. Bivariate correlation between magnitude of undeclared work and structural conditions in the European Union: Spearman's rank correlation coefficient

Macro Indicators	Undeclared work, % of labour input in the corporate sector	
	r_s	Sig.
GDP per capita in purchasing power standards (2013)	-,783	***
European Quality of Government Index (2013)	-,686	***
Corruption Perceptions Index (2013)	-,597	***
Trust in authorities index (2012-2013)	-,597	***
Impact of social transfers on poverty reduction (2013)	-,570	***
Public expenditure on labour market interventions to protect vulnerable groups (2013)	-,507	***
Migration rate (2013)	-,495	***
Gini coefficient (2013)	,444	**
Income inequality (2013)	,443	**
Long-term unemployment rate (2013)	,383	**
Very long-term unemployment rate (2013)	,376	*
Job vacancy rate (2013) – only 15 countries included	-,252	-
Implicit tax rate (ITR) on labour (2012)	-,142	-

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