The Hidden Economy in Europe: A Tale of Deterrence and Morale

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Abstract

The concern about the hidden economy has long been focused on its size but not so much on what is driving individuals to engage in undeclared work. We provide EU wide evidence of the drivers of participation in undeclared work, analysing the effect of classical deterrents and morale in encouraging individuals to join the side economy. We find that where classical deterrents (sanctions and detection) play an important role when the morale in the economy is low, ther importance is lessened when morale is high. We find that individuals who typically participate in the hidden economy show signs of financial strain. Typical sociodemographic characteristics of the individuals are also presented. Our analysis is performed for a EU wide scenario and are then disaggregated by geographical areas.

1 Introduction

Reducing the size of the hidden economy features as one of the points in the agenda of European countries in order to meet the Europe 2020 Employment goals.[1] It is not difficult for one to be convinced that there are critical reasons why policy makers should be concerned about the hidden economy, to mention one the erosion of tax and social security bases leads to significant deficits.

Different methods have been presented to quantify the hidden economy, but if we are to address the question of how to reduce it, then as Cowell (1990) states in the conclusion of his book 'sheer size is not the point'.

Using Ovid's words, the Hidden Economy, as Salmacis Fountain, is a phenomenon for which 'the cause is hidden but the effect is visible to all.' This represents precisely the focus of this paper, to try to pierce the fog of uncertainty that governs the understanding of what motivates individuals to participate in the hidden economy. It is only by knowing what is encouraging or deterring them from participating that we can start thinking about what actions need to be taken towards reducing the hidden economy in Europe.

Previous work on tax evasion recognises that classical deterrents and social factors play a role into shaping the decision to evade. Evidence on the first is mixed. Whereas the effect of detection seems to be more widely documented, the same is not true in the case of sanctions. Regarding tax morale, evidence from experiments and survey tend to support a negative relationship between a strong tax morale and noncompliance. However, litle is known about their effect on the shadow economy as Schneider (2013) recognises.[2] Both the deterrence and the tax morale of the taxpayers are parameters that the tax administration can influence in order to reduce the size of the shadow economy. Therefore, understanding their power and effect seems of paramount importance in order to form sound tax policies.

Purely due to the nature of the phenomenon, there is a substantial lack of data about the hidden economy which is hampering the accumulation of knowledge in this area. Administrative as well as official data are, for obvious reasons, not appropriate sources and macroeconomic approaches can only offer a global picture of the hidden economy from an aggregate perspective.

If what we want is to understand why it is happening, to be able to know how to tackle it, then it seems necessary to go to the root of the problem. Participation is a personal choice, which is driven by personal motives and thus should be analysed from a micro perspective. One of the ways this could be achieved is making use of survey data.

We are not claiming using survey data is flawless[3], although surely no method is. However in this case where other sources of information are scarce, it provides us with a unique source of data that allows access to a wealth of variables disaggregated at the individual level which can help us shed some light over who and why.

In this paper, a multi-level model for the decision about participation in the hidden economy across the 28 member states of the European Union (EU-28) is fitted on the recently conducted Eurobarometer Survey of Undeclared Work. This survey provides a unique dataset that researches on undeclared work within a comparable framework across all European Countries. The analysis is then conducted by geographical areas and occupations of the individuals in the hidden economy.

The aim of the present paper is multiple. Firstly, we aim at providing evidence about the effect of classical deterrents (both detection and sanctions) and morale in the decision about participation in the hidden economy in Europe. If evidence of the effect of sanctions in the tax evasion literature was scarce, it is even more in the shadow economy literature. The effect of morale is assessed using different constructs for morale. This research provides to our knowledge the first measure of tax morale solely constructed from individual's attitudes towards undeclared work and that does not rely on individual's attitudes to tax evasion.

Secondly, this paper looks at contributing to the debate about whether norms and deterrence are inter-acting or independent processes (Wenzel, 2004). This is, should the strategy of the tax administration be focused on affecting both classical deterrence and morale? Lastly, the sociodemographic characteristics of the typical individuals participating in the hidden economy are also determined.

All in all, the sole aim of this paper is to contribute to the knowledge about the agents's traits and motivations for participation and to highlight the value of using individual survey data in analysing a behaviour as complex as the participation in the hidden economy.

The results provide the first EU-wide survey-based analysis of the determinants of participation in the hidden economy. It is shown that:

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[1] This has been noted in the Annual Growth Survey for 2013-15

[2] Section 2 provides an overview of the literature on hidden work.

[3] We will return to this point later in the paper in the Methodology section.

- There is a strong significant effect on the perception of the probability of detection and a weaker result on the perception of the severity of the sanction in reducing noncompliance.

- Tax Morale, constructed for the purpose of the study in different manners, plays an important role in constraining the decision of participation.

- The interaction of the previous two processes is interesting: When tax morale is high, classical deterrence factors have minimal power in reducing noncompliance, whereas as tax morale becomes more lax, the effect of the classical deterrents gains increasing importance.

- Individuals who participate in the hidden economy show signs of facing financial strains.

- As is standard from the criminology and tax evasion literature, older individuals are less prone to participate in the hidden economy than younger individuals.

- Men seem to dominate in terms of participation in the hidden economy. However this feature is dependent on the occupation they have in the hidden economy.

- Self-Employed and Unemployed individuals seem to engage in more hidden economy work than employed, retired and other non-active individuals.

The structure of this paper will be as follows. The first part will briefly review the existing literature. The second part will provide an overview of the data which leads to the third section where the empirical strategy is outlined and the model explained. The results are then displayed in Section 4 and Section 5 will conclude.

2   A brief literature review

Undeclared work has not yet received enough recognition as a subject of analysis on its own.[4] Until very recently surveys specifically targeted to analyse undeclared work are anecdotal, country specific and referring to a certain moment in time. In fairness, the strongest tradition in using surveys to unravel the undeclared economy can be found in Denmark, Norway and the Netherlands.[5] The lack of homogeneity and thus comparability of the questionnaires, the territorial limitation and their lack of contemporaneity really challenges the development of a strong literature on the decision of participation in the hidden economy. In this section we are going to briefly review the findings from these studies about the profile of the individuals and the effect of classical deterrents and morale.

2.1   Profile

The phenomenon of undeclared work is characterised by its heterogeneity and therefore not so many clear-cut characteristics of the individuals can be extracted. We do observe some commonalities with respect to the literature on deviant behaviour and in particular tax evasion, for example compliance tends to rise with age (Pedersen, 2003; Merz and Wolff, 1993; Kimmel and Conway (2001)). Regarding gender, there is widespread practice in the literature to assess the different degree of participation of men and women in the informal economy as may happen in the formal economy. The implication is not clear and it seems to be dependent on the type of job performed in the informal sector.[6] To set an example Lobo (1990) documents a higher participation rate of women in informal work with respect to total employment in the footwear and toy industry in Spain. Pahl (1988, p.45) for UK finds that women are a minority when it comes to holding multiple jobs. Hvidtfeldt et al. (2011) in an analysis of undeclared work in Denmark for 2008-10 finds that men are more inclined to participate in the hidden economy than women. Pedersen (2003) for Great Britain finds no significance of gender participation.[7] The effect of marital status is confounded. Pedersen (2003)

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[4]Most of the literature has been occupied with the measurement of the hidden economy. Reviewing this strand of literature goes beyond the scope of the present paper. For a critical evaluation of direct and indirect methods proposed refer to Gemmell and Hasseldine (2012).

[5]See Van Eck and Kazemier (1988) for Holland; Feld, Lars and Larsen and Claus (2005), Lamnek, Olbrich and Schafer (2000) for Germany and Merz and Wolff (1993) for West Germany ; Isachsen and Strom (1985), Goldstein (1990), Tufte (1994) and Tone Ognedal et al. (2002) for Norway; Laurin (1986), Wahlund (1991) for Sweden; and Pedersen (2003) for Germany, Great Britain and Scandinavia.

[6]One of the main difficulties of characterising informal work is the heterogeneity of the phenomenon. It refers to a wide range of activities as Pahl (1988) recognises, from innovative activities to informal work on traditional agriculture or building sectors which will attract different profiles and motivations.

[7]Official data for multiple job holding by Eurostat gives a male-female ratio of 85:15 for 1986. (Pahl, 1988)

shows that whereas single men are more likely to participate in Denmark, it does not prove to be significant in Norway, Sweden, Germany and Great Britain. Merz and Wolff (1993) find that married men are more likely to participate whereas marital status is not significant in the case of women. Education has a varying effect, although it is widely found not significant.[8]

Regarding the occupation of the individuals who engage more typically in undeclared work, there are different findings in the literature. Knowing who are the occupations who typically engage in undeclared work may have different policy implications.[9] Contrary to the popular misconception, employed and self-employed are found to participate in the hidden economy more widely than unemployed individuals.[10] In Spain, as an example, Lobo (1990) find that a third of the informal work is carried out by self-employed individuals. Williams (2001) in a survey of low income neighbourhoods in UK also finds that employed individuals participate to a greater extent. Representing 36% of the sampled population they carry 70% of paid informal taksts whereas the nonemployed undertook only 30% .The same result has been found for Portugal (Lobo, 1990), the Netherlands (Van Genus et al., 1987), and Italy (Mingione,1991)[11]. However, the findings are not uncontested, other studies find higher participation rates for the unemployed although they are less frequent. Haigner (2011) in a microstudy for Germany finds that 30% supplied undeclared work. Pedersen (2003) for Germany also finds that unemployed participation doubled the participation of the population as a whole (20.4%).

2.2   Classical Deterrence

The impact of sanctions and audits on the decision of participation in the hidden economy as in the empirical evidence with tax evasion yields mixed results. Due to the lack of data on audit rates and the complexity of the fine system, the strategy followed in most literature has been to use the perceived risk of being detected and the perceived severity of sanctions.

Van Eck and Kazemier (1988) find a negative effect of the probability of being detected on participation in the hidden economy for the Netherlands in 1982/1983. Pedersen (2003) finds that the risk of being detected disencourages participation in the hidden economy for men in Denmark, Norway, Sweden and Germany, and for women in Germany and also marginally in Sweden. He fails to find significance of the perceived probability of being detected for Great Britain.

The role of sanctions is understudied. Feld and Larsen (2009) fail to find a significant effect of fines in the shadow economy in any wave of their survey (2004-07) nor in the pooled sample. They do find a significant effect of the risk of being detected only for women for each year in the sample, but the effect for the pooled sample also finds the effect to be significant for men.

2.3   Morale

The inability of the classical deterrents to explain the observed level of compliance led the literature to consider other noneconomic aspects of the decision. Norms and attitudes have been recognised as fundamental part of the decision to comply (Feld and Frey, 2007; Alm and Kirchler, 2014).[12] Despite the large recognisition of the importance of introducing tax morale to solve the compliance puzzle[13], there is scarce empirical evidence of the effect of tax morale in compliance. Especially, regarding the shadow economy research about the impact of tax morale in the hidden economy has been mostly performed at a country level, regressing the size of the shadow economy estimated using DYMIMIC models on a tax morale variable extracted from the World Values Survey which refer to how (un)acceptable it is for individuals to evade tax (Feld et al., 2007; Torgler and Schneider, 2009; Torgler Schaffner and Macintyre, 2007). They find a strong negative correlation.[14] However, almost all research so far makes use of the World Values Survey which contains questions about how acceptable it is for the interviewee tax evasion behaviour but none to our knowledge have referred

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[8]One of the reasons for this could be the correlation between education and employment status. In some surveys such as Merz and Wolff (1993) income is included and proven not significant and may also be due to this correlation which is already captured in another variable.

[9]A review of the policy implications can be found in Schneider and Collins (2011) and Collins(2014).

[10]Pahl (1988) in a report about the Black Economy in the UK estates that a particular difficulty faced in obtaining an objective understanding of undeclared work is "the popular obsession with what are often referred as "welfare scroungers"." He goes further and says "it seems that a few colourful anecdotes gain more credibility than sober statistics".

[11]For a more extensive review see Williams (2008).

[12]It is needless to say that the analysis of what factors are driving compliance gives the tax administrations a unique view to which tools they need to use in order to increase compliance and therefore can inform a better tax policy.

[13]See Torgler, Schaffner and Macintyre (2007) for a review on the importance of morale.

[14]The fact that the World Values Survey question is one of the causal variables which enter the estimation of the DYMIMIC model to produce the shadow economy estimates casts some doubts over these results. Especially later on the determinants of tax morale are analysed regressing the same estimates on variables such as GDP which also enter the DYMIMIC estimation.

to individual's perceptions about how bad it is to participate in the hidden economy.[15] The concern with this approach is the level of aggregation. We know most of the variance happens at the individual level. In this case we are summarizing the whole behaviour of a country with a single index which loses a great deal of information specially regarding the atomistic behaviour of taxpayers. We have evidence that tax morale may be affected by perceived fairness of the tax system (Slemrod, 2007; Barth et al., 2013), the relationship with the tax authorities (Feld and Frey, 2001) and trust in the government and legal system (Slemrod, 2003; Torgler, 2003) and therefore this leads to a wild heterogeneity in tax morale among taxpayers.[16]

In order to solve for the endogeneity problem that arises from the fact that tax morale can be influenced by the perceived size of the hidden economy, the authors use an instrumental approach using different instruments for tax morale depending on the nature of their data: a climate variable, the index of cloudiness, as cloudiness has been found to impact negatively individuals attitudes; or using benefit morale and public transport as Torgler and Schneider (2007). They still find that negative correlation with the size of the hidden economy.[17] [18]

Survey data evidence is more scarce but findings are consistent. Feld and Larsen (2005, 2009) and Van Eck and Kazemier (1988) also find a negative effect of tax morale and social norms in the probability of participation.

2.4 Norms and Deterrence

There is also a stream of literature analysing the combined effect of the classical deterrents and tax morale. It has been found that sanctions in the case when tax morale is high can crowd out tax morale. This is, if there is an extrinsic motivation of expected sanctions, then the intrisic motivation to comply is crowded out. As an example Wenzel (2004) finds that personal norms moderates the effects of sanction severity, so there was only a deterrence effect when tax morale was lax. No evidence on an effect of deterrence on tax evasion was found when tax morale was strong. When social norm is strong, then the severity of the sanctions cause an increase in evasion. Smith (1990) found that deterrence has a stronger effect on individuals who regarded tax evasion as acceptable than between those who regarded it as unacceptable. There is little evidence still on the impact of increased deterrence and tax morale in the reduction of the shadow economy.

3 The data

The data we use in this paper consists on the last wave (2013) of the Eurobarometer Survey of Undeclared Work. The sample contains 27,541 interviewees which are residents in the 27 Member States of the European Union and Croatia between April and May 2013. The sample mirrors the distribution of the population across the territories in the countries surveyed.[19]

Summary statistics:

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[15] How acceptable it is to evade tax and to perform undeclared work may be correlated but the nature is different. With undeclared work as it is collected in the survey both parties purchaser and participant benefit from the fact that the work is undeclared, it gives access to goods to which the purchaser will not access if they had not been in the hidden economy (price). Therefore the morale towards it may be more lax than towards tax evasion where only the person that is evading is benefiting.

[16] Surveys in Norway have found that out of the 69 % of individuals who report evading taxes as unacceptable, a third of them would be willing to participate (Ognedal, 2014)

[17] Experiments analysing the impact of tax morale one vasion such as summarized in Torgler, Schaffner and Macintyre (2007) are not going to be reviewed in this paper. Particularly on this paper, the degree of correlation of the items that relate to tax morale and if they do measure one single construct is not reported. An unweighted average is taken and used as a proxy for tax morale to be introduced as a regressor for the compliance rate. Using this individual level data, they find that tax morale positively impacts compliance.

[18] Regarding individual survey data, Torgler et al. use the Taxpayers Opinion Survey in the US which has been discontinued since 1990 in order to analyse the impact of tax morale measured with 15 different dummy variables upon tax evasion. The wording of the questions about tax evasion and asking about a behaviour for the last five years have been common criticism to the survey Lempert (1992). They use two questions to refer to tax evasion (overstatement of deductions and under declaration in the last five years) and regress them against sociodemographic controls, risk of detection and 15 variables related to tax morale. Out of the 15, 5 refer to asking individuals' perception about how (un)acceptable are various acts of tax evasion in different lines/degrees of reporting, but the other 10 refer to estatements of agree/disagree. Although we do think it is necessary to use as much information as available, the nature of the data is different. They refer to the reasons for evading, the likelihood of being caught and how much it is ok to use different strategies to evade. The mix in the purposes of these variables makes it hard to relate them to one and only one construct: tax evasion. Still the same result is found, tax morale influences compliance.

[19] Further details of the survey are provided in the appendix.

Table 1: Summary Statistics of Supply of labour to the Hidden Economy

	Continental		Eastern-Central		Southern		Nordic Countries		Total	
	Own Participation in HE									
Yes	492	3.80%	253	4.30%	219	3.00%	69	6.20%	1,034	3.80%
No	12,606	96.20%	5,644	95.70%	6,999	97.00%	1,050	93.80%	26,298	96.20%
Total	13,098	100.00%	5,897	100.00%	7,218	100.00%	1,119	100.00%	27,332	100.00%
	Knowing other Participants									
Yes	3,850	29.70%	1,757	30.40%	2,625	37.10%	473	42.60%	8,705	32.30%
No	9,103	70.30%	4,026	69.60%	4,447	62.90%	636	57.40%	18,212	67.70%
Total	12,953	100.00%	5,783	100.00%	7,072	100.00%	1,109	100.00%	26,917	100.00%

Notes:

1. Knowing somebody that participates in the hidden economy is used as a proxy for own participation.

2. We are providing counts and column percentages.

3.1 On the reliability and validity of self-reported data

The reliability of using self-reported measures of deviant behaviour in general has been highly debated in the social science literature. Three main problems are recognised to affect self-reports: self-presentation, awareness of behaviour and fear of being identified. The first of them has to do with individuals trying to project an image that has to do more with their ideal self than the real self or put in another way, they attempt to provide an idea of themselves that is in line with the commonly held social norms. The second problem has to do with individuals not being aware of their actual behaviour. On one hand it may be the case that the individual does not feel that he has done something that can be considered deviant or they can even forget about the act. Several studies have accounted for the fact that the longest the distance between the occurrence of the deviant act and the questioning, the lower the awareness. (Hessing, Robben & Elffers, 1989) However, it seems that the salience of the act also repercutes in the awareness about it. If we have performed undeclared work with a certain frequency or earned a substantial sum of money, we are more likely to remember it than if we have just participated sporadically or gained a trivial amount from it.[20] Lastly, response can be affected by simply the fear that the survey does not preserve the anonymity of the respondent and therefore acknowledging participation could potentially lead to identification by the tax authority.

Surely, these three issues cannot be disentangled but they are factors that can affect the answers given to own participation questions.

The survey is carefully constructed to minimise these problems and increase the quality of self-report. Firstly, the present survey reminds the interviewee constantly about the anonymity of his answers.[21] Secondly, the way the questionnaire is built goes from less compromising to more compromising questions which invite the individual to provide better answers than if he is approached with a delicate question from the beginning. This method is called careful priming and it is recognised as a recommended method when addressing sensitive questions (Sudman and Bradburn, 1982).[22] Thirdly, the questionnaire when providing a common definition of undeclared work presents it as a socially spread phenomenon which would encourage individuals to repond more honestly to the question of undeclared work. Lastly, the questions refer to the previous 12 months periods reducing the incidence of the individuals' forgetting about the behaviour if the lapse in time between the act and the question is large.

All in all, we assume that the measurement of undeclared work directly from survey data will lead to a lower bound estimate of the incidence of undeclared work. However, as we said all methods and estimations are valuable in forming a better picture of the undeclared economy and we just need to understand the limitations of each of them. A great advantage of using survey data particularly on the topic is the availability of other information such as the occupation in the hidden economy and the reasons for participation together with some demographic information which help provide a better understanding of the underlying processes

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[20] See Hood and Sparks (1970) or Guze and Goodwin (1972) for evidence from deviant behaviours research.

[21] Along the survey, the following estatement is mentioned throughout: "The following questions are of a sensitive nature and I would like to confirm you that all the information collected is handled in strict confidentiality and anonymity. Your answers to the following questions therefore will remain absolutely ANONYMOUS."

[22] The question of participation in the survey is worded as follows: "Apart from a regular employment, have you yourself carried out any undeclared paid activities in the last 12 months?" In order to circumvent the problems that come from the direct questioning about their own participation, another variant is used to reduce the threaten posed on the individuals: "Do you personally know any people who work without declaring their income or part of their income to tax or social security institutions?" In this study we have used this variable as a proxy for own participation. If we have a look at the number of positive responses to this question it almost quadruples the number of positive responses to the former question. This behaviour also varies by countries, but individuals are generally more comfortable to report others than themselves.

and areas that drive undeclared work.

3.2 Missing data

As is frequent in surveys, we find missing data. The data we are facing is believed to face two types of missingness. Some of the covariates are believed to be Missing At Random (MAR) and therefore Multiple Imputation is used.[23] [24]The explanatory Participating (par) and Knowing Someone who participates (kno) have missing values due to individuals either refusing to respond or responding do not know.[25] The mechanism of missingness of these variables, we believe is missing not at random (MNAR). The reason why is that the missing value depends on the value of the missing observation itself. This will happen if individuals who refuse to respond are more likely to participate than individuals who do respond. There is no definite proof to check between MAR and MNAR data but we can perform some sensitivity analysis to make sure the results of the estimation are robust. However, using the methods that consider the missingness as MAR for these variables provides a good starting point as once we have introduced some information about the missigness mechanism based on the observed data, we leave little room for information that can only be contained in the unobserved data, this is we are bringing the missingness of our data closer to MAR. Then the assumptions for multiple imputation are more closely met and we can more confidently used the method.

In our analysis, due to the belief that the missingness mechanism of Participation and Knowing to be MNAR, we are going to use multiple imputation and perform a sensitivity analysis to test the robustness of our conclusions for possible departures of the MAR assumption. We also present only for comparison purposes the case of listwise deletion.

The importance about assuming this different missingness of the data yields on how our conclusions are sensitive to the assumption behind the models we are using. In this case, and due to the small number of observations missing, the estimations and conclusions are robust. These practices are widely spread in the medical research literature (specially in Randomised Controlled Trials literature), however the questionability of the missingness mechanism needs to be addressed also in the empirical economics literature where we do find a tendency for assuming it is missing completely at random and therefore listwise deleting the data.

4 Empirical strategy

4.1 A Multilevel Logistic Regression

We are going to define a three-level logistic regression which acknowledges the hierarchical structure of the data to be used: individuals i are nested within regions j which are situated in country k. Failure to take into account the multilevel structure of the data may lead to biased results as the assumption of conditional independence is broken due to the existence of group random errors. Therefore, we are allowing for the fact that individuals pertaining to a certain region and country may be more similar to one another than individuals in different regions or countries. Although it is intuitive to expect individuals living in different countries to be different, the reason for allowing regional variation may not be that straightforward. There are many reasons why individuals living in different regions may be similar to each other. In all countries there are substantial cultural differences between regions. Regarding tax policy, some regions can be more intensively targeted by the tax administration with their compliance activities, both audits and campaigns. All this is captured as a group random error.

In this three-level structure, the error term will be composed of three random errors: one individual error and two group random errors. One of the group random errors is common to all individuals within a region, and the other is common to all individuals within a country. Failing to recognise the third level and staying with a two level model will lead to mis-attributing response variation to two levels of data which inevitably would lead to a misunderstanding of the source of variation in the data.

Using the standard notation, define $\pi_{ij} \equiv \Pr(y_{ijk}|x_{ijk})$, where y_{ijk} is our response variable which signals the probability of participating in the hidden economy by supplying undeclared work. It is assumed that y_{ijk} follows a Bernoulli distribution with success probability determined by the logistic cumulative distribution.

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[23]See the Appendix for a wider explanation on Missing data.

[24]Between MAR and MCAR we have performed a logistic regression of the missing-data indicator for each imputed variable on other explanatory variables to test for associations. We find strong associations between the two which should not be the case if data are MCAR. The missing mechanism is not ignorable and therefore listwise deletion is not an appropriate method,

[25]The reason for treating Don't Know as a missing answer here is due mainly to the representativeness of the individuals who choose this option (175/27563) which could not justify the additional computational power required. This estimation was still performed and the results from estimating a multlevel multinomial logit do not substantially change.

x_{ijk} represents the subject specific covariates. A logistic regression with cluster and super-cluster effects of the probability of participation can be written as a two-level model:[26]

$$
\begin{aligned}
y_{ijk} &\sim Bernoulli(\pi_{ijk}), &(1)\\
\text{logit}(\pi_{ijk}) &= \phi_{ijk}, &(2)\\
\phi_{ijk} &= \beta_{0jk} + \beta_1 x_{1ijk}. &(3)
\end{aligned}
$$

The random part of the model, the second and third level, can be defined as follows:

$$
\beta_{0jk} = \beta_0 + v_{0k} + u_{0jk}, \tag{4}
$$

where u_{0jk} and v_{0k} represent the cluster and super-cluster random effects which are normally distributed as:

$$
\begin{aligned}
v_{0k} &\sim N(0, \Sigma_v), &(5)\\
u_{0jk} &\sim N(0, \Sigma_u), &(6)\\
\Sigma_v &= \sigma_v^2 I, &(7)\\
\Sigma_u &= \sigma_u^2 I. &(8)
\end{aligned}
$$

For our specific case β_{0jk} represents the mean log odds of participation in the hidden economy across all countries and regions. v_{0k} represents the effect of country k, and u_{0jk} represents the effect of the region j belonging to country k in the log odds of participation.

Using the latent response form, the model could be specified as:

$$
y_{ijk}^* = \beta_0 + \beta_1 x_{1ijk} + v_{0k} + u_{0jk} + \epsilon_{ijk}, \tag{9}
$$

where ϵ_{ijk} is a level-1 error term with a standard logistic distribution with mean 0 and variance $\pi^2/3$.

The intraclass correlation for levels 2 and 3 can be computed as:

$$
\begin{aligned}
\rho_{jk} &= Corr(y_{ijk}^*, y_{i'j'k}^*) = \frac{\sigma_v^2 + \sigma_u^2}{\sigma_v^2 + \sigma_u^2 + (\pi^2/3)}, &(10)\\
\rho_k &= Corr(y_{ijk}^*, y_{i'j'k}^*) = \frac{\sigma_v^2}{\sigma_v^2 + \sigma_u^2 + (\pi^2/3)}. &(11)
\end{aligned}
$$

The intraclass correlation at the regional level (level 2) ρ_{jk} measures the correlation between two individuals who come from the same country and live in the same region. More formally, it measures the correlation between latent responses i and i' from the same level 2 and level 3 groups, $j = j'$ and $k = k'$. The correlation at the country level measures the correlation between individuals who live in the same country. That is, it measures the correlation between latent responses i and i' from the same country and different regions, $j \neq j'$ but $k = k'$.

4.2 The Model

In order to characterize the behaviour of the individuals, we need to draw from social psychology. As Yinger (1963) recognises, a behaviour is both personal and situational. Therefore, the choice of variables that are introduced into the model need to characterize not only the traits of the individuals but also the situational influences that contribute to that behaviour. In order to assess the variables that need to be introduced in the model of undeclared work we are going to source from the past literature on the shadow economy, the literature on deviance and its application to tax evasion, and especially from Weigel, Hessing and Elffers (1987).

The variables that are going to be introduced in the model correspond to a mix of instigators and constraints of participation and can be grouped into four different sets. The first group will capture financial strain, the second will reflect the perception of the deterrence power of the tax administration, the third will indicate moral constraints, and the fourth is simply a control for sociodemographic characteristics.

The dependent variable is own participation in the hidden economy and robustness checks are carried out using another question in the survey where individuals report whether they know someone who works in the hidden economy. This variable is used as a proxy for own participation. The results point in the same direction as in the case of own participation and the results are available upon request.

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[26]Raudenbush and Bryk (2002) and software packages such as MLWiN use this two-level formulation. We recurr to this formulation in order to provide a more clear presentation of the model.
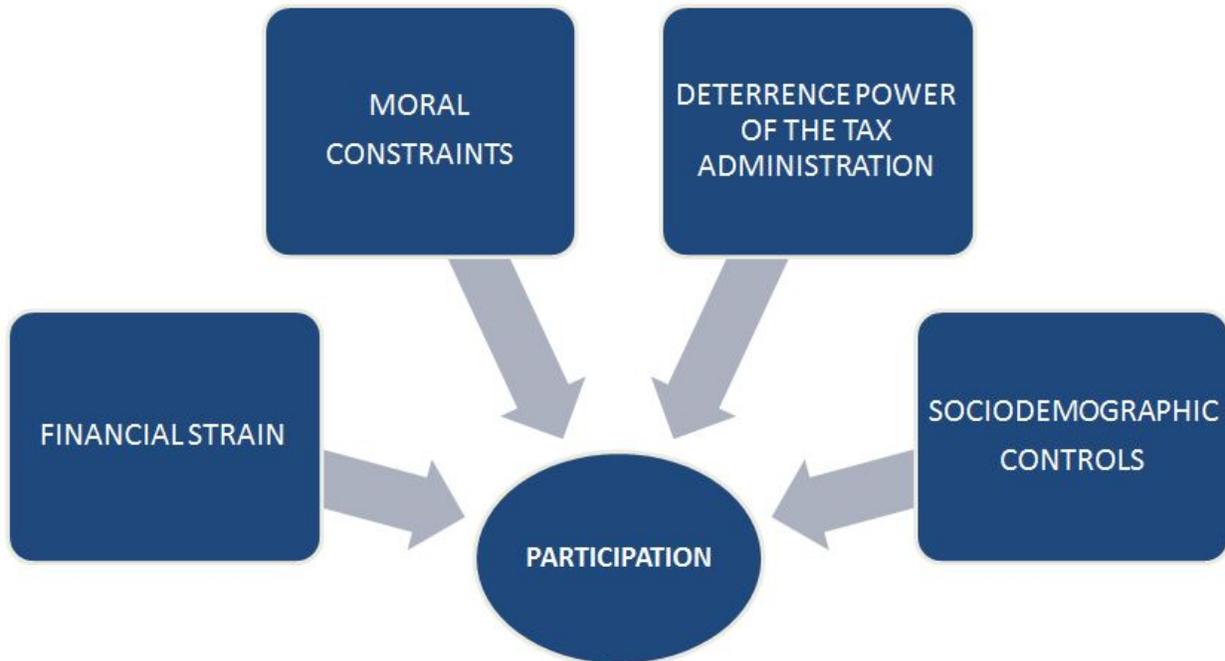
Figure 1: Extent of underreporting

4.2.1 Financial Strain

In the tax literature we find evidence that those experiencing financial strain or who perceiven their situation as comparatively worse than others are more willing to engage in evasion (Warneryd and Walerud (1982); Webley *et al.* 1991) In order to capture these two elements, and due to the lack of an income variable in the survey, we use two distinct variables. The first captures the first effec by using whether the interviewees generally struggle to pay their bills. In order to capture the social comparison, we use a self-classification of the individual into social classes and the position they hold in society.[27]

4.2.2 Deterrence Power of the Tax Administration

In the 70s and 80s the theory of deterrence was extensively discussed in order to disentangle the effect of sanctions on individuals behaviour. Individuals were considered rational actors who weigh the cost and rewards of engaging in crime as opposed to other behaviours. The theory then shifted from assessing the impact of objective measures of certainty and severity of sanctions to a recognition that the impact of the deterrents was dependent on individuals' perceptions. As Williams and Hawkins (1986) express it "deterrence theory implies a psychological process whereby individuals are deterred from committing criminal acts only if they *perceive* legal sanctions as certain, swift and/or severe". The use of objective measures as proxies for perceptions does not recognise the fact each taxpayer is unique and makes their behavioural decision based on their own perceptions which can be influenced by many factors: their own experience, the interaction with others, their knowledge of the tax environment...[28]

The intensive and extensive effects of deterrence can be perceived differently by the actors and this difference in perception may be what casuses differences in behaviour[29]. Therefore, we are going to consider

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[27] For a description of the variables, see appendix.

[28] Feld and Schmidt study the effect of deterrence in the shadow economy, trying to disentangle the causality between the two across time. They use DYMIMIC estimates and penalties per investigation and firms per audit as proxies for deterrence. These measures are objective measures of deterrence and therefore ignore the fact that individuals may perceive a completely different story to the numbers they present there. Perceptions are influenced by a plethora of factors which may make their perception about deterrent tools very different from the actual figures. Using objective measures to proxy for perceptual measures roots on the belief that there is a positive correlation between the objective reality of the tax administration deterrent policy and the subjective perception of the taxpayers. We recognise though that using macro methods can have other advantages to micro methods and therefore the tecniques to be used in assessing this impacts may differ substantially.

[29] Including objective measures of sanctions and audit probabilities (or proxies of it) and finding a negative relationship, can be a sign of the deterrent effect of sanctions/detection. However, it may also be the case that the observed low participation is due to moral constraints. Introducing perceptual variables can help us disentangle the effects. If the perceived cost of

the perceptions of the risk of being detected and the severity of the sanction. The effect of the perceived severity of the sanctions has found mixed effects in the literature (see Jensen *et al.*, 1978; Paternoster *et al.*, 1982)

4.2.3 Norms

We are going to introduce two measures of morale. A broad measure which is going to be composed of a composite score of individual's perceptions about different dishonest acts. A factor analysis was performed to assess whether all the variables where part of the same construct. The factor analysis presented in the Appendix only displays one factor. This factor would be taken as an overall measure of morale for the individual.

We then build a more specific measure of morale which just takes into account variables related to the hidden economy and, using the same procedure, we check that they all measure the same construct. This measure will provide direct evidence of how an individual's shadow economy morale affects his decision about participation. Although other measures of morale may be correlated, it is necessary to evaluate individual's perceptions about the act without taking into account the noise that can be introduced by other dishonest behaviours. This is, to our knowledge, the first study that will provide a shadow economy morale. It is important to disaggregate the concepts as the hidden economy may not be as condemned as tax evasion. The reason behind this argument is that a great deal of the interviewees accepted buying and participating from the hidden economy because it was beneficial to both parties engaged in the transaction. As there is a common interest, morale can be less condemning than when there are individual acts of evasion where only the ones that have the opportunity will evade. For comparison with the literature that uses individual's attitudes towards tax evasion as a proxy for shadow economy morale, we also present the results for this case.

Summary statistics follow.

Table 2: Summary Statistics of Morale

		Broad Measure	HE Morale	Proxy	Evasion
Continental	Mean	2.40	2.46	2.29	2.38
	Median	2.00	2.00	2.00	1.00
	S.D.	1.44	1.61	1.58	1.91
Eastern-Central	Mean	2.79	2.99	2.41	2.81
	Median	2.29	2.50	1.50	2.00
	S.D.	1.79	2.03	1.88	2.33
Southern	Mean	2.17	2.22	2.07	2.12
	Median	1.71	1.75	1.50	1.00
	S.D.	1.36	1.50	1.45	1.65
Nordic Countries	Mean	1.83	1.93	1.72	1.64
	Median	1.57	1.50	1.00	1.00
	S.D.	1.05	1.23	1.17	1.38
Total	Mean	2.45	2.57	2.23	2.42
	Median	2.00	2.00	1.50	1.00
	S.D.	1.58	1.78	1.66	2.03

4.3 Sociodemographic characteristics

The individual characteristics we use are: age, gender, education, occupation, and marital status. We include gender to capture if there exists a different participation rate for men and women as there is in the formal sector. Age will determine the different behaviours along the lifecycle. Occupation captures whether different groups tend to participate more intensively than others. Marital status will capture possible differences in behaviour that may be linked to the type of household. Regarding household composition, we control for the number of children and the size of the household in general.

participation does not play any role in participation and we do find a role of morale, then we can recognise there is a process of moral condemnation in order.

5 Results

We present a weighted analysis using both poststratification and population size weights. The analysis is carried out using multiple imputation as the data is assumed to be MAR.[30] Results for the listwise deletion case are presented as well for comparison purposes. The results are practically the same as the fraction of missing observation is relatively small.[31] The table of results can be found in the Appendix.

5.1 Sociodemographics and Financial Constraints

The employed and the retired appear to participate less in the hidden economy than individuals who are unemployed. The self-employed variable is not significant. This seems to point in the same direction as was found by Haigner *et al.* (2011) for Germany. In our case it seems that the unemployed, who are mostly individuals who have lost their jobs[32], are the individuals who engage the most. This can be explained by the argument that they are individuals who are used to a certain living standard sustained by their job and a sudden shock into their financial position makes them resort to hidden econoic activities to make up for the loss of income. Indeed, when asked in the survey for the reason why they do undeclared work, the lack of formal jobs, the difficulty of living on benefits and the unavailability of other means of income and the fact that both parties benefited appear as the most recurrent reasons.

The finding that individuals who face greater financial strain are more likely to participate in the hidden economy is reinforced by the fact that individuals who face a higher struggle to pay their bills will be more prone to participate. This is also marginally captured by the variables social class which shows that individuals who are in the working class will participate more than individuals in higher social classes.

Participation seems to be more widespread among men than women. This feature appears as the occupations of individuals who report participation are male dominated in the hidden economy. We have tested this result by analysing the occupations individuals take in the hidden economy separately. In the first group we considered individuals who perform babysitting, cleaning, and ironing tasks as part of their hidden economy activities. The second group was composed of individuals who did gardening, repairs and renovations, car repairs, or help moving house. The third group was composed of individuals who gave administrative or IT assistance and tutoring and the fourth included selling goods and services. We find that the categories are male dominated with the exception of the first one.

We find that individuals seem to become more compliant as they age. This result is consistent with previous findings in the tax evasion literature. We find no significance in the education variable, which may be because the effect is likely to be correlated with other variables in the model such as occupational choice or some of our wealth indicators. Estimation results can be found in Table 4.

5.2 Tax Administration and Morale

As is the case in the literature on tax evasion, the effect of detection is stronger than the effect of sanctions. As the perception of the chance of being caught is reduced, the probability of participating increases. We also find that as individuals perceive the strength of the sanction to increase, the probabilities of participating will be reduced. The dummy variable that indicates the hardest punishment, which is prison, is not significant but this could well be due to the fact that very few individuals thought this would be the consequence of being caught performing undeclared work. However, the relevance of the severity of sanctions in their role of deterring undeclared work is directly related to two further matters. The first one is individuals' perceptions about their chances of being caught: even if they think the sanction is quite severe if the chances of being caught are minimal then the deterrent power of sanctions is lessened[33]. The second is enforcement: if there are severe sanctions established but not enforced, then this will cause the sanctions to also lose their relevance, this is regarded as the tipping point or the threshold effect.

Morale seems to be consistently deterring individuals from participating. This variable is strongly statistically significant in all the different specifications we have used: under a broad measure of tax morale, using a specific shadow economy morale, and using tax evasion morale as a proxy. The results are provided in Table 5.

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[30] We also carry a sensitivity analysis for the case when the missingness of the data for participation and knowing someone is missing not at random. We take into account the case where all the missing values were participants who refused to participate to conceal this fact. The results hereby presented are robust to the check,

[31] Note that as said before this method is only sensible if data are MCAR which we have tested it not to be.

[32] Only a small proportion are represented by individuals who have never worked.

[33] Williams and Hawkins (1986) outlines the importance of the link between perceived certainty and perceived severity of sanctions. Grasmick and Bryjak (1980) found a significant negative effect of sanctions which was greater when the level of perceived certainty was higher.

We are particularly interested in seeing how the two concepts of morale and classical deterrents operate together. Calculating the predictive margins, we see that in scenarios where morale is very high, the effect of the classical deterrents in the decision is significantly dampened. This is, the morale is a more powerful constraint that renders classical deterrents almost irrelevant. This can be seen in graphs 2 and 3 in the Appendix.[34] However, as morale becomes more lax, the power of detection and sanctions as deterrents gains increasing weight towards shaping the decision of the individual towards compliance. This is in line with the findings by Wenzel (2004) and Smith (1990) for tax evasion.

These observations add to the debate whether they are competing or interacting processes. We do show that in situations where tax morale is very high then deterrence is not that relevant. However, morale is an individual variable so it is unlikely that a situation could be achieved in which all individuals within a country held such high morale that the tax administration would not need to use their classical tools. The heterogeneity of the morale of the individuals makes the use of both strategies necessary. Besides, we should not forget as Williams and Hawkins (1986) outline that legal sanctions and social sanctions are linked. They outline three particular reasons why legal sanctions are necessary: first, as a mere deterrent; second, as normative validation, this is, signalling and condemning that a certain behaviour is socially wrong, and thirdly through the social cost, that is, socially mediated deterrence. Therefore, both processes are absolutetly necessary and should coexist.

The consequence of the results is that both classical deterrents (sanctions and detection) are necessary to stop individuals from joining the informal labour force, but if we manage to create a stronger morale, a stronger tax culture, then we may in the long-run need to resort less to the classical tools which are in some cases very resource intensive.

5.3 Analysing by geographical location

We have divided the EU zone into four geographical areas: Continental Europe[35], Central-Eastern Europe[36], Southern Europe[37] and the Nordic Countries[38]; and we have repeated the analysis from the pooled sample to see if there are variations in the results. We expect that due to smaller sample sizes, some of the effects may be weaker due to the loss of sampling power.

The result that males participating more prominently than females in general is consistent across all regions except for Continental Europe. The effect of age is especially strong in Southern Europe and Central-Eastern Europe. Regarding occupations in the formal economy, self-employed individuals consistently seem to participate to the same extent as unemployed individuals. Employed and Retired are found to participate less in the Nordic Countries and Central-Eastern Europe specially. Individuals who show signs of financial strain are identified as more typically participating and this finding is also consistent and significant across regions. The effect of sanctions is supported in all regions except from the Nordic countries and the effect of detection seem to be particularly powerful in Continental Europe. The constraining power of morale in the decision of participation is highly significant all across regions.

We believe the effect of administrative variables (audits and sanctions) are also significant across all regions but the mixed result may be due to measurement errors. It is highly surprising that the finding for tax morale is so consistent and significant. Results for selected variables are shown in Table 6, full results are not shown here due to limitation of space but are available from the author upon request.

6 Conclusion

A need for tackling the hidden economy has surged as countries strive to achieve the Employment goals and reduce their deficits that come from noncompliant activities. Taking the problem back to the individual level, we analyse what is motivating or deterring individuals to/from participating in the hidden economy in order provide evidence on how policy should be formed. Using microsurvey data provides a invaluable insight into individuals´reasons, attitudes, perceptions and situational position. This paper has analysed this issue from a pooled sample of all European countries and then disaggregated it by geographical areas, in order to identify differences in these motivations.

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[34]When not strictly specified, we use the broad measure of tax morale. We provide the results using different measures of morale in the Appendix 8.5.

[35]Belgium, France, Ireland, Germany, The Netherlands, Luxembourg, Austria and the UK.

[36]Bulgaria, Estonia, Latvia, Lithuania, Hungary, Czech Republic, Poland, Romania, Slovenia, Slovakia and Croatia.

[37]Spain, Greece, Cyprus, Italy, Malta and Portugal.

[38]Sweden, Denmark and Finland.

We have found a strong link of participation in the hidden economy and financial strain. Individuals who participate in the hidden economy seem to be doing so mostly out of necessity. We acknowledge this may not be generally the sole motivation for participation but it is the one that our data clearly outlines. This makes individuals who struggle to face their financial burden and individuals affected by an economic shock, such as losing their job more prone to participation.

This finding leads us to reflect deeper. If the situation of participation in the hidden economy is temporary and anecdotal and is the result of a transition, say temporary strain, then the issue of participation should not be of greater importance. The problem would come if individuals do not seem to have easy access to come back to the formal economy, or if the access they are provided is to low quality employment or even worse if they have never had access at all. This opens another stream of thoughts: are institutions ultimate responsible for the flourishing of the hidden economy? Are we providing the right mechanisms to ensure the incorporation to formal quality employment?

Whereas financial strain acts as a trigger, a high perception of the chances of being detected and the perception that a severe penalty would be imposed serve as deterrents to the decision of participation. We identify another powerful tool in deterring participation and it is morale. We have found that when a strong morale (be it shadow economy morale or our broad measure of morale) is present in the economy, the effect of classical deterrents is dampened. When there is an intrinsic motivation to comply, the power of the extrinsic motivation is weakened.

This should not be interpreted as a sign that they are competing processes, they are in fact interdependent. Recognising the atomistic behaviour of the taxpayers and the fact that the decision is a personal choice determined by individuals´perceptions and experiences, their situation and their environment, it seems highly unreal to imagine an scenario where the morale of all individuals in the economy is so high that audits and sanctions would render irrelevant. In fact as Williams and Hawkins (1986) recognise we need to take into account the role of sanctions as demonstrators of what is socially right or wrong.

This on the contrary provides evidence that the role of tax administration of constraining participation through the threat of detection and penalties seems to be at least as important as the role of the tax administration as a creator of a stronger tax morale. This brings good news as there seems to be a real chance that educating the taxpayers will have an effect in the reduction of the hidden economy.

The importance of analysing undeclared activities is paramount. They are a source of loss of revenues, causes inequalities being the tax burden shifted from those who are working undercover to those who do not and affects competition between the informal and formal producers. It also has social consequences, individuals working in the hidden economy would not contribute towards social security reducing their pensions rights in the future; the access to healthcare may also be restricted as contributions are not made; their rights may be violated and the health and safety conditions in their workplace may not be met. Undeclared work has even more negative consequences than tax evasion and therefore further investigation is required.

In order to do this we need to take into consideration all approaches and methods available, but we need to promote the creation of quality data to help monitor the hidden economy. The discontinuity of the surveys is detrimental as the behaviour cannot be tracked along time. Having a continuous survey or what is best a panel of individuals, would help track participation and the size of the hidden economy along time and what is more important to be able to analyse how the motivations and perceptions of the individuals are changing and are contributing to shaping the hidden economy.

What is clear is that research in this area needs to develop further to be able to give response to policy questions that are arising and for which countries are taking diverse policies of which we are not able to monitor its effectiveness or even if they are tackling the phenomenon in the right direction. As Arthur Conan Doyle puts it, "it is a capital mistake to theorize before one has data", so more data is all we need to be able to provide stronger findings.

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8   Appendix

8.1   The variables

Table 3: Table of Variables

Sociodemographics	
Gender: Male	Dummy variable equal 1 if individual is a male, 0 if a female.
Age	
Age Squared	
Education	Categories: Less than 15 years of full-time education (o); 16-19 years; More than 20; Still studying; No full-time education
Occupation	Categories: Self-Employed; Employed; Retired; Unemployed (o); Other Non-Active.
Marital Status	Categories: Single (o); Single with partner; Married; Other civil status.
Region	Categories: Rural (o); Small-Medium size town; Large town.
Size of the Household	
Number of Children	
Financial Constraints	
Struggle with Bills	Categories: Never struggle (o); Occasionally struggle; Almost never struggle.
Level in Society*	Categories: Low level (o); Middle level; High level.
Social Class*	Categories: Working class (o); Middle class; High Class.
Wealth Variables	
Tax Administration	
Sanctions (Perceptions of severity)	Categories: Amount due (o); Amount due plus fine; Prison; Other; Do not Know.
Risk of Detection (Perceptions of)	Categories: Very High (o); Fairly High; Fairly Low; Very Low; Do not Know
Moral Constraints	
	Broad Measure: Construct explained in Appendix.
Morale	Specific Measure of Shadow Economy Morale.
	Both 10 point scale where 1 is totally unacceptable and 1 is totally acceptable.
Dependent variables	
Own Participation in the Hidden Economy	Dummy variable equal 1 if individual participates, 0 otherwise.
Knowing someone who participates in the hidden economy	Used as a proxy of own participation. Provides a robustness check for the results presented on this paper. It takes the value 1 if individuals know someone who participates, 0 otherwise.

Notes:

1. * Individuals are asked to classify themselves. Level in society was original in a 11 point scale and has been grouped into these categories to ease interpretation.

2. (o) Indicates that this category is omitted in the regression.

8.2 The survey

The Eurobarometer Survey is part of the European Commission or other EU Institutions to investigate the public opinion in the different member estates on certain topics of interest. It was carried out by the TNS Opinion & Social network on request of the European Comission in 27 Member States of the European Union and Croatia between April and March 2013. This special Eurobarometer 402 survey corresponds to the 79.2 wave. Face-to-face interviews were performed on a sample of 27,563 interviewees which are resident in each of the aforementioned states and are 15 years or over of age. This means the sample size is an average of 1,000 individuals per country.[39] [40]

A multi-stage random probability method was used to obtain the sample of the study. In each country a number of sampling points with a probability proportional to the population size and density was drawn from each of the administrative regional units after stratifying by individual unit and type of area. The sample is therefore representative of the territory of the countries surveyed and of the distribution of the population. In each of the sampling points, the first address was drawn at random and then every Nth address was selected. In each household the respondent was chosen randomly according to the "closest birthday rule".

The Eurobarometer Survey on undeclared work provides a common framework to analyse undeclared work in a comparable way for the different countries in the EU. This survey is a follow-up survey for the one in 2007 although comparison is not always possible as some of the questions did change slightly from one wave to another. The questionnaire was originally created following the proposal of the Danish Rockwool Foundation Research Unit which had previously applied it in a number of studies in Denmark and later a modified version was used in studies in Sweden, Germany, the United Kingdom and Norway. The EBS records information on individuals involvement in undeclared work practices in different levels, as users and as suppliers and it surveys their perceptions and reasons for doing so.

At the start of the survey, the individuals are all faced with a common definition of undeclared work.

"It is widely known that part of the population is engaged in undeclared work, in the sense of activities which avoid partly or entirely declaration to tax authorities or social security institutions, but which are otherwise legal. This could be people working in certain sectors of activity like construction, transport or agriculture for example but also in hotels, restaurants and cafes. Often it concerns only part of their income from work like remuneration of overtime or other extras. Undeclared work is also common in a whole range of household services - such as gardening, babysitting and elderly care -, personal services - like hairdressing,cosmetic or medical treatment - and repair services for cars, clothes, or computers."

This approach to undeclared work does no include any criminal activities such as drug dealing or smuggling. It only considers activities which being legal, they are just not reported to the tax office. This will include individuals such as ghosts, this is, individuals who perform an activity and are not in the tax administration records at all, but also moonlighters, individuals who are registered for their first employment but fail to declare their income from their secondary employment. However, we may also consider that some illegal production might be picked up in the sense that it could be a perfectly legal activity but that turns unlawful not because of the activity itself but because of the individual performing the activity not being authorised to perform it.

8.3 More on missing data

The literature documents three types of mechanisms underlying missing data: Missing At Random (MAR), Missing Completely At Random (MCAR) and Missing Not At Random (MNAR). Depending on the underlying mechanism the method that needs to be used to deal with nonresponse is different. In our case, we believe the data is missing at random. As we said we can identify two types of missingess MNAR for the dependent and MAR for the rest of the covariates. When the structure is MAR, complete case analysis or listwise deletion leads to a bias in the estimation. Using listwise deletion in general may lead to a large number of observations being deleted which can lead to inefficient results or can even leave the researcher with a sample no longer representative of the population leading to a bias in the estimation.[41] Multiple

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[39] This sample size is quite small per country to provide an independent analysis per country. As it was advised in the Feasibility study performed by the Rockwool foundation p.90 estimations based on a sample size of less than 2,000 individuals may not provide a reliable analysis of the structure of undeclared work.

[40] Some may argue that a face-to-face interview may not be the best method to use in order to address such sensitive topics. However, face-to-face interviews eliminate the problem of self-selection which plague online and mail surveys. Face-to-face interviews have even proved superior to telephone interviews in cases such as Germany. Feasibility (p.90)

[41] See Kenward and Carpenter (2007), Piggot (2001), Little and Rubin (2002) or Allison(2001) for a detailed analysis of the missingness mechanisms and a review of the methods to use.

imputation has stood as the most preferred choice among researchers when facing MAR data.[42] In short the idea of multiple imputation is through obtaining a distribution of possible values of the missing observations, create a number (M) of different complete datasets in which to run the estimation.[43] The next step after the imputation and the estimation is the pooling of the estimates of the m dataset using Rubin's rules to provide a single estimate and standard errors that incorporate missing data uncertainty. The choice on the number of imputations necessary is still under debate. Rubin (1987) asserts that to obtain a relative efficiency of 90% with 50% of the data missing only two imputations are enough but that five imputations will provide a relative efficiency of 95%. Others suggest that a minimum of twenty imputations. The truth is that it depends on the number of missing observations in the dataset. White et al. (2011) suggest that the rule of thumb is that the number of imputations should be equal to the proportion of missing cases in the dataset. This is, if 90% of the cases are complete, then the number of imputations M should be equal to 10. In our case 1734 cases have missing observations being our total count 27563. This makes the number of cases with missing observations equal to 6%. According to the rule of thumb this should be our number of imputations. We are going to choose 10 imputations as it is computationally possible to do so.[44]

We have used all predictors for the imputation that will appear as explanatory and outcome variables in the regression and the data has been appropriately weighted for the sample to be representative of the population. We have used Multiple Imputation by Chained Equations (MICE) as it allows different variable types to be imputed in the same command. See Royston and White (2011) for an explanation of how MICE operates.[45]

When the data is believed to be MNAR, we can use MAR methods and perform a sensitivity analysis on the imputations. We have performed a sensitivity analysis of the estimation assuming all data are MAR. We have tested for the robustness if we consider all imputed data to be participants, all imputed data to be nonparticipants and compared it with the imputation yield assuming MAR. The results are robust and results are available from the author.

8.4 Factor Analysis

We are going to use two measures of morale which are composite scales. The first is a broad measure of morale while the second corresponds to shadow economy morale. The unidimensionality of the constructs was tested through Exploratory Factor Analysis (EFA). In the first case, we have used Kaiser-Meyer-Olkin test of sample adequacy. An overall value of 0.8767 is obtained which supports the appropriateness of factor analysis. The measure of sample adequacy is greater than 0.83 for all variables. Using Guttman-Kaiser rule, we can see that only one factor has eigenvalues greater than one and the rest are significantly lower. This is confirmed using a scree plot. This means that we can only identify one factor. Factor loadings are larger than 0.43 in all cases and they load mainly on the first factor. The first factor explains 77.7% of total variance. This one factor solution is going to represent our construct of tax morale which we are going to construct as an average of the scores in order to keep our data closer to the data provided by the respondents. We have also used factor loadings to consider each item's contribution to the factor and the results are invariable. The scale internal reliability has been shown with Cronbach's alpha of 0.8728. The second factor measure loads again only in one factor as there is only one eigenvalue larger than 1 and all factors loads on only the first component. The Cronbach's alpha for this scale is 0.8335.

Another variable for morale is going to be constructed from individual's evaluation of riding public transport without a ticket and claiming benefits when one does not have the right. As we said before, evasion will be used as well as a proxy for shadow economy morale as has been done previously in the literature.

The items in the scale respond to the question: How acceptable is it to...?

- Receive welfare payments without entitlement

- Use public transport with no ticket

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[42]Since Rubin (1976, 1987) first introduced the method of multiple imputation as a way to go beyond complete case analysis, a large strand of literature specially steming from medical research has been developed supporting multiple imputation to other methods. See Carpenter and Kenward (2013), Kenward and Carpenter (2007), Royston (2004, 2005).

[43]The imputation methods typically available in STATA obtain the imputations by simulating from a Bayesian posterior distribution of missing data.

[44]Different number of imputations have been added in order to test for the robustness of the estimates and they are robust across estimations when the number of imputations differ. Multiple imputation builds on the assumption of MAR which cannot be tested. However following Abayomi, Gelman, and Levy (2008), Raghunathan and Bondarenko (2007) and Marchenko and Eddings (2012) we can check that the imputation model fits the data well which we have done graphically and also that the summary statistics of the imputation are reasonable. All these tests are available from the author.

[45]http://www.jstatsoft.org/v45/i04/paper

- An individual not declaring income despite being hired

- A firm not declaring an income despite being hired by a household

- A firm is hired by another firm and it does not declare its activities

- A firm hires an individual and all or a part of their wage is not declared

- Evade taxes

8.5 Tables

Table 4: Estimation results of the three-level logistic regression of Own Participation.

	(5)	(6)	(11)	(12)
	Listwise deleted (w2)		Multiply Imputed (w2)	
	Coefficients	Odds Ratio	Coefficients	Odds Ratio
Sociodemographics				
Male	0.388**	1.474**	0.381**	1.464**
	(0.197)	(0.290)	(0.179)	(0.262)
Age	-0.00325	0.997	-0.00235	0.998
	(0.0167)	(0.0167)	(0.0152)	(0.0152)
Age squared	-0.000398**	1.000**	-0.000385**	1.000**
	(0.000171)	(0.000171)	(0.000160)	(0.000160)
Education				
Education: 16-19	-0.157	0.854	-0.227	0.797
	(0.115)	(0.0983)	(0.184)	(0.147)
Education: More 20	-0.263	0.769	-0.342*	0.710*
	(0.176)	(0.135)	(0.205)	(0.145)
Education: Still studying	-0.294	0.745	-0.391	0.676
	(0.247)	(0.184)	(0.281)	(0.190)
Education: No Education	-0.801	0.449	-1.074	0.342
	(0.710)	(0.319)	(0.904)	(0.309)
Occupation				
Self-Employed	0.209	1.233	0.248	1.281
	(0.322)	(0.397)	(0.218)	(0.280)
Employed	-0.457**	0.633**	-0.517**	0.596**
	(0.205)	(0.130)	(0.201)	(0.120)
Retired	-0.633*	0.531*	-0.741**	0.477**
	(0.379)	(0.201)	(0.338)	(0.161)
Other non-active	-0.0965	0.908	-0.197	0.821
	(0.212)	(0.193)	(0.186)	(0.152)
Marital status				
Single with partner	0.135	1.145	0.204	1.226
	(0.125)	(0.143)	(0.125)	(0.153)
Married	-0.102	0.903	-0.116	0.891
	(0.145)	(0.131)	(0.127)	(0.113)
Other Civil Status	0.290	1.336	0.237	1.268
	(0.232)	(0.311)	(0.206)	(0.261)
Region				
Small-Medium size town	0.0313	1.032	0.0408	1.042
	(0.155)	(0.160)	(0.161)	(0.168)
Large town	-0.0219	0.978	0.0227	1.023
	(0.206)	(0.202)	(0.160)	(0.164)
Household				

	(5)	(6)	(11)	(12)
	Listwise deleted (w2)		Multiply Imputed (w2)	
	Coefficients	Odds Ratio	Coefficients	Odds Ratio
Size	-0.149**	0.861**	-0.148**	0.863**
	(0.0670)	(0.0577)	(0.0591)	(0.0510)
Number of children	-0.00307	0.997	0.00741	1.007
	(0.0743)	(0.0741)	(0.0668)	(0.0673)
Financial Constraints				
Bills				
Struggle occasionally	-0.473***	0.623***	-0.485***	0.616***
	(0.168)	(0.104)	(0.140)	(0.0864)
Never struggle	-0.846***	0.429***	-0.845***	0.430***
	(0.186)	(0.0797)	(0.158)	(0.0678)
Social Class				
Middle Class	-0.128	0.880	-0.0945	0.910
	(0.114)	(0.101)	(0.117)	(0.106)
High Class	-0.253	0.777	-0.246	0.782
	(0.425)	(0.330)	(0.399)	(0.312)
Other	0.795	2.215	0.741	2.099
	(0.637)	(1.411)	(0.569)	(1.195)
None	0.328	1.389	0.698	2.010
	(0.895)	(1.243)	(0.800)	(1.608)
DK	-0.0867	0.917	-0.0874	0.916
	(0.575)	(0.527)	(0.393)	(0.360)
Level in society				
Middle Level	-0.161	0.851	-0.165	0.848
	(0.131)	(0.112)	(0.120)	(0.102)
High Level	-0.317**	0.728**	-0.353***	0.702***
	(0.154)	(0.112)	(0.125)	(0.0878)
Wealth Variables				
Still paying house	-0.00357	0.996	0.0126	1.013
	(0.141)	(0.141)	(0.118)	(0.119)
House already paid	0.0231	1.023	-0.0177	0.982
	(0.158)	(0.162)	(0.136)	(0.134)
Internet	-0.286	0.751	-0.278	0.757
	(0.191)	(0.143)	(0.171)	(0.129)
Car	0.0977	1.103	0.138	1.148
	(0.133)	(0.146)	(0.111)	(0.127)
TV	0.0608	1.063	0.116	1.123
	(0.405)	(0.430)	(0.342)	(0.384)
DVD	-0.0405	0.960	-0.0699	0.932
	(0.238)	(0.229)	(0.202)	(0.188)
CD	0.314***	1.368***	0.299***	1.348***
	(0.0974)	(0.133)	(0.101)	(0.136)
PC	0.170	1.185	0.185	1.203
	(0.144)	(0.171)	(0.127)	(0.152)
Tax Administration				
Sanction				
Due plus fine	-0.144*	0.866*	-0.147*	0.863*
	(0.0823)	(0.0713)	(0.0820)	(0.0708)
Prison	0.0119	1.012	-0.0341	0.967
	(0.320)	(0.324)	(0.291)	(0.281)
Other	0.338***	1.403***	0.325**	1.383**
	(0.105)	(0.148)	(0.132)	(0.183)

	(5)	(6)	(11)	(12)
	Listwise deleted (w2)		Multiply Imputed (w2)	
	Coefficients	Odds Ratio	Coefficients	Odds Ratio
DK	-0.0625	0.939	-0.147	0.863
	(0.166)	(0.156)	(0.170)	(0.146)
Risk of Detection				
Fairly High	-0.148	0.862	0.00448	1.004
	(0.319)	(0.275)	(0.315)	(0.317)
Fairly Low	0.331	1.393	0.439*	1.552*
	(0.245)	(0.342)	(0.254)	(0.394)
Very Low	0.764***	2.147***	0.843***	2.323***
	(0.263)	(0.566)	(0.285)	(0.661)
DK	-0.406	0.666	-0.463	0.629
	(0.313)	(0.209)	(0.319)	(0.201)
Moral Constraints				
Morale	0.409***	1.505***	0.403***	1.497***
	(0.0414)	(0.0623)	(0.0354)	(0.0529)
Constant	-2.598***	0.0744***	-2.756***	0.0636***
	(0.816)	(0.0607)	(0.865)	(0.0550)
Random effects				
Region	0.668***	0.668***	1.909***	1.909***
	(0.10)	(0.10)	(0.15)	(0.15)
Country	0.479***	0.479***	1.903**	1.903**
	(0.06)	(0.06)	(0.43)	(0.43)
Observations	24,947	24,947	27,541	27,541

Notes:

1. Weighted estimation includes design and poststratification weights.

3. The stars signal significance at the following levels:

* $p<0.10$ ** $p<0.05$ ** $p<0.01$

Table 5: Estimation of Own Participation with different specifications of Morale.

	(1)	(2)	(3)	(4)
Sociodemographics	Yes		Yes	
Financial Constraints	Yes		Yes	
Tax Administration	Yes		Yes	
Moral Constraints	Shadow Economy Morale		Evasion	
Morale	0.359***	1.432***	0.271***	1.311***
	(0.0400)	(0.0572)	(0.0180)	(0.0236)
Random effects				
Region	0.665***	0.665***	0.627***	0.627***
	(0.12)	(0.12)	(0.1)	(0.1)
Country				
	0.520**	0.520**	0.557***	0.557***
	(0.24)	(0.24)	(0.08)	(0.08)
Observations	24,781	24,781	24,571	24,571

Notes:

1. Weighted estimation includes design and poststratification weights.

2. The stars signal significance at the following levels:

* $p<0.10$ ** $p<0.05$ *** $p<0.01$
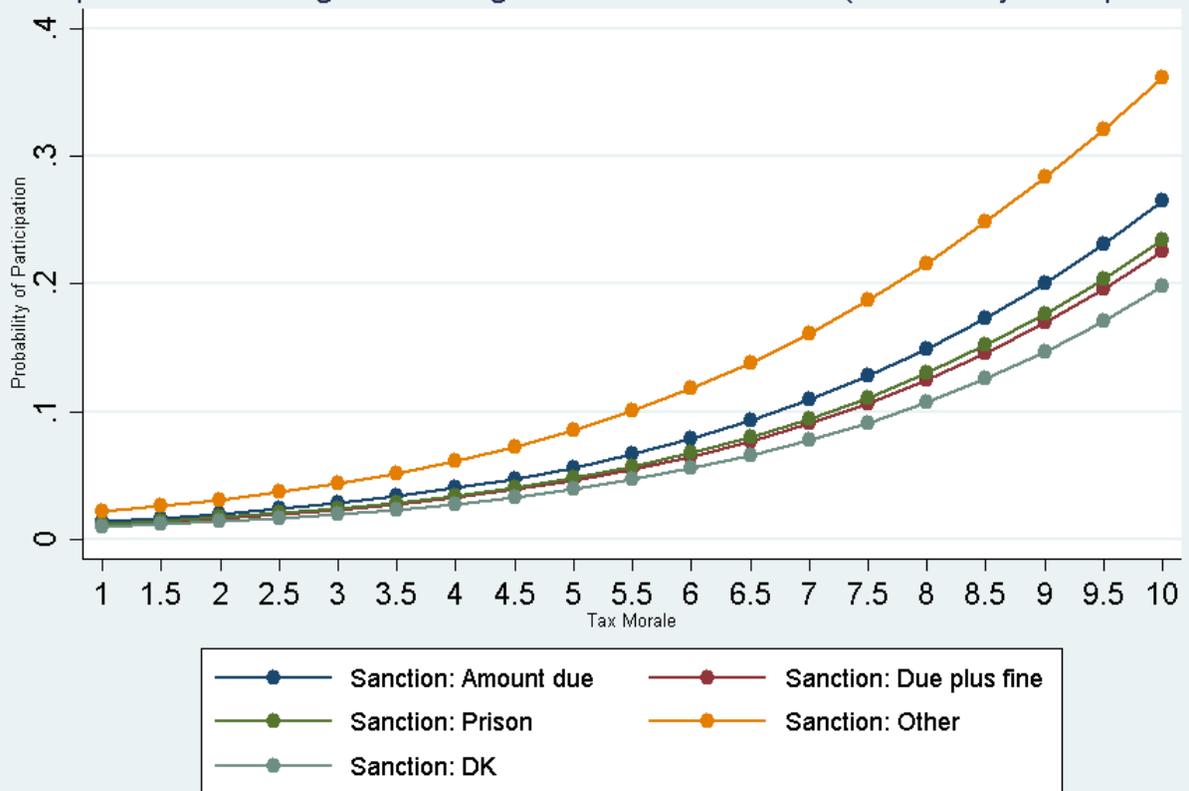
Figure 2: Predictive margins for sanctions at differing levels of tax morale.
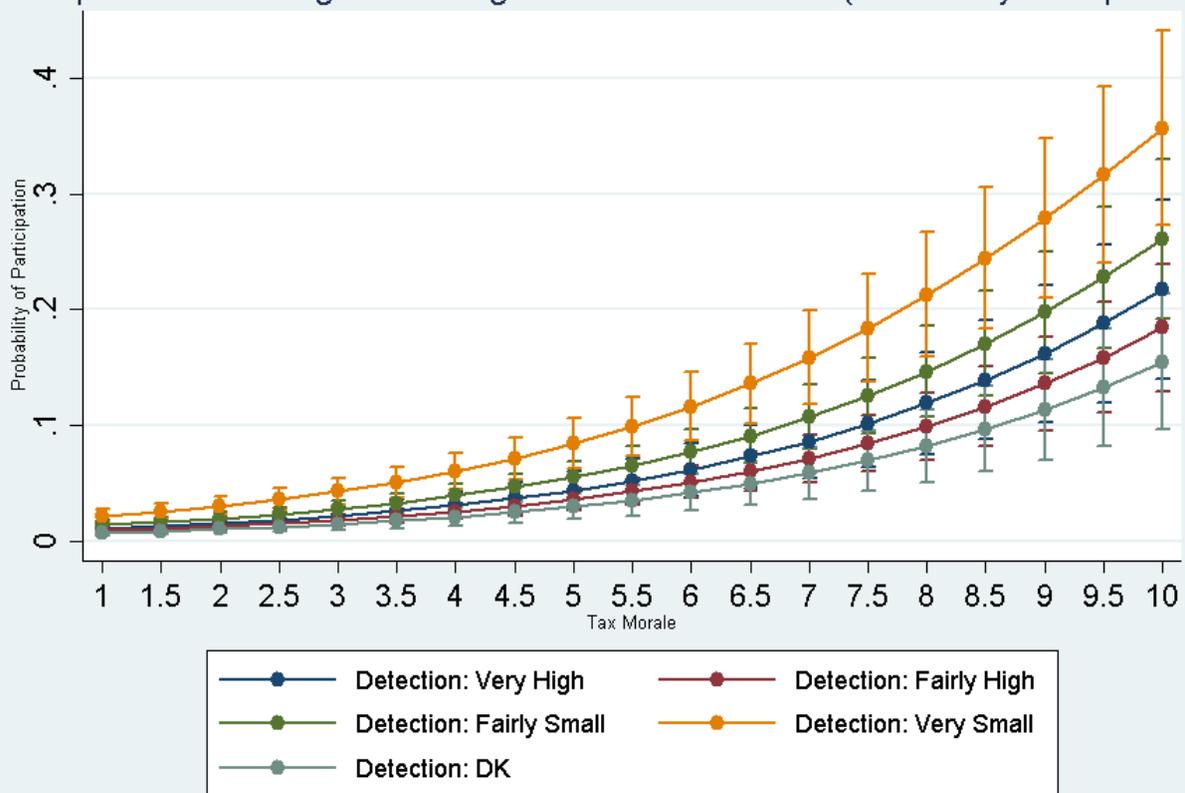
Figure 3: Predictive margins for detection at differing levels of tax morale.

Table 6: Estimation by Geographical Area.

	Nordic Countries		Southern Europe		Central-Eastern Europe		Continental Europe	
	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio
Sociodemographics	Yes		Yes		Yes		Yes	
Financial Constraint	Yes		Yes		Yes		Yes	
Tax Administration								
Sanction								
Due plus fine	-0.161	0.852	-0.428**	0.652**	-0.0361	0.965	-0.0908*	0.913*
	(0.218)	(0.185)	(0.169)	(0.110)	(0.151)	(0.146)	(0.0477)	(0.0435)
Prison	-0.00574	0.994	0.0578	1.059	-0.963*	0.382*	0.246	1.279
	(0.467)	(0.464)	(1.000)	(1.060)	(0.498)	(0.190)	(0.312)	(0.399)
Other	0.985	2.679	0.751**	2.120**	0.436***	1.547***	-0.365	0.694
	(0.806)	(2.159)	(0.300)	(0.636)	(0.101)	(0.157)	(0.604)	(0.419)
DK	-0.556	0.574	0.186	1.204	-0.157*	0.854*	-0.171	0.842
	(0.842)	(0.483)	(0.618)	(0.744)	(0.0951)	(0.0812)	(0.258)	(0.217)
Risk of Detection								
Fairly High	0.0203	1.021	-0.864*	0.422*	-0.202	0.817	0.445*	1.561*
	(0.384)	(0.392)	(0.464)	(0.196)	(0.460)	(0.376)	(0.228)	(0.355)
Fairly Low	0.956	2.602	-0.187	0.829	0.348	1.416	0.863***	2.370***
	(0.650)	(1.691)	(0.261)	(0.217)	(0.302)	(0.428)	(0.142)	(0.337)
Very Low	1.542**	4.673**	0.390	1.476	0.657	1.928	1.326***	3.768***
	(0.689)	(3.218)	(0.348)	(0.513)	(0.423)	(0.815)	(0.138)	(0.518)
DK	0.246	1.279	-0.791***	0.454***	-0.191	0.826	-0.222	0.801
	(1.488)	(1.903)	(0.273)	(0.124)	(0.342)	(0.282)	(0.773)	(0.619)
Moral Constraints								
Tax Morale	0.450***	1.569***	0.350***	1.419***	0.371***	1.449***	0.483***	1.622***
	(0.0327)	(0.0513)	(0.0824)	(0.117)	(0.0466)	(0.0675)	(0.0739)	(0.120)

Notes:
1. Weighted estimation includes design and poststratification weights.
2. The stars signal significance at the following levels:

* p<0.10 ** p<0.05 ** p<0.01

3. Blanks imply that the variable needs to be dropped for estimation as it predicts failure perfectly.
4. Full estimation is not reported due to space constraint but is commented in the paper and available from the author.
5. Listwise deletion is used as the results do not vary significantly from the Multiple Imputed ones as the fraction of missing observations is very small.