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**Evaluating tax evasion in the European Union:  
a case study of the prevalence and character of  
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# Evaluating tax evasion in the European Union: a case study of the prevalence and character of ‘envelope wage’ payments

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## Abstract

*In the current climate of economic crisis, European governments are trying to raise revenue via various means such as fighting tax evasion. This paper evaluates a form of tax evasion in Europe that has so far received little attention. This is the illegitimate wage practice used by legitimate businesses whereby they pay their formal employees two separate wages, an official wage that is declared to the state for tax and social security purposes and an unofficial ‘envelope’ wage which is not declared and allows employers to avoid paying their full social insurance and tax liabilities. Examining a data-base composed of 26,659 face-to-face interviews conducted in the 27 member states of the European Union, using unordered and ordered discrete models as well as interval regression, we provide evidence of the factors that significantly impact on the propensity to receive envelope wages and the amounts received. We control for relevant socio-economic and other characteristics of individuals in our estimations. There is an interesting geographical variation in the incidence of ‘envelope wages’ in Europe. Most workers receiving envelope wages are concentrated in South-Easter and East-Central Europe while few of them are found in Nordic Countries and Continental Europe including the UK and Ireland. Arguably, this is a reflection of heterogeneity in social norms, attitudes towards the state and income inequality across countries. Our estimates corroborate this geographical heterogeneity and identify other significant correlates affecting the probability of participating in ‘under-declared’ activity, namely gender, age, sector of employment, firm size, occupation and household income. We also find perception variables about the scale of evasion to be significant predictors of the probability of evasion.*

Key words: *envelope wages, tax evasion, Europe, discrete choice models, Eurobarometer Survey*

## 1. Introduction

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Over the past decade, a small stream of scholarly thought has started to highlight a little discussed form of tax evasion that previously received little attention. This is the illegitimate wage practice that is being used by legitimate businesses whereby they pay their formal employees two separate wages, an official wage that is declared to the state for tax and social security purposes and an unofficial ‘envelope’ wage which is not declared and allows employers to avoid paying their full social insurance and tax liabilities (Hazans, 2005; Karpuskiene, 2007; OECD, 2003; Sedlenieks, 2003; Williams, 2008a,b; 2009a,b,c; Williams and Round, 2008; Woolfson, 2007; Žabko and Rajevska, 2007). Until now, only small-scale qualitative studies of this illegitimate wage practice have been conducted in particular industries and locations. The outcome is that little is known about whether this violation of work payment principles by legitimate businesses is widely prevalent throughout the European Union, or merely in a few small enclaves. The intention in this paper is to seek to start to fill that gap.

To achieve this, the paper is organised as follows. The second section reviews the previous research on envelope wages in Europe. Revealing that these have been limited to small-scale studies of particular industries or locations, resulting in a lack of understanding of the pervasiveness and nature of envelope wages both in Europe and beyond, the third section provides a simple theoretical motivation to the paper which depends on the seminal tax evasion theory advanced by Allingham and Sandmo (1972). Section 4 then provides a description of the data used in the analysis followed in Section 5 by a discussion of the results and various possible policy options and measures for tackling this illegitimate wage practice.

## **2. Previous work**

Tax evasion is damaging to any economy, especially in the face of the current tight national budgets and increasing government deficits. Therefore, tax evasion in the form of under-reporting of actual income deserves a serious consideration both in academic and policy circles. It weakens the cardinal virtues of social justice and efficiency (Cowell, 1990). On aggregate, it distorts prices and incomes in economies rendering macroeconomic policies ineffective (Adam and Ginsburgh, 1985).

In this paper, we focus upon a particular type of tax evasion which until now has remained relatively under-researched. Although a large body of literature exists on the extent and nature of undeclared work in Europe (e.g., Bajada and Schneider 2005; Henckel et al, 2008; Pavlovskaya, 2004; Persson and Malmer, 2006; Schneider 2008; Surdej, 2005; Round and Williams, 2008; Wallace and Latcheva 2006; Williams, and Round, 2007; and Windebank, 1995, 1998), few studies have so far analysed the issue of under-declared work, or what we here term 'envelope wages'. Undeclared work, that is, is widely defined as paid work that is not declared to the authorities for tax, social security and/or labour law purposes when it should be declared but which is licit in every other sense (European Commission, 1998, 2007; OECD, 2002; Renooy et al., 2004; Sepulveda and Syrett, 2007; Williams, 2004; Williams and Windebank, 1998).

Few studies until now, however, have analysed under-declared work, or what is here referred to as 'envelope wages'. This is here easily explained. There exists a recurring assumption that jobs are either declared or undeclared, but never simultaneously both. In other words, declared jobs are depicted as separate and discrete from undeclared jobs. They are viewed as dualistic opposites. The consequence is that few have enquired whether legitimate businesses employing declared employees might be simultaneously engaging in tax evasion practices with them. In recent years, however, undeclared work has started to be

re-theorised in that the dichotomous depiction of declared and undeclared jobs as binary opposites has started to be transcended.

A small emergent body of literature, that is, has started to draw attention to an illegitimate wage practice that brings into question this depiction of declared and undeclared jobs as separate and discrete. This is the employment arrangement where legitimate businesses pay their declared employees two wages, an official wage declared to the state for tax and social security purposes and an unofficial ‘envelope’ wage which is not declared (Hazans, 2005; Karpuskiene 2007; Neef 2002; Sedlenieks 2003; Williams 2007; Williams and Round 2007; Woolfson, 2007; Žabko and Rajevska 2007). Such an arrangement is primarily used by employers to avoid paying their full social insurance and tax liabilities but is also used to avoid redundancy pay in that its withdrawal acts as a useful tool to encourage employees no longer wanted to voluntarily leave (Hazans 2005; Round et al. 2008).

Until now, studies of envelope wages have tended to be small-scale qualitative studies which have provided in-depth portrayals of this wage practice in countries such as Latvia (OECD, 2003; Sedlenieks, 2003; Žabko and Rajevska, 2007), Lithuania (Karpuskiene, 2007; Woolfson 2007), Russia (Williams and Round, 2007), Romania (Neef, 2002) and Ukraine (Round et al., 2008; Williams 2007). For instance, the study in Lithuania by Woolfson (2007) is an in-depth case study of one person, albeit a *cause celebre*, whilst the Latvian study by Sedlenieks (2003) reports 15 face-to-face interviews conducted in Riga. Although the Ukraine survey covers 600 households, it is limited to three localities (Williams, 2007), whilst the evidence from Russia is based on interviews with 313 households in three districts of Moscow (Williams and Round 2007). None are national-level representative sample surveys.

Despite this, such studies provide a strong rationale for the further empirical study of this practice. Some 30 per cent of employees in Ukraine reported receiving envelope wages (Williams, 2007) and two-thirds (65 per cent) in Moscow (Williams and Round, 2007). Comparing labour force and employer surveys, meanwhile, the OECD (2003) find that 20 per cent of private sector employees in Latvia earn envelope wages. What remains unknown, however, is whether this is ubiquitous or confined to a few small pockets of the European Union in terms of the regions, nations, industries, occupations and workers effected by such a tax evasion practice. Consequently, in 2007, a survey was undertaken to more fully understand its extent, nature and distribution across the 27 member states of the European Union.

### **3. Theoretical Motivation**

Economic theory often represents the tax evasion decision as a choice under uncertainty (Hindriks and Myles, 2006). In the literature, a game theoretic characterisation of the strategic interaction of tax payers and governments is also common. Here, a brief theoretical model of the individual decision to receive under-declared wages is presented. To do this, we draw heavily on the model of Allingham and Sandmo (1972), which is an adaptation of Becker's (1968) model of the economics of crime. This model analysed the individual's decision on whether and to what extent to avoid taxes by deliberate under-reporting. This tax declaration decision model is relevant in our analysis because the receipt of envelope wages is a failure to declare actual income and a tax evasion tool.

Our analysis is restricted to the income of the individual not declared to the tax authorities. We assume that the individual and the business concerned has an indirect utility function, which has income ( $W$ ) as the only argument [i.e.  $U(W)$ ]. Income ( $W$ ) is exogenous

and is known only to the individual, not to the tax authorities. A constant tax rate,  $\theta$ , is imposed on declared income,  $X$ . Hence, the under-declared or envelope wage is given by  $y_e = (W - X)$ . If caught with probability of  $p$ , the individual pays a penalty on  $y_e$  at the rate of  $\pi$ . Note that  $\pi < \theta$ . This inequality summarises the reason behind the action of the individual evader which is based on comparing the cost of being caught with the benefit of evading tax.

The individual evader chooses  $X$  to maximise the following expected utility;

$$E(U) = (1-p)U(W - \theta X) + pU(W - \theta X - \pi(W - X)) \quad (1)$$

The concavity of the utility function guarantees the satisfaction of the second order condition for maximum. In terms of our empirical work, it is true that our sample of individual evaders have the following income trajectories. For those in receipt of envelope wages  $0 < X < W$  while  $X = W$  for those who do not. If  $X = W$ , the expected marginal utility is decreasing with  $X$  and we have;

$$\frac{\partial E(U)}{\partial X} = -\theta(1-p)U'(w(1-\theta)) - (\theta - \pi)pU'(w(1-\theta)) < 0 \quad (2)$$

or

$$p\pi < \theta$$

This condition for an interior maximum is interesting in terms of the individual evader's motive for envelope wage payments. The condition implies that the individual evader declares less than his/her actual income if the expected tax payment on undeclared income (if caught) is less than the regular tax rate and vice versa. The above model disregards other factors that should go into the utility function of the individual evader such as reputation and is very limited. The potential impact of such factors is to make the condition for opportunistic

tax evasion stricter as the individual evader has more reasons to worry about in making the decision to engage in envelope wage payments than only income or income penalties. The conventional expected utility set up does not say anything about the extent of evasion and suggests that all tax payers choose to evade. In our empirical analysis, the objective is to identify the factors significantly associated with the probability of engaging in envelope wage payments and the amount of envelope wages paid. The advantage of the empirical set up is that it gives us information on who participates in evasion and the extent of evasion as given by the interval of hourly income earned from the illegitimate payments.

#### **4. Econometric framework**

Due to the nature of our outcome variables, we adopted standard probit, ordered probit and interval regression models. Under a normality assumption for the distribution of the error term, a probit specification is adopted to identify the factors significantly affecting the likelihood of tax evasion while an ordered probit model and interval regression are used to examine the determinants of the amount of envelope wages received in intervals.

##### ***4.1. The probability of receiving ‘envelop’ wages***

We estimate (first run) a probit model which predicts individuals’ participation in envelope wage activities. We postulate that a propensity to receive envelope wages, say  $P_i$ , depends on a vector of exogenous variables,  $x_i$  such as age, gender and, region of residence. The list of explanatory variables is based on previous empirical work on tax evasion and also suggestions from economic theory. Our econometric analysis complements the descriptive information we have displayed in Table 1 below. The decision to receive envelope wages (or the decision to evade) is estimated using the following model;

$$P_i = \alpha + \beta x + \varepsilon_i, \forall \varepsilon_i \sim N(0, \sigma^2) \quad (3)$$

where  $P_i$  takes a value of 1 if the individual received envelope wage and 0 otherwise.

Individuals who refused to report whether they received envelope wages are excluded as those who gave the response “*I don't know*”. The  $x$  represents a vector of regressors presumed to affect the probability of evading. The individual evader chooses to engage in envelope wage payments based on an underlying random utility maximisation objective.

This can be represented by;

$$P_i = \begin{cases} 1 \Rightarrow \text{if } I_i^* > 0 \\ 0 \Rightarrow \text{otherwise} \end{cases} \quad (4)$$

The individual chooses to evade tax if  $I_i^* > 0$ . We can interpret  $I_i^*$  as the maximum utility or the expected net benefit accruing to the individual from evading or receiving ‘envelope’ wages.  $I_i^*$  is an unobservable latent variable that stands for the propensity to underestimate income by receiving formal pay in the form of envelope wages. The term  $P_i$  is an observed indicator which equals 1 if the individual evades and zero otherwise. The vector  $x_1, \dots, x_n$  consists of all the socio-economic, demographic and other control variables used in the estimated model. In our estimates, we controlled for heteroscedasticity to avoid a bias in our inferences. For instance, we expect that the variations in receipt of ‘envelope’ wages are not constant across different income groups. Hence, we expect the compliance opportunities of low income earners to differ from high income earners.

#### ***4.2. The amount of envelope wages received***

In addition to predicting the probability of receiving envelope wages, we also estimate an ordered probit model using the different amounts of envelope wages reported. We do not use any other continuous model to investigate the determinants of the amount of envelope wages because wages are reported in intervals but not as continuous observations. Individuals were asked the question ‘*approximately, how much did you get per hour for this activity*’ and

they chose from the following average hourly pay bands/intervals 1.00-5.99; 6.00-10.99; 11.00-15.99; 16.00-20.99; 21.00-25.99; 26 and 26+ euros. Since these responses are amenable for ranking by design, we classified individuals into six ranked categories and modelled the categories as function of socio-economic, demographic, sector and firm characteristics. Out of all individuals interviewed, 23% either refused to answer or preferred to simply say ‘*don’t know*’. The number of individuals and percentage distribution of the 927 final sample individuals in the six categories ranked from the lowest to the highest wage category, respectively, is given as follows: 319 (34.4%); 283 (30.5%); 122(13.2%); 61(6.6%); 33(3.6%) and 109(11.8%). It is clear that most workers are located at the lower end of the hourly wage distribution. However, it is worth noting that a non-negligible proportion of individuals (i.e. 11.8%) receive hourly wage more than 26 Euros in the form of envelope wages.

We have more than two outcomes which have a natural (ordinal) ranking. The appropriate estimating frameworks in such a setting include an ordered probit/logit and interval regression models. The major advantage of the ordered discrete models is that, by exploiting the ranking feature of the data, the resulting model is relatively easy to estimate. The disadvantage is that the behavioural model underlying the econometric relationship may be too restrictive. Suppose we have a sample of data on ranked hourly envelope wages  $y_i$  and a vector of explanatory variables,  $x_i$  of size  $n$  drawn independently from some population, where now the dependent variable  $y_i$  has  $M$  possible outcomes  $y_i = 1, 2, \dots, M$  with a natural ordering (that is,  $m+1$  is in some sense ‘better’ than  $m$ ). We have 6 outcomes in our application. The observed values are assumed to derive some unobservable latent variable  $y_i^*$  (say the expected net benefit or utility of receiving envelop wages which is not observable to the researcher) where, as with the binary choice models;

$$y_i^* = x_i' \beta + \varepsilon_i, \forall, i = 1, 2, \dots, n \quad (5)$$

for some  $k \times 1$  parameter vector  $\beta$  and (univariate) stochastic disturbance term  $\varepsilon_i$ . The  $M$  outcomes for the observed variable  $y_i$  are assumed to be related to the latent variable through the following observability criterion;

$$y_i = m, \text{ if } \alpha_{m-1} \leq y_i^* \leq \alpha_m, \text{ for } m = 1, \dots, M, \quad (6)$$

for a set of parameters  $\alpha_0$  to  $\alpha_M$ ,  $\alpha_0 < \alpha_1 < \alpha_2 < \dots < \alpha_M$ ,  $\alpha_0 = -\infty$  and

$\alpha_M = \infty$ . Then, the conditional probability of observing the  $m$ th category (i.e.  $y_i = m$ , say the lowest category of the hourly envelop wage) can be written as:

$$\begin{aligned} \Pr(y_i = m | x_i) &= \Pr(\alpha_{m-1} \leq y_i^* \leq \alpha_m) \\ &= \Pr(\alpha_{m-1} \leq x_i' \beta + u_i \leq \alpha_m) \end{aligned} \quad (7)$$

Assuming a normal distribution for the error term, we have estimated an ordered probit model for the 6 wage categories. Note that wage is measured as average hourly pay for illegal activity.

We also use interval, or grouped data regression which provides an alternative to the ordered probit model in the case when the values of the upper and lower limits of the intervals are known. Except the infinity as an upper limit in the last category, all our interval limits are clearly indicated. Because the  $\alpha$ 's are known, the estimates of  $\beta$  are more efficient and it is possible to identify the variance of the error term  $\sigma^2$  and hence, the scale of  $y_i^*$  (Jones et al 2007).

## 5. Data Description

The analytical work is based on a large Eurobarometer Survey data-set collected in 2007 from individuals working in 27 European countries based on 26,659 face-to-face interviews. This data has two crucial pieces of information reported by interviewed individuals which serve as a basis for our econometric analysis. These include data on whether they received ‘envelope wages’ from their legitimate employer or not, and the average hourly pay received as an hourly wage. The sample of countries we investigate consists of the 27 member states of European Union. The presence of data on a range of diverse countries improves the power of our statistical findings. It also helps to identify important and potential cultural influences on individual tax compliance behaviour.

The data was collected from all 27 EU member states in May and June 2007. We used a weighting variable on all observations to adjust the data to reflect the national population. The weighing is essential to minimise potential biases in our econometric estimations. The origins of the survey lie in late 2005 when the European Commission, concerned by the lack of primary data on undeclared work, funded a team to design a survey to evaluate undeclared work in the EU (TNS Infratest et al, 2006). Once designed, the European Commission’s Directorate General Communication then requested the implementation of this survey as Special Eurobarometer No. 284 (*‘Undeclared work in the European Union’*), as part of wave 67.3 of Eurobarometer. Applying the same sampling method used in standard Eurobarometer surveys, 26,659 face-to-face interviews were conducted in the 27 member states of the EU, ranging from some 500 interviews in smaller member states to 1,500+ interviews in larger EU countries. In each country, that is, a multi-stage random (probability) sampling method was applied. To do this, sampling points were drawn with probability proportional to population size (for total coverage of the country) and to population density according to the

Eurostats NUTS II (or equivalent) and the distribution of the resident population in terms of metropolitan, urban and rural areas. In each sampling unit, a starting address was then drawn at random. Further addresses (every nth address) were then selected by standard ‘random route’ procedures from the initial address. For each household, meanwhile, the respondent was drawn at random (following the ‘closest birthday rule’). All interviews were conducted face-to-face in people’s homes and in the appropriate national language with adults aged 15 years and over. So far as the data collation is concerned, CAPI (Computer assisted personal interview) was used in those countries where this was available. For all countries, a national weighting procedure was then employed for analysis purposes that used marginal and intercellular weighting by comparing the sample with the universe description taken from Eurostat population data and national statistical offices. In each country, this weighting procedure ensured that the gender, age, region and size of locality of the sample were proportionate to the universe.

We are not analysing individual tax returns but we have a rich array of individual level variables and also self-reported responses by individuals whether they have received envelope wages or not. Such a survey inevitably leads to underestimation of noncompliance. However, the direct response by individuals of the receipt of envelope wages enables us to separate wilful from inadvertent error. The type of evasion reported in our data is in the form of ‘envelope’ wages which we can confidently classify as blatant or wilful noncompliance.

Of the 26,659 face-to-face interviews conducted in the 27 EU member states, 11,887 were conducted with formal employees, of whom one in 20 (5%) across the EU as a whole were paid envelope wages amounting on average to 43% of their gross monthly wage packet. Of these 616 formal employees reporting that they receive envelope wages, 33% had received this envelope wage for their regular work hours, 28% for extra work or overtime and 32% for both their regular and overtime work, with the remaining 6% either refusing to answer or not

knowing. To provide descriptive evidence geographically, we group our sample into five EU regions:(a.)Southeast Europe (Bulgaria, Cyprus, Greece, Hungary, Romania and Slovenia); (b) Continental Europe, UK and Ireland (Belgium, Germany, France, Ireland, Luxembourg, Netherlands, Austria and the UK); (c) East-Central Europe (Czech Republic, Estonia, Latvia, Lithuania, Poland and Slovakia); (d) Southern Europe (Spain, Italy, Malta and Portugal); and (e) Nordic countries (Denmark, Finland; Sweden).

Table 1 documents the prevalence and character of envelope wages in these five regions. It reveals that this is a more prevalent practice in southeast Europe, where nearly one in six formal employees (16%) are paid envelope wages, compared with elsewhere in the EU. It also reveals that they receive on average 60% of their gross wage as an envelope wage in southeast Europe compared with 43% across the EU as a whole. This is doubtless because it is more common to receive envelope wages in southeast Europe for regular work or for both regular work and overtime, than in Continental Europe and Nordic countries, where it is more common paid for extra time worked.

**Table 1: Prevalence and Types of Envelope Wages: By EU Region**

Region	% of all waged employees surveyed	% who receive envelope wage	Average % of gross wage paid as an envelope wage	Envelope wage paid as remuneration for:			
				Regular work	Overtime/extra work	Both regular and OT work	Refusal + don't know
Southeast Europe	9	16***	60***	43***	18	37	2
Nordic nations	5	3	10	18	50	18	15
Continental Europe, UK and Ireland	51	2	24	15	60	18	8
East-Central Europe	13	9	41	39	24	35	2
Southern Europe	22	6	37	16	25	33	25
EU-27	100	5	43	33	28	32	6

Statistical significance: \* = 0.05 (5% probability), \*\*=0.01 (1%) and \*\*\*= 0.001 (0.1%)

Source: Eurobarometer Survey, No. 284, 2007; Williams et al. (2011)

Table 2 provides a summary statistical for the two variables of interest (i.e. the dependent variables ‘received envelope wage’ and ‘average hourly pay’ interval) and all the explanatory variables in the analytical part of the paper (see discussions of table 3 and 4 results). On average, 6% (10388) of respondents reported receiving wages. This is not negligible proportion given the sensitive nature of the evasion question. Unsurprisingly, only 927 indicated the average hourly pay bracket for the illegal activity. The interval nature of the

hourly pay variable limited our statistical modelling to an ordered probit model instead of a preferred and efficient counterpart provided by continuous variable models. The last two variables in the table provide an interesting option to examine the role of perception and knowledge of tax evasion of individuals in shaping their own tax evasion behaviour. More details are provided in the econometric results discussion section.

**Table 2: Descriptive Statistics of the variables used in the econometric analysis**

	Mean	Min.	Max.	Observations
Received envelope wage	0.059	0	1	10388
Average hourly pay interval	1.496	0	5	927
Male	0.419	0	1	28660
South Eastern Europe	0.119	0	1	29543
Nordic Countries	0.103	0	1	29453
Eastern and Central Europe	0.241	0	1	29543
Sothern Europe	0.119	0	1	29543
Continental Europe, UK and Ireland	0.275	0	1	29543
Age between 15 and 24	0.126	0	1	29543
Age between 25 and 39	0.227	0	1	29543
Age between 40 and 54	0.246	0	1	29543
Age 55 and above	0.371	0	1	29543
Construction	0.042	0	1	29543
Industry	0.067	0	1	29543
Personal Services	0.075	0	1	29543
Retail	0.047	0	1	29543
Hotels, Restaurants and Cafes	0.020	0	1	29543
Other sector	0.168	0	1	29543
1 to 20 employees (start amendments)	0.115	0	1	29543
21 to 50 employees	0.038	0	1	29543
51 to 100 employees	0.026	0	1	29543
101 to 500 employees	0.047	0	1	29543
More than 500 employees	0.058	0	1	29543
Professional	0.037	0	1	29543
Managerial	0.056	0	1	28660
Manual	0.086	0	1	29543
Student	0.081	0	1	29543
Other Occupation	0.710	0	1	29543
Formal job Income less than 500 euros	0.077	0	1	29543
Income between 500 and 1000.99	0.074	0	1	29543
Income between 1001 and 2000.99	0.073	0	1	29543
Income between 2001 and 3000.99	0.044	0	1	29543
Income above 3000.99	0.048	0	1	29543
Ranked Perception of Evasion	4.663	1	8	21385
Know others who evade(yes/no)	0.432	0	1	24851

## 6. Results and discussion

### 6.1. Probit model estimates

Table 3 provides the probit estimates. Note that in the regression results reported below, the reference region is continental Europe, firm size with more than 501 employees, professional occupation, age group above 55, sectors such as agriculture, repairs and others. The selection of base category is based on the 'most common criteria'. Therefore, our interpretation of the results should take this into consideration. Our probit model estimates give an interesting insights with regard to the important question “who evades?” The findings seem to support the old saying among tax professionals that “the poor evade and the rich avoid,” meaning that the rich tend to reduce their taxes through legal “avoidance” measures such as tax shelters, while those with lower incomes attempt more outright evasion (Slemrod, 2007). Therefore, we see evasion coming from both end of the income distribution.

First we discuss column 2 results. Men are more likely to receive envelope wages compared with women. This is in line with existing global evidence showing women as having higher tax morale or compliance than men. Both descriptive and analytical results show that incidence of ‘envelope’ wages varies across countries. This is in line with survey evidence based on World Values survey on attitudes about acceptability of tax evasion (Torgler, 2004). Individuals from SE Europe, East & Central Europe & Southern Europe regions are more likely to receive envelope wages compared to Continental Europe and UK. This might be due to the relatively larger size of the shadow economy in these countries (Schneider, 2004; Alm and Torgler, 2006). Individuals from Nordic countries are less likely to receive envelope wages, but the result is not statistically significant. With regard to age, relative to older category, individuals in the age categories 15-24 and 25-39 and 40-54 are more likely to receive envelope wages. Likewise, studies based on individual tax returns in

the US (Clotfelter, 1983) and results for Europe and the US based on World Value Surveys show that underreporting is significantly higher for the younger groups of individuals (Alm and Torgler, 2006). Employees working in sectors such as construction, retail and hotel are more likely to receive envelope wages. Income from these sectors is similar to income from moonlighting and cash-only businesses and hence is more likely to be underreported. The individuals in sectors such as retail and hotel are also more likely to be self-employed who often tend to have lower tax compliance. Company size is measured by the number of employees working in the company. Workers in smaller firms are more likely to receive envelope wages. There is an interesting contrast between those engaged in managerial positions and manual activities. The former are less likely while the latter are more likely to receive envelope wages.

The notion of increasing absolute risk aversion (ARA) suggests that evasion increases with income and this is confirmed by our results (Allingham and Sandmo, 1972). This is because ARA increases as income increases. However the effect of income can be ambiguous a priori. Greater income may either increase or decrease probability of receiving envelope wages depending on factors such as risk preferences and opportunity cost of time. Alm and Torgler (2006) argue that in countries with a highly progressive income tax, richer individuals may realise a higher return by evading but with possibly less increase in utility due to declining marginal utility of income. Hindriks, Keen and Muthoo (1999) indicate that high income earners are more prone to evasion than low income households. In contrast, poorer tax payers might have lower social restrictions but are also less able to take evading risks. This is due to a higher marginal utility loss from a reduction in income if they are caught (Jackson and Milliron, 1986). But inequality in an economy can be a key consideration by poor households. One possibility is that large income inequality reduces the

perceived fairness of the tax system among low-income households. Hence, they have an increased tendency to evade (Pirttilä, 1999).

The only difference between column 2 and column 3 results is the inclusion of perception variables in the latter<sup>†</sup>. The perception variables provide important insights into whether there is any significant link between individuals' perceptions of the level of tax compliance at the national level and the propensity to receive envelope wages. In addition, we have a variable generated based on the question "Do you personally know anyone who works without declaring their income?" Both of our perception variables are found to be positive and significant. Therefore, if one perceives that a higher percentage of the national population evades, he/she is more likely to evade. According to our results, it is not only the percentage that matters but also whether the individual knows someone who evades or not. Earlier findings from other empirical studies similarly show an increased likelihood of evasion among individuals who know others who evade taxes (Lewis, 1979; Song and Yarbrough, 1979). Attitudes towards evasion are corroborated by actual behaviour of receiving envelope wages which suggests the validity of our survey based evidence.

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<sup>†</sup> Note that with the inclusion of perception variables, we lost a non-negligible proportion of our sample size (i.e. from 10338 to 8809) and hence of freedom. However this did not lead to qualitative changes to the original results in column 2.

**Table 3: Probit Estimates of the probability of taking envelope wages**

Variable	Coefficient (Robust standard errprs)	Coefficient (Robust s.e.) with perception variables
<b>Constant</b>	-2.712(0.10)***	-3.307(0.14)***
<i>Individual characteristics</i>		
<b>Male</b>	0.304(0.05)***	0.256(0.05)***
<b>Aged 15 to 24</b>	0.525(0.09)***	0.497(0.11)***
<b>Aged 25 to 39</b>	0.338(0.08)***	0.298(0.09)***
<b>Aged 40 to 54</b>	0.218(0.07)***	0.188(0.09)**
<i>Location</i>		
<b>South Eastern Europe</b>	0.934(0.07)***	0.914(0.09)***
<b>Nordic Countries</b>	0.069(0.08)	0.009(0.09)
<b>East-Central Europe</b>	0.566(0.07)***	0.629(0.08)***
<b>Southern Europe</b>	0.316(0.08)***	0.385(0.09)***
<i>Perception variables</i>		
<b>Ranked perception of evasion</b>	-	0.061(0.01)***
<b>Know others who evade</b>	-	0.511(0.06)***
<i>Sector of Employment</i>		
<b>Construction</b>	0.368(0.07)***	0.377(0.08)***
<b>Industry</b>	0.017(0.06)	0.086(0.07)
<b>Personal services</b>	0.091(0.07)	0.110(0.07)
<b>Retail</b>	0.176(0.08)**	0.221(0.08)***
<b>Hotel and Restaurants</b>	0.219(0.09)**	0.264(0.10)**
<i>Size of Firm</i>		
<b>1 to 20 employees</b>	0.395(0.05)***	0.439(0.06)***
<b>21 to 50 employees</b>	0.168(0.07)***	0.160(0.07)**
<b>51 to 100 employees</b>	0.228(0.08)***	0.240(0.09)***
<b>101 to 500 employees</b>	-0.098(0.08)	-0.122(0.09)

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<i>Type of job/work</i>		
<b>Professional</b>	0.105(0.08)	0.097(0.09)
<b>Management</b>	-0.124(0.07)*	-0.117(0.08)
<b>Manual</b>	0.147(0.05)***	0.155(0.06)***
<i>Household Income position</i>		
<b>Formal job Income less than 500 euros</b>	0.176(0.06)**	0.125(0.08)
<b>Income between 500 and 1000.99</b>	-0.033(0.06)	-0.082(0.07)
<b>Income between 1001 and 2000.99</b>	0.159(0.06)**	0.171(0.07)**
<b>Income between 2001 and 3000.99</b>	-0.100(0.10)	-0.087(0.11)
<i>Log pseudo likelihood</i>	-2023.78	-1653.09
<i>Wald Chi2 (p_value)</i>	584.9 (0.0000)	577.9(0.0000)
<i>Number of Observations</i>	<b>10,388</b>	<b>8809</b>

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N.B. \*, \*\*, \*\*\*=significant at 10, 5 and 1 percent respectively.

## ***6.2. Ordered probit estimates***

The ordered models results are summarised in column two of table 4. Men and employees in the age range 25 to 54 are more likely to receive higher hourly pay for undeclared activity which suggests the presence of gender and age discrimination in pay. Employees that come from poorer households (i.e. those located in the lower end of the household income distribution) and from geographical locations such as south eastern, eastern, southern and central Europe are more likely to get lower hourly pay. It is interesting to mention the Nordic countries dummy which is positive and significant. This dummy indicates that illegal workers are more likely to get higher wages in Nordic countries relative to continental Europe and the UK. We know that from the probit results that employees are less likely to engage in undeclared work in Nordic countries, but if it exists it is rewarding as the ordered probit results suggest. There is no significant relationship between firm size and average hourly pay

for those who declared participating in undeclared activities. Generally, hourly formal wages tend to be higher in sectors such as construction and personal services mainly due to the nature of the work undertaken and the risk associated with some activities. As it is evident from the ordered probit results, this seems to be also the case for the average hourly paid for undeclared activities in Europe.

**Table 4: Ordered Probit and interval regression Estimates of the average hourly wage from under-declared employment**

Variable	Ordered Probit Coefficients(s.e.)	Interval Regression Coefficients (s.e.)	
		<i>Unlogged lower &amp; upper bounds</i>	<i>Logged lower &amp; upper bounds</i>
<i>Individual characteristics</i>			
<b>Male</b>	0.339*** (0.08)	2.559***(0.57)	0.210***(0.05)
<b>Aged 15 to 24</b>	-0.076(0.12)	-0.709(0.85)	-0.049(0.08)
<b>Aged 25 to 39</b>	0.205* (0.12)	1.079(0.84)	0.129*(0.07)
<b>Aged 40 to 54</b>	0.234* (0.13)	1.580**(0.88)	0.153**(0.08)
<i>Location</i>			
<b>Southeast</b>	-0.548*** (0.16)	-2.362**(1.12)	-.0331***(0.12)
<b>Nordic Countries</b>	0.326*** (0.10)	2.126***(0.75)	0.214***(0.05)
<b>Eastern and Central Europe</b>	-0.851*** (0.10)	-4.025***(0.69)	-0.529***(0.07)
<b>Southern Europe</b>	-0.386** (0.18)	-2.583**(1.24)	-0.251***(0.09)
<i>Sector of Employment</i>			
<b>Construction</b>	0.377*** (0.13)	2.543***(0.95)	0.232***(0.08)
<b>Industry</b>	-0.007(0.15)	0.333(1.08)	-0.009(0.09)
<b>Personal services</b>	0.521*** (0.143)	3.768***(1.01)	0.307***(0.08)
<b>Retail</b>	0.199(0.22)	2.199(1.52)	0.111(0.14)
<b>Hotel and Restaurants</b>	0.389(0.28)	2.123(1.99)	0.231*(0.12)
<i>Size of Firm</i>			
<b>1 to 20 employees</b>	0.023(0.11)	0.474(0.80)	0.016(0.07)
<b>21 to 50 employees</b>	-0.078(0.17)	-0.078(1.19)	-0.051(0.11)

<b>51 to 100 employees</b>	-0.109(0.18)	-0.476(1.32)	-0.075(0.10)
<b>101 to 500 employees</b>	0.0115(0.17)	1.415(1.19)	0.053(0.09)
<i>Type of job/work</i>			
<b>Professional</b>	0.828*** (0.17)	5.779***(1.25)	0.520***(0.102)
<b>Management</b>	0.086(0.16)	0.543(1.169)	0.045(0.10)
<b>Manual</b>	0.089(0.12)	0.453(0.87)	0.059(0.08)
<i>Household Income position</i>			
<b>Formal job Income &lt; 500 euros</b>	-0.496*** (0.15)	-3.618***(1.01)	-0.293***(0.10)
<b>Income between 500 &amp; 1000.99</b>	-0.296** (0.14)	-3.513***(1.02)	-0.182** (0.09)
<b>Income between 1001 &amp; 2000.99</b>	0.029(0.14)	-1.238(1.00)	0.038(0.08)
<b>Income between 2001 &amp; 3000.99</b>	0.045(0.13)	-0.228(1.02)	0.056(0.07)
<b>Log likelihood</b>	-1293.74	-1647.03	-1443.60
<b>LR Chi2 (p_value)</b>	278.27(0.000)	209.59 (0.000)	-
<b>Wald chi2(p-value)</b>	-	-	359.60(0.000)
<b>Ln (sigma)</b>	-	2.02***(0.03)	-0.437***(0.03)
<b>Sigma</b>	-	7.54***(0.20)	0.646***(0.02)
<b>No of observations</b>	927	927	927

N.B. \*, \*\*, \*\*\*=significant at 10, 5 and 1 percent respectively. Allowing for robust standard errors to correct for potential heteroscedasticity did not lead to qualitative changes to the sign and statistical significance of estimated parameters. Column 3 and 4 estimates are based on wage intervals of equal size.

In south eastern, southern, and East-Central Europe, individuals are more likely to engage in under-declared employment (see the probit estimates) and receive lower hourly wages relative to individuals living in Nordic countries (see ordered probit estimates).

### ***6.3. Robustness checks: Interval Regression estimates***

It is evident that our interval regression estimates serve as useful in terms of the robustness of our ordered probit results since almost all estimated parameters did not display changes in sign as well as statistical significance. Further, instead of predicting the likelihood of individuals' wages falling in a given interval, the interval regression predict the envelope wage received without observing continuous wage values. The 3 and 4<sup>th</sup> columns of Table 4 above give the estimates of the interval regression using unlogged and logged lower and upper bounds of the hourly wages received as dependent variables respectively. The coefficients for the interval regression are measured on the same scale as the cut-points. Hence, we can interpret them as in terms of changes in hourly wages. For instance, men receive envelope wages, on average, at an hourly wage that is 2.55 Euros higher than females. Consistent with our ordered probit results, individuals in Nordic countries report higher wages (precisely 2.83 Euros more) than their counterparts in continental Europe including UK and Ireland.

Our results suggest the presence of an envelope wage penalty associated with old age. Relative to the reference age category, those in the age group from 40 to 54 (both in the unlogged and logged version) and in the younger cohort 25 to 39 (significant only in the logged version) receive higher hourly wages. Workers in construction, personal services and hotels/restaurants (only in the logged version) also receive higher hourly wages. Size of firm significantly influences the propensity to take envelope wages (table 3) but not the amount of hourly wage paid (table 4). Individuals with formal job incomes less than 500 Euros per month are more likely to participate in under-declared wage practices (Table 3) but attract lower hourly wages (Table 4). In Table 3, the coefficient for those earning a monthly wage between 500 and 1000 Euros in the probit regression was not significant. But in Table 4 if they happen to receive envelope wages, they receive less than those in the higher monthly income brackets.

## Conclusions

The contribution of this paper is to provide empirical individual-level evidence on under-declared wage practices in the 27 member states of the European Union. The data used in this study is unique given the sensitive nature of the variables examined analytically. As expected individuals, who are engaged in such tax evasion are often reluctant to report openly about their illegitimate activity. Our study found that individual characteristics (age and gender), household characteristics (income bracket of household), geography, sector of employment, type of work and size of firm as significant determinants of participation probability and the likelihood of receiving either higher or lower hourly pay. Our results have potential policy implications. Some of the direct policy intervention options to prevent tax evasion in Europe include targeting young workers, males, small firms, countries with prevalent evasion, manual, construction, hotel and personal service employees. Though we cannot use policy levers on them, perception variables were also found to be key in tax evasion decisions. This shows the significant role played by social interactions on tax compliance decisions. Hence, unlike the basic model which highlights the importance of only risk (e.g. probability of detection and the fine rate), there are social aspects which are crucial to the evasion decision.

In terms of the potential policies to be followed, one can argue for increases in fines for those evading which is costless to implement or a case can be made for a costly measure such as recruiting more tax inspectors to increase probability of detection of such activity. There are also complex measures that can be taken, such as designing a tax structure that minimises evasion and ensures that existing policy is optimal in the presence of evasion. Improving tax administration especially in the former socialist countries is of paramount importance.

Policies to change attitudes towards tax payment relate greatly to social norm. Our results suggest that there is a virtuous social norm in Scandinavian and Nordic countries relative to the other countries in Europe given their high level of compliance, even if tax rates are high in those countries. Arguably imposing a social norm on behaviour might be considered in countries where evasion is relatively common. The concept of Kantian morality can prompt individuals to feel that they need to make contribution to provision of public goods via fair tax payments. This can be difficult and can easily be undermined because in countries where evasion is common (e.g. former communist nations), there is mistrust developed over the years between government and citizens as the former was repressive and did not benefit citizens through public policy initiatives.

### **Disclosure Statement**

As authors of this paper, we confirm that there are no any actual or potential conflict of interest including any financial, personal or other relationships with other people or organizations within three (3) years of beginning the work submitted that could inappropriately influence (bias) their work.

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