



**Working Paper:**

**Ermano FEGATILLI**

**UNDECLARED WORK IN THE EUROPEAN UNION**

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**WHAT CAN WE LEARN FROM AN EUROPEAN SURVEY?**

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## WHAT CAN WE LEARN FROM AN EUROPEAN SURVEY?

Ermano FEGATILLI\*

### **Abstract :**

Undeclared work is a popular academic and governmental research topic in most developed countries. In 2007, the European Commission decided to carry out a European Survey called “Eurobarometer” on this sensitive issue. The Commission interviewed almost 27 000 citizens coming from the 27 European Union Member States. In this paper, we have relied on the undeclared work and tax evasion literature to identify 7 testing hypothesis that we test by a probit regression analysis corrected of the sample selection (with *Heckman's two-stage correction technique*).

### **INTRODUCTION**

Throughout the world, the development of the shadow economy is a pervasive phenomenon, which, to date, are aroused the interest of many scholars. The development of the shadow economy indeed raises a range of issues pertaining to a large range of disciplines, from economics to sociology, political sciences, criminal law, etc.

This being said, most scholars have to date encountered difficulties in formulating an accurate definition of the concept of “shadow economy”. This, in turn, is because the shadow economy covers a plethora of activities which are uneasy to observe: they may be either “underground” activities (undertaken by private persons for their own personal use), illegal activities, or simply activities which are missed because of deficiencies in the data collection program.<sup>1</sup>

In an attempt to surmount this methodological flaw, the present paper focuses a specific aspect of the “shadow economy”, *i.e.* the legal economic activities which are hidden to the

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<sup>1</sup> See FEIGE and OTT (1999).

State. More specifically, this paper focuses on undeclared work,<sup>2</sup> i.e. work that are lawful as regards to their nature, but which is not subject to the payment of taxes (income taxes, value added taxes, social security contributions, etc.) and to legal work standards (minimum wages, legal weekly working hours, etc.).

The purpose of the present paper is to offer a formal analysis of the development of undeclared work in the European Union (“EU”). The development of undeclared work is indeed a primary cause of concern for most European Member States. Undeclared work costs a considerable amount to the Member States’ budgets (less revenue in form of tax income and social security contributions), with loss estimates ranging between 7 and 16 per cent of GDP in Western Europe.<sup>3</sup> In addition, undeclared work is also a major social issue since undeclared workers are neither covered by social protection, nor protected by labour law standards. Finally, since 2003, the fight against undeclared work ranks amongst the top 10 priority list of the ambitious Lisbon agenda. However, whilst the deadline is coming fast, many European countries are still far from the objectives specified by the Lisbon Strategy.<sup>4</sup>

This paper follows the publication, in 2007, of the *Eurobarometer*, which is the result of an unprecedented survey (the “*Eurobarometer Survey*”) on undeclared work. In this survey, the European Commission interviewed 26.755 EU citizens aged 15 and over living in the 27 EU Member States.<sup>5</sup> In the majority of countries, this was the first time that a direct method of this kind was tested, making this survey a pilot study. The Eurobarometer database is thus a useful instrument. It can certainly improve the understanding and the causes of undeclared work.<sup>6</sup> Indeed, quantitative interviews have been conducted where the focus has been on the demand and supply of undeclared work. The interviewees have been asked how they view others’ frauds and, where applicable, fraud that they themselves have engaged into. They have

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<sup>2</sup> *Productive activities that are lawful as regards to their nature, but are not declared to the public authorities.* See RENOY (1990).

<sup>3</sup> See EUROPEAN COMMISSION (1998).

<sup>4</sup> In 2010, each European Union country should have: overall employment rate of 70%; employment rate of workers between the ages of 55 and 64 years of 50% and employment rate of women of 60%. See synthesis of the legislation at Europa Website (<http://europa.eu/scadplus/leg/fr/lvb/l25014.htm>). For instance, according to Eurostat, Belgium had in 2006 an employment rate of 61%, an employment rate of 54%, and an employment rate for older workers of 32%, which is away from the objectives.

<sup>5</sup> EUROPEAN COMMISSION (2007).

<sup>6</sup> However, we have to keep in mind that a survey is a direct method of measurement that relies on information provided directly by the population. Consequently, this method tend to measure only the lower limit of the undeclared activities since not everybody is willing to admit or fully admit their involvement in this kind of activities.

also been asked how extensive they believed fraud to be, as well as the motives leading people to commit fraud.

The purpose of the present paper is not to provide yet another estimate of the level of the undeclared work.<sup>7</sup> Rather, it seeks to ascertain, on the basis of the Eurobarometer survey, the structure and key explanatory factors for the development of undeclared work in Europe. To this end, we apply an econometric analysis corrected of sample selection bias, as usual with this kind of survey.

The present paper is divided in three sections. First, it discusses the theory of undeclared work and introduces some well-know concepts in economic and social literature (I). Second, it describes our research design and explains our methodology (II). Third, a descriptive analysis is provided and finally, we report our results with explanations in the last section (III). The conclusion summarizes up our results and tries to identify tentative policy implications.

## **I. WHAT ARE THE KEY EXPLANATORY FACTORS FOR UNDECLARED WORK IN THE EUROPEAN UNION ?**

The theory of tax evasion exhibits a significant number of analogies with the theory of undeclared work, and may thus help formulate various assumptions over the determinants of undeclared work.

The large fiscal and social fraud's scientific literature indicates that several attributes may explain why people in some countries cheat on paying taxes. Sandmo (2004, pp.31) made a relevant overview of tax evasion, which may be put in perspective with undeclared work. According to him, the decision to evade taxes results from an individual utility maximisation calculation. Individuals have to decide if they declare their whole income. If they do not, they can be detected and prosecuted. In this model, the whole income is exogenously given and the declared income is the decision variable. Individuals maximise their utility function by choosing the optimal taxable income. Sandmo's conclusion is relatively intuitive since the

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<sup>7</sup> Many studies study level of undeclared work. See RENOY, IVARSSON, VAN DER WUSTEN-GRITSAI and MEIJER (2007; pp.250–256) ; SCHNEIDER, ENSTE (1999, pp.71) ; SCHNEIDER, ENSTE (2002, pp.236) ; SCHNEIDER (2004, pp.64).

higher the risk of being detected and the greater the punishment is, the higher the taxable part of income will be. In brief, this model suggests a correlation between, on the one hand, punishment or detection rate and, on the other hand declared income.

Besides Sandmo's general theory of tax evasion, many other studies have shown that a number of personal characteristics and/or psychological and sociological factors may explain the decision *not to* report activities to state. For instance, a study of Jackson and Milliron identifies age, gender, education, income level, marginal tax rates, fairness, complexity and social ethics (or tax morale) as key explanatory factors for undeclared work and tax evasion.<sup>8</sup>

This literature provides a number of hypothesis that will later be tested with our database. First, older taxpayers are often more compliant than younger taxpayers (H1). The later are seemingly less risk averse than the former.<sup>9</sup>

Second, women would generally more compliant than men (H2).<sup>10</sup>

Third, the degree of education is also relevant. Individuals with a certain degree of education are assumed to better understand the utility of taxation than others, and thus are more prone to report their entire income to the tax administration.<sup>11</sup> This observation involves a negative correlation between the educational level and tax evasion for an individual (H3).<sup>12</sup>

Fourth, the social ethics (or tax morale) is another important determinant. This concept describes the moral principles or values individuals hold about paying taxes.<sup>13</sup> The literature shows that the social ethics and tax evasion are negatively correlated.<sup>14</sup> We suppose the same correlation for undeclared work. Indeed, social ethics could be defined as the general and personal willingness to act some undeclared activities. We will later discuss more about it in the research design of our analysis. For the time being, however, we assume a negative correlation between social ethics and undeclared work (H4).

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<sup>8</sup> See JACKSON and MILLIRON (1986, pp.125-165).

<sup>9</sup> See FEINSTEIN (1991, pp.14-35).

<sup>10</sup> See R. JACKSON and C. MILLIRON (1986, pp. 131).

<sup>11</sup> A study of LAMNEK et Al. in Germany shows another result: school education has no influence on the supply of undeclared work; See SCNEIDER, ENSTE, *op. cit.* (pp.82-83).

<sup>12</sup> See RICHARDSON (2006, pp.150-169).

<sup>13</sup> See TORGLER and MURPHY (pp.298-335). In this paper, tax morale is the independent variable. The authors try to identify factors that have an impact on tax morale.

<sup>14</sup> See RIAHI-BELKAOIU (2004, pp. 135-143).

Fifth, the deterrence effect is one of the tax evasion's determinants which is most studied in the economics and psychology literature.<sup>15</sup> This effect depends on the chance of getting caught and penalized (detection probability) and the penalty's size for evasion.<sup>16</sup> Therefore, deterrence effect should decrease tax evasion, or in others words, more detection probability is close to 1 and/or more penalty is high, less tax evasion occurs. This assumption is the same for the undeclared activities. People will work more without reporting their income to the government if the hazard to be caught is weak and/or if the penalty incurred is low (H5).

Sixth, regarding the territorial spread, it's common knowledge that some countries are renowned for cheating more than others (H6). South European countries as Italy, Greece, Spain or Portugal are often alleged to be more affected by the phenomenon than Nordic countries as Germany, Denmark, Sweden, etc.<sup>17</sup> This is why, South European countries implement more correctness for the undeclared income in their national accounting than Nordic ones.

Finally, our last hypothesis concerns the cooperation of the interviewees. When interviewees cooperate hardly or simply do not cooperate, it can be assumed that they distrust the survey's anonymity because they are probably involved. So cooperation should be negatively correlated with undeclared work (H7).

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<sup>15</sup> See FREY (2003, pp.385-406); FREY and FELD (2002) ; G. YANIV (1999, pp. 27) ; F. COWELL (1985, pp.163-193).

<sup>16</sup> ALLINGHAM and SANDMO (1972) first formulated the deterrence model. In this model, tax payers have to ask themselves whether and how much to evade taxes. To do so, they apply the same approach as they would take any risky decision (by maximizing expected utility, taking into account penalties, probability to be discover and any other cost).

<sup>17</sup> See SCHNEIDER (2005, pp.20-21).

## II. RESEARCH DESIGN

### II.1 Sample

Our database relies on a survey and is thus necessarily fraught with methodological flaws. Tax evasion or undeclared work are indeed sensitive subjects since questioning an individual on tax evasion requires the disclosure of personal, and potentially incriminating, information. Thus, self-reports are vulnerable to substantial underreporting, or even, no reporting.<sup>18</sup> However, the Eurobarometer provides the required information to understand what kind of individual is more likely to cheat the tax authorities.

The sample covers the 27 European Union member's states. Each data had been created by an interview, conducted in a face-to-face way. The number of interviews carried out is between 500 and 1500 per country.

### II.2 Descriptive analysis of the data

The Eurobarometer survey seeks information over individuals' undeclared activities. Individuals have been asked whether they carried out any activity in the last 12 months for which they were paid in money or in kind without reporting to tax authorities. To be specific, the question was *“Did you yourself carry out any undeclared activities in the last 12 months for which you were paid in money or in kind? Herewith we mean activities which were not or not fully reported to tax or social security authorities and where the person who acquired the good or service was aware of this”*.<sup>19</sup>

As can be seen in Table 1, undeclared work seems to be more common among men than women. 8% of men in the sample performed undeclared work in the previous year, whereas only 3.4% of women did so. Moreover, undeclared work is more pervasive amongst younger people with the level of undeclared work becoming smaller when the age category raises.

Concerning the occupational status of people involving in undeclared activities, two groups are usually in the spotlight of government state: unemployed and self-employed. These two

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<sup>18</sup> See BAUMEISTER (1982, pp.3-26).

<sup>19</sup> Eurobarometer, question QB19

groups are assumed to be largely involved in undeclared work since the first ones have time to do it and the second ones do activities which make it easier. As can be seen in table 1 hereinafter, the unemployed and self-employed people are less willing to answer the question (regarding their own involvement in undeclared activities) but when they did so, these two groups are those who affirm the most to work without informing tax authorities.

**Table 1: Descriptive analysis of the Eurobarometer database**

	Sample composition	Answer (%)	UDW (Yes)
<i>Men</i>	42%	96.3%	8%
<i>Women</i>	58%	96.8%	3.4%
<b>Age</b>			
15-24	12.6%	96.5%	9.7%
25-39	22.9%	95.9%	7.8%
40-54	25.6%	96.7%	5.7%
55+	38.9%	96.9%	2.2%
<b>Occupation</b>			
House persons	9.4%	96.5%	2.7%
Students	8.3%	97.1%	9.6%
Unemployed	5.4%	94.9%	10.5%
Retired	28.9%	97.2%	2.0%
Self-employed	6.3%	95.3%	9.3%
Managers	4%	96.5%	5.3%
Others white collar workers	24.1%	97.2%	4.9%
Manual workers	13.7%	95.4%	8.4%
<b>Risk level to be caught (perception)</b>			
Very high	6.4%	96.8%	2.6%
High	24.7%	97.2%	3.4%
Weak	38.6%	97.8%	6.7%
Very weak	18.1%	97.2%	8.5%
Don't know	12.1%	90.4%	1.4%
<b>Sanction perception</b>			
Nomal taxes	21.4%	96.9%	6.9%
Normal taxes + fine	59.0%	97.9%	5.3%
Jail	5.1%	97.3%	5.4%
Don't know or refusal	14.5%	90.4%	3.1%
<b>Politics opinion</b>			
Left orientation	45.6%	97.2%	5.6%
Right orientation	30.6%	96.8%	6.2%
Don't know & Refusal	23.7%	95.2%	3.5%
<b>Country location</b>			
Nordic	11.4%	98.9%	9.7%
Southern	31.6%	96.6%	2.3%
Eastern	18.9%	95.9%	5.9%
Continental	38.2%	96.6%	4.8%
<b>Others</b>			
<i>Owner</i> <sup>20</sup>	75.2%	96.8%	4.9%
<i>Couple</i> <sup>21</sup>	58.3%	96.8%	4.8%

<sup>20</sup> The owner variable is composed by house or apartment's owner who has finished paying for or who are paying for.

<sup>21</sup> The couple variable is composed by married, remarried and unmarried partner.



Across all the 27 countries of the European Union, more than half of the general public (55%) estimated that the risk of being detected when doing undeclared work was weak or very small. Furthermore, our descriptive analysis seems to confirm us that our hypothesis H5 is right since, in a first time, more people think that the probability to be detected is small,<sup>22</sup> more people report to be involved in undeclared activities. Then, the less the sanction perception is significant, the more the undeclared work participation is important.

A surprising observation concerns the geographic area, in which data tend to show that undeclared work in Nordic countries appears to be most significant than elsewhere. This observation refutes our theoretical hypothesis H6 since south European countries report less undeclared activities participation than the others areas. Indeed, only 2.3% of the southern countries interviewees affirm doing undeclared work whereas 9.7%, 5.9%, and 4.8% of the Nordic, Eastern, and Continental people respectively declare doing so.

For the social ethics variable, we used a proxy variable established with seven specific questions in order to assess feelings about various behaviours.<sup>23</sup> The interviewee had to answer the questions by using a scale of values between 1 and 10 depending on whether the interviewees find the behaviour “absolutely unacceptable” (“1”) or whether he/she find it “absolutely acceptable” (“10”). Therefore, the more the variable “social ethics” is close to 70, the less the social ethics is strong. Conversely, if the variable “social ethics” is weak, the social ethics of the individual is strong. This observation seems to confirm our hypothesis H4.

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<sup>22</sup> This observation is based on respondents’ personal perceptions. They don’t necessarily correspond to the real detection risk in the respective countries. However, personal assessments of the detection risk might be more relevant to the decision to participate in undeclared work.

<sup>23</sup> Eurobarometer, question QB32(1-7): For each of their behaviour, please tell me to what extent you find it acceptable or not : 1) “Someone receives welfare payments without entitlement ; 2) Someone uses public transport without a valid ticket ; 3) A private person is hired by a private household for work and he\ she does not report the payment received in return to tax or social security institutions although it should be reported ; 4) A firm is hired by a private household for work and it does not report the payment received in return to tax or social security institutions; 5) A firm is hired by another firm for work and it does not report its activity to tax or social security institutions ; 6) A firm hires a private person and all or a part of the salary paid to him\ her is not officially registered ; 7) Someone evades taxes by not or only partially declaring income”. The variable Social Ethics is build as the sum of the seven responses.

**Table 2: Descriptive analysis of the Social ethics variable**

	Mean	Standard Error
Someone receives welfare payments without entitlement	2.25	2.49
Someone uses public transport without a valid ticket	2.87	2.63
A private person is hired by a private household for work and he\ she does not report the payment received in return to tax or social security institutions although it should be reported	4.07	3.15
A firm is hired by a private household for work and it does not report the payment received in return to tax or social security institutions	2.82	2.77
A firm is hired by another firm for work and it does not report its activity to tax or social security institutions	2.52	2.69
A firm hires a private person and all or a part of the salary paid to him\ her is not officially registered	2.72	2.75
Someone evades taxes by not or only partially declaring income	2.88	2.72
<b>Social ethics<sup>24</sup></b>	<b>18.86</b>	<b>12.50</b>

### II.3 The model: introduction and specification

In the survey, some people have refused to answer to the question dealing with their own involvement in the undeclared work. This decision causes a selection bias. The selection bias comes from the self-selection of individuals to answer to this specific question. The term selection bias most often refers to the distortion of a statistical analysis, due to sample collection methods. If the selection bias is not taken into account then any conclusions drawn may be wrong. Therefore, we have tried to treat the selection effect of our database.<sup>25</sup> To do so, the most appropriate technique taking into account a selection bias is a Heckman's model.<sup>26</sup>

Consider a model, in which we try to identify and predict the likelihood of undeclared work's participation from some personal characteristics, political and institutional perception features. We have 26,659 observations in our database in which only 909 persons refused to answer the question "*Did you yourself carry out any undeclared activities in the last 12*

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<sup>24</sup> 547 observations are undetermined because some individual refuse to answer at least one of the seven questions.

<sup>25</sup> Selection bias is a distortion of evidence or data that arises from the way that the data are collected. It is sometimes referred to as the *selection effect*. See GREENE (1981, pp. 795-798).

<sup>26</sup> See HECKMAN (1979, pp.153-163).

*months for which you were paid in money or in kind?*".<sup>27</sup> We cannot make a simple-minded model in which we estimate the regression model using only the observations that have a response.

This analysis could be fine if, in fact, the missing “*answer*” data were missing completely at random. However, the decision to refuse or not answering the question about undeclared work was made by the respondent. Therefore, those who refuse to answer at the question constitute a self-selected sample and not a random sample. It is likely that some interviewees who chose to refuse to answer to the question would have answered “yes” and this would account for much of the missing “*answer*” data. Thus, it is likely that we underestimate the positive statement of undeclared work participation. This is problematic if collectively the individuals who don’t answer the question are systematically different from those who do, and consequently the final sample may be biased. This is known as “sample bias”.<sup>28</sup>

A possible solution to solve this inconvenient is to apply the Heckman selection model. Theoretically, this model is formulated in two equations. At first, we have to regress the selection for the response. This is a simple equation which explains the answer or no answer to the question about undeclared work:  $R_i = \alpha + \beta_i X_i + u_i$ , where R is binary variable (1 for response “yes or no”, 0 otherwise),<sup>29</sup> X is a vector including all observed factors which could explain the answer to the question (age, sex, sector, education, owner, political opinion, profession, etc.) and U is the error term which is assumed to be normally distributed  $u_i \mapsto N(0, \sigma_u^2)$  in order to take into account non observed factors which could affect the response decision. A vector of inverse Mill’s ratios (estimated expected error) can be generated from the parameter estimated. The independent variable, y, meaning “*did you get an undeclared activity in the last 12 months*” is observed only when the selection equation equals 1 (i.e. when people have answered to the question) and is then regressed on the explanatory variables, x, and the vector of inverse Mill’s ratios from the selection equation by a probit specification.<sup>30</sup> Therefore, the second stage reruns the regression with the estimated expected error included as an extra explanatory variable, removing the part of the error term

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<sup>27</sup> See EUROBAROMETER, *op. cit.*, question QB19: they mean in the question, activities which were not or not fully reported to the tax or social security authorities and where the person who acquired the good or service was aware of this.

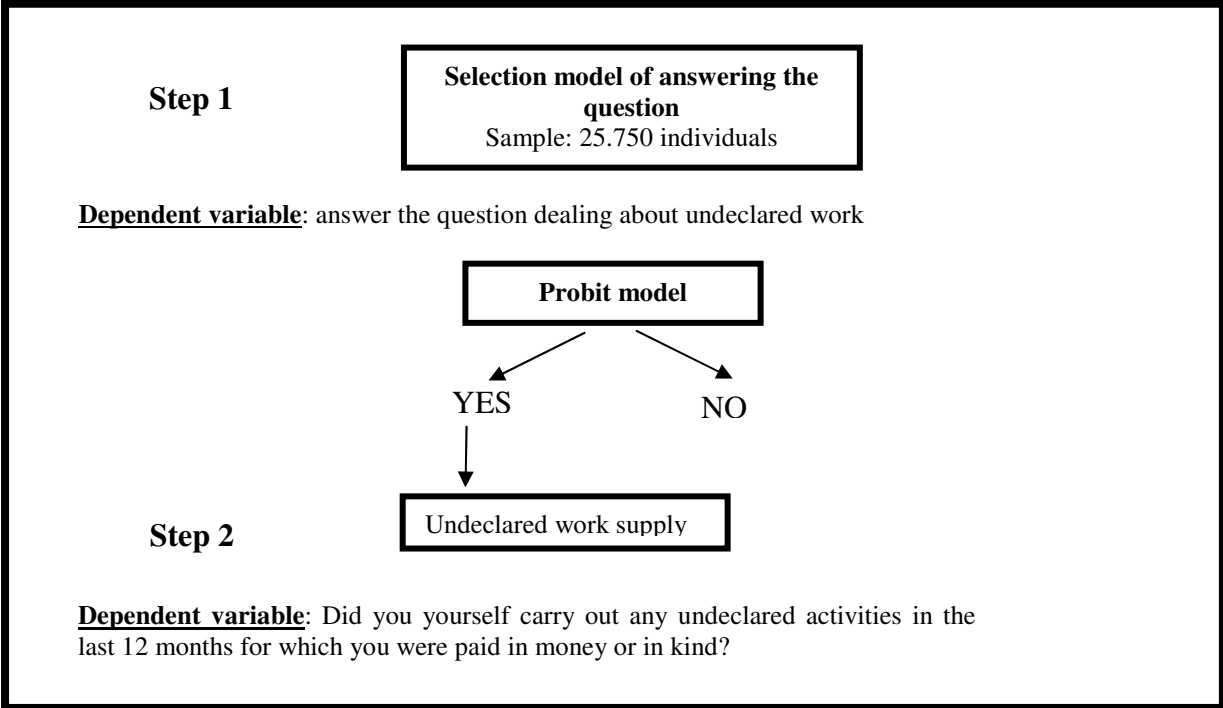
<sup>28</sup> CUDDEBACK, WILSON, ORME and COMBS-ORME (2004, pp. 20-21).

<sup>29</sup> Otherwise means refuse to answer or don’t know.

<sup>30</sup> The Heckman selection model allow us to use information from non respondent to the undeclared work’s question in order to improve the estimates of the parameters in the regression model

correlated with the explanatory variable and avoiding the bias.<sup>31</sup> Sample selection bias has been corrected by the selection equation, which determines whether an observation makes it into the non-random sample. The second regression can be written as:  $Y_i = \alpha + \beta X_i + \delta M + u_i$ , where  $Y_i$  is the binary dependent variable (making undeclared work or not),  $X_i$  is a vector with explanatory variables, and  $M$  is the inversed Mill's ratio. The following figure describes the methodology adopted to estimate the decision to answer the question and to supply undeclared work in the past 12 month.

**Graph 1: Schema of the econometric analysis design**



In practice, some statistical software such as STATA provides indicators in order to identify and to correct bias selection. This indicator is called  $\rho$  in the STATA software. When  $\rho = 0$ , the probit regression provides unbiased estimates and when  $\rho \neq 0$ , the probit estimates are biased. The Heckman selection model allows us to improve the estimates of the parameters in the regression model. The Heckman selection model provides consistent, asymptotically efficient estimates for all parameters in the model.<sup>32</sup>

<sup>31</sup> CUDDEBACK, WILSON, ORME and COMBS-ORME (2004, pp.19-31).

<sup>32</sup> BAUM (2006, pp.273-275)

### III. EMPIRICAL RESULTS AND ANALYSIS

The Tables 3 and 4 show the results of the probit regression analysis. The estimations come from the STATA software where we used the “*heckprob*” command.<sup>33</sup>

**Table 3 : Probit estimation result with sample selection**

	Coef.	Std. Err.		Coef.	Std. Err.
<b>Answer or not at the undeclared work involvement question</b>	Dependent variable: Answer or not		<b>Answer or not at the undeclared work involvement question</b>	Dependent variable: Answer or not	
<i>Household size</i>	0.005	(0.014)	<i>Town (reference = small or middle size town)</i>		
<i>Social ethics</i>	-0.013	(0.001)***	Rural	0.009	(0.038)
<i>Sex (reference women)</i>	-0.062	(0.034)*	Large town	-0.019	(0.041)
<i>Occupation (reference = blue collar)</i>			<i>Couple</i>	-0.010	(0.038)
House Person	0.140	(0.069)**	<i>Age</i>	0.000	(0.005)
Unemployed	-0.004	(0.071)	<i>Age^2</i>	0.000	(0.000)
Retired	0.260	(0.064)***	<i>Education</i>	-0.001	
Self employed	-0.074	(0.068)	<i>Owner</i>	0.054	(0.036)
Managers	-0.013	(0.088)	<i>Politics opinion (reference= right)</i>		
Other white collars	0.093	(0.052)*	Politics left	0.057	(0.038)
Students	0.150	(0.085)**	Politics refuse	0.063	(0.043)
<i>Risk (reference = weak)</i>			<i>Cooperation (reference = fair)</i>		
Very high risk	-0.132	(0.067)**	Excellent	0.078	(0.037)**
High risk	-0.068	(0.044)	Medium	-0.230	(0.048)***
Very weak risk	-0.034	(0.049)**	Bad	-0.282	(0.085)***
Risk, don't know	-0.311	(0.051)***	<i>Area (reference = Continental) (1)</i>		
<i>Sanction (reference = normal taxes)</i>			Nordic	0.299	(0.075)***
Sanction, normal taxes + fine	-0.095	(0.041)**	South	0.075	(0.048)
Sanction jail	-0.102	(0.076)	Estern	0.044	(0.039)
Sanction, don't know	-0.389	(0.045)***	<i>Constant</i>	2.12	(0.159)***
<b>ρ</b>	<b>-0.449</b>	<b>(0.181)***</b>			
LR test of indep. eqns.			(rho = 0):chi2(1) =3.92 (3)		
***, **, * signal a level of significance of 1%, 5%, 10% ;					
(1) The 27 countries were pooled into four analytical groups : Continental for Belgium, Germany, France, Ireland, Luxembourg, The Netherlands, Austria and United Kingdom; Eastern for Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovakia; Southern for Cyprus, Greece, Spain, Italy, Malta and Portugal; Nordic for Denmark, Finland and Sweden ;					
(2) P value = 0.033;					
(3) Prob > chi2 = 0.0478					

When  $\rho \neq 0$ , standard probit techniques applied to the main equation yield biased results. “*Heckprob*” provides consistent, asymptotically efficient estimated for all the parameters in such models. In our database, the Heckman estimation confirms that the selection bias is present. Indeed, the likelihood-ratio test of independent equations conclusively rejects that

<sup>33</sup> Heckprob fits maximum-likelihood probit models with sample selection.

null hypothesis with an estimated  $\rho$  of -0.449. The two step procedure is therefore useful to get non biased estimation on the undeclared work participation.<sup>34</sup>

As can be seen on Table 4 hereinafter, coefficients of explanatory variables have changed, becoming either more accurate, either more statistically significant. The main determinants which influence the availability of answering the question dealing with people's own participation in undeclared activities are not surprising: social ethics, occupation, sanction, risk of being detected, survey's cooperation and sex are statistically significant. Most of them act in the expected direction. Indeed, social ethics has negative coefficient, indicating that less people have social value (about collective choice, public goods, and etc.),<sup>35</sup> less they tend to answer the question.

Retired and students are more willing to answer the question than the others occupation status. We could explain this result by the fact that both groups are usually less audited than the others professions.

The risk to be caught is an interesting variable since it seem that people who thinks that the risk is very high or very weak tend to response less than people who thinks that this risk is simply weak. This result gets a 5% of statistical level of significance. Obviously, cooperation is an important determinant of response since all the dummies have an important statistical significance. The results confirm the insight since the correlation between cooperation and response in the specific question on their own involvement in undeclared work is positive. Finally, an interesting result can be found in geographic area variables. In fact, Nordic countries (Denmark, Finland and Sweden) have people who seem to be straighter. Indeed, the estimated coefficient of Nordic countries is positive and highly statistically significant.

To summarize our first analysis, we have showed that our database exhibits a selection bias which we have to correct for our next study. Some factors can explain why people are more willing to speak about their own involvement in undeclared work. The most important ones are the social ethics, the occupation, the geographic area, the risk to be caught and the cooperation. But is it the most relevant factors to explain why people do undeclared work?

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<sup>34</sup> For more information about this econometric technique, see BAUM ( 2006, pp.272-280)

<sup>35</sup> See how the variable is built in section III.2. Therefore, more the variable is positive and high, less people has intrinsically social ethics.

Table 4 presents the probit analysis with correction of selection bias. The corrected estimation provides better statistical results (more precisely assessed).<sup>36</sup> In this regression, the dependent variable is a binary variable which takes 1 if the interviewee stated having participated to an undeclared work in the last 12 months, 0 if he/she didn't. This dependent variable is regressed on a series of explanatory variables.

**Table 4: Probit estimation result with sample selection**

With correction selection bias			
Variable	Coefficients	Variable	Coefficients
<b>Udw participation (supply)</b>			
<i>Social ethics</i>	0.018***	<i>Politics opinion: reference = right</i>	
<i>Sex (reference women)</i>	0.351***	Politics left	0.001
<i>Education</i>	-0.002	Politics refuse	-0.183***
<i>Owner (reference no)</i>	-0.078**	<i>Country : reference = Belgium</i>	
<i>Couple</i>	-0.125***	Denmark	0.707***
<i>Age</i>	0.024***	Germany	-0.326***
<i>Age^2</i>	-0.001***	Greece	-0.161
<i>Occupation : reference = manual workers</i>		Spain	-0.183
House Person	-0.066	Finland	0.096
Unemployed	0.21**	France	0.166*
Retired	-0.176***	Ireland	-0.218*
Self employed	0.129**	Italy	-0.106
Managers	-0.276***	Luxembourg	0.086**
Other white collars	-0.286***	Netherlands	0.544***
Students	-0.092	Austria	0.200**
<i>Risk : reference = weak</i>		Portugal	-0.228**
Very high risk	-0.365***	Sweden	0.478***
High risk	-0.292***	United Kingdom	-0.236**
Very weak risk	0.126***	Cyprus	-0.797***
Risk, don't know	-0.573***	Czech Republic	0.017
<i>Sanction: reference = contribution + fine</i>		Estonia	0.491***
Sanction contribution	0.160***	Hungaria	0.145
Sanction jail	0.019	Latvia	0.494***
Sanction refuse	-0.049	Lituania	0.075
<i>Ville: reference = small and mid size</i>		Malta	-0.426**
Rural village	0.044	Poland	0.044
Large town	-0.013	Slovakia	0.012
<i>Cooperation : reference = fair</i>		Slovénia	-0.007
Excellent	0.025	Bulgaria	-0.002
Medium	-0.018	Romania	-0.085
Bad	0.222**	<b>Constant</b>	-2.05***

\*\*\*, \*\*, \* signal a level of significance of 1%, 5%, 10% respectively.

Hypothesis 1 in the section II indicated a negative correlation between age and undeclared work. Our result contradicts this hypothesis since our coefficient for the variable Age is

<sup>36</sup> Some variables are becoming statistically different from zero, others are becoming non significant.

positive. Nevertheless, we have to relativize our result by the fact that the coefficient is very small and because the coefficient of age squares is negative.<sup>37</sup>

Women were assumed to be more compliant (so less willing to do undeclared activities) in our hypothesis 2. Our result confirms that scientific literature's observation since our estimated coefficient is positive (0.351) and statistically significant at 1% level.

Education doesn't seem to be a relevant factor of undeclared work, which undermines the hypothesis 3 mentioning a negative correlation between education level and undeclared work. But occupation and education could be linked up. And yet, occupation is a relevant variable explaining undeclared activities. Unemployed and self-employed seem to take part in undeclared activities more than the other groups of workers. On the other hand, the retired, the managed and the other white collars workers are less involve than the manual workers (reference category). All these results are statistically significant.

As we have said in our theoretical analysis, tax morale and social ethics are sorely related.<sup>38</sup> Social ethics of people are an important determinant of the undeclared activities. We had presumed in our hypothesis 4 that people with greater social ethics tend to be less involved in undeclared work, i.e. that social ethics should be negatively correlated with undeclared work. This is confirmed by our results: the coefficient of the social ethics is indeed positive<sup>39</sup> and statically significant at 1% level.

Deterrence effect (hypothesis 5) is a combination of risk to be detected and level of sanction. First, the risk to be detected seems to be a good dissuasive effect. Our results show that more it is perceived as high, less people report doing undeclared work. All the coefficients are highly statically different from zero. Then, concerning the level of sanction, our results are less conclusive. Only the fact that undeclared workers have to pay the amount of income tax

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<sup>37</sup> A positive coefficient for age and a negative coefficient for the variable age squares means that more people become older, more they do undeclared work and proportionally less than before (when they were younger)

<sup>38</sup> But in an opposition way, given that social ethics construction. Recall that the variable is build by adding up the interpreting result of 7 questions. More the variable "social ethics" is close to 70, less the social ethics is strong. Conversely, if the variable "social ethics" is weak, that means the social ethics of the individual is strong. See descriptive analysis section for more details.

<sup>39</sup> Pay attention to the construction of the variable SOCIAL ETHICS: if the individual has an important value of social ethics, then the value of his variable SOCIAL ETHICS is weak (closer to 7 than to 70). Therefore, hypothesis 8 assumes a negative correlation between social ethics and undeclared work and our positive correlation in our results means the same as the hypothesis 4.



plus a fine is deterrent: the coefficient of this variable is indeed the only to be positive and statically significant at 1% level. A first inconvenient of our database could be showed in the variable “Risk don’t know”. People who refuse to answer at the risk level question report also not doing undeclared work: the coefficient amount to -0.573 and is statically significant at 1% level, which is relatively considerable. People, who refuse to answer at the level risk question and state to not doing undeclared work, are probably lying upon the real undeclared practices. A simple correlation analysis between those variables and cooperation shows a negative liaison, which tend to confirm our idea of lie.

Some countries are known for accommodating more cheating than others. Our hypothesis 6 assumes that countries from the south geographic area should be those countries. Curiously, they don’t. All the estimated coefficients (Italy, Spain, Greece, Cyprus, Malta and Portugal) are negative but no significantly different from zero (compare to Belgium) except for Portugal, Cyprus and Malta. This is again a surprising result. Our underlying assumption hereinbefore is perhaps also in application for that result. On the contrary, Nordic countries, which were assumed to be less involved in undeclared work, have positive (and highly significant) coefficients.<sup>40</sup> From an individual standpoint (and with all the precaution induced by a survey), some countries as France, Luxembourg, The Netherlands, Austria, Sweden, Denmark, Estonia, Latvia tend to be more affected by undeclared work than the others members of the European Union. Contrarily, countries such as Germany, Ireland, Portugal, United Kingdom, Cyprus, and Malta are less concerned by undeclared work than the others European Union countries.

Finally, cooperation is assumed to be negatively correlated to undeclared work in our hypothesis 7. This hypothesis seems to be confirmed by our result, in particular when the interviewees cooperate rather badly. The coefficient of the variable bad cooperation is positive and statically significant at 5% level.

Others variables than those debated in our hypothesis had been inserted in our model. The results of our regression show that homeowners and couple (married or cohabits people) are less willing to work without declaring their income to the tax authorities. The coefficients are estimated at -0.078 and -0.125 respectively and are statically significant.

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<sup>40</sup> Except for Finland

## CONCLUSION AND POLICY IMPLICATIONS

Undeclared work is a popular academic and governmental research topic in most developed countries. In 2007, the European Commission decided to carry out a European Survey called “*Eurobarometer*” on this sensitive issue. The Commission interviewed almost 27 000 citizens coming from the 27 European Union Member States, thereby providing an important cross-country database on the primary determinants of undeclared work in the EU.

In this study, we have relied on the undeclared work and tax evasion literature, to identify 7 testing hypothesis. Our probit regression analysis corrected of the sample selection shows that many, but not all, of these hypotheses are corroborated by our database. Women are less willing to engage into undeclared work than men. Social ethics, synonymous to tax morale in the literature, is a relevant factor of undeclared work. Literature takes the view that tax morale (or social ethics) and its determinants can best explain the phenomenon of tax compliance (or declared work compliance) internationally.<sup>41</sup> Our results indicate that the less the individuals adhere to moral taxation principles, the more they declare working without paying taxes. Therefore, informing and educating people to the utility of their taxes should help enhance the social ethics of the population. Indeed, we think that the best way to improve the moral values of people is to well-informed them. The nexus between the risk of being detected and a high, costly, sanction (called deterrence effect) is also a major determinant of undeclared work.

From a public policy standpoint, this implies that Governments should elevate the perception of the deterrent effect in order to decrease the people’s tendency to work without declaring all their income. To this end, governments may either increase tax control (and in so doing, the risk to be caught) or elevate the sanctions incurred for a violation of reporting obligations. Landlords and couples (married or cohabits people) are finally less willing to work without declaring their income to the tax authorities than people who are not. Thus, the tax administrations should primarily concentrate on single individuals and people that do not own their residence. All our results remain robust to different cross-country control variables.

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<sup>41</sup> A. RIAHI-BELKAOIU (2004, pp. 135–136).

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