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Exploring the illegal practice of under-reporting wages in the construction industry: some lessons from Romania

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Abstract

The aim of this paper is to evaluate the practice of under-reporting wages (and its multifarious forms) in the construction industry, which is a dominant type of undeclared work found in the industry, and how it can be explained and tackled. To do so, a mixed methods approach is used, including in-depth interviews, focus groups and a representative national survey comprising 1,212 respondents collected during April-May 2021 in Romania, a country with one of the highest shares of undeclared work in the European Union. A logistic regression analysis shows that this practice is not confined to vulnerable groups but is rather an extensive phenomenon. Evaluating how wage under-reporting could be tackled, the finding is that there is no significant relationship between how employees perceive the level of sanction and the risk of detection and their likelihood of participating in wage under-reporting. However, the results reveal the significance of social norms; those who have acquaintances who receive under-reported wages are more likely to engage themselves in this wage arrangement. The implications for theory and practice are then considered.

Key-words: informal economy; under-reported wages; under-reported employment; undeclared work; construction industry

1. Introduction

Despite its negative effects on workers, businesses, society and governments, undeclared work persists in both developed and emerging economies (Franić and Cichocki 2022). Recent estimates reveal that more than 60% of the world`s workers have their main job in the undeclared economy (ILO 2018). Advancing the understanding of undeclared work in the construction industry is highly important given that it is rife in this sector (Dimitridias 2022; European Federation of Building and Woodworkers 2010; Federation of Master Builders 2003; Cremers 2017; Cremers et al. 2017; Williams 2020; Williams, Nadin, and Windebank 2011; Tedds 2010). Indeed, a representative survey conducted in all European Union Member States in 2007, 2013 and 2019 reveals that the proportion of all undeclared work in the construction industry is high and has increased over time. The share of all undeclared work conducted in the construction industry in the EU reached 21% in 2019, rising from 16% in 2013. The result is that over 1 in 5 undeclared jobs in the European Union are in the construction industry (Williams 2020).

However, undeclared work takes various forms, ranging from working without any contract (i.e., unregistered employment) to concealing a part of the employee`s wage. Under-reported wages, also known in literature as envelope wages, quasi-formal, under-declared or grey employment (Franić 2020; Williams and Horodnic 2017a) refers to an agreement between the employer and the employee to pay the wage into two fractions, one official part which is declared to the authorities and one hidden cash-in-hand part which, conversely, remains untaxed (Hazans 2005; Meriküll and Staehr 2010; Besim and Jenkins 2005). This is not a minority practice. Previous studies show that, when analyzing the three main components of the undeclared economy, namely unreported income by businesses, unregistered employment and under-declaring the employees` wages, the latter represents

between 39% to 52% of the total undeclared economy in the Baltic countries (Putninš and Sauka 2015). However, until now, research on wage under-reporting in the construction industry is notable by its absence.

This paper aims to fill this gap and advances the knowledge on wage under-reporting in three ways. Conceptually, this is the first paper on the construction or any other industry that investigates the various forms of wage under-reporting (i.e., fixed undeclared supplement, variable undeclared income by professional achievements, income varying by the total worked hours, only a fixed amount declared, occasional undeclared payments for holiday allowances, bonuses). In addition, and theoretically, it advances explanations of the prevalence and distribution of wage under-reporting by evaluating whether it is vulnerable groups and whether they are rational economic actors or social actors. Secondly, empirically and methodologically, mixed methods are employed on a unique dataset which is representative at national level for the construction industry in Romania. Finally, from a policy perspective, the paper shows that the dominant policy approach based on deterrents (i.e., sanctions and level of detection) does not prove to be effective for tackling wage under-reporting in the construction industry. Instead, policy measures aimed at altering the social norms in the industry are required.

To show this, the following section surveys the literature on the individual-level characteristics of workers in wage under-reporting and the main theories used for explaining and tackling wage under-reporting. Section 3 provides information on why Romania represents an appropriate case study for the topic and the data collection strategy. Section 4 reports the findings and then, Section 5 discusses the theoretical and policy implications of the findings, together with the paper's limitations and avenues for future research.

2. Literature Review

2.1. Who Receives Under-Reported Wages?

Exploring the previous literature, the finding is that, surprisingly, no previous study has investigated the issue of under-reported wages in the construction industry. However, synthetizing the findings of the previous literature conducted on the overall economy, the finding is that the practice of under-declaring wages is rather instigated by the employer, more prevalent amongst small businesses and most often imposed on vulnerable groups of employees (Chavdarova 2014; Round et al. 2008; Sasunkevich 2014; Williams and Horodnic 2017b). As such, previous research underlines a higher participation of some marginalized categories of employees such as: younger persons amongst whom there is a high share unemployed; single people; unskilled workers and those on low incomes (Chavdarova 2014; Williams and Horodnic 2017b; Williams and Padmore 2013; Dougherty and Escobar 2019). Similarly, previous findings reveal that this practice is more prevalent in less economically developed areas (Williams and Horodnic 2017a, 2017b). Based on these findings, this paper uses as control variables the socio-demographic characteristics of the respondents to identify the profile of the worker who is more likely to participate in under-reporting wages.

2.2. Theoretical Explanations of the Participation in Under-Declared Wages

Reviewing the literature two different explanations for participation in under-declared wages emerge, namely a rational economic actor theorization viewing people as rational actors evaluating the opportunities and risks of disobeying the law and, a social actor theorization grounded in the view that individual behavior is shaped by the social environment in which they live. Consequently, each of these explanations advance different policy measures for tackling under-declared wages. Here, each is briefly described in turn.

2.2.1. Rational Economic Actor Explanation

The most common approach adopted by governments when tackling under-declared wages is rooted in the rational economic actor theoretical explanation (Franić 2020; Horodnic and Williams 2022). This view originates in the work of Bentham (1788) and Beccaria (1797) who developed the utilitarian theory of crime according to which individuals are rational actors who decide whether to disobey the law by evaluating the benefits and the risks associated to an activity. This view has been firstly applied to the tax-noncompliance field by Allingham and Sandmo (1972) advancing that individuals will evade tax as long as the gain is higher than the probability of being detected and punished. As such, adopting this view, governments aimed at increasing the costs of non-compliant behavior by increasing the deterrents (i.e., risk of detection and the penalty level). However, the evidence that doing so reduces participation in under-declared wages is inconclusive. Some studies find a significant relationship between participation to this practice and level of deterrents and other studies no association (Franić 2019; Williams and Bezeredi 2017; Williams and Horodnic 2016; Williams and Yang 2017). Therefore, the following propositions for the construction industry are tested:

> *H1a:* The higher the perceived risk of detection the lower is the likelihood of an employee in the construction industry receiving under-reported wages.
>
> *H1b:* The higher the perceived level of sanction the lower is the likelihood of an employee in the construction industry receiving under-reported wages.

2.2.2. Social Actor Explanation

Recognizing that individuals are not always rational actors and limited in their ability to correctly evaluate the costs and the benefits of their actions, and are influenced by their social environment, has led to the emergence of a new social actor explanation (Alm 2011). Acknowledging that deterrent measures are not effective in all contexts and that, surprisingly, many individuals comply with the law even when the evaluation of the cost-benefits ratio suggest they should disobey it, the social actor approach explains the participation in under-reported wages to result from a low motivation to pay taxes generated by the social norms (McKerchar, Bloomquist, and Pope 2013; Torgler 2011). Individuals are more likely to be non-compliant if they live in a society where tax non-compliance is common because firstly, they might fear less being caught and secondly, because they will adopt the behavior, they perceive everyone else has (Horodnic and Williams 2022). Indeed, previous studies show that the likelihood of individuals being tax compliant is conditioned by the behavior of other individuals in the society (Bicchieri and Dimant 2019; Bicchieri and Xiao, 2009; Chang and Lai 2004; Hallsworth et al. 2017; Lefebvre et al. 2015; Traxler 2010). Therefore, the following hypothesis can be tested:

> *H2:* The more non-compliant are acquaintances an employee has in the construction industry, the more likely they are to receive under-reported wages.

3. Methodology

3.1. The Pertinence of the Romanian Case Study

Although the wage under-reporting is ubiquitous across countries, its prevalence and distribution differ. Previous findings suggest that this practice is more prevalent in transition

economies (Horodnic and Williams 2021; Vâlsan et al. 2020). According to the Eurobarometer surveys, in 2007, Romania was the country with the highest share of employees receiving under-reported wages in the European Union, with 22% of employees reporting this arrangement (Williams and Padmore 2013). The latest Eurobarometer survey on undeclared work conducted in 2019, revealed that although the practice decreased in Europe, Romania still has a larger proportion of employees receiving under-reported wages compared with the European Union Member states average (5% compared to 3%) (European Commission 2020; Williams and Horodnic 2020). Similarly, using estimates based on the labour force (Labour Input Method), the finding is that undeclared work in Romania represents no less than 26% of the total Gross Value Added (GVA), placing Romania as the country with the second-highest undeclared work in the European Union (Williams et al. 2017). The construction industry in Romania constitutes a large sphere, accounting for more than 12% of its GDP (Leontie et al. 2022), and plays an essential role in promoting national economic development, according to efficiency indicator measurements (Zhu et al. 2021). Thus, Romania represents an appropriate case study for investigating issues related to unregistered and under-reported wages. Indeed, similar to other post-communist countries (e.g., Croatia; see Franić 2020), citizens in Romania display a low trust in public authorities and high perception of corruption and, consequently, many of them try to outsmart the tax authorities. Hence, the employees and their employers collude together for maximizing their income by using practices such as under-reporting wages (Horodnic and Williams 2019).

3.2. Data and Analytical Approach

To test the hypotheses, investigating whether the vulnerable employees receive under-reported wages to a greater extent than other groups of employees and the policy measures

derived from the rational economic actor and social actor theoretical explanations, both qualitative and quantitative data are here used.

The data here reported arises from a study investigating the undeclared economy in the construction industry commissioned by The General Federation of Trade Unions FAMILIA (FGS Familia). The study included in-depth-interviews, focus-groups and representative surveys at country level of both workers and employers. Data collection has been conducted by the specialized market research company Eastern Marketing Insights. The obtained dataset is unique in being representative for a specific sector (i.e., construction). Here the analysis is confined to the issue of under-reported wages from the workers` perspective.

In-depth interviews and a focus group with 10 employees took place in April and May 2021, while 1,212 questionnaires from workers were collected between late May and late June 2021. Due to the difficulty of identifying construction sites and the sensitivity of the topic, a snowball strategy was used, recommended in investigating issues such as undeclared work (Williams 2015). However, the sample was carefully selected to obtain a stratified sample with respect to the population distribution in terms of the seven development regions of Romania and to the size of the company where the workers are employed.

As a methodological approach, mixed methods are thus used. Here, the results of both the qualitative research and the quantitative research are reported. The hypotheses are tested using logistic regression analysis. To test the reliability of the findings, the results are not based only on crude data (excluding the missing values) but also those obtained by using an imputation strategy for the missing data. In addition, for a better understanding of the decision process and the importance of different drivers in under-reporting wages predicted probabilities, classification trees are used to enable a sequential view on the decisions to engage in under-reporting wages.

3.3. Variables

To evaluate the relationship between receiving under-reported wages and various independent variables extracted from the hypotheses mentioned above, a computed variable is used with value 1 if the employee reported that they receive any of the four types of under-declared salary investigated (i.e. fixed undeclared supplement, variable undeclared income by professional achievements, income varying by the total worked hours, only a fixed amount declared, occasional undeclared payments for holiday allowances, bonuses) and 0 otherwise.

For testing our hypotheses, the following independent variables were used:

(i) For testing the effectiveness of the deterrent measures, derived from the rational economic actor theoretical explanation *(H1a, H1b):* expected sanctions and expected risk of detection;

(ii) For testing the effective of social norm, derived from the social actor theoretical explanation *(H2)*: knowing others in the construction industry who receive under-declared wages.

In addition, for testing whether the more vulnerable groups of employees are receiving under-declared wages to a greater extent than other groups, the following control variables (identified as relevant in previous studies; Chavdarova 2014; Dougherty and Escobar 2019; Horodnic et al. 2020; Williams and Horodnic 2017a, 2017b, 2018; Williams and Padmore 2013) are used: age, education, occupation, work experience, marital status, number of children, income, region of residence and employer size.

Information on how these variables were measured and some descriptive statistics are details in Table A1 in the Appendix.

Thus, our final intercept model specification, which include the socio-demographic characteristics of the respondents, the size of the business and the individual characteristics related to the policy measures is the following (Leckie, 2010):

$$log\ \left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + \beta_1 X_i$$

where π_i/(1- π_i) is the odds that y = 1 and log[π_i/(1- π_i)] is the log-odds, β_0 is the overall intercept and β_1 is individual variables effect and X_i is the vector containing all the individual variables.

According to the hypotheses and the control variables listed above, the test equation is expected to have the following derivation of the signs:

$$\begin{aligned} log\ \left(\frac{\pi_i}{1-\pi_i}\right) = {} & \beta_0 - \beta_1 social\_contribution\_due\_and, or\_fine_i - \beta_2 prison_i \\ & - \beta_3 other\_sanction_i + \beta_4 don`t\_know\_sanction_i \\ & - \beta_5 high\_detection\_risk_i + \beta_6 don`t\_know\_detection\_risk_i \\ & + \beta_{7-15} control\_variables_i \end{aligned}$$

4. Findings

Starting with the qualitative data, the first main finding is that, despite the definition of undeclared work included in the Labour Code that include two forms of undeclared work (i.e., unregistered employment and under-declared wages), the lived practice perceives only unregistered employment as undeclared work. Indeed, both the employees and the employer make a clear demarcation between the traditional so called “black work” (racist) which refers to unregistered employment and “grey work” which refers to wage under-reporting. Given that part of the employment/ wage is legal, the parties do not perceive wage under-reporting as part of undeclared work nor do they see it negatively. The second main finding is that wage under-reporting is perceived as more prevalent and to take different forms (e.g., only

registering for the minimum wage or only registering a lower number of hours than the real number of working hours). This is exemplified in the quotes below:

> *"... maybe even 10% is in the black or grey area, in the sense that there is a minimum form of employment that do not necessarily reflect either the working program or the wage. So somewhere about 5-10% I think of those on construction sites." (Employer)*

> *"More prevalent is the grey work in which the worker has a contract paid with the minimum wage and beyond that, in order to be stimulated, they receive something in one form or another. I don't know how to tell you how these things are hidden in accounting documents, but this practice is much more common." (Employee)*

Based on these findings, the survey included different questions on undeclared employment and under-declared wages as well as provided a more variegated option list for the different type of under-declared wages. This approach followed the types and definitions recently introduced in the Eurobarometer survey on undeclared work conducted in 2019 (European Commission. 2020).

Turning to the quantitative data and starting with the prevalence of the various facets of undeclared work, the finding is that most undeclared work conducted in construction industry is wage under-reporting. Indeed, using a question that allowed the respondents to tick all the work situations that apply to them (varying from having all the work declared to under-reporting wages and working fully undeclared either for an employee or on own account), reveal that 17% of respondents reported engaging in some form of undeclared

work. As Table 1 displays, 12% reported receiving under-declared wages, with 5% receiving a monthly fixed undeclared supplement to the official wage registered in the working contract, 3% receiving a variable undeclared income in accordance with the professional achievements (e.g., if they finish the work quicker than agreed, if the work is high quality), 4% having their income varying by the total worked hours, but only a fixed amount declared and 1% receiving occasional undeclared payments for holiday allowances, bonuses or 13th salary. Analyzing the whole economy across the European Union member states, Cichocki and Franić (2022) found that in most of the cases, various types of wage under-reporting are found simultaneously (over 9% of employees) with about 8% of the employees receiving additional payments in accordance to their achievements and about 3% of the employees receiving a monthly fixed undeclared supplement to their official wage.

In terms of prevalence of wage under-reporting across population groups, Table 1 reveals that of those receiving under-declared salaries, 12% are youth, 87% adults and only 1% seniors. While young and adult employees receive different types of under-reported wages, for seniors only one type applies, namely a fix monthly undeclared wage. Moving to education, those with secondary superior education and non-university tertiary education (ISCED 3 and 4) represent 66% of the total employees receiving under-declared wages and this is consistent for all types of under-declared wages. Nearly similar results are found in relation to the occupation of the employee. 50% of the employees receiving under-declared salaries are skilled workers. However, this higher prevalence amongst skilled workers does not hold for occasional undeclared payments which are more prevalent amongst unskilled workers.

Table 1. Under-reported wages in the construction industry in Romania, by socio-demographic and employer characteristics and policy approaches (N = 1,212)

		Under-reported salaries[6]	Under-reported salaries, by type:			
			Fixed undeclared supplement[7]	Variable undeclared income[8]	Fixed amount declared[9]	Occasional undeclared payments[10]
TOTAL		12	5	3	4	1
Age (years)	Youth	12	15	8	12	22
	Adult	87	83	92	88	78
	Senior	1	2	0	0	0
Education[1]	ISCED 1, ISCED 2	22	34	8	14	22
	ISCED 3, ISCED 4	66	51	76	80	56
	ISCED 5-8	12	15	16	6	22
Occupation	Unskilled worker	36	42	41	27	45
	Skilled worker	50	42	44	65	22
	Team Leader[2]	4	3	5	2	22
	Engineer[3]	7	11	5	4	11
	Administrative, other	3	2	5	2	0
Work experience (mean 15 years)	Below mean	62	70	58	57	67
	Above mean	38	30	42	43	33
Marital status	Married / with partner	67	60	75	73	56
	Single	33	40	25	27	44
Children	None, 1	22	20	24	23	33
	Two	66	69	68	60	45
	Three or more	12	11	8	17	22
Net income / month	<500 EUR	20	24	11	26	25
	500-700 EUR	58	51	56	63	63
	701-1000 EUR	15	15	25	9	0
	> 1000 EUR	7	10	8	2	12
Region of residence[4]	Macro-region 1	1	2	0	0	11
	Macro-region 2	89	84	89	98	78
	Macro-region 3	4	6	3	0	11
	Macro-region 4	6	8	8	2	0
Employer size	1-9 employees	15	20	9	12	25
	10-49 employees	53	43	73	50	50
	50+ employees	32	37	18	38	25
Knowing others[5] receiving under-reported salaries	No	46	56	23	51	40
	Yes, one/two persons	15	7	23	21	40
	Yes, > 2 persons	39	37	54	28	20
Expected sanctions	None	3	0	5	5	0
	SC[11] due and/or fine	63	73	61	50	67
	Prison	1	2	0	2	0
	Other sanction	2	2	0	2	11
	Don`t know	31	23	34	41	22
Expected risk of detection	Low	31	25	37	35	33
	High	59	63	53	59	67
	Don`t know	10	12	10	6	0

Notes: [1] ISCED 1: Primary education; ISCED 2: Secondary lower education; ISCED 3: Secondary superior education; ISCED 4: Non-university tertiary education; ISCED 5-8: Higher education; [2] Team Leader / Technician / Foreman; [3] Engineer / Architect / Site Manager; [4] NUTS 1 regions - according to the NUTS classification (Nomenclature of territorial units for statistics); Macro-region 1 (North-West, Centre), Macro-region 2 (North-East, South-East), Macro-region 3 (South, Bucharest-Ilfov), Macro-region 4 (South-West, West); [5] in the construction industry; [6] Don`t know / Refusal included; [7] always the same amount; [8] Varying by professional achievements; [9] Income varying by the total worked hours, being declared only a fixed amount; [10] e.g., holiday allowances, bonuses; [11] SC = Social contribution.

Source: own calculation

Turning to work experience, all the types of wage under-reporting are more prevalent amongst those with less experience. In terms of household composition, wage under-reporting is more common amongst those married or living with a partner and those having two children. As for income, most receiving under-declared wages have a mean wage (58% of all the employees declaring they receive under-declared wages having an income ranged between 500 to 700 EUR). As for the regional distribution, the nearly 90% of the employees who received under-declared wages are from the macro-region 2 (which includes the North-East and South-East), the macro-region with the lowest standard of living in Romania (according to gross domestic product at current market prices or per inhabitant, data from Eurostat). From all the employees receiving under-declared wages, 53% work for medium-sized companies (10-49 employees), the trend keeping valid regardless of the type of wage under-reporting. As such, the tentative finding is that vulnerable employees' groups receive under-reported wages to a greater extent only in relation to the development region of residence and level of experience.

Finally, moving to the characteristics related to the policy measures, 46% of those reporting that they receive under-reported wages have no acquaintance with a similar work arrangement. However, 63% of them expect that only social contributions would apply to them if detected receiving under-reported wages and 59% of them estimate that the risk of being detected is high. Therefore, the tentative descriptive finding is only the level of sanction is linked to wage under-reporting.

However, these descriptive findings should be carefully interpreted considering that they can be influenced by the relative size of each population group in the total sample. To verify whether the socio-demographic variables and the policy-related variables are significantly associated with the prevalence of the under-declared wages, a logistic regression is employed. To ensure the reliability of the findings, an additive fashion is used. Model 1 in

Table 2 introduces the socio-demographic characteristics of the respondents, Model 2 the size of business they work for and Model 3 the individual characteristics related to the policy measures.

Starting with whether more vulnerable employees` groups are more likely to receive under-reported wages, the finding is that younger employees are more likely to receive under-reported wages than older groups. Similarly, employees from the less affluent regions (according to gross domestic product at current market prices or per inhabitant by Eurostat) are more likely to receive under-declared wages than those from more affluent regions. No significant relationship is identified in relation to education, occupation, work experience, number of children or income. Furthermore, and the opposite of what was expected, single employees are less likely to receive under-reported wages than those married or living with a partner and employees working in larger companies are more likely to receive under-reported wages than those working for small-sized companies (1-9 employees).

Moving to the policy related individual characteristics, the finding is that the deterrence measures derived from the rational economic actor explanation are not significantly associated with the prevalence of wage under-reporting. Employees who perceive higher sanctions and higher risk of detection are not less likely to receive under-reported wages (refuting hypotheses *H1a* and *H1b*). However, the social norm proves to be significantly associated with the participation in wage under-reporting. Employees who know at least one person engaging in wage under-reporting are more likely to engage themselves in compared with those not having such acquaintances (confirming hypothesis *H2*). The results remain broadly the same when multiple imputations of the missing values are used (Table A3 in the Appendix).

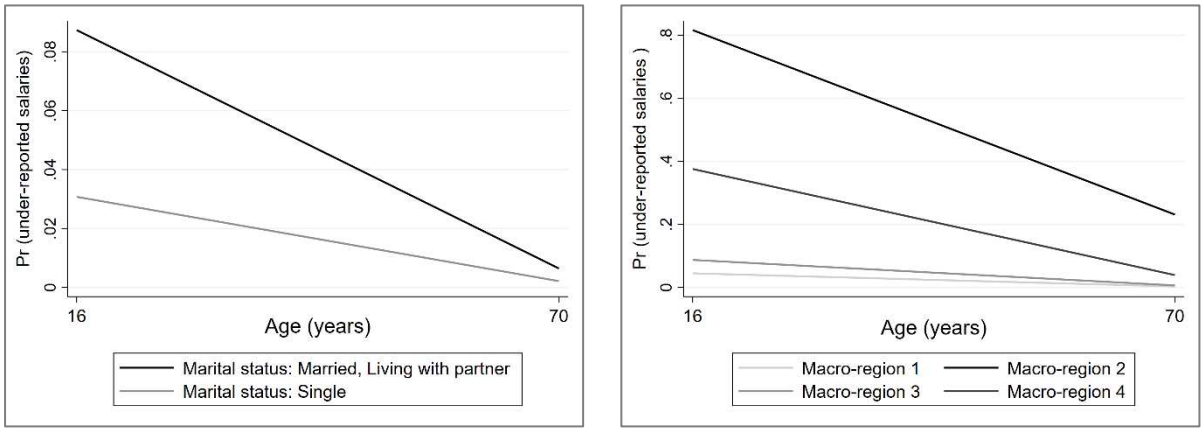
Table 2. Logistic regressions of the propensity to receive under-reported wages in the construction industry in Romania (crude data)

	Model 1			Model 2			Model 3		
Variables[1)]	β	se(β)	Exp(β)	β	se(β)	Exp(β)	β	se(β)	Exp(β)
Age (years)	-0.046***	0.014	0.956	-0.054***	0.015	0.947	-0.050***	0.017	0.951
Education[2)] (CG: ISCED 1, ISCED 2)									
ISCED 3, ISCED 4	-0.162	0.288	0.850	0.023	0.337	1.024	-0.042	0.399	0.959
ISCED 5-8	1.092	0.918	2.981	1.303	1.078	3.679	0.512	1.222	1.668
Occupation (CG: Unskilled worker)									
Skilled worker	-0.055	0.272	0.947	-0.309	0.310	0.734	-0.232	0.358	0.793
Team Leader[3)]	-0.555	0.730	0.574	-0.704	0.801	0.495	-0.045	0.857	0.956
Engineer[4)]	-0.162	1.037	0.851	-0.825	1.189	0.438	-0.131	1.320	0.877
Administrative staff, other	-0.468	1.161	0.626	-0.847	1.293	0.429	-0.052	1.412	0.950
Work experience (years)	0.004	0.011	1.004	0.003	0.012	1.003	0.003	0.013	1.003
Marital status (CG: Married, Living with partner)									
Single	-0.783***	0.303	0.457	-1.103***	0.335	0.332	-1.104***	0.385	0.331
Children (CG: none, 1)									
Two	0.162	0.287	1.176	0.372	0.309	1.451	0.384	0.357	1.468
Three or more	0.289	0.404	1.335	0.133	0.454	1.142	-0.133	0.539	0.876
Net income / month (CG: <500 EUR)									
500-700 EUR	0.195	0.317	1.216	0.621	0.388	1.860	0.473	0.439	1.604
701-1000 EUR	-0.276	0.419	0.759	0.181	0.486	1.199	0.004	0.556	1.004
> 1000 EUR	0.221	0.712	1.247	0.561	0.757	1.753	-0.054	0.860	0.947
Region of residence[5)] (CG: Macro-region 1)									
Macro-region 2	4.481***	0.724	88.35	4.403***	0.734	81.72	4.547***	1.027	94.33
Macro-region 3	0.441	0.846	1.554	0.309	0.852	1.362	0.712	1.116	2.038
Macro-region 4	2.107***	0.804	8.226	2.166***	0.809	8.720	2.550**	1.093	12.80
Employer size (CG: 1-9 employees)									
10-49 employees				0.723**	0.334	2.060	0.637*	0.377	1.891
50+ employees				1.628***	0.402	5.096	1.549***	0.451	4.708
Knowing employees[6)] receiving under-reported salaries (CG: No)									
Yes, one or two persons							1.617***	0.497	5.036
Yes, more than 2 persons							1.133***	0.318	3.106
Expected sanctions (CG: None)									
Social contribution due and/or fine							1.211*	0.680	3.357
Prison							-0.082	1.274	0.921
Other sanction							-0.094	1.096	0.911
Don`t know							0.741	0.739	2.098
Expected risk of detection (CG: Low)									
High							-0.403	0.350	0.668
Don`t know							0.036	0.606	1.036
Constant	-2.980***	0.917		-3.799***	0.984		-5.238***	1.473	
Observations			1,069			1,040			957
Pseudo R^2			0.3693			0.3826			0.4360
Log likelihood			-253.27			-219.39			-173.34
χ^2			296.55			271.89			268.03
p>			0.0000			0.0000			0.0000

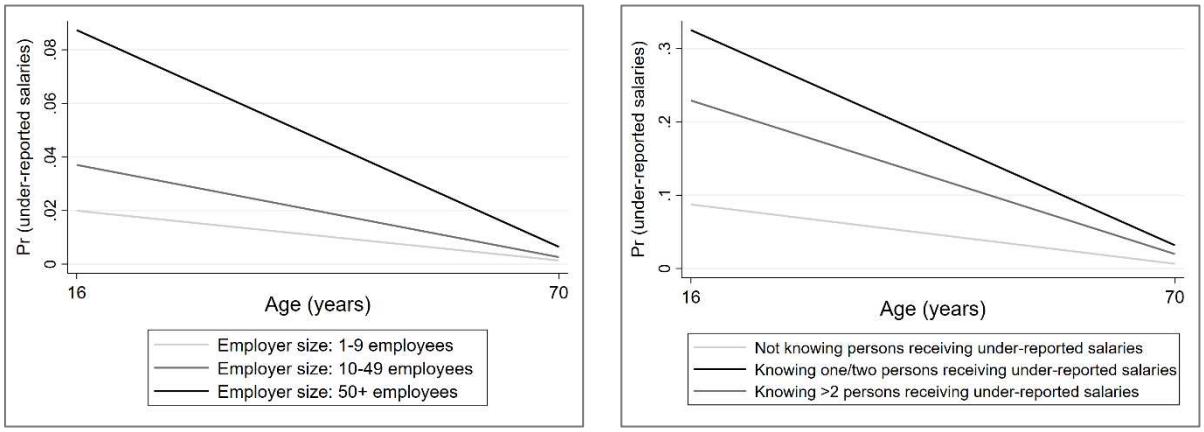
Notes: Significant at *** p<0.01, ** p<0.05, * p<0.1; [1)] Dependent variable: value 1 if the employee reported any of the four types of under-declared: fixed undeclared supplement, variable undeclared income by professional achievements, income varying by the total worked hours, only a fixed amount declared, occasional undeclared payments for holiday allowances, bonuses; [2)] ISCED 1: Primary education; ISCED 2: Secondary lower education; ISCED 3: Secondary superior education; ISCED 4: Non-university tertiary education; ISCED 5-8: Higher education; [3)] Team Leader / Technician / Foreman; [4)] Engineer / Architect / Site Manager; [5)] NUTS 1 regions - according to the NUTS classification (Nomenclature of territorial units for statistics); Macro-region 1 (North-West, Centre), Macro-region 2 (North-East, South-East), Macro-region 3 (South, Bucharest-Ilfov), Macro-region 4 (South-West, West); [6)] in the construction industry.

Source: own calculation

To enable a better understanding of the effect of the significant variables, predicted probabilities of receiving under-reported salaries for a "representative" employee working in the construction industry in Romania are displayed in Figure 1. This shows that with aging, the effect of these significant variables reduces.



a) Marital status **b) Region of residence**



c) Employer size (no. of employees) **d) Knowing employees receiving under-reported salaries**

Figure 1. Predicted probability of receiving under-reported wages for a "representative" employee working in the construction industry in Romania: by age and marital status, region of residence, employer size, knowing other employees receiving under-reported salaries in the construction industry

Note: the representative employee working in the construction industry in Romania (mode or mean for the variables in the analysis) – 41 years old skilled worker with 15-year work experience, with secondary superior or non-university tertiary education, married or living with partner, with two children, working for an employer with 10-49 employees for a net monthly income between 500-700 EUR, living in macro-region 3, not knowing other employees receiving under-reported salaries and who considers as high the expected risk of being detected and who expect social contribution due and/or fine as sanction for under-reported salaries.

Source: own calculation

To further understand the decision-making process, Figure 2 unfolds the layers of a classification tree model (commonly labeled as CART for classification and regression tree). The tree is pruned to consider the most important variables, considering the set of complexity parameters (Breiman et al. 2017). Each node shows the following information: the predicted class (1 – the individual received any type of under-declared wages, respectively 0 – did not receive any), the predicted probability of receiving under-reported wages and the percentage of observations in the node.

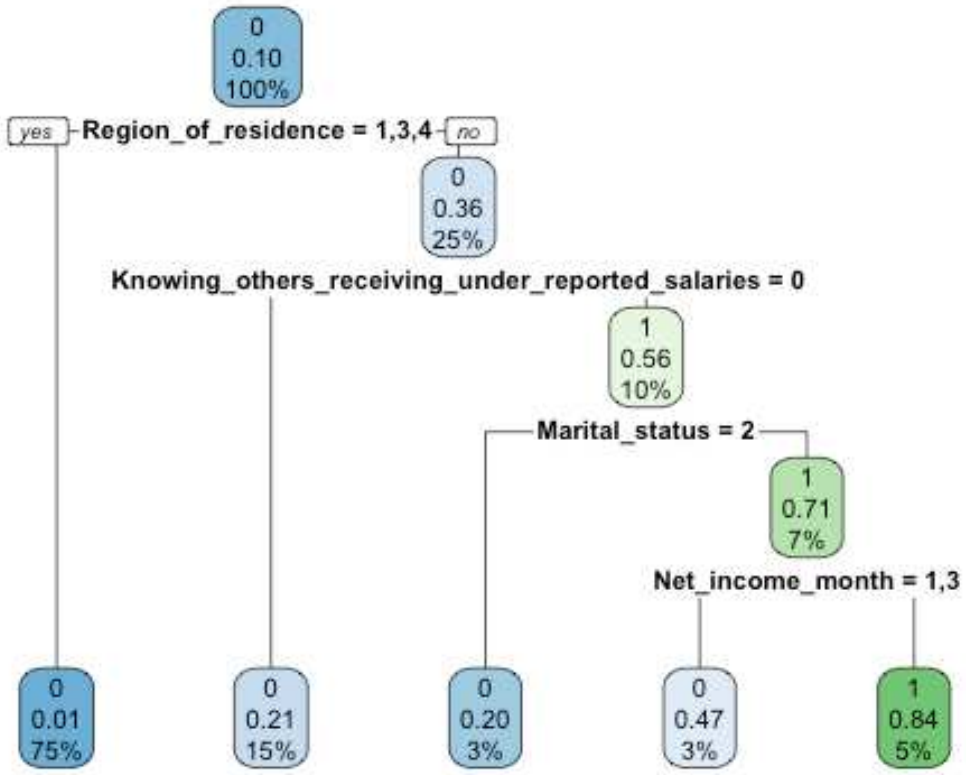


Figure 2. Decision tree for receiving under-reported wages in the construction industry in Romania

Source: own calculation

The tree illustrates the socio-economic environment as being the dominant force explaining the likelihood of under-reported wages. Namely, the region of residence generates the first split. Individuals living in macro-regions 1, 3 and 4 (considered affluent regions) have a higher likelihood not to receive under-reported wages, while for those living in macro-region 2 (the region with the lowest level of economic development in the country), the tree highlights social norms as the next most important causal factor. This variable points out that being acquainted with at least one person receiving under-reported wages further influences one's decision to do so (the predicted probability of receiving under-reported wages is 0.56). The third relevant variable is marital status, and the fourth is monthly net income: for those that are married/with partner (category 1 of the marital status variable) the predicted probability of receiving under-reported wages rises to 0.71 for those with a monthly income between 500-700 EUR and for those earning more than 1000 EUR (categories 2 and 4), the probability further increases to 0.84. The model has a good accuracy, with an area under a ROC curve (AUC) of 0.82 (thus it predicts 81% of the observation correctly), Its performance further improves to 0.91 through a random forest model with 200 simulations (thus avoiding the overfitting tendency and generating predictions with lower variance, Buskirk, 2018).

5. Discussion and Conclusions

This paper has aimed to shed light on the issue of under-reporting wages in the construction industry. Employing a mixed methods strategy, the finding is that amongst the various types of undeclared work, under-reporting wages is by far the most common type used in the construction industry (12% of the respondents declaring they receive under-reported wages from the total of 17% who reported engagement in any form of undeclared work). This is in line with other previous studies which identify a higher prevalence of under-reported wages

compared with other forms of undeclared work (e.g., 39% to 52% of the total undeclared economy in the Baltic countries, Putninš and Sauka 2015). Similarly, according to the Special Eurobarometer survey conducted in 2019, more than 30% of the workers in the European Union declared a form of under-reported wage (Cichocki and Franić 2022) compared with only 3% of respondents undertaking undeclared paid work (European Commission 2020). Furthermore, the practice of under-reporting wages is not homogeneous as treated in previous studies (Franić and Cichocki 2022; Williams and Horodnic 2017a, 2017b; Williams and Padmore 2013) but rather has a variegated character. The most common type of wage under-reporting in the construction industry is receiving a monthly fixed undeclared supplement to the official wage registered in the working contract (5% of the respondents), while the least common type is receiving occasional undeclared payments for holiday allowances, bonuses, or 13th salary (1% of respondents).

Investigating whether more vulnerable groups of employees are more likely to receive under-reported wages (Chavdarova 2014; Round et al. 2008; Sasunkevich 2014; Williams and Horodnic 2017a, 2017b; Williams and Padmore 2013) the finding is that this assumption holds true only in respect to younger groups and those living in more deprived regions (the second result mirrors the higher prevalence of informal payments in public health found in such deprived areas; Tomini and Groot 2013). Meanwhile, there are no differences in relation to education, occupation, work experience, number of children or income, suggesting that the practice is equally prevalent amongst all employee groups. Surprising, and in opposition to expectations, employees working in larger companies are more likely to receive under-reported wages compared with those working in smaller companies. However, this might suggest that those in smaller size companies use more unregistered employment than under-declared wages.

Turning to how this prevalent practice in the construction industry could be curbed, the finding is that the deterrent measures do not prove to be efficient. No significant relationship exists between how an employee perceives the level of sanction and the risk of detection and their likelihood of engaging in wage under-reporting. This is not surprising considering that only some of the studies on undeclared employment found support for deterrent measures, while the previous studies on under-declared wages found a weak or no relationship between participation in this practice and the level of deterrents (Franić 2019; Hartl et al. 2015; Williams and Bezeredi 2017; Williams and Horodnic 2016; Williams and Yang 2017). Meanwhile, the results reveal a high importance of social norms when explaining participation in wage under-reporting. As such, those who have acquaintances who receive under-reported wages are more likely to engage themselves in this wage arrangement, adhering as such to informal practices, as previous findings suggest (Bicchieri and Dimant 2019; Lefebvre et al. 2015; Traxler 2010). This finding is not surprising considering that a previous study conducted in Romania and the UK show that workers in the construction industry have higher acceptability of undeclared work practices and the perception of the prevalence of non-compliance behavior is perceived as higher compared with the perception of workers in other sectors (Horodnic and Williams 2019). Furthermore, perceiving a high spread of uncompliant practices in a society influences the individuals` decision of adopting a similar behavior because the individuals fear less the possible consequences of being caught and punished (Horodnic and Williams 2022). In addition, when citizens perceive a high level of corruption, they engage in undeclared work practices regardless of the potential costs (i.e., the risk of detection and the sanction) because they expect that the enforcement agents can be bribed and therefore, nothing severe will happen to them or their business (Horodnic and Williams 2019).

These findings therefore, suggest that in order to tackle wage under-reporting, instead of aiming at punitive deterrent measures, a high commitment culture should be nurtured in order to improve workers social norms to reduce the acceptability of this practice (Williams and Horodnic 2017b). As such, policy measures aimed at increasing workers trust that their peers are compliant are required (Mathieu et al. 2010). These might include information and educational campaigns and using notification letters. Indeed, natural field experiments showed that notification letters based on enhancing social norms (i.e. "nine out of ten people in the UK pay their tax on time. You are currently in the very small minority of people who have not paid us yet") prove to be effective in tax compliance issues (Hallsworth et al. 2017; Ianole 2016). Initiatives on changing the social norms in the construction industry using informational and educational campaigns have been implemented in countries such as Bulgaria, Germany and Portugal (Venturi 2017).

If this paper stimulates other researchers to investigate the issue of wage under-reporting in other regional spaces and sectors, then it will have accomplished its main purpose. If the paper also stimulates enforcement bodies to acknowledge the multifarious forms of wage under-reporting and that measures aimed at improving social norms are required, then the paper will have accomplished its wider purpose.

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Appendix

Table A1. Variables in the analysis (n = 1,212)

Variable	Code	Mode or mean
Under-reported salaries	0 – No 1 – Yes	No (88%)
Age	years (the exact age of the respondent)	41 years
Education	1 – ISCED 1: Primary education; ISCED 2: Secondary lower education 2 – ISCED 3: Secondary superior education; ISCED 4: Non-university tertiary education 3 – ISCED 5-8: Higher education	ISCED 3, ISCED 4 (72%)
Occupation	1 – Unskilled worker 2 – Skilled worker 3 – Team Leader / Technician / Foreman 4 – Engineer / Architect / Site Manager 5 – Administrative staff, other	Skilled worker (57%)
Work experience	years	15 years
Marital status	1 – Married, Living with partner 2 – Single	Married, Living with partner (62%)
Children	1 – None, 1 2 – Two 3 – Three or more	Two (63%)
Net income / month	1 – <500 EUR 2 – 500-700 EUR 3 – 701-1000 EUR 4 – > 1000 EUR	500-700 EUR (62%)
Region of residence	1 – Macro-region 1 (North-West, Centre) 2 – Macro-region 2 (North-East, South-East) 3 – Macro-region 3 (South, Bucharest-Ilfov) 4 – Macro-region 4 (South-West, West)	Macro-region 3 (36%)
Employer size	1 – 1-9 employees 2 – 10-49 employees 3 – 50+ employees	10-49 employees (50%)
Knowing employees receiving under-reported salaries	1 – No 2 – Yes, one or two persons 3 – Yes, more than 2 persons	No (70%)
Expected sanctions	1 – None 2 – Social contribution due and/or fine 3 – Prison 4 – Other sanction 5 – Don`t know	Social contribution due and/or fine (56%)
Expected risk of detection	1 – Low 2 – High 3 – Don`t know	High (78%)

Source: own calculation

Table A2. Multiple imputation for missing data

Variable	Complete	Imputed	Total
Under-reported salaries	1174	38	1212
Age	1208	4	1212
Education	1206	6	1212
Occupation	1208	4	1212
Work experience	1212	0	1212
Marital status	1208	4	1212
Children	1207	5	1212
Net income / month	1114	98	1212
Region of residence	1212	0	1212
Employer size	1164	48	1212
Knowing employees receiving under-reported salaries	1119	93	1212
Expected sanctions	1194	18	1212
Expected risk of detection	1210	2	1212

Source: own calculation

Table A3. Logistic regressions of the propensity to receive under-reported salaries in the construction industry in Romania (imputed data)

	Model 1i			Model 2i			Model 3i		
Variables	β	se(β)	Exp(β)	β	se(β)	Exp(β)	β	se(β)	Exp(β)
Age (years)	-0.045***	0.013	0.956	-0.050***	0.013	0.952	-0.045***	0.014	0.956
Education[1)] (CG: ISCED 1, ISCED 2)									
ISCED 3, ISCED 4	-0.095	0.282	0.910	-0.093	0.296	0.911	-0.189	0.314	0.828
ISCED 5-8	1.125	0.862	3.081	1.090	0.945	2.975	0.507	0.986	1.660
Occupation (CG: Unskilled worker)									
Skilled worker	-0.109	0.263	0.897	-0.246	0.277	0.782	-0.271	0.300	0.762
Team Leader[2)]	-0.153	0.608	0.858	-0.285	0.640	0.752	0.032	0.667	1.032
Engineer[3)]	-0.200	0.977	0.818	-0.641	1.049	0.527	-0.218	1.072	0.804
Administrative staff, other	-0.740	1.044	0.477	-0.962	1.120	0.382	-0.445	1.172	0.641
Work experience (years)	0.008	0.008	1.008	0.004	0.009	1.004	0.007	0.009	1.007
Marital status (CG: Married, Living with partner)									
Single	-0.778***	0.300	0.459	-0.889***	0.304	0.411	-0.779**	0.316	0.459
Children (CG: none, 1)									
Two	0.162	0.282	1.175	0.250	0.289	1.284	0.257	0.303	1.293
Three or more	0.325	0.385	1.384	0.334	0.404	1.397	0.309	0.429	1.362
Net income / month (CG: <500 EUR)									
500-700 EUR	0.144	0.306	1.155	0.062	0.319	1.064	0.071	0.334	1.073
701-1000 EUR	-0.454	0.420	0.635	-0.547	0.431	0.578	-0.704	0.452	0.495
> 1000 EUR	0.040	0.700	1.041	-0.091	0.707	0.913	-0.695	0.772	0.499
Region of residence[4)] (CG: Macro-region 1)									
Macro-region 2	4.581***	0.722	97.57	4.660***	0.731	105.6	4.410***	0.730	82.28
Macro-region 3	0.403	0.838	1.497	0.351	0.844	1.420	0.115	0.846	1.122
Macro-region 4	2.093***	0.800	8.109	2.165***	0.808	8.712	2.049**	0.813	7.758
Employer size (CG: 1-9 employees)									
10-49 employees				0.684**	0.333	1.982	0.604*	0.351	1.830
50+ employees				1.538***	0.381	4.653	1.462***	0.407	4.316
Knowing employees[5)] receiving under-reported salaries (CG: No)									
Yes, one or two persons							1.300***	0.476	3.668
Yes, more than 2 persons							1.060***	0.298	2.886
Expected sanctions (CG: None)									
Social contribution due and/or fine							1.035*	0.625	2.816
Prison							-0.854	1.245	0.426
Other sanction							0.234	0.919	1.264
Don`t know							1.062	0.662	2.891
Expected risk of detection (CG: Low)									
High							-0.333	0.312	0.717
Don`t know							-0.289	0.484	0.749
Constant	-3.070***	0.927		-3.469***	0.949		-4.419***	1.173	
Observations			1,212			1,212			1,212
Imputations			10			10			10
F			8.91			7.91			5.76
Prob. > F			0.000			0.000			0.000

Notes: Significant at *** p<0.01, ** p<0.05, * p<0.1; [1)] ISCED 1: Primary education; ISCED 2: Secondary lower education; ISCED 3: Secondary superior education; ISCED 4: Non-university tertiary education; ISCED 5-8: Higher education; [2)] Team Leader / Technician / Foreman; [3)] Engineer / Architect / Site Manager; [4)] NUTS 1 regions - according to the NUTS classification (Nomenclature of territorial units for statistics); Macro-region 1 (North-West, Centre), Macro-region 2 (North-East, South-East), Macro-region 3 (South, Bucharest-Ilfov), Macro-region 4 (South-West, West); [5)] in the construction industry.

Source: own calculation