

## TAX EVASION AND CASH PAYMENT CAP. DOES REALLY EXIST A RELATIONSHIP?

**Fabrizio Antolini<sup>1</sup>**

*Department of Business Communication, University of Teramo, Campus Aurelio Saliceti, Via Renato Balzarini, 1- Teramo, Italy. ORCID: 0000-0002-3112-524X*

**Samuele Cesarini**

*Department of Business Communication, University of Teramo, Campus Aurelio Saliceti, Via Renato Balzarini, 1- Teramo, Italy. ORCID: 0000-0001-7062-1580*

**Abstract.** *The shadow economy, which falls under the broader definition of the unobserved economy, has not found a univocal interpretation of the causes of its origin and evolution over time. The analysis becomes more difficult when extended to European countries, which differ in terms of the culture and structure of their tax systems. Despite this, to squelch a phenomenon related to the shadow economy, such as tax evasion, the European Commission has repeatedly stressed that the introduction of a cap on cash payments could be a possible tool for reducing tax evasion. Over time, different methodologies have been used to estimate both the unobserved economy and tax evasion, although the results have nonetheless converged. This does not happen in the formulation of country tax gap rankings, which change depending on whether tax evasion is used in relation to Gross Domestic Product or population. The purpose of this paper is to investigate the relationship between the levels of tax evasion and the introduction of the cash cap limits in the European countries. The existing tax regulations are different across the countries and not all have placed limits on cash payments. From the econometric estimation, the relationship between the existence of cash payment limits and the reduction in evasion was confirmed only for a threshold exceeding five thousand euros. The other variables considered – such as the tax burden on enterprises and families and the efficiency of the tax system – produce, instead, effects of a very different magnitude.*

**Keywords:** *Shadow economy; digital payments; tax gap; tax burden*

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<sup>1</sup> Corresponding author: Fabrizio Antolini, e-mail: fantolini@unite.it.

## 1. INTRODUCTION

The shadow economy, or grey economy, is that part of the economy that avoids taxation because it frequently goes undetected (Schneider, 2011; International Monetary Fund [IMF], 2017; 2020). Initially, this term was used (Lewis, 1955) to describe unstructured forms of employment in developing countries, mainly concentrated in the service and agricultural sectors. Over time, different theories and definitions have been used to explain the causes of the shadow economy (Andrews et al., 2011; Deléchat and Medina, 2021; Dell'Anno, 2021; Elgin, 2020; Marinescu, 2019; Morales, 1997). For example, the *dualists* argue that people working in the informal sector are those who have been unable to enter the workforce due to a lack of the required technical skills. The *legalists* and *structuralists*, on the other hand, believe that it is the complex functioning of the legal system (e.g., excessive bureaucracy, high tax burden, and high labour costs) that induces workers to enter the underground economy, while finally, the *voluntarists* base it on an economic assessment of the costs and benefits associated with carrying out shadow economic operations.

The measurement of the shadow economy was addressed systematically by the European National Statistical Institutes (INs) in 1987, although it was not until 1989 that the first directive on *exhaustiveness* (89/130 EEC) was issued. The intention of this directive was that the shadow economy should be included in the calculation of gross domestic product (GDP) by countries adopting the European System of Accounts (ESA). In that period, the definition of shadow economy was a fuzzy definition, since:

“[...] Also called the underground, informal, or parallel economy, the shadow economy includes not only illegal activities but also unreported income from the production of legal goods and services, either from monetary or barter transactions. Hence, the shadow economy comprises all economic activities that would generally be taxable were they reported to the tax authorities [...]” (IMF, 2017/20).

During this same period, the concept of the *not directly observed economy* (NOE) was introduced by the United Nations in the System of National Accounts (SNA), considering NOE as the sum of underground economy (business and/or labor activities not known to the public administration, such as tax or contribution evasion), the informal economy (production activities that

are legal but characterized by strong precariousness) and finally, the illegal economy (economic activities prohibited by law, or legal but carried out by unauthorized persons). The official definition was analytically reported a few years later, by OECD (2002) that classified not observed economy as in the SNA, articulating in underground economy, illegal economy and informal economy (the equivalent of shadow economy for IFM)

Although in its 1993 formulation the SNA (United Nations, 1993) had already included the illegal economy in the calculation of GDP, it was only in 2014 that national accounting systems officially included it. The concept of final domestic production (GDP) ignores any moralistic consideration and requires, as its only constraint, the existence of supply and demand. This explains why cigarette and alcohol smuggling, drug trafficking, and prostitution services are included in the GDP, while the same is not true of kidnapping. The measure of NOE is important for the credibility of GDP and more in general of national accounts estimates (OECD, 2002). Several problems are met in the NOE measurement, the first is a problem of the definition of what is to be measured. This lack of precision about the measurement target is evident looking at the range of different terms in common use – hidden economy, shadow economy, parallel economy, subterranean economy, informal economy, cash economy, black market. There is no common understanding whether they all mean the same thing and what type of relation exists with tax evasion, shuttle trade, or illegal activities. The second problem is that the estimation methods and the data sources utilized by the national statistical institutes are not always the same. Consequently, the macro-models used by the INs are not always sufficiently explained. For instance, several approaches have been used to estimate the *informal economy* (Elgin et al., 2021), defined as the market-based and legal production of goods and services that are hidden from public authorities for monetary, regulatory, or institutional reasons (Schneider et al., 2010). Among indirect methods for estimation, Schneider (2010) suggests the Multiple Indicators Multiple Causes (MIMIC) model, a structural equations model that can be used to estimate the relative size of informal economic activity. In contrast, the Dynamic General Equilibrium (DGE) model considers how optimizing households will allocate labor between formal and informal economies in each period and how the allocation will change over time (Elgin and Oztunali, 2014; Ihrig and Moe, 2004). However, both methodologies have their limitations (Elgin and Oztunali, 2014). Table 1 presents the values of the

informal economy as estimated by applying the two different methodologies to the 27 states of the European Union in 2018 (the latest available period). In the official sources, these figures are reported only as a percentage of GDP. The absolute values were therefore obtained by considering the GDP recorded for the various countries in 2018. In Italy, for example, the GDP was 1,771 billion euro. Table 1 shows that when the MIMIC and DGE models are applied, the derived estimates do not necessarily coincide with those of the respective NSIs. For example, if again we consider the Italian National Institute of Statistics (ISTAT), the unobserved economy officially recorded in 2018 was 211 bn, of which 191.7 bn was the shadow economy, 91 percent of which was due to tax evasion (ISTAT, 2020). The same estimates obtained from MIMIC (28.41%) and DGE (26.08%) in relation to Italy's 2018 GDP lead to values of 503 bn and 462 bn, respectively.

Making a cross-country comparison, estimates expressed as a percentage of GDP (Table 1) indicate that Italy (28.41% and 26.08%), Lithuania (28.54% and 27.95%), Estonia (29.19% and 27.48%), Greece (29.35% and 26.17%), Croatia (29.96% and 28.66%), Romania (30.27% and 26.55%) and Bulgaria (31.75% and 27.84%) are the countries with the highest shadow economy rates. If, however, we look at estimates of the shadow economy in absolute value (billions of euro), the countries with the highest values are Germany (509.54 and 506.14), Italy (503.33 and 461.99), France (349.49 and 332.17) and Spain (269.13 and 249.49). Finally, when the estimates of absolute values are related to the resident population (per capita), the ranking of the countries changes again; now it is Luxembourg (with 9,776 and 8,858 euro per capita, as calculated by the two models), Ireland (9,593 and 9,194 euro), Denmark (8,889 and 8,554 euro), Belgium (8,701 and 8,205 euro), Sweden (8,621 and 8,038 euro) and Italy (8,415 and 7,724 euro) that have the highest share of the undeclared per capita economy.

**Table 1 - MIMIC and DGE shadow (informal) economies estimates in EU countries (year 2018)**

Country	MIMIC			DGE		
	% GDP	Total	Per capita	% GDP	Total	Per capita
Austria	9.51	36.66	4,138	9.24	35.61	4,020
Belgium	21.67	99.67	8,701	20.43	94.00	8,205
Bulgaria	31.75	17.85	2,550	27.85	15.66	2,237
Croatia	29.96	15.80	3,877	28.66	15.12	3,709
Cyprus	27.67	6.00	6,847	25.23	5.47	6,243
Czech Republic	16.96	35.79	3,360	16.57	34.96	3,283
Denmark	17.07	51.62	8,890	16.43	49.67	8,554
Estonia	29.19	7.57	5,713	27.48	7.13	5,379
Finland	17.79	41.52	7,525	16.10	37.58	6,810
France	14.79	349.49	5,194	14.06	332.17	4,936
Germany	15.14	509.55	6,138	15.04	506.15	6,097
Greece	29.35	52.70	4,914	26.18	47.00	4,382
Hungary	22.78	30.99	3,171	23.22	31.60	3,233
Ireland	14.40	47.05	9,593	13.81	45.09	9,194
Italy	28.41	503.33	8,415	26.08	461.99	7,724
Latvia	26.37	7.69	4,003	26.04	7.59	3,954
Lithuania	28.54	12.99	4,650	27.92	12.71	4,547
Luxembourg	9.98	6.00	9,776	9.05	5.44	8,858
Malta	23.96	3.10	6,287	24.94	3.23	6,545
Netherlands	13.05	101.00	5,844	12.57	97.32	5,631
Poland	24.66	123.03	3,240	23.28	116.15	3,059
Portugal	21.04	43.18	4,202	22.58	46.33	4,509
Romania	30.27	62.38	3,213	26.56	54.73	2,819
Slovak Republic	16.61	14.93	2,738	16.14	14.50	2,661
Slovenia	24.43	11.21	5,385	24.26	11.13	5,347
Spain	22.36	269.13	5,734	20.72	249.49	5,315
Sweden	18.74	88.19	8,621	17.47	82.23	8,038

Source: Data elaboration on CERP discussion paper "Understanding Informality" (Elgin et al. 2021.)

Whichever the methodology is utilized, there is no doubt that the existence of the unobserved economy creates a loss of tax revenue for the economic system, a distortion in the functioning of markets and, therefore, in their productivity levels. However, without a careful preliminary analysis of the causes that incentivize the shadow economy, the introduction of limits and rules in the payment system could not be a solution to catch the hidden economy.

The paper is structured as follows. In Section 2, we delve deeper into the economic rationale behind the European Commission's endorsement of cash payment limits. This section includes a comparative analysis of tax structures across different European countries and discusses the balance between tax burden and social benefits. In Section 3, a comprehensive analysis of the relationship between cash payment limits and the tax compliance gap in Europe is presented. An econometric estimation to taste the relationship between tax evasion and cash payment caps, has been applied considering two different models. Finally, the paper concludes in Section 4 with a discussion on the broader implications of our findings.

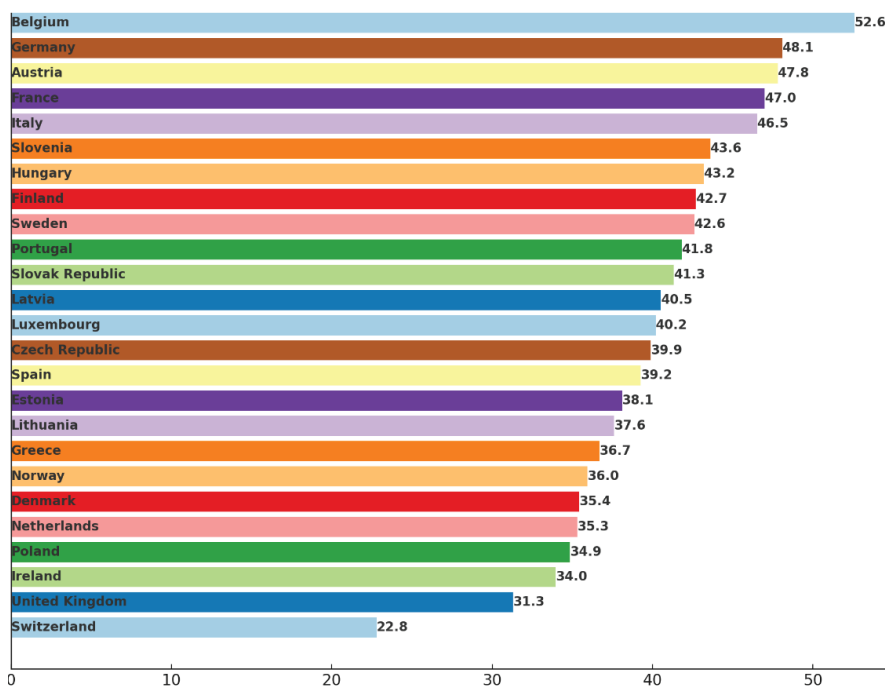
## **2. ECONOMIC ENVIRONMENT AND THE EUROPEAN POSITION ON THE CASH PAYMENT CAP**

The European Commission has repeatedly stressed the appropriateness of introducing limits on cash payments in countries that are part of the European Union, considering it a useful approach for thwarting money laundering. The introduction of regulations on how transactions are settled, favoring card transactions, is intended to act as a deterrent. In February 2016, the Commission released a communication to the Council and Parliament on an action plan to intensify the struggle against terrorist financing (European Commission, 2016). This action plan states that ‘cash payments are widely used for the financing of terrorist activities. In this context, the relevance of potential upper limits for cash payments could also be examined’. Subsequently, on February 12, 2016, the Economic and Financial Affairs Council endorsed this and invited the Commission to assess the need to introduce appropriate restrictions on cash payments exceeding specified thresholds. Several member states, taking up these suggestions, introduced prohibitions on cash payments above a specific threshold to inhibit the anonymity of cash transactions that facilitate and incentivize the underground economy and more in general, the

NOE. This position, however, has not been supported by the evidence and, in fact, very different positions are held on the issue. For example, the IMF believes:

*“Hence, the higher the tax burden and labor costs, the more incentives individuals have to avoid these costs by working in the shadow economy”* (IMF, 2017).

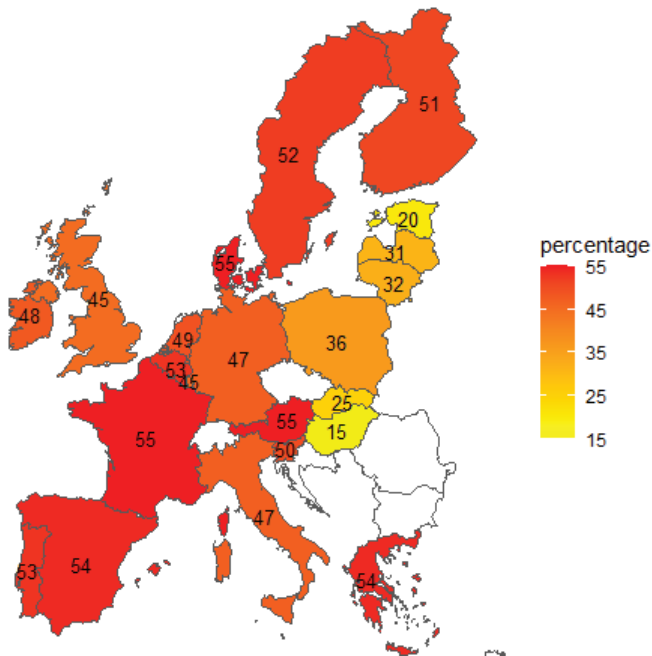
The tax burden (tax and social security contributions) existing in European countries is shown in Figures 1 and 2, which show the level of the tax wedge and tax burden, respectively. Concerning the tax wedge expressed as a percentage of labor costs, in the highest quartile, we find Italy (46.5%), France (47.0%), Austria (47.8%), Germany (48.1%) and Belgium (52.6%). However, this indicator cannot be used as a proxy for the effectiveness and efficiency of public economic and welfare systems since this type of analysis should also consider the level and quality of the social benefits provided.



**Figure 1 - Tax wedge (%) of labour costs (year 2021)**

Source: Organisation for Economic Co-operation and Development (OECD) data elaboration

With regard to the tax burden (Figure 2), and considering, in particular, the tax rates on personal income in the major European countries, these exceed the 50% threshold in Denmark, France, Austria, Greece, Spain, Belgium and Portugal. Italy ranks fourteenth among the European countries considered, with a personal tax rate of 47.2%. The Czech Republic, Estonia and Hungary close the ranking with values below 25%.



**Figure 2 - Tax rates on personal income (%) in some European Countries (year 2021)** Source: OECD data elaboration

Extending the analysis to the taxation of corporate profits, Table 2 shows the corporate tax rate, following the prescribed statutory rates at various levels of government.

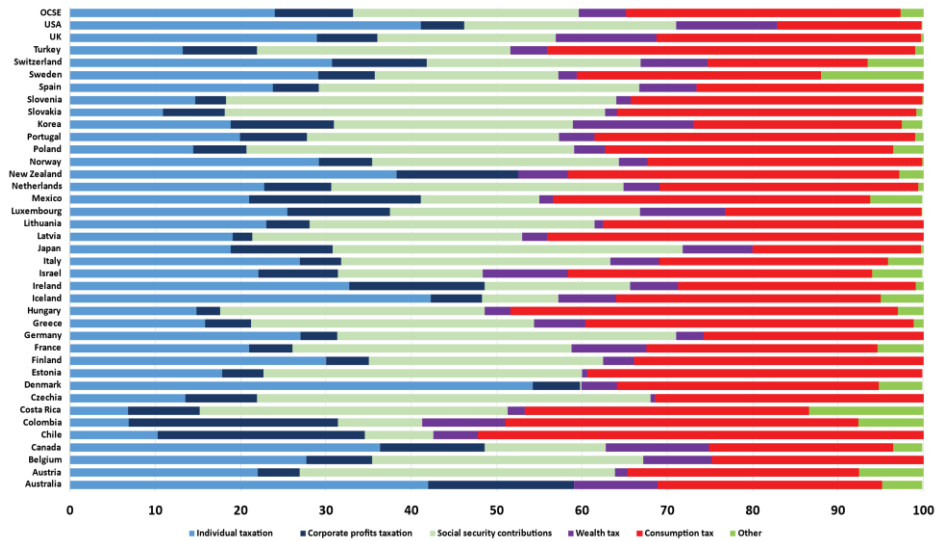


**Table 2 - Corporate tax rate (year 2022)**

Country	Central	Sub	Total	Country	Central	Sub	Total
Austria	25.00	-	25.00	Latvia	20.00	-	20.00
Belgium	25.00	-	25.00	Luxembourg	18.19	6.75	24.94
Denmark	22.00	-	22.00	Netherlands	25.80	-	25.80
Finland	20.00	-	20.00	Norway	22.00	-	22.00
France	25.83	-	25.83	Poland	19.00	-	19.00
Germany	15.83	14.01	29.83	Portugal	30.00	1.50	31.50
Greece	22.00	-	22.00	Slovak Republic	21.00	-	21.00
Hungary	9.00	-	9.00	Spain	25.00	-	25.00
Ireland	12.50	-	12.50	Sweden	2.60	20.60	20.60
Italy	24.00	3.90	27.81	Switzerland	8.50	12.87	19.70

Source: OECD data

Not all European countries impose regional or territorial taxes on companies; however, by combining the two tax levels, it is possible to get a comprehensive overview. Italy again ranks in the highest quartile (27.8%), just behind Portugal (31.5%) and Germany (29.8%). Ireland (12.5%) and Hungary (9.0%) show the lowest values, thus influencing the flow of foreign direct investment. Overall, the tax burden in some countries, such as Italy, Luxembourg, Finland, and Australia (Fig. 3), is characterized by an unbalanced composition of the state's tax revenue. If we look at Italy, a country which, as we will have the opportunity to analyze, has a high tax gap, individual taxation contributes 26.9% of total revenue (24.0% is the average figure for OECD countries), taxation of corporate profits accounts for 4.9% (cf. 9.2% in OECD countries), social contributions account for 31.5% (cf. 26.4% in OECD countries), wealth tax accounts for 5.7% (cf. 5.6% in OECD countries) and finally, consumption tax accounts for 26.9% (cf. 32.1% in OECD countries).



**Figure 3 - Typologies of taxation in some OECD countries (year 2020 – percentage values)**

*Source: OECD data elaboration*

Despite the European Commission's contention that they would act as a measure to curb money laundering operations, restrictions on cash payments are not applied uniformly in EU countries. Some countries (Table 3) prohibit cash payments above a certain threshold, while others do not. In September 2022, the European Consumer Centres Network (ECC), a body set up by the European Commission and the Member States to provide assistance to consumers, reported information on 30 European states, of which 27 are part of the EU, and including Iceland and Norway (ECC, 2022). Of the 30 states, only 17, which include Italy, have cash limits in force. These are mostly the southern European countries, except for Belgium and some Eastern European states.

At the top of the list of European countries with a higher limit on the use of cash is Croatia, with 15,000 euro, followed by the Czech Republic and Malta, with 10,000 euro each. A high use of cash is also authorized in Latvia (7,200 euro), Bulgaria, Slovakia, and Slovenia (5,000 euro). Italy (2,000 euro), Romania, France, and Spain (1,000 euro) hold the lowest positions, other than Greece (500 euro). Austria, Cyprus, Estonia, Finland, Germany, Hungary,

Iceland, Ireland, Luxembourg, the Netherlands, Sweden, and the United Kingdom have no limits on cash circulation.

**Table 3 - Limits on cash payments in Europe (year 2022 – values in euro)**

Country	Private	Trade	Country	Private	Trade
Austria	-	-	Italy	2,000	2,000
Belgium	-	3,000	Latvia	7,200	7,200
Bulgaria	5,108	5,108	Lithuania	3,000	3,000
Croatia	15,000	15,000	Luxembourg	-	-
Cyprus	-	-	Malta	10,000	10,000
Czech Republic	10,509	10,509	Netherlands	-	-
Denmark	-	2,689	Norway	-	3,841
Estonia	-	-	Poland	-	3,267
Finland	-	-	Portugal	3,000	3,000
France	1,000	1,000	Romania	10,165	1,016
Germany	-	-	Slovakia	15,000	5,000
Greece	500	500	Slovenia	-	5,000
Hungary	-	-	Spain	10,000	1,000
Iceland	-	-	Sweden	-	-
Ireland	-	-	United Kingdom	-	-

Source: European Consumer Centres Network

It is widely believed that electronic payments are more likely to be used in Nordic countries, but the available information (Table 4) does not support this conclusion (European Central Bank, 2021). The value of other payment services is not reported.

**Table 4 - Main payment instruments (%) in EU countries (year 2021)**

Country	AT	BE	BG	HR	CY	CZ	DK	EE	FI	FR
<b>Card</b>	51.5	52.0	-	-	69.5	-	-	63.9	61.6	59.3
<b>Credit transfer</b>	27.0	36.0	-	-	18.3	-	-	29.8	38.4	17.9
<b>Direct debits</b>	19.4	10.2	-	-	-	-	-	-	-	18.5
<b>E-money</b>	0.2	0.9	-	-	3.5	-	-	-	-	0.2
<b>Cheques</b>	0.0	0.0	-	-	3.1	-	-	-	0.0	4.1
Country	DE	GR	HU	IS	IE	IT	LV	LT	LU	MT
<b>Card</b>	30.3	69.5	-	-	62.4	52.5	62.8	68.4	4.9	54.4
<b>Credit transfer</b>	26.1	22.4	-	-	17.2	17.4	34.0	17.4	1.4	19.3
<b>Direct debits</b>	43.1	1.2	-	-	6	11.5	0.0	1.0	0.4	-
<b>E-money</b>	0.1	2.2	-	-	11.7	15.7	-	10.2	93.3	11.6
<b>Cheques</b>	0.0	0.2	-	-	0.8	0.9	0.0	-	0.0	4.7
Country	NL	NO	PL	PT	RO	SK	SI	ES	SE	UK
<b>Card</b>	49.2	-	-	72.2	-	56.5	51.6	66.4	-	-
<b>Credit transfer</b>	34.2	-	-	13.4	-	37.2	32.3	13.8	-	-
<b>Direct debits</b>	16.6	-	-	8.8	-	3.3	8.9	18.0	-	-
<b>E-money</b>	0,0	-	-	2.6	-	-	0.9	0.4	-	-
<b>Cheques</b>	0,0	-	-	1.0	-	0.0	0.0	0.3	-	-
Average (UE)										
<b>Card</b>	55.7									
<b>Credit transfer</b>	23.9									
<b>Direct debits</b>	11.1									
<b>E-money</b>	10.2									
<b>Cheques</b>	0.9									

Source: European Central Bank|Eurosysteem (2021)

Table 4 shows the main payment instruments in each EU country, expressed as a percentage of the total transactions in the country. The interpretation of these data can be supplemented by that presented in Table 5, which shows the average use of cards as a payment instrument over the period 2015 to 2019 (European Central Bank, 2021).

**Table 5 – Average (AV) number of card transactions metered per EU country (EUC) (years 2015–2019)**

<b>EUC</b>	<b>AT</b>	<b>BE</b>	<b>BG</b>	<b>HR</b>	<b>CY</b>
<b>AV</b>	765,648	1,877,696	131,948	304,243	51,143
<b>EUC</b>	<b>CZ</b>	<b>DK</b>	<b>EE</b>	<b>FI</b>	<b>FR</b>
<b>AV</b>	912,442	1.995,77	314,731	1,674,945	12,238,172
<b>EUC</b>	<b>DE</b>	<b>GR</b>	<b>HU</b>	<b>IE</b>	<b>IT</b>
<b>AV</b>	4,763,357	474,847	692,446	941,53	2,939,932
<b>EUC</b>	<b>LV</b>	<b>LT</b>	<b>LU</b>	<b>MT</b>	<b>NL</b>
<b>AV</b>	278,626	287,69	126,079	25,422	4,311,381
<b>EUC</b>	<b>PL</b>	<b>PT</b>	<b>RO</b>	<b>SK</b>	<b>SI</b>
<b>AV</b>	4,011,703	1,587,680	513,686	425,808	185.028
<b>EUC</b>	<b>ES</b>	<b>SE</b>	-	-	-
<b>AV</b>	4,155,485	3,322,688	-	-	-

Source: European Central Bank | Eurosystem (2021)

A final, socially oriented comment on the use of digital payments is warranted. The reality is that the use of digital instruments, including electronic payments, is often considered a proxy for a country's technological progress. However, countries experiencing an aging population do not necessarily gain the social benefits resulting from their wide distribution, since this population is characterized by insufficient literacy in information and communication technology (ICT). The digital divide may indeed produce new forms of inequality, although the digital payment system is moving increasingly towards user-friendly technologies (Forbis, 2019).

### 3. TAX COMPLIANCE GAP AND CASH LIMITS IN EUROPE. WHAT RELATIONSHIP REALLY EXISTS?

The annual tax compliance gap (Table 6) in Europe is estimated to be 824 billion euro. This figure was given in the report 'The European Tax Gap', which was approved by the European Parliament on 26 March 2020 (Murphy, 2019). The data contained in this report make a comparative analysis of EU countries possible. This tax gap information can be used for different purposes. It can be used to assess the effectiveness and efficiency of a tax authority, to measure inequality resulting from the failure to enforce the tax law fairly, or to measure the effectiveness, or otherwise of tax policy implementation in a

particular jurisdiction. The estimated tax compliance gap shown in Table 6 is defined as the difference between the amount of taxes that could be collected under the current legislation by the tax system and the amount of taxes actually collected. For this reason, it is considered an estimate of tax evasion.

**Table 6 - Tax gap estimates in Europe (year 2019 – “Total” values in billion euro – “Per capita” values in euro)**

Country	Total	Per capita	Country	Total	Per capita
Italy	190.9	3,191.4	Hungary	9.1	931.2
Germany	125.1	1,506.9	Czech Republic	8.8	826.3
France	117.9	1,752.1	Ireland	6.9	1,406.9
United Kingdom	87.5	1,312.9	Slovakia	5.4	990.7
Spain	60.0	1,278.3	Bulgaria	3.8	542.9
Poland	34.6	911.2	Croatia	3.5	858.6
Belgium	30.4	2,653.7	Lithuania	3.1	1,109.4
Netherlands	22.2	1,284.6	Slovenia	2.6	1,249.5
Greece	19.9	1,855.5	Latvia	1.7	885.4
Denmark	17.5	3,014.1	Cyprus	1.6	1,826.7
Sweden	16.9	1,652.0	Luxembourg	1.6	2,606.3
Romania	16.2	834.4	Estonia	1.4	1,056.7
Austria	12.9	1,456.2	Malta	0.9	1,823.5
Portugal	11.0	1,070.4	Iceland	-	-
Finland	10.7	1,939.1	Norway	-	-
<b>Total</b>	<b>824.1</b>	<b>1,493.8 (AV)</b>			

Source: European Parliament “European Tax Gap” report

In absolute terms, the European country with the highest tax gap is Italy, where missed payments due to tax authorities were estimated at 190.9 billion euro (Murphy, 2019). Germany followed with 125.1 billion and France with 117.9 billion. In some countries, the NSIs produced a slight revision of the estimates included in the report. For example, in Italy, as a result of a revision by the National Economic Accounts, the estimated tax gap for 2019 was adjusted to 183.4 billion with ‘unobserved’ at 203.3 billion euro. Illegal activities accounted for 19.4 billion.

Evasion in relation to population size (evasion per capita) is an indicator that improves the social representativeness of the phenomenon, since taxes are

mainly used to finance public services, matching changing demographic needs and the relative composition of the active and non-active populations. Using this indicator, Italy (with an average evasion of 3,191 euro per capita), together with Denmark (3,014 euro) ranked first, followed by Belgium (with 2,653 of euro evasion per capita). France and Germany, third and second, respectively, when using absolute total evasion values, drop to the ninth (1,752 euro) and eleventh (1,507 euro) positions in the per capita tax evasion ranking. The European average was 1,494 euro, and below that we find Romania (834 euro), the Czech Republic (826 euro) and Bulgaria (543 euro).

Data from the European Commission published in the EU VAT Gap Report in 2018 confirms that among EU countries, value added tax (VAT) is the tax most evaded, representing a revenue loss of 140 billion euro. The data in Table 6 are interesting, but they do not allow us to understand the reasons for the amounts of tax evasion, even if it seems to be partially correlated – but not for Belgium – with the tax wedge of labor cost described in Table 1. Table 7 shows the data for 2017 contained in the report.

**Table 7 - Evaded VAT EU countries (year 2017) – value in billions of euro**

Country	%	Total	Country	%	Total
Austria	9.0%	2.91	Italy	24.5%	35.44
Belgium	10.4%	3.62	Latvia	9.5%	2.56
Bulgaria	10.8%	0.61	Lithuania	25.9%	1.23
Croatia	3.5%	0.25	Luxembourg	5.1%	1.99
Cyprus	3,8%	0.77	Malta	15.1%	0.16
Czechia	12.0%	2.19	Netherlands	4.2%	2.28
Denmark	7.2%	2.25	Poland	9.9%	4.45
Estonia	5.2%	0.13	Portugal	9.6%	1.89
Finland	3.6%	0.81	Romania	33.8%	6.60
France	7.1%	12.79	Slovakia	20.0%	1.58
Germany	8.6%	22.08	Slovenia	3.8%	0.15
Greece	30.1%	0.66	Spain	6.0%	4.91
Hungary	8.4%	1.19	Sweden	0.7%	0.31
Ireland	10.6%	1.68	United Kingdom	12.2%	23.45
<b>Total</b>		<b>138.92</b>			

*Source: European Commission (2018)*

The highest VAT gap was observed in Romania, where 33.8% of the estimated VAT revenue was lost, followed by Greece (30.1%) and Lithuania

(25.9%). Sweden (0.7%), Croatia (3.5%) and Finland (3.6%) recorded the smallest percentage gaps. The largest VAT gaps, measured in absolute terms, occurred in Germany (22 billion euro), the United Kingdom (23.5 billion euro) and Italy (35.4 billion euro). The VAT gap is considered the form of tax evasion that can most effectively be prevented by the use of card payments.

Figures 4 and 5, while only considering countries with a limit on cash payments made between individuals (13 countries) and in trade (17 countries), show the potential relationship between the recorded levels of the tax gap, both total and per capita (Table 6), for each country and the limit on cash (for both individuals and in trade).

A graphical inspection of the scatter plots shows the existence of a weak inverse relationship between the per capita and total tax evasion and the existence of a cash limit, both among private individuals and in trade. From a theoretical point of view, the descriptive results presented enhance the argument (IMF, 2017) of those who state that it is the level of the existing tax and the contribution burden that is one of the causes influencing the attitude of operators who evade tax payments and not only regulations on the use of cash. This reinforces the theory that a higher level of taxation is not inevitably matched by a higher level of tax revenue (Brill and Hassett, 2007). On the other hand, it cannot be argued that a higher tax rate is always associated with a greater tax evasion. The results must, therefore, be assessed according to the institutional context of each country. For example, another factor that may represent an incentive for tax evasion is the complexity of the functioning of the tax system since this has been identified as one of the determinants of increased tax and contribution evasion (Kelmanson et al., 2019). For this reason, we introduced the Easy Pay Taxes Score (Table 8) into our analysis. This records the taxes and mandatory contributions that a medium-sized company must pay each year as well as measures of the administrative burden of paying taxes and contributions, including the time needed to comply with the major taxes and to comply with post-filing procedures (World Bank Data and PwC [PricewaterhouseCoopers], 2020). A higher score corresponds to a lower burden from the tax system as a whole and, thus to a higher level of efficiency.



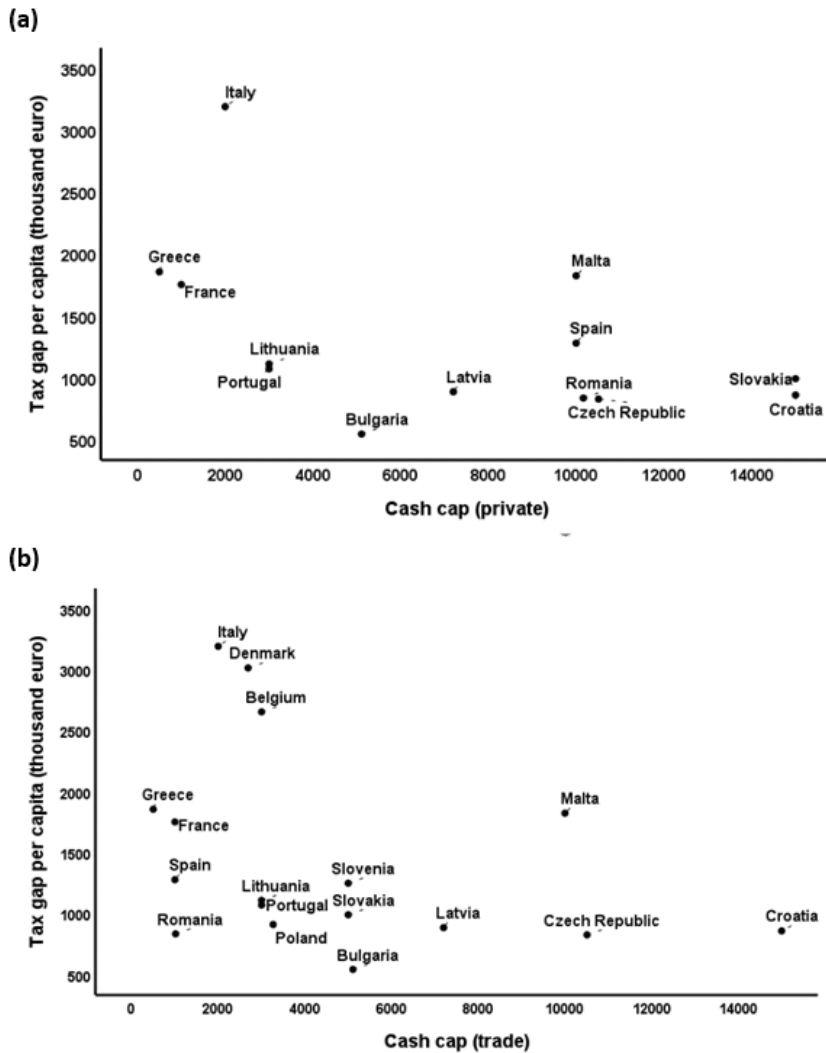


Figure 4 - Relation per capita tax gap and cash limit among private individuals (a) and in trade (b) in EU countries

Source: Data elaboration European Parliament report "European Tax Gap"- European Consumer Centres Network

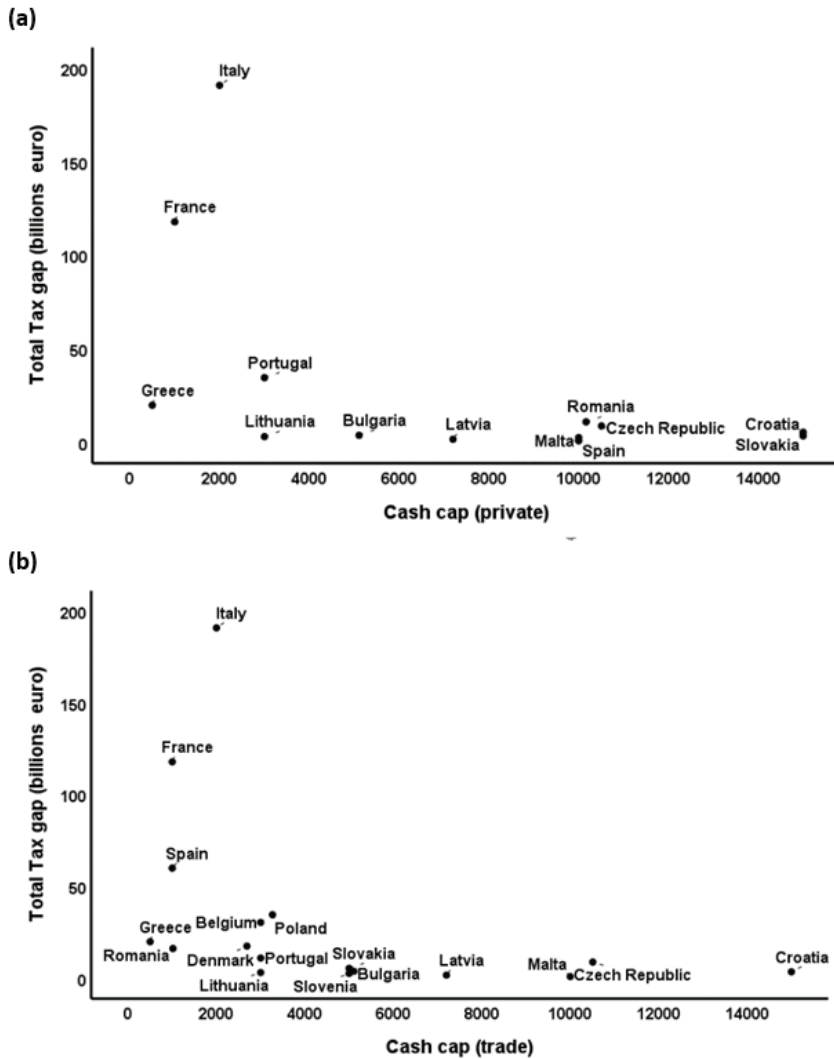


Figure 5 - Relation total tax gap and cash limit among private individuals (a) and in trade (b) in EU countries

Source: Data elaboration European Parliament report "European Tax Gap"- European Consumer Centres Network

**Table 8 - Easy Pay Taxes Score for each EU country (year 2020)**

Country	Easy Pay Taxes Score	Country	Easy Pay Taxes Score
Austria	83.5	Italy	64.0
Belgium	78.4	Latvia	89.0
Bulgaria	72.3	Lithuania	88.8
Croatia	81.8	Luxembourg	87.4
Cyprus	85.5	Malta	76.2
Czech Republic	81.4	Netherlands	87.4
Denmark	91.1	Poland	76.4
Estonia	89.9	Portugal	83.7
Finland	90.9	Romania	85.2
France	79.2	Slovakia	80.6
Germany	82.2	Slovenia	83.3
Greece	77.1	Spain	84.7
Hungary	80.6	Sweden	85.3
Ireland	94.6	-	-

Source: World Bank/PwC report data

Italy, with a score of 64 is in last place in this ranking, together with Malta (76.2), Poland (76.4), Greece (77.1) and France (79.2). The best performances are recorded, instead, in Ireland (94.6), Denmark (91.1) and Finland (90.9).

### 3.1 Tax evasion and the cash cap: an econometric estimate

To estimate the relationship between tax evasion (or the tax gap) and the existence of the cash cap, we used a regression model with dummy variables (James et al., 2020) and applied it to the 27 EU countries (Equation 1). For these countries, the data available for measuring the tax gap (Table 6) were entered as the dependent variable, while the predictors were the cash limits, divided as shown below.

The necessity of dividing cash limits into thresholds was due to the heterogeneity of levels across countries, as specified above.

$$\mathbf{y} = \beta_0 + \beta_1\mathbf{d1} + \beta_2\mathbf{d2} + \beta_3\mathbf{d3} + \varepsilon_i \quad (1)$$

$y$  = tax gap per capita (in thousands of euro)

$d1$  = 1 if country  $i$  has a cap on cash between 500 and 2999; otherwise, 0.

$d2$  = 1 if country  $i$  has a cap on cash between 3000 and 5000; otherwise, 0.

$d3$  = 1 if country  $i$  has a cap on cash  $> 5001$ , otherwise 0.

Model (1) is specified below:

**Model 1: OLS, using observations 1-27**  
**Dependent variable: Tax gap per capita**

	<i>Coefficient</i>	<i>Error Std.</i>	<i>ratio t</i>	<i>p-value</i>
$\beta_0$	1566.66	204.33	7.66	<0.0001 ***
$d1$	420.989	333.67	1.26	0.2197
$d2$	-235.832	333.67	-0.70	0.4868
$d3$	-579.317	353.91	-1.63	0.1153
Average dependent variable	1500.52	SQM dependent variable		695.03
Sum residual squared	9602805	Error standard		646.15
R-squared	0.23	Adjusted R-squared		0.13
F(3, 23)	2.36	P-value(F)		0.09
Log-likelihood	-210.86	Akaike criterion		429.72
Schwarz criterion	434.27	Hannan-Quinn		431.27

*Breusch-Pagan test for heteroscedasticity -*

*Null hypothesis: heteroscedasticity not present.*

*Test statistic: LM = 4.81*

*with p-value = P(Chi-square(3) > 4.81) = 0.18*

*Test for normality of residuals -*

*Null hypothesis: Error is normally distributed.*

*Test statistic: Chi-square(2) = 3.73*

*with p-value = 0.15*

This model (James et al., 2020) has the advantage of interpreting the intercept  $\beta_0$  – the model without dummy variables – as the reference category (baseline), which describes the situation of countries with no cash payment limits. The estimation method identifies statistical significance for the intercept, but not for the dummy explanatory variables representing the cash payment thresholds. Therefore, the introduction of cash limits would not be related to the

reduction of the tax gap. In this kind of model,  $R^2$  is usually characterized by low values, while the F-test, which is not statistically significant, is more important for confirming the hypothesis that there is no relationship between the cash limit and the reduction of the tax gap (James et al., 2020).

Economic theory, as explained above, requires the model to be integrated by including additional explanatory variables that are considered to affect the tax gap in different countries. For this reason, the Easy Pay Taxes Score (**EPTS**), which takes into account the tax burden on businesses and the level of efficiency of the existing tax system in each Member State; the tax burden on individuals in relation to GDP (**PFP/GDP**) and, finally, the average number of card payments (**card**) between 2015 and 2019, as well as its interaction effect with the cash cap above 5000 euro (**card\*d3**), were included as covariates.

The identification of the model required the logarithmic transformation of the dependent variable Total tax gap to ensure the assumption of normality of the residuals. Below is the formulation (2):

$$\ln(y) = \beta_0 + \beta_1 d1 + \beta_2 d2 + \beta_3 d3 + \beta_4 EPTS + \beta_5 PFP\_GDP + \beta_6 card + \beta_7 card * d3 + \varepsilon \quad (2)$$

The regression results are shown in Model 2 and provide further insight.

**Model 2: OLS, using observations 1-27**  
**Dependent variable: log Total tax gap**

	<i>Coefficient</i>	<i>Error Std.</i>	<i>ratio t</i>	<i>p-value</i>
<b><math>\beta_0</math></b>	10.97	2.39	4.59	0.0002 ***
<b>d1</b>	0.32	0.42	0.75	0.4567
<b>d2</b>	-0.29	0.38	-0.74	0.4626
<b>d3</b>	-2.00	0.57	-3.46	0.0026 ***
<b>EPTS</b>	-0.11	0.02	-4.03	0.0007 ***
<b>PFP_GDP</b>	0.08	0.03	2.56	0.0191 **
<b>card</b>	2.36e-07	6.32e-08	3.73	0.0014 ***
<b>card*d3</b>	2.42e-06	1.04e-06	2.31	0.0321 **

Average dependent variable	2.30	SQM dependent variable	1.44
Sum residual squared	9.59	Error standard	0.71
R-squared	0.82	Adjusted R-squared	0.75
F(3, 23)	12.68	P-value(F)	5.69e-06
Log-likelihood	-24.34	Akaike criterion	64.69
Schwarz criterion	75.06	Hannan-Quinn	67.78

*Breusch-Pagan test for heteroscedasticity -*

*Null hypothesis: heteroscedasticity not present.*

*Test statistic: LM = 9.34*

*with p-value =  $P(\text{Chi-square}(7) > 9.34) = 0.23$*

*Test for normality of residuals -*

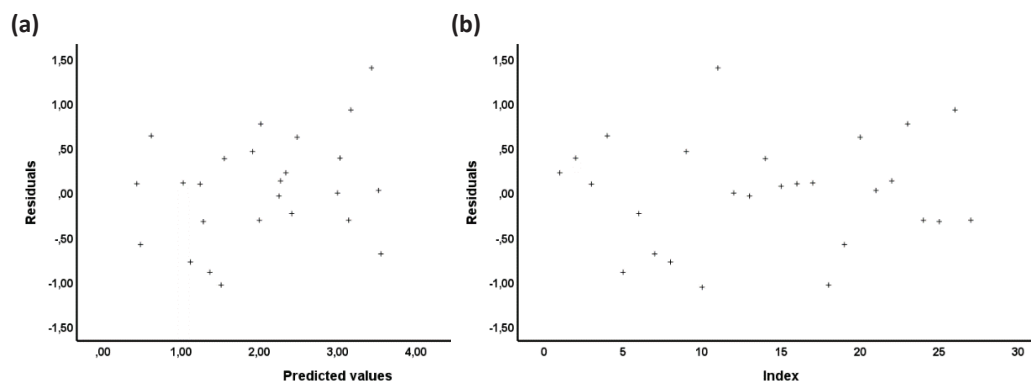
*Null hypothesis: Error is normally distributed.*

*Test statistic: Chi-square(2) = 0.25*

*with p-value = 0.88*

In Model 2, a cash cap variable greater than 5,000 euro is the only threshold to be statistically significant. The estimated results for the other variables are consistent with economic theory since they have an effect on the tax gap trend. In fact, the variables corporate tax burden and the efficiency of a country's tax system (**ETPS**) show an inverse relation (-0.11), while the tax burden on individuals (0.08) has a positive sign. Also, positive, and statistically significant are the coefficients recorded for the number of card payments (**card**) and its interaction with the cash threshold above €5.000 (**card\*d3**). For the latter two variables, however, the net effect on the tax gap is lower, although these effects should be assessed by considering the log transformation of y.

In this type of analysis, the main methodological problem will be any omitted variables and the consequent use of a misspecification model (Ahsan et al., 1992; Clarke, 2005; Lütkepohl, 1982; Pace and LeSage, 2010; Wooldridge, 2003). The verification of the lack of correlation between residuals, and the lack of systematic relationships between them and the regressors (Stock and Watson, 2019) (Figure 6a and b) is therefore necessary. For simplicity, the related test statistics were omitted.



**Figure 6 - Relation residuals and estimated values (a) and residuals and country index (b) for Model 2**

#### 4. CONCLUSIONS

The situation of countries with regard to their taxation systems appears quite differentiated, both in terms of types and levels of the taxes applied and the efficiency of their respective tax systems. Finding a cause or a theory that can provide a comprehensive explanation for the existing heterogeneity appears difficult. However, the unobserved economy, divided internally into underground, informal and illegal, is included in a country's GDP calculation, even if the methods of estimation used vary. If tax evasion is analyzed as an aspect of the shadow economy, it is possible to grasp the relevance of the phenomenon that can, among other things, affect the competitiveness of economic systems and their productivity levels. It is necessary, however, to understand whether the existence of possible limits to cash payments can contribute to reducing the tax gap or whether they represent an irrelevant element in comparison to a model of taxation that sees the taxpayer as a person to whom services are offered, rather than merely one from whom emoluments are requested. Taxation must be perceived as non-hostile and fair by citizens. It needs to be seen as an instrument of support for those who produce income.

The cash cap, a measure that, as demonstrated, is not in place in all countries, may find a limitation in its application in that an aging population is often characterized by insufficient ICT literacy. However, it is important to note

that the preference for cash transactions in some regions may be rooted in a stronger historical connection to traditional payment methods as compared to practices in other countries. The descriptive analysis of those countries that have introduced a cash limit, conducted by means of graphical representation, showed a weak inverse relationship between the tax gap estimate and the cash limit. The econometric analysis carried out on the 27 countries of the EU provides a useful reflection for identifying a policy for tackling the tax gap. Considered analytically, in Model 1 no threshold for the use of cash payment was significant, whereas in Model 2, in which other variables were also included, a threshold above 5,000 euro became statistically significant. The results estimated for the other variables are consistent with economic theory since they influence the tax gap trend. The variables corporate tax burden and the efficiency of a country's tax system (**ETPS**) showed an inverse link (-0.11), while the tax burden on individuals (0.08) had a positive sign. Also, positive, and statistically significant were the coefficients recorded for the number of card payments (**card**) and its interaction with the cash threshold above 5,000 euro (**card\*d3**). For these last two variables, however, their net effect on the tax gap was lower, although these effects should be assessed by considering the log transformation of the  $y$  performed.

There is no doubt that tax evasion depends on several factors, not least on the level of education and the importance people attribute to the public good, but it also reflects the trust that citizens place in institutions. The danger of misspecification of the model due to omitted variables has been verified, however, and therefore the model is correctly specified. The introduction of the cash cap can only be justified when it is above 5,000 euro. One of the most useful approaches in an attempt to reduce tax evasion could be to set up a tax policy that is as homogeneous as possible across countries. The existence of different rates, particularly on the taxation of corporate profits, can introduce significant distortions into the functioning of economic systems.

## References

- Andrews, D., Sánchez, A. C., and Johansson, Å. (2011). *Towards a Better Understanding of the Informal Economy*. OECD Publishing, Paris.
- Ahsan, S. M., Kwan, A. C., and Sahni, B. S. (1992). Public expenditure and national income causality: Further evidence on the role of omitted variables. *Southern Economic Journal*, 58(3): 623–634.



- Brill, A., and Hassett, K. A. (2007). *Revenue-Maximizing Corporate Income Taxes: The Laffer Curve in OECD countries*. <https://ssrn.com/abstract=2235697>. Last access: 29/01/2024
- Clarke, K. A. (2005). The phantom menace: Omitted variable bias in econometric research. *Conflict Management and Peace Science*, 22(4): 341–352.
- Deléchat, C., and Medina, L. (2021). *What Do We Know about the Informal Economy? The Global Informal Workforce*, 1. IMF Library.
- Dell'Anno, R. (2021). Theories and definitions of the informal economy: A survey. *Journal of Economic Surveys*. 36(5): 1610-1643.
- Elgin, C. (2020). *The Informal Economy: Measures, Causes, and Consequences*. Routledge.
- Elgin, C., Kose, M. A., Ohnsorge, F., and Yu, S. (2021). *Understanding Informality*. [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3916568](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3916568). Last access: 29/01/2024
- Elgin, C., and Oztunali, O. (2014). Institutions, informal economy, and economic development. *Emerging Markets Finance and Trade*. 50(4): 145–162.
- European Central Bank (2021a). *Study on the Payment Attitudes of Consumers in the Euro Area (SPACE)*. <https://www.ecb.europa.eu/pub/pdf/other/ecb.spacereport202012~bb2038bbb6.en.pdf>. Last access: 29/01/2024.
- European Central Bank (2021b). *Payments Statistics: 2021*. <https://www.ecb.europa.eu/press/pr/stats/paysec/html/ecb.pis2021~956efe1ee6.en.html>. Last access: 29/01/2024.
- European Commission (2016). *Communication from the Commission to the European Parliament and the Council on an Action Plan for strengthening the Fight Against Terrorist Financing*. [https://eur-lex.europa.eu/resource.html?uri=cellar:e6e0de37-ca7c-11e5-a4b5-01aa75ed71a1.0002.02/DOC\\_1&format=PDF](https://eur-lex.europa.eu/resource.html?uri=cellar:e6e0de37-ca7c-11e5-a4b5-01aa75ed71a1.0002.02/DOC_1&format=PDF). Last access: 29/01/2024.
- European Commission (2018). *EU VAT Gap Report*. [https://taxation-customs.ec.europa.eu/sites/default/files/vat-gap-full-report-2020\\_en.pdf](https://taxation-customs.ec.europa.eu/sites/default/files/vat-gap-full-report-2020_en.pdf). Last access: 29/01/2024.
- European Consumer Centres Network (2022). *Cash Payment Limitations*. <https://www.europe-consommateurs.eu/en/shopping-internet/cash-payment-limitations.html>. Last access: 29/01/2024.
- Forbis, S. M. (2019). *Examining and Protecting Senior Citizens from Elder Financial Exploitation within the Digital World*. Doctoral dissertation, Utica College.
- Ihrig, J., and Moe, K. S. (2004). Lurking in the shadows: The informal sector and government policy. *Journal of Development Economics*. 73(2): 541–557.

- ISTAT (Istituto Nazionale di Statistica) (2020). *The unobserved Economy in the National Accounts. Years 2015-2018 Report*. <https://www.istat.it/it/files//2020/10/Economia-non-osservata-nei-conti-nazionali.pdf>. Last access: 29/01/2024.
- James, G., Witten, D., Hastie, T., and Tibshirani, R. (2020). *An introduction to statistical learning with R*. Piccin-Nuova Libreria.
- Kelmanson, B., Kirabaeva, K., Medina, L., Mircheva B., and Weiss J. (2019). *Explaining the shadow economy in Europe: Size, causes and policy options*. International Monetary Fund.
- Lewis, A. W. (1955). *Theory of economic growth* (1st ed.). Routledge, London.
- Lütkepohl, H. (1982). Non-causality due to omitted variables. *Journal of Econometrics*. 19(2-3): 367–378.
- Marinescu, C., and Valimareanu, I. (2019). The mai current (schools) of thoughts about the informal economy. *Review of International Comparative Management*. 17(5): 310–316.
- Medina, L., and Schneider, F. (2017). *Shadow economies around the world: What did we learn over the last 20 years?*. International Monetary Fund.
- Morales, A. (1997). Epistemic reflections on the informal economy. *International Journal of Sociology and Social Policy*. 17(3/4): 1–17.
- Murphy, R. (2019). *The European tax gap. A report for the Socialists and Democrats Group in the European Parliament*. Global Policy.
- OECD et al. (2002). *Measuring the Non-Observed Economy: A Handbook*. OECD Publishing, Paris.
- Pace, R. K., and LeSage, J. P. (2010). Omitted variable biases of OLS and spatial lag models. In *Progress in spatial analysis: Methods and applications*. Springer, Berlin, Heidelberg.
- Schneider, F. (2011). *Handbook on the Shadow Economy*. Edward Elgar, Northampton USA.
- Schneider, F., Buehn, A., and Montenegro, C. E. (2010). New estimates for the shadow economies all over the world. *International Economic Journal*. 24(4): 443–461.
- Stock, J. H., and Watson, M. W. (2019). *Introduction to econometrics* (4th Edition). Pearson Education Limited.
- Wooldridge, J. M. (2003). *Diagnostic testing. A companion to theoretical econometrics*. Blackwell Publishing Ltd.
- World Bank Data and PwC (PricewaterhouseCoopers) (2020). *Paying Taxes 2020 Report*. <https://archive.doingbusiness.org/content/dam/doingBusiness/pdf/db2020/PayingTaxes2020.pdf>. Last access: 29/01/2024.
- United Nations. (1993). *System of national accounts*. UN.