

TAX EVASION IN THE CONTEXT OF THE SHADOW ECONOMY. EVIDENCE FOR THE EUROPEAN UNION COUNTRIES

**Maria - Mihaela POSTEA¹,
Monica-Violeta ACHIM²,
Isabella LUCUȚ CAPRAȘ³**

Abstract: *In the literature, often the size of the shadow economy is considered equivalent to the size of tax evasion. This is a misunderstanding of the two concepts. This paper shows that the two concept are related, are correlated, and congruent, but are not identical. To do so, in the current paper we highlight the differences and the similarities between the two phenomena and we present the actual relationship between them. We then present the different type of methodologies used to estimate the size of the two concepts. In the end, we present estimates of the shadow economy using the physical input approach and analyze different levels of the indicator in various areas of the European Union. The estimations show a higher level of shadow economy in the Central East European countries and a lower level in the Western European countries. The results also show a flourishing shadow economy in the European Union, the unweighted average size of the shadow economy ranging from 23,7% of the official GDP in 2007.to 21,3 % of the official GDP in 2013. To reduce tax evasion and the shadow economy is needed a multifaceted policy approach that includes enforcement, the improvement of public services and trust. Knowing the size and distribution of the shadow economy and tax evasion and the differences between them can help to develop more efficient strategies at the government level.*

Keywords: *Shadow economy, tax evasion, estimation methods*

JEL classification: E26, O17, D69, H53, C23

Introduction

Analyzing tax evasion and estimating the shadow economy has been recently a real concern for the politicians, economists and other social scientists. Yet, despite the many methodological advances and empirical evidence, even today there are still areas that have not been researched.

In the literature, often the size of the shadow economy is treated as equivalent to the amount of tax evaded. This may be misleading. The problem can arise when developing policies to reduce the two phenomena. A better understanding of the two terms is essential in this area of research.

¹ Ph.D. Student, Babeș-Bolyai University, Cluj-Napoca, mihaela.postea@econ.ubbcluj.ro

² Professor Dr., Babeș-Bolyai University, Cluj Napoca, monica.achim@ubbcluj.ro

³ PhD Student, Babeș-Bolyai University, Cluj Napoca, isabella.lucutcapras@econ.ubbcluj.ro

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Measuring the size and elaborating policies to reduce their influence in the official economy are of crucial importance. In this endeavor it is very important to understand the concepts, to identify their determinants and to reveal the differences between them.

This article focuses on highlighting the differences and the common aspects of the two concepts and a review of the literature regarding the estimation methods for the two phenomena is provided. These aspects could be important for the authorities responsible of reducing tax evasion and the shadow economy.

The findings in this paper can help policy makers make the distinction between the shadow economy and tax evasion and elaborate targeted measures to reduce the consequences of the two phenomena and their level. Policy makers at the European Union level can adopt different strategies for different regions by analyzing the estimates of the shadow economy by geographical positioning of the countries.

The rest of the paper is organized as follows. In the next section a literature review is conducted on the definition, differences and common elements of tax evasion and the shadow economy. We highlight the link between the two concepts and provide a brief overview on the existing methods used for estimating the two concepts. The third part consists in presenting the methodology including the ways of estimating the shadow economy using the electricity consumption method among European Union countries. The fourth part is dedicated to the results and discussion regarding the levels of shadow economy in different EU countries and different EU geographical regions. The last section is dedicated to the conclusions of the study, highlighting the main findings of the study.

Literature review

Tax evasion and the shadow economy. Common elements and differences.

The main motivation for any entity to get involved in tax evasion and the shadow economy activities seems to be the possibility to earn higher income with less effort. The interesting aspect is that this motivation is not correlated with the level of income an individual actually earns in the context that does not involve tax evasion or shadow economy activities (Pickhardt, Prinz, 2012). As a result, we can observe the poor getting involved in social benefit fraud or seeking low skill jobs in the shadow economy, and the rich getting involved in tax evasion or seeking top level jobs in shadow economy activities.

The main difference between tax evasion and shadow economy involvement is the extent of criminal activities. Tax evasion is usually seen as petty crime that sometimes might be even socially be accepted. For this reason, we can observe that tax evasion is often punished with monetary fines and not actual imprisonment. However, an engagement in the shadow economy may include serious criminal activities. Regarding criminal intensity, shadow economy activities can be classified into three different levels. The first is the non-crime level which can include activities such as neighborhood support with respect to manual jobs. Exchanges in this case are usually in the form of a barter and therefore they are difficult to be traced with monetary methods to estimate the size of the shadow economy.

The second level is the criminal level, this can include black labor activities. Most of these activities are settled in cash to avoid being discovered by the authorities and because the amount of many involved at an individual level is relatively low.

The third level is the organized crime level, which may include illegal arms trading, drug dealing, prostitution, blackmailing, etc. in most of these cases the goods are sold in cash and because the turnover can be large and permanent, a money laundry industry is required. (Unger, 2007). Most of these activities are based on international trade because the goods and services

are usually produced cheaply in other countries than those in which the actual consumption takes place. This international characteristic requires a wholesale and retail structure and usually various vertically integrated “firms” would compete for business.

This classification can be helpful for highlighting the difference from tax evasion. While tax evasion can occur without an involvement in the shadow economy, an engagement in the crime or organized crime level of the shadow economy almost always leads to tax evasion, even if tax evasion is not the main purpose of the criminal activity.

The first two levels can be used for distinguishing tax evasion. At the petty crime level of tax evasion, we can usually find actions that bend the tax law, but not break it, although sometimes the authorities may find them illegal. Underreporting of income or overreporting of cost belong to this level. However, at the crime level of tax evasion we can find deliberate and permanent activities to evade taxes.

In regard with the estimation methods, the classification is useful for assessing which level is covered by the available methods. As an example, the currency demand methods are suitable to cover the second and third levels of the shadow economy, but not the first. On the other hand, the questionnaire survey methods can cover the first and second levels, but may not cover the third. These facts can result in the underestimation of the shadow economy.

The empirical analysis shows that shadow economy acts as a substitute to official economy while tax evasion is complement to GDP. (Dell’Anno, Davidescu, 2019) Shadow economy and tax evasion are not congruent, but activities in the shadow economy almost always imply the evasion of direct or indirect taxes, such as the determinants of tax evasion will most certainly also affect the shadow economy. (Feld, Schneider, 2010)

The relationship between shadow economy and tax evasion is represented in fig1.

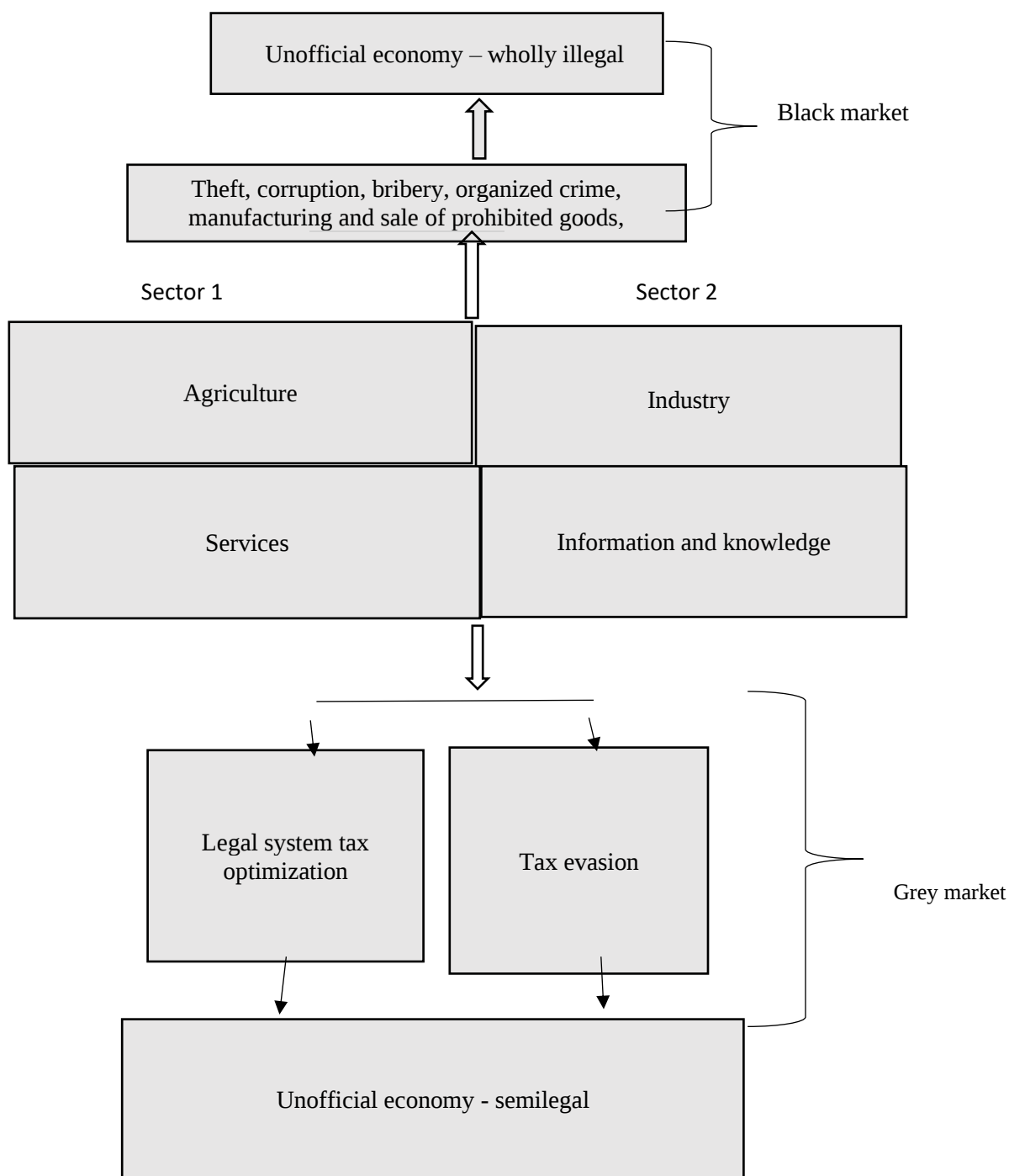


Fig. no. 1 The shadow economy and tax evasion

Estimation methods for the shadow economy and tax evasion.

There are many terms to describe activities that are concealed from the authorities. Examples as “underground economy”, “grey economy”, “hidden economy”, “cash economy”,

“shadow economy”, “parallel economy”, and “black economy” have been used by various authors. (OECD, 2002)

It is not a simple task to estimate the size of the shadow economy because of its hidden nature. Usually, the participants in this informal sector deliberately avoid being identified by the authorities. Therefore, it is not unusual to have different estimates of the size of the shadow economy for the same country. Over the years there have been developed several methods to estimate its size. These methods can be categorized as it follows:

A) Direct methods

In this category, we can distinguish two types of estimation methods: survey based and tax audit based methods. These are not widely used because of the costs that imply such a procedure and the biased results that might be obtained by not answering honestly to the questions by the respondents. They exploit the micro-level data obtained from tax audits and surveys. Because tax audits are not always random, this could lead to biased results as well.

B) Indirect methods

Indirect approaches are mostly macro-economic, they are also called “indicator” approaches. In the literature we identified four groups of methods: 1) the discrepancy between national expenditure and income statistics; 2) Estimating the shadow economy using employment statistics; 3) Monetary methods; 4) The physical input approach (energy consumption).

C) The model approach

The indirect methods consider just one indicator to capture the size of the shadow economy. They ignore other background information and variables that lead to shadow economy activities. Frey and Weck (1983) address this issue by proposing a latent variable method which considers a wide range of explanatory variables. The size of the shadow economy is estimated based on variables that affect its size, on the one hand, and variables that are traces of the phenomenon, on the other.

Table 1. Estimation methods of the shadow economy. Literature review

Estimation method	References in the literature	Advantage	Disadvantage	
Direct methods	Survey based methods	Barthe, 1985; Fortin et al., 1996; Howe, 1988; Lemieux et al., 1994; Leonard, 1994; McCrohan et al., 1991; Pahl, 1984; Warde, 1990; Williams, 2004, 2006; Williams and Windebank, 2001	They can deliver estimations to specific sectors and regions;	High costs; Biased sample of the population The honesty of the respondents can be questionable; They offer point estimates at a certain time.
	Tax audit-based methods	US IRS	They can deliver estimation regarding a specific sector or region;	They are not always random; They reveal a fraction of the informal activity
	The discrepancy between national expenditure and income statistics	Franz, 1983; O’Higgins, 1989; Smith, 1994; MacAfee, 1980; Petersen, 1982; Del Boca & Forte, 1982; Park, 1979; Yoo & Hyun, 1998	The national accounts provide both income based and expenditure based estimates;	There can be other causes for the discrepancy; Some activities might be omitted from the expenditure - based

				estimates
Indirect methods	Estimating the shadow economy using employment statistics	Contini,1981; Del Boca, 1981; O'Neill, 1983.	They can reveal the structure of workforce at different times, sectors and regions.	Differences can have other causes, such as an economic crisis; People can have both formal and informal jobs at a time; They don't include "envelop" wages
	Monetary methods	Feige in 1979; Boeschoten and Fase, 1984; Cagan, 1958; Gutmann, 1977; Tanzi, 1980, 1983; Alm, Embaye, 2013; Chen, Schneider, 2019	They can reveal useful information regarding the shadow economy activities settled with cash	Not all shadow economy transactions are paid with cash; The sensitivity of the results to the base year assumptions
	The physical input approach	Lizzeri, 1979; Del Boca and Forte, 1982; Portes, 1996; Kaliberda and Kaufmann, 1996; Johnson et al,1997; Lacko, 1996, 2000; Johnson et al, 1998; Eilat, Zinnes, 2002; Psychoyios, D., et al, 2021;	Very simple and can appear appealing	There are shadow economy activities that do not use energy; They rely on a broad definition of the shadow economy
The model approach	MIMIC	Frey and Weck, 1983; Quintano & Mazzocchi, 2013; Ruge, 2010; Schneider and Enste, 2000; Buehn and Schneider, 2007; Dell Anno and Schneider, 2009; Schneider, et al, 2010; Williams and Schneider, 2013; Schneider et al, 2015; Hassan and Schneider, 2016; Schneider and Buehn, 2018; Medina and Schneider, 2019; Schneider, 2019.	The use of multiple variables to explain the shadow economy	The results are highly dependent on proper selection of the variables

Regarding tax evasion, a common method to estimate its size is to audit businesses and households' tax returns (see Slemrod, 2007). In this way, the authorities can assess the magnitude of noncompliance to tax regulations and design suitable policies regarding tax enforcement. In the United States this approach is known as the Internal Revenue Service's Taxpayers Compliance Measurement Program (TCMP). The TCMP conducts random audits regarding the differences between the amount that is reported by the taxpayers and the amount that the examiner thought is correct. However, this method is costly and it reveals taxes evaded from the aboveground activities.

Three decades ago, Tanzi (1983) made an attempt to estimate the size of tax evasion from the underground sector. He estimated tax evasion by multiplying the average tax rate of the

aboveground economy with the estimated size of the shadow economy. In his endeavor, he made two assumptions. First, the average tax rate is the same in the shadow economy as in the official economy. And second, he assumed that participants in the shadow economy do not pay taxes. This methodology makes use of the estimated size of the shadow economy. If these estimates are inaccurate in the first place, the estimation of the size of tax evasion can be inaccurate as well. However, using the size of the shadow economy as a proxy for the magnitude of tax evasion is not surprising given the strong correlation between the two measurements. According to Sam (2010), the measures of shadow economy and tax evasion obtained from the World Competitiveness Report for 2008, the coefficient of correlation shows a statistically significant value of 0,87.

Methodology and data

Over time, researchers used various estimation methods to reveal the magnitude of the shadow economy. None of the method is better than the other. The literature review shows that all of these methods have their advantages and disadvantages. In our research we focused on developing the electricity consumption method. (Appendix 1 – source: own processing of data). In this paper we use the estimate of the size of the shadow economy in 25 EU countries, by implementing a variation of the physical input approach, where instead of the electric power consumption we use as a dependent variable the total final energy consumption, which includes all forms of energy used in the economy.

For delivering the results we classified the 25 EU countries in for different clusters (Table no 2). We mention that Estonia and Lithuania were not included in the study because of the lack of data:

Table 2 European Union countries clustered by geographical position

No.	EU regions	EU countries (25)
1	Northern Europe	Denmark, Finland, Sweeden
2	Southern Europe	Cyprus, Greece, Italy, Portugal, Spain, Malta
3	Western Europe	Austria, Belgium, France, Germany, Irland, Luxemburg, The Netherlands
. 4	Central and Eastern Europe	Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Poland, Romania, Slovakia, Slovenia .

Results and discussion

Using this method, estimates show that Western European and Northern European countries have smaller informal sector, whereas in Central Eastern European countries the percentage of the shadow economy in the official GDP is higher. In the figures 2 and 3 we can see the differences between EU countries for the years 2001 and 2021 regarding the percentage of the shadow economy in the official GDP.

When analyzing the shadow economy in the 4 regions of European Union we can clearly observe that there was a higher percentage of shadow economy from the official GDP in the Central Eastern European countries and in the Southern European ones than in the countries from the Western and Northern part of the European Union in 2001. The trend is kept for the year 2021 (fig no 4,5)

We can observe that, in time, the percentage of shadow economy in the official GDP had overall a growing trend. Central Eastern European countries had a higher percentage of shadow economy in the official GDP in 2001 and also in 2021.



Fig. no. 2 Shadow economy EU 2001



Fig. no. 3 Shadow economy EU 2021

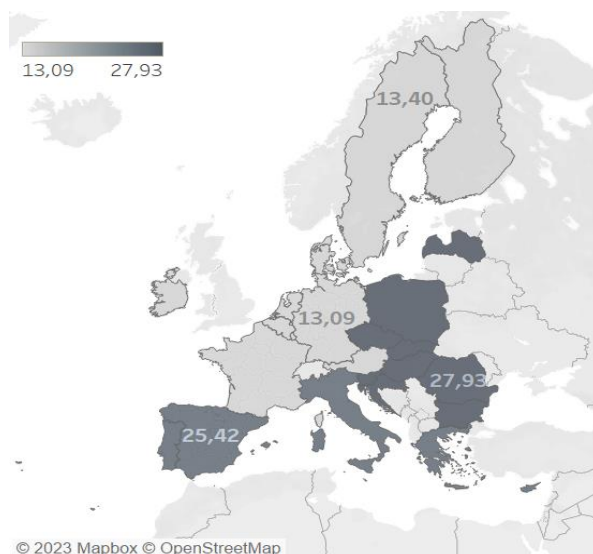


Fig. no. 4 Average SE in Europe by regions 2001
regions

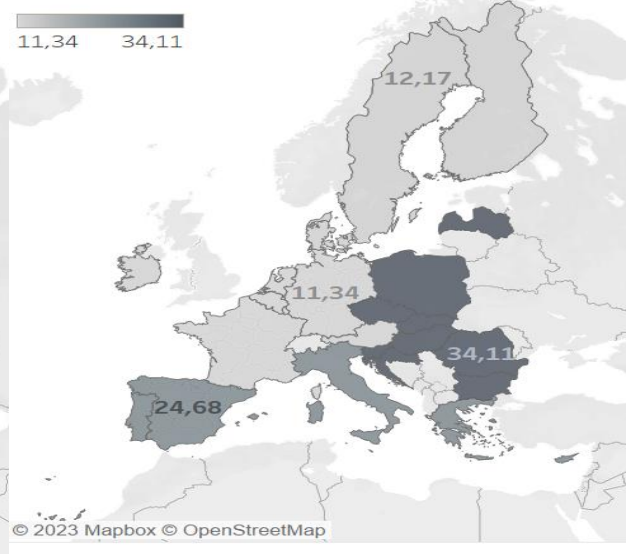


Fig. no. 5 Average SE in Europe by regions
2021

Regarding the estimates in various areas of EU in figures 6-13 we can see the differences in the estimates of the shadow economy for 25 EU countries. We can also compare the estimates for the years 2001 and 2021.

For Central Eastern Europe the highest percent of shadow economy in the official GDP are recorded by Romania and Bulgaria in 2001 and the trend is kept for 2021 as well. On the other hand, The Czech Republic had the smallest level of shadow economy, with a descending trend between 2001-2021 (fig 6,7). Among the Northern European countries Denmark had the highest percentage of shadow economy in the official GDP, while Sweden and Finland had the lowest. The trend in the period 2001-2021 was descending for all three countries (fig no 8,9) Greece and Cyprus had the highest levels of shadow economy among the Southern countries of Europe, while the lowest levels are recorded by Spain, Portugal and Italy. The trend was descending over the period 2001-2021 for all the countries except Greece. (fig no 10,11). Regarding the Western European countries, we can recognize that this is the area where the percentage of shadow economy is the lowest in Europe and the trend between the period 2001-2021 is descending. (fig no 12,13)

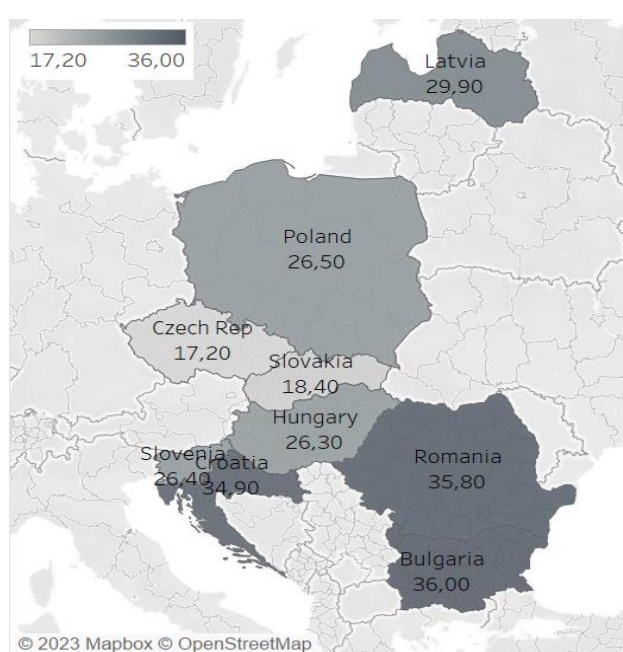


Fig. no. 6 Shadow economy Central Eastern Europe 2001

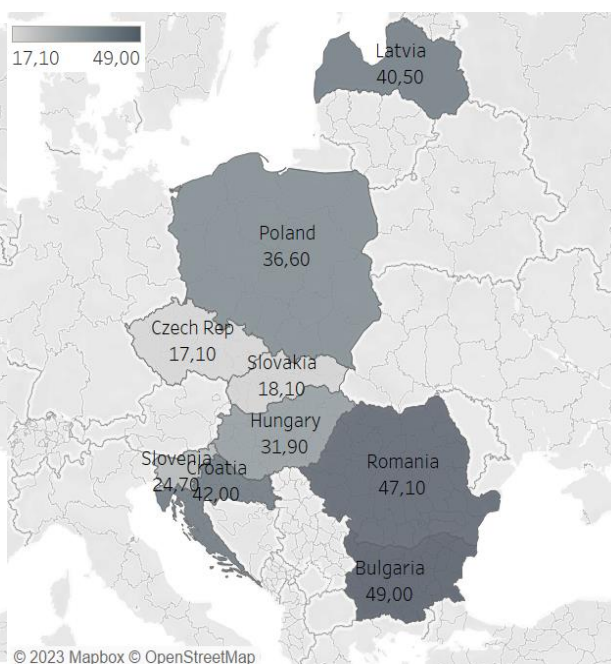


Fig. no. 7 Shadow economy Central Eastern Europe 2021

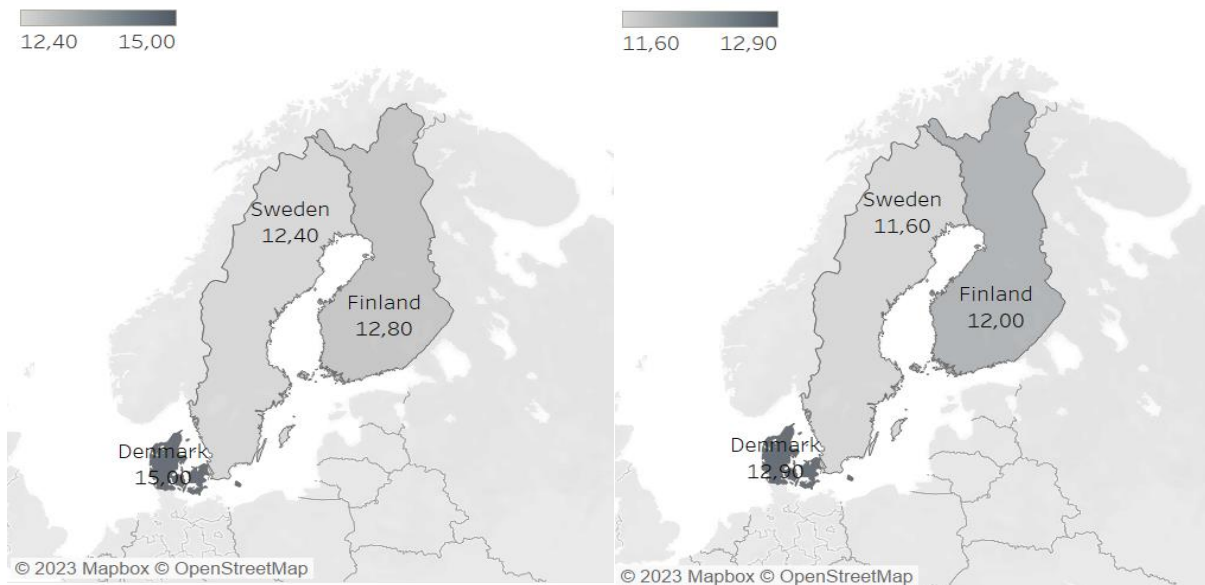


Fig. nr. 8 Shadow economy Northern Europe 2001

Fig. no. 9 Shadow economy Northern Europe 2021



Fig. no. 10 Shadow economy Southern Europe 2001

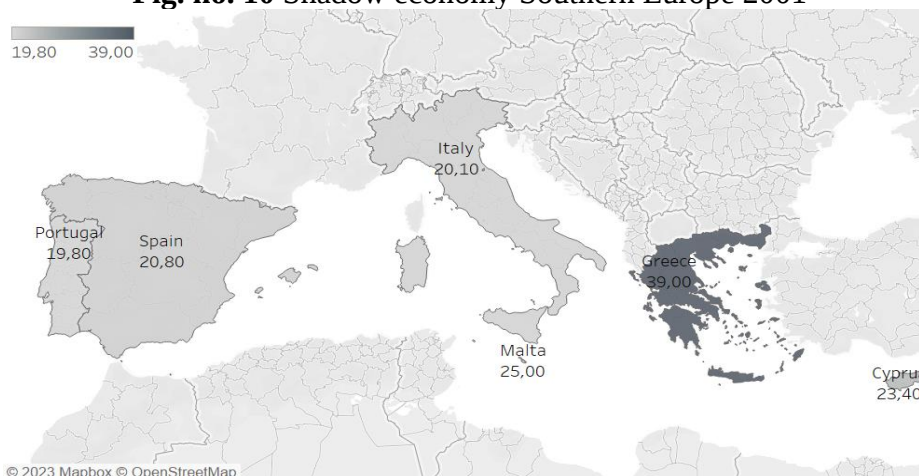


Fig. no. 11 Shadow economy Southern Europe 2021

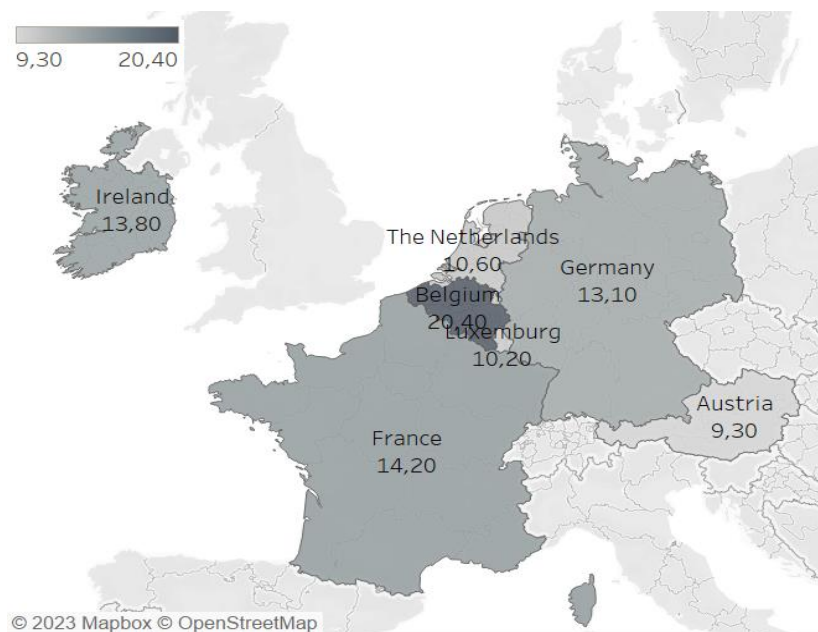


Fig. no. 12 Shadow economy in Western Europe 2001

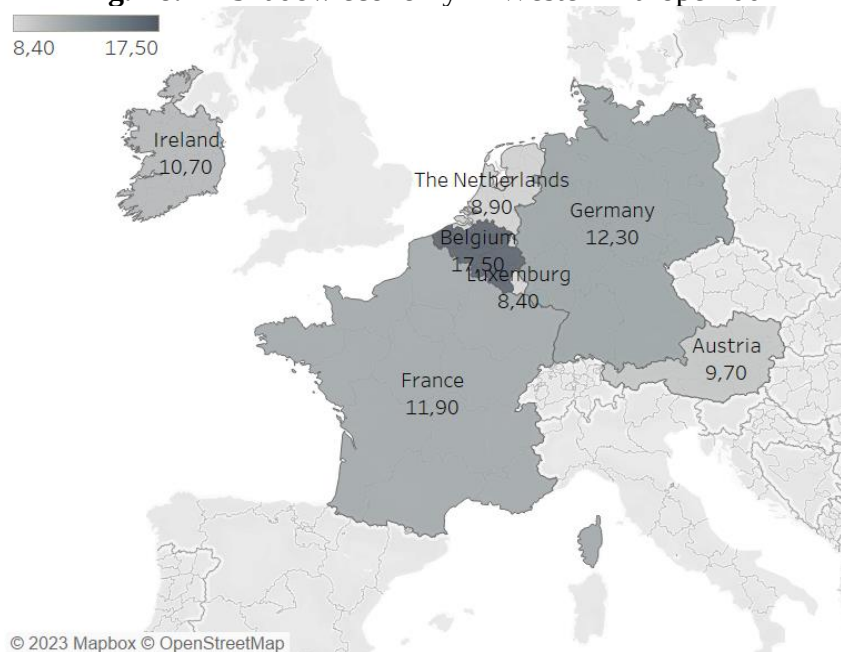


Fig. no. 13 Shadow economy in Western Europe 2021

Estimates show that Western European countries have smaller shadow economy, whereas in Eastern European countries the percentage of the shadow economy in the official GDP is higher. The results also show a flourishing shadow economy in the European Union, the unweighted average size of the shadow economy ranging from 23,7% of the official GDP in 2007.to 21,3 % of the official GDP in 2013. (fig 14). On the other part, starting on the estimations of Schneider (2015), the study of Achim et al. (2019), on their study conducted on 31 European countries over the period 2005–2015, found an average level of shadow economy of 19%. So, we may observe that the current results of measuring shadow economy evidence higher

level of shadow economy compared with previous studies conducted by Achim et al. (2019) based on Schneider (2015).

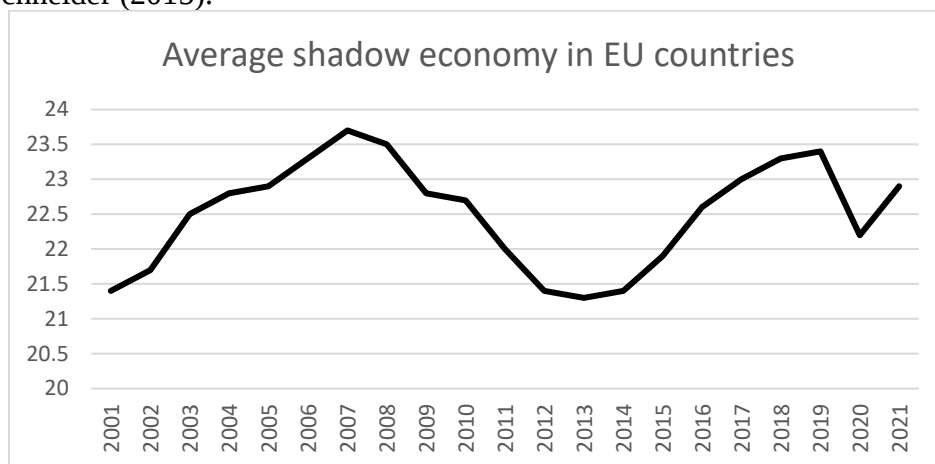


Fig. no. 14 Average shadow economy in EU countries over the period 2001-2021

Conclusions

As we highlighted in the article, shadow economy and tax evasion are not equivalent concepts. The empirical analysis shows that shadow economy acts as a substitute to official economy, while tax evasion is complement to GDP. The two concepts are not congruent, but are highly correlated. Activities in the shadow economy almost always imply the evasion of taxes, such as it is obvious that the determinants of tax evasion will most certainly also affect the shadow economy.

In the paper we focused on highlighting the common elements of tax evasion and the shadow economy, the differences between them and revealing the main methods used in the literature for estimating the two concepts. Reviewing the literature, we understood that the main difference between tax evasion and shadow economy involvement is the extent of criminal activities. Tax evasion is usually seen as petty crime that sometimes might be even socially accepted. For this reason, we can observe that tax evasion is often punished with monetary fines and not actual imprisonment. However, an engagement in the shadow economy may include serious criminal activities.

We then categorized the main methods found in the literature for estimating the size of the shadow economy and the size of tax evasion and described some of the methods used in estimating tax evasion. Reviewing the literature, we acknowledged that all the methods, with no exception, have their weaknesses and their strength. Regarding tax evasion there were very few methods identified in the literature, most of which make use on the estimated size of the shadow economy. More research regarding the estimation methods is mandatory in this area mainly for efficiently implementing policies to reduce these phenomena.

The last part was dedicated to empirical evidence on shadow economy using the electricity consumption method. The results show that Western European countries and Northern European had the lowest level of shadow economy among the European countries, whereas the Central Eastern European countries had the highest levels, both for the year 2001 and 2021.

Given the influence of the shadow economy, and specifically of tax evasion, in the official economy, there is the need for an improvement of both the scope and measurement of the shadow economy. A special interest should be given for the estimation of tax evasion

considering that at the present moment there are no reliable methods of estimating this phenomenon. In this respect, researchers should consider the enlargement of econometric models that include institutional variables, such as governance indicators. Also, using spatial and sectorial breakdowns of GDP would help to link surveys to indirect methods. (Pickhardt, Prinz, 2012)

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Declaration of Competing Interest

The authors of this paper certify that there is no financial or personal interest that could have appeared to influence the work reported in this paper.

References

1. Achim, M. V., & Borlea, S. N. (2020). Economic and Financial Crime: Corruption, shadow economy, and money laundering (Vol. 20). Springer Nature.
2. Achim, M.V., Borlea N.S., Gaban L.V. & Mihaila A.A. (2019). The Shadow Economy and Culture: Evidence in European Countries, *Eastern European Economics*, vol 57(5), 352-374
3. Alm, J., & Embaye, A. (2013). Using dynamic panel methods to estimate shadow economies around the world, 1984–2006. *Public Finance Review*, 41(5), 510-543.
4. Barthe, M.A. (1985), “Cho[^]mage, travail au noir et entraide familial”, *Consommation*, Vol. 3 No. 1, pp. 23-42
5. Boeschoten, W.C. and M.M.G. Fase (1984), The Volume of Payments and the Informal Economy in the Netherlands 1965–1982. *M. Nijhoff, Dordrecht*.
6. Buehn, A. & Schneider, F. (2007). Shadow economies and corruption all over the world: Revised estimates for 120 countries. *Economics*, 1(9), 1–66.
7. Cagan, P. (1958). The demand for currency relative to the total money supply. *Journal of Political Economy*, 67, 303-328.
8. Chen, H. ; Schneider, F (2019). Size and Causes of Shadow Economy in China over 1978–2016: Based on the Currency Demand Method. *Retrieved on*, 2018.
9. Contini, B. (1981), Labor market segmentation and the development of the parallel economy: the Italian experience, *Oxford Economic Papers*, 33, pp. 401–412.
10. Dell’Anno, R., & Davidescu, A. A. (2019). Estimating shadow economy and tax evasion in Romania. A comparison by different estimation approaches. *Economic Analysis and Policy*, 63, 130-149.
11. Dell’Anno, R., & Schneider, F. (2009). A complex approach to estimate shadow economy: the structural equation modelling. In *Coping with the Complexity of Economics* (pp. 111-130). *Springer*, Milano.
12. Del Boca, D. (1981), Parallel economy and allocation of time, *Micros (Quarterly Journal of Microeconomics)*, 4, pp. 13–1
13. Del Boca, D., & Forte, F. (1982). Recent empirical surveys and theoretical interpretations of the parallel economy in Italy. *The underground economy in the United States and abroad, Lexington (Mass.), Lexington*, 160-178.
14. Eilat, Y., & Zinnes, C. (2002). The shadow economy in transition countries: Friend or foe? A policy perspective. *World Development*, 30(7), 1233-1254.

15. Feige, E. L. (1979). How big is the irregular economy? *Challenge*, 22(1), 5–13.
16. Fortin, B., Garneau, G., Lacroix, G., Lemieux, T. and Montmarquette, C. (1996), *L'Economie Souterraine au Quebec: mythes et realites*, *Presses de l'Universite Laval*, Laval.
17. Frey, B.S. and H. Weck (1983a), Bureaucracy and the shadow economy: a macro-approach, in: Hanusch, H. (ed.), *Anatomy of Government Deficiencies*, *Springer*, Berlin, pp. 89–109.
18. Frey, B.S. and H. Weck (1983b), Estimating the shadow economy: a “naïve” approach, *Oxford Economic Papers*, 35, pp. 23–44.
19. Franz, A. (1983), Wie groß ist die „schwarze“ Wirtschaft?, *Mitteilungsblatt der Österreichischen Statistischen Gesellschaft*, 49, pp. 1–6.
20. Gutmann, P.M. (1977), The subterranean economy, *Financial Analysts Journal*, 34/1, pp. 24–27.
21. Hassan, M., & Schneider, F. (2016). Size and development of the shadow economies of 157 countries worldwide: Updated and new measures from 1999 to 2013. Available at SSRN 2861026.
22. Howe, L. (1988), “Unemployment, doing the double and local labour markets in Belfast”, in Cartin, C. and Wilson, T. (Eds), *Ireland from below: Social Change and Local Communities in Modern Ireland*, Gill and Macmillan, Dublin
23. Johnson, S., Kaufmann, D., & Shleifer, A., (1997). The unofficial economy in transition. *Brook. Pap. Econ. Act.* 2, 159–239.
24. Johnson, S., Kaufmann, D. and P. Zoido-Lobaton (1998a), Regulatory discretion and the unofficial economy, *The American Economic Review*, 88/2, pp. 387–392.
25. Johnson, S., Kaufmann D. and P. Zoido-Lobaton (1998b), Corruption, Public Finances and the Unofficial Economy, *World Bank Policy Research Working Paper Series No. 2169*, *The World Bank*, Washington, D.C.
26. Kaliberda, A., & Kaufmann, D. (1996). Integrating the unofficial economy into the dynamics of post-socialist economies: A framework of analysis and evidence. *The World Bank*.015 p5
27. Lackó, M. (1996). Hidden economy in East-European countries in international comparison. International Institute for Applied Systems Analysis (IIASA), Laxenburg.
28. Lemieux, T., Fortin, B. and Frechette, P. (1994), The effect of taxes on labor supply in the underground economy. *American Economic Review*, Vol. 84 No. 1, pp. 231–54.
29. Leonard, M. (1994), *Informal Economic Activity in West Belfast*, *Ashgate*, Aldershot.
30. Lizzeri, C. (1979), *Mezzogiorno in Controluce*. *Enel*, Naples.
31. MacAfee, K. (1980), A glimpse of the hidden economy in the national accounts, *Economic Trends*, 136, pp. 81–87
32. McCrohan, K., Smith, J.D. and Adams, T.K. (1991), “Consumer purchases in informal markets: estimates for the 1980s, prospects for the 1990s”, *Journal of Retailing*, Vol. 67 No. 1, pp. 22–50.
33. Medina, L., & Schneider, F. (2019). Shedding light on the shadow economy: A global database and the interaction with the official one. *CESifo Working Paper No. 7981*
34. OECD. (2002). *Measuring the Non-Observed Economy*.
35. O'Higgins, M. (1989), Assessing the underground economy in the United Kingdom, in: Feige, E.L. (ed.), *The Underground Economies: Tax Evasion and Information Distortion*, *Cambridge University Press*, Cambridge, UK, pp. 175–195.

36. O'Neill, D.M. (1983), Growth of the underground economy 1950–81: some evidence from the current population survey, Study for the Joint Economic Committee, U.S. Congress Joint Committee Print, U.S. Gov. Printing Office, Washington, DC, pp. 98–122.
37. Quintano, C., & Mazzocchi, P. (2013). The shadow economy beyond European public governance. *Economic Systems*, 37, 650–670.
38. Pahl, R.E. (1984), Divisions of Labour, Blackwell, Oxford
39. Park, T. (1979), Reconciliation Between Personal Income and Taxable Income, *Bureau of Economic Analysis*, Washington, DC, pp. 1947–1977.
40. Petersen, H.G. (1982), Size of the public sector, economic growth and the informal economy: development trends in the Federal Republic of Germany, *Review of Income and Wealth*, 28, pp. 191–215
41. Pickhardt, M., & Prinz, A. (Eds.). (2012). *Tax evasion and the shadow economy*. Edward Elgar Publishing.
42. Portes, A. (1996), The informal economy, in: Pozo, S. (ed.), Exploring the Underground Economy, W.E. Upjohn Institute for Employment Research, Kalamazoo, pp. 147–165
43. Psychoyios, D., Missiou, O., & Dergiades, T. (2021). Energy based estimation of the shadow economy: The role of governance quality. *The Quarterly Review of Economics and Finance*, 80, 797-808.
44. Raczkowski, K., & Schneider, F. (2013). Size and development of the shadow economy and of tax evasion within Poland and of its neighbouring countries from 2003 to 2013: some new facts.
45. Ruge, M. (2010). Determinants and size of the shadow economy – A structural equation model. *International Economic Journal*, 24, 511–524
46. Sam, C. Y. (2010). Exploring the link between tax evasion and the underground economy. *Pakistan Economic and Social Review*, 167-182.
47. Schneider, F. (2019). Size of the shadow economies of 28 European Union countries from 2003 to 2018. In European Union (pp. 111-121). *Palgrave Macmillan*, Cham.
48. Schneider, F. & Enste, D. (2000). Shadow economies: size, causes, and consequences. *J. Econ. Lit.* 38, 77–114.
49. Schneider, F., Buehn, A., & Montenegro, C.E. (2010). New estimates for shadow economies all over the world. *Int. Econ. J.* 24(4), 443–461.
50. Schneider, F (2015). Size and Development of the Shadow Economy of 31 European and 5 Other OECD Countries from 2003 to 2015: Different Developments. Accessed August 12, 2018. <http://www.econ.jku.at/members/Schneider/files/publications/2015/ShadEcEurope31.pdf>.
51. Schneider, F., Raczkowski K., Mróz, B., (2015),"Shadow economy and tax evasion in the EU", *Journal of Money Laundering Control*, Vol. 18 Iss 1 pp. 34 – 51
52. Schneider, F., & Buehn, A. (2018). Shadow economy: Estimation methods, problems, results and open questions. *Open Economics*, 1(1), 1-29.
53. Schneider, F., Linsbauer, K., & Heinemann, F. (2015). Religion and the Shadow Economy. *Kyklos*, 68(1), 111–41.
54. Slemrod, J. (2007). Cheating ourselves: The economics of tax evasion. *Journal of Economic perspectives*, 21(1), 25-48.
55. Smith, P. (1994), Assessing the size of the underground economy: the Canadian statistical perspectives, *Canadian Economic Observer*, 11, pp. 16–33.

56. Tanzi, V. (1980), The underground economy in the United States: estimates and implications, *Banca Nazionale del Lavoro*, 135, pp. 427–453.
57. Tanzi, V. (1983), The underground economy in the United States: annual estimates, 1930–1980, *IMF Staff Papers*, 30, pp. 283–305
58. Unger, B. (2007). The scale and impacts of money laundering. In *The Scale and Impacts of Money Laundering*. Edward Elgar Publishing.
59. Warde, A. (1990), “Household work strategies and forms of labour: conceptual and empirical issues”, *Work, Employment & Society*, Vol. 4 No. 4, pp. 495-515.
60. Williams, C.C. (2004), Cash-in-hand Work: The Underground Sector and the Hidden Economy of Favours, *Palgrave-Macmillan*, London.
61. Williams C., (2006), "Evaluating the magnitude of the shadow economy: a direct survey approach", *Journal of Economic Studies*, Vol. 33 Iss 5 pp. 369 – 385
62. Williams, C. C., & Schneider, F. (2013). The shadow economy. London: *Institute of Economic Affairs*.
63. Williams, C.C. and Windebank, J. (2001), "Acquiring goods and services in lower income populations: an evaluation of consumer behaviour and preferences", *International Journal of Retail & Distribution Management*, Vol. 29 No. 1, pp. 16-24.
64. Yoo, T., & Hyun, J. K. (1998). International comparison of the black economy: Empirical evidence using micro-level data. Paper Presented at 1998 *Congress of Int. Institute Public Finance*

Appendix 1 Shadow economy estimation using the electricity consumption method in 25 EU countries

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Austria	9.3	9.5	9.9	9.8	9.9	9.8	9.8	9.6	9.4	9.8
Belgium	20.4	19.5	19.9	19.4	18.6	18.5	17.9	18	17.5	18.2
Bulgaria	36	37.2	39.1	39.3	40.4	41.8	41.9	40	35.5	36.5
Croatia	34.9	36.1	37.4	37.7	38.2	38.6	39.3	39.4	39.3	38.7
Cyprus	30.8	30.1	30.9	29.8	29.4	29.1	29.6	29.3	29.4	29.5
Czech Rep	17.2	17.2	17.8	17.6	17	17.2	17	16.5	16.3	15.8
Denmark	15	14.9	15	15	14.9	14.9	15.1	14.5	14.2	14.2
Finland	12.8	13.2	13.1	13	12.4	12.6	12.6	12	11.5	12.3
France	14.2	14.2	14	13.8	13.4	13.2	12.9	12.6	12.5	12.5
Germany	13.1	13.1	13.1	12.8	12.5	12.8	12.2	12.4	12.2	12.5
Greece	27.1	30.7	40	47.5	48.8	53.7	62.4	69.5	64.5	57.8
Hungary	26.3	26.9	27.5	27.1	28.4	27.9	27	26.8	27	26.8
Ireland	13.8	13.7	13.9	13.8	14.3	14.4	14.3	13.7	12.5	12.3
Italy	23.2	23.5	24.2	23.8	23.7	23.5	23.3	22.5	21.9	21.7
Latvia	29.9	31	32.6	33.4	34.6	35.5	37.2	35.5	35.9	34.8
Luxemburg	10.2	10.4	10.7	11.6	11.6	11.4	11	10.7	10.3	10.4
Malta	25.4	22.9	23.3	26.4	25.8	27.3	29	27	27.5	29.2
Netherlands	10.6	10.6	10.6	10.6	10.5	10.4	10.3	9.8	10	10.2
Poland	26.5	26.8	26.8	27.2	27	28.3	29	28.8	28.7	30.2
Portugal	21.9	22.7	22.3	21.9	21.6	22	22.1	21.1	21.8	21
Romania	35.8	36.7	37.6	38.8	38.6	39	39	39.1	36.7	36.3
Slovakia	18.4	19	17.9	17.3	17.7	17.3	17.2	17.4	16.8	17.7
Slovenia	26.4	26.3	26.5	26.4	26.9	26.8	27.1	28.4	26	26.3
Spain	24.1	24.3	25.1	25.2	25.2	24.5	24.7	22.9	22.1	21.8
Sweden	12.4	12.5	12.3	12	11.6	11.5	11.5	11	10.9	11.1
EU average	21.4	21.7	22.5	22.8	22.9	23.3	23.7	23.5	22.8	22.7

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Austria	9.5	9.5	9.7	9.4	9.8	10	10	9.7	9.9	9.3	9.78
Belgium	17	16.9	17.3	16.8	17.7	18.1	17.9	17.8	17.6	16.9	17.58
Bulgaria	37.7	37.1	37.4	38.7	42.4	43.7	44.9	45.3	46.5	46.4	49.05
Croatia	37.5	36.2	36	35.4	38.3	39.2	41	40.7	42	40.2	42.08
Cyprus	26.9	24.8	23.4	24.7	25.1	26.8	27.3	27.6	26.3	22.5	23.47
Czech Rep	15.4	15.4	15.2	15.2	15.9	16.4	16.7	16.5	16.7	16.6	17.16
Denmark	13.7	13.1	12.9	12.8	13.5	13.8	13.7	13.5	13.2	12.6	12.97
Finland	11.9	11.9	11.8	11.8	12	12.5	12.3	12.5	12.4	11.8	12.09
France	12.3	12.4	12.5	11.9	12.4	12.6	12.5	12.2	12.1	11.3	11.97
Germany	12.3	12.4	12.6	12.3	12.7	12.9	12.9	12.6	12.6	12.2	12.3
Greece	55.1	47.4	47.1	46.7	39.1	38.7	40.1	42.7	41.4	38.2	39.08
Hungary	26.9	25.7	26.1	26	28.4	29.4	30.4	30.5	31.1	30.9	31.91
Ireland	11.4	11.1	11.2	11.3	11.1	11.6	11.5	11.7	11.8	10.7	10.72
Italy	20.9	20.7	20	19.4	20.4	20.6	20.1	20.3	20.5	19	20.11
Latvia	33.8	35.3	34.7	35.9	36.9	37.7	39.4	40.9	40.9	40.1	40.5
Luxemburg	10.3	9.7	9.3	9.1	8.9	8.9	9	9.1	9	8.1	8.43
Malta	27	27.5	29.2	31.2	31.6	32.7	31.3	32.9	32.4	25.8	25.01
Netherlands	9.7	9.6	9.5	9.1	9.5	9.7	9.7	9.6	9.5	9	8.99
Poland	29.7	29.4	29.1	28.9	30.1	32.4	34.5	36.1	36.3	36	36.65
Portugal	20.4	18.5	18.5	19.1	20	20.4	21.1	20.6	21.6	19.6	19.87
Romania	36.5	37.5	36.7	37.2	39	40.3	42.3	42.9	44.8	45.5	47.19
Slovakia	16.4	15.8	16.4	15.7	16.1	16.9	17.9	17.7	18	17.2	18.14
Slovenia	26.3	25.5	25	24.6	25.4	26.6	26.7	26.5	25.9	23.9	24.72
Spain	21.6	20.6	20.1	20.4	21.2	21.8	22.4	22.2	22.4	19.8	20.82
Sweden	10.5	10.6	10.5	10.4	10.6	10.4	10.4	10.1	10.3	10.3	11.69
EU average	22	21.4	21.3	21.4	21.9	22.6	23	23.3	23.4	22.2	22.9