Size and Development of Tax Evasion in 38 OECD Coutries: What do we (not) know?

By Andreas BUEHN [a†] & Friedrich SCHNEIDER [b]

Abstract. For the first time we develop a time series of tax evasion (in % of official GDP) for 38 OECD countries over the period 1999 to 2010 based on MIMIC model estimations of the shadow economy. Considering indirect taxation and self-employment as the driving forces of tax evasion, we observe a declining trend of tax evasion between 1999 and 2010 for all countries. The average size of tax evasion across all 38 countries over the period 1999 to 2010 is 3.2% of official GDP. The country with the highest average value is Mexico with 6.8%, followed by Turkey with 6.7%; at the lower end we find the United States and Luxembourg with 0.5% and 1.3%, respectively.
Keywords. Tax evasion, OECD, MIMC model.
JEL. K42, H26, D78, O17, O5, H11.

1. Introduction

In a recent paper, Schneider & Buehn (2012) study the driving forces of the shadow economies in 38 OECD countries between 1999 and 2010. Their analysis of the relative impact of those determinants on the development of the shadow economy demonstrates that determinants are not equally important across countries, although general patterns are observable. The average figures of the relative impact they present show that indirect taxes have by far the predominant influence (29.4%) across countries. It is followed by self-employment with an average relative impact of 22.2%, then by the unemployment rate (16.9%), the personal income tax (13.1%), tax morale (9.5%), the business freedom index (8.1%), and finally GDP growth with an average relative impact of only 0.9%. Considering single variables (compare table 1), the personal income tax shows a large variance with respect to the relative impact on the shadow economy.

The personal income tax has a very large relative impact in Denmark (34.6%) and the United States (27.5%), while the impact in Chile (1.8%) and Mexico (2.3%) is almost negligible. The relative impact of indirect taxes concerning the shadow economy's evolution is largest in Mexico (42.1%), followed by Malta and Iceland (39.7%); the relative impact of indirect taxes is smallest in the United States (5.1%) and Canada (17.5%). Tax morale has the highest relative impact on the shadow economy in Luxembourg with an average value of 20.0% between

[a†] Department of Public Management, University of Cooperative Education Bautzen, LoebauerStrasse 1, 02625 Bautzen, Germany.
. +49 (0)3591-353-128
. buehn@ba-bautzen.de
[b] Department of Economics, Johannes Kepler University, Altenbergerst. 69, A-4040 Linz, Austria.
. +43 (0)732 2468-8210
. friedrich.schneider@jku.at

1999 and 2010, and the lowest in Turkey (0.7%). The unemployment rate has the largest impact in Spain (29.2%), followed by Poland (26.1%). The relative impact of the unemployment rate is smallest in Iceland (7.1%), Denmark (9.5%), and Switzerland (9.6%). Self-employment is on average most important in Korea (44.3%), Turkey (41.4%), Romania (37.7%), and Greece (37.6%).

Table 1. *Average relative impact (in %) of the shadow economy determinant's in 38 OECD countries (1999:2010)*

Country	Average size of the shadow economy	Personal income tax	Indirect taxes	Tax morale	Unemploy-ment	Self-employ-ment	GDP growth	Business freedom
Australia	13.8	21.3	25.4	7.4	15.8	19.3	0.9	9.9
Austria	9.8	18.5	27.4	11.6	12.1	20.5	0.8	9.1
Belgium	21.5	19.2	20.2	19.1	16.5	17.3	0.4	7.2
Bulgaria	34.6	5.1	37.7	5.7	25.9	17.5	1.9	6.2
Canada	15.6	22.1	17.5	7.7	19.2	22.4	0.7	10.4
Chile	19.4	1.8	35.3	5.5	17.3	32.7	0.8	6.7
Cyprus	27.2	4.3	35.9	9.1	11.2	29.9	0.8	8.7
Czech Rep.	17.6	7.8	30.7	9.4	19.0	23.5	1.2	8.3
Denmark	17.3	34.6	33.5	4.0	9.5	9.9	0.3	8.2
Estonia	21.7	10.0	36.0	11.7	21.8	10.4	1.8	8.3
Finland	17.4	19.7	29.1	8.7	18.6	15.2	0.8	7.9
France	14.8	12.8	24.3	15.5	23.2	15.1	0.4	8.6
Germany	15.7	16.6	24.2	8.3	24.3	16.9	0.6	9.1
Greece	27.0	5.8	21.8	10.4	18.0	37.6	0.7	5.7
Hungary	24.1	12.3	34.9	6.4	18.6	18.5	1.2	8.0
Iceland	15.2	19.9	39.7	6.5	7.1	17.9	0.6	8.2
Ireland	16.1	12.5	36.4	7.9	12.5	21.3	1.0	8.5
Italy	26.9	15.6	18.9	9.0	18.6	31.0	0.1	6.8
Korea	26.3	5.7	27.3	3.4	9.8	44.3	1.4	8.0
Latvia	22.2	8.2	32.3	13.3	23.3	14.6	1.8	6.6
Lithuania	25.4	9.0	28.8	17.5	19.9	17.1	1.5	6.1
Luxembourg	9.6	13.2	33.4	20.0	10.4	11.9	1.2	9.8
Malta	27.3	5.9	39.7	3.2	20.0	21.2	0.8	9.3
Mexico	30.0	2.3	42.1	10.2	5.9	33.8	0.4	5.3
Netherlands	13.2	13.6	32.5	13.0	10.4	19.7	0.8	10.0
New Zealand	12.2	21.8	25.4	8.4	11.9	22.9	0.6	9.1
Norway	18.6	21.2	31.5	12.5	10.8	13.0	0.5	10.5
Poland	26.4	6.1	27.8	7.8	26.1	25.7	1.3	5.3
Portugal	22.7	8.1	29.9	8.7	14.6	31.1	0.4	7.2
Romania	32.2	4.2	24.5	14.2	13.1	37.7	1.1	5.2
Slovak Rep.	17.5	4.8	31.7	6.4	34.9	13.7	1.5	7.1
Slovenia	25.2	9.6	33.9	9.6	15.4	21.7	1.2	8.6
Spain	22.8	10.6	17.9	10.4	29.2	23.8	0.6	7.5
Sweden	18.6	23.5	30.6	8.7	15.2	13.2	0.8	8.0
Switzerland	8.3	17.7	30.7	9.0	9.6	23.8	0.5	8.7
Turkey	30.6	4.9	31.4	0.7	16.4	41.4	0.6	4.6
UK	12.5	18.2	30.8	8.1	14.3	18.0	0.6	9.9
United States	8.7	27.5	5.1	13.2	22.0	16.0	0.9	15.4
Average	20.3	13.1	29.4	9.5	16.9	22.2	0.9	8.1

Source: Schneider & Buehn (2012), Table 10.

For the first time we develop a time series of the tax evasion estimates for 38

OECD countries. Using the MIMIC model estimation results of Schneider & Buehn (2012) as a basis, we show how large the tax evasion in these 38 countries had been during the period 1999 to 2010. This paper thus presents alternative, macroeconomic estimates of tax evasion. Of course we are aware that these are rough measures, which have a number of problems, e.g. that we capture not all factors that drive tax evasion especially deterrence, punishment, the role of state institutions and governance etc. However, this paper should be seen as a first attempt to get more and better empirical knowledge about tax evasion.

The reminder of the paper is organized as follows: In section 2 we discuss some literature about tax evasion and shortly explain the method. Section 3 presents the empirical results and finally section 4 provides a summary of the most important results and draws some policy conclusions.

2. A Short Literature Review and the Methodological Approach

2. 1. Literature Review: Shadow Economy, Undeclared Work, Tax evasion and Tax Morale

The literature on the shadow economy, undeclared work, tax evasion and tax morale is rather huge and only some, for our research important remarks, will be made here to motivate the paper better.[1] According to this literature, the term "shadow economy" mainly refers to its property of being hidden.[2] It includes economically legal but hidden activities in the sense of black work as well as some illegal hidden activities like trade of illicit drugs or prostitution. The first part, legal undeclared work in the shadow economy, usually involves tax evasion, but taxes could also be evaded pursuing different activities than those of the shadow economy. This is, for example, the case when capital income earned officially is not truthfully reported. Tax compliance can be understood, in contrast to the tax gap, as the amount of the projected total tax base that tax authorities actually collect. Finally, tax morale traditionally refers to the residuum of tax compliance which cannot be explained by standard portfolio choice determinants and deterrence measures.

These terms and activities are overlapping to a certain extent and are of a very clandestine nature. As we will see, it will not be a question of taxonomical precision, but of measurability which activity we use as an approximation for the further empirical analysis. Hence, we will focus on economically legal but illegally hidden activities and leave other criminal activities aside.

There is a huge literature on studies of tax compliance and tax morale, which started in Germany in the early 1930s with the works of Schmölders (1932; 1960). Data on the size of the shadow economy, its partial activities and, even more, on the extent of tax evasion are not easily available for most OECD countries, especially on a time series basis. The reason often is not only the very clandestine nature but the fiscal secrecy laws in most OECD countries. Thus, several estimation methods have been developed to "measure the immeasurable" which are usually linked to one or the other aspect of tax evasion.[3]

[1] To quote a few recentand all prominent surveys, compare Andreoni, Erard & Feinstein (1998), Schneider & Enste (2000), Feld & Larsen (2005; 2011), Feld & Schneider (2010) and Feld, Schmidt & Schneider (2011).

[2] This part closely follows the work of Feld, Schmidt & Schneider (2011), pp 412 and 413.

[3] Compare Thomas (1999), Schneider & Enste (2000), Pedersen (2003), Lyssiotou, Pashardes & Stengos (2004) and Feld & Schneider (2010). As there has been an extensive discussion of these methods, they are not repeated here. Rather, the interested reader may be referred to the just quoted literature.

All of these indirect and direct methods have disadvantages. The income gap method has to cope with the unreliability of statistical mistakes. The monetary methods may overestimate the importance of the money market; e.g. as many transactions in the shadow economy take place without cash payments. The electricity approach heavily depends on the assumption that undeclared work involves the use of electricity. As indirect measures minimize strategic problems that emerge when individuals are directly confronted with questions about tax honesty, it could be argued that the indirect methods serveas an upper boundary of tax evasion or the shadow economy. The survey approach is sensitive to the formulation of the questions and participants in the survey may behave strategically and simply do not tell the truth. Even in face-to-face interviews, which promote the greatest degree of participation in a survey, respondents may simply lie. The survey method may thus measure a lower limit of undeclared work in an economy. The tax auditing method is prone to sample selection bias because selection for audit is based on the properties of the tax returns submitted to the tax office and thus not independent of the probability of evading taxes. Those tax payers, identified as tax cheaters, could be the tip of the iceberg only because it is highly improbable that tax authorities would detect all tax cheaters even when they wanted to. The survey of individual tax morale only measures hypothetical tax morale and not real tax compliance. Although some progress has been made in the theoretical and empirical literature about tax morale, the literature on its interaction with the shadow economy and tax evasion, we are still lacking a rigorous theoretical model with appropriate econometric tests of the interaction of these crucial elements.[4]Although the literate knows quite a few figures and time series data for the size and development of the shadow economy for most OECD countries we are still lacking time series analysis of tax evasion. Hence, in this paper is an attempt to close this gap.

2.2. Methodological Remarks

The study of Schneider & Buehn (2012) and their results repeated in Table 1 allows us to present – for the first time – macroeconomic time series evidence for the potential level of tax evasion across OECD countries, also using insights from the excellent survey on the German shadow economy presented in Feld & Schneider (2010). In their survey, Feld and Schneider compare the size of the shadow economy estimated using surveys (microeconomic approach) with estimates derived – and most widely published – by the macroeconomic MIMIC-model and/or currency demand approaches. They argue that the rather large differences originate from the survey method, which does typically not record the total value added but only the value added of undeclared work (Feld & Schneider, 2010). If one takes into account material, another 3–4% may be added to the survey estimates. Moreover, illegal activities such as prostitution and illegally firms in the construction sector contribute another 4–5% of official GDP to the size of the shadow economy. Finally, statistical offices in OECD countries usually impute informal activities in officially published GDP measures; hence some shadow activities are already included in the 'official' GDP. Thus another 1–2% of black activities from official GDP may be further added to the survey figures. This analysis of Feld and Schneider allows two conclusions: first, the shadow economy estimates derived by the MIMIC and/or currency demand approaches, and the survey approach can be reconciled with each other. Second and more importantly, the shadow economy can be disaggregated into different kinds of legal and illegal activities.

---

[4] Compare the works of Feld & Torgler (2007), Torgler & Schneider (2009) and Feld & Frey (2007).

Table 2. *The proportion of legal, explicit shadow economic activities in Germany*

Kinds of shadow economy activities	Size in % of official GDP	Proportion of the overall shadow economy
(1) Total shadow economy (estimated by the MIMIC and calibrated by the currency demand procedures)	15.0	100
(2) Material (used)	3.0–4.0	20–25
(3) Illegal activities (goods and services)	4.0–5.0	26–33
(4) Already in the official GDP included illegal activities	1.0–2.0	7–13
(5) Sum (2) to (4)	8.0–11.0	53–71
(6) Legal, explicit shadow economic activities (position (1) minus position (6))	4.0–7.0	29–47
(7) Tax evasion (approx. one fourth of the explicit shadow economy)	1.0–1.7	7–11

Source: Adapted from Feld & Schneider (2010)

Applying the approach of Feld & Schneider (2010) we are able to derive estimates for legal undeclared work or – as we would like to define it – explicit shadow economic activities such as unreported income from self-employment; wages, salaries and assets from unreported work related to legal services and goods; and tax evasion. Using the size of the German shadow economy of 15% in 2010 as estimated by Schneider & Buehn (2012), we calculate an average size of the legal or explicit German shadow economy of approximately one third of the official GDPas demonstrated in table 2.To compute time series estimates of tax evasion across OECD countries on the basis of the results of Feld & Schneider (2010) and Schneider & Buehn (2012), we make two assumptions. The first – to our view uncritical – assumption is that behavioral patterns across OECD countries are reasonably comparable. This assumption allows us to disaggregate the MIMIC model shadow economy estimates of Schneider & Buehn (2012) in a similar way for all OECD countries as demonstrated for Germany in table 2. The second assumption – maybe a bit more debatable – is that the dynamics of tax evasion may be attributable to impact of the indirect tax burden and of self-employment. This assumption may be justified as for the majority of citizens direct taxes such as the personal income tax are automatically deducted, which leaves no room for evasion. All other determinants (except self-employment) Schneider & Buehn (2012) have identified as the driving forces of the shadow economy are rather linked to undeclared work than pure tax evasion. Hence, the relative impact of the indirect tax burden and of self-employment may explain that proportion of legal shadow economic activities due to tax evasion.

For Germany, the average contribution of the indirect tax burden to the dynamics of the shadow economy is approximately one fourth (compare table 1). Following our line of reasoning this means that one fourth of the shadow economy and its dynamics is due to tax evasion. Position (7) in table 2 shows the so computed size of tax evasion in Germany in 2010, if we only consider indirect taxation.

As Table 2 shows, material used and illegal shadow economic activities, i.e., non-explicit shadow economic activities, account for up to 71% of the size of the shadow economy. Hence, explicit shadow activities, i.e., shadow activities from 'black' hours worked, make up approximately one third of the size of the shadow economy. Assuming that the size of the non-explicit shadow economy has not changed a lot between 1999 and 2010, we deduct the 11% of non-explicit shadow

economic activities from Schneider & Buehn's (2012) MIMIC model shadow economy estimates for each year during 1999 and 2010. This yields estimates of the explicit shadow economy for Germany between 3.6 and 5.4% of official GDP as shown in Figure 1. The explicit shadow economy thus accounts for 24% to 33% of the total shadow economy estimated from the MIMIC model and currency demand approaches.
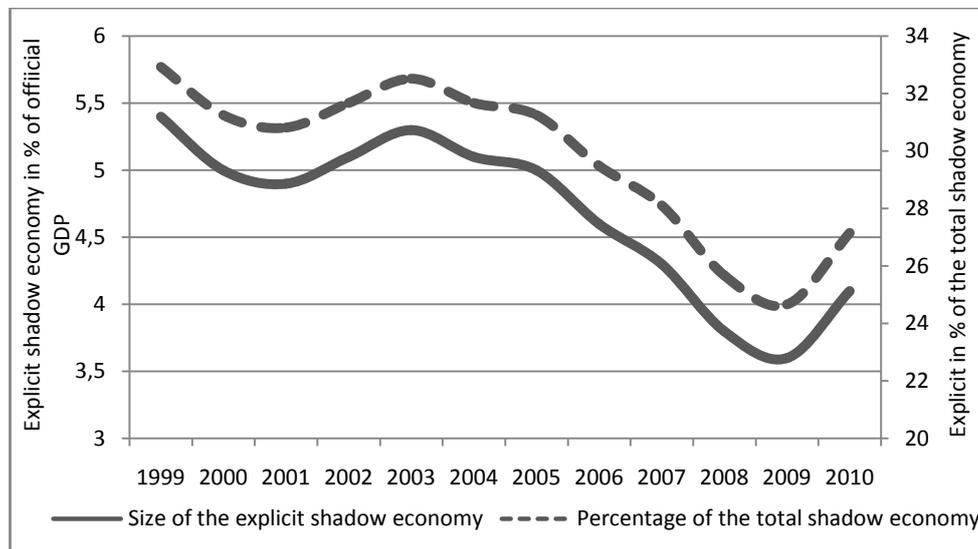

Figure 1. *Size and development of the explicit shadow economy in Germany (1999:2010)*

3. Empirical Results of Tax Evasion Figures

The computed tax evasion estimates for 38 OECD countries between 1999 and 2010 following the methodology proposed in the previous section are presented in table 3.As discussed above, we assume that behavioral patterns across OECD are reasonably comparable. This assumption makes it possible to apply the proportion of the explicit shadow economy in percent of the total shadow economy computed for Germany across all OECD countries. The average size of legal, explicit shadow economic activities in the 38 OECD countries was 6.0 averaged over 1999 to 2010; it had decreased from 6.9% of official GDP in 1999 to 4.8% and 5.2% of official GDP in the years 2009 and 2010, respectively. We clearly see that the negative trend of the overall size of the shadow economies of the 38 countries over the years 1999 to 2010 also holds for the legal, explicit activities of the shadow economy (e.g. repairing a car, constructing a house, doing a cleaning service, etc.). The highest level of the size and development of "legal, explicit activities" produced in the shadow economy has Bulgaria with and average value over 1999 to 2010 of 10.3% of GDP, followed by Romania with an average value of 9.6% of GDP and Turkey with an average value of 9.1% of GDP. The lowest size of legal activities in the shadow economy has Switzerland with an average value over 1999 to 2010 of 2.5%, followed by the United States with 2.6% and 2.9% of the countries of Austria and Luxembourg.

Table 3. *Size and development of legal, explicit shadow economic activities (in % of GDP) in 38 OECD countries*

Country	99	2000	01	02	03	04	05	06	07	08	09	2010	Average
Australia	4.7	4.5	4.4	4.5	4.5	4.3	4.3	4.0	3.9	3.4	3.3	3.6	4.1
Austria	3.3	3.1	3.0	3.1	3.2	3.1	3.1	2.8	2.7	2.4	2.4	2.9	2.9
Belgium	7.5	6.9	6.8	7.0	7.2	6.9	6.8	6.3	5.8	5.2	5.1	5.6	6.4
Bulgaria	12.3	11.5	11.3	11.4	11.6	11.1	10.7	9.9	9.3	8.7	7.9	8.7	10.3
Canada	5.4	5.0	4.9	5.0	5.1	4.9	4.8	4.5	4.3	3.8	3.8	4.2	4.6
Chile	6.6	6.2	6.0	6.2	6.3	6.1	5.9	5.5	5.2	4.9	5.1	5.4	5.8
Cyprus	9.6	9.0	8.7	8.8	9.2	8.9	8.7	8.1	7.7	7.1	6.6	6.9	8.3
Czech Rep.	6.4	6.0	5.8	6.0	6.1	5.8	5.6	5.1	4.6	3.9	3.9	4.2	5.3
Denmark	6.1	5.6	5.5	5.7	5.9	5.6	5.5	5.0	4.6	3.9	4.0	4.4	5.2
Estonia	-	8.0	7.8	7.9	7.9	7.6	7.3	6.7	6.3	5.3	6.0	6.1	7.0
Finland	6.1	5.7	5.5	5.6	5.8	5.6	5.4	5.0	4.7	4.2	4.1	4.6	5.2
France	5.2	4.8	4.6	4.8	4.9	4.7	4.6	4.4	4.1	3.6	3.6	4.0	4.4
Germany	5.4	5.0	4.9	5.1	5.3	5.1	5.0	4.6	4.3	3.8	3.6	4.1	4.7
Greece	9.4	9.0	8.7	8.9	8.9	8.6	8.4	7.8	7.4	6.7	6.2	6.8	8.1
Hungary	8.4	7.8	7.6	7.8	7.9	7.6	7.5	7.0	6.7	5.9	5.7	6.3	7.2
Iceland	5.3	5.0	4.9	5.1	5.2	4.9	4.7	4.4	4.0	3.5	3.6	3.9	4.5
Ireland	5.3	5.0	4.9	5.0	5.2	5.0	4.9	4.6	4.5	4.1	4.3	4.5	4.8
Italy	9.2	8.5	8.2	8.5	8.8	8.6	8.5	7.9	7.5	6.9	6.5	7.2	8.0
Korea, Rep.	9.3	8.6	8.4	8.5	8.7	8.4	8.2	7.6	7.3	6.6	6.0	6.7	7.9
Latvia	7.9	7.4	7.1	7.3	7.3	7.0	6.7	6.1	5.8	5.8	4.9	5.8	6.6
Lithuania	9.0	8.5	8.2	8.3	8.3	8.0	7.6	7.0	6.8	6.7	5.8	6.9	7.6
Luxembourg	3.3	3.1	3.0	3.1	3.2	3.1	3.0	2.8	2.6	2.3	2.3	2.6	2.9
Malta	9.0	8.5	8.4	8.6	8.9	8.7	8.5	8.0	7.5	6.9	6.6	7.6	8.1
Mexico	10.1	9.4	9.3	9.6	9.9	9.5	9.3	8.6	8.1	7.7	7.4	8.1	8.9
Netherlands	4.4	4.1	4.0	4.2	4.3	4.2	4.1	3.9	3.7	3.3	3.2	3.7	3.9
New Zealand	4.3	4.0	3.9	3.9	4.0	3.8	3.8	3.6	3.4	3.0	3.0	3.3	3.7
Norway	6.3	6.0	5.9	6.0	6.2	5.9	5.8	5.4	5.1	4.5	4.6	4.9	5.5
Poland	9.1	8.6	8.5	8.8	8.9	8.6	8.4	7.8	7.1	6.3	6.1	6.5	7.9
Portugal	7.6	7.1	7.0	7.2	7.5	7.3	7.3	6.8	6.3	5.6	5.4	6.0	6.8
Romania	11.3	10.8	10.4	10.6	10.7	10.1	9.9	9.1	8.7	8.1	7.4	8.4	9.6
Slovak Rep.	6.2	5.9	5.8	5.9	6.0	5.7	5.5	5.1	4.7	4.1	3.9	4.3	5.3
Slovenia	9.0	8.5	8.2	8.4	8.6	8.3	8.1	7.5	7.1	6.3	5.8	6.4	7.7
Spain	7.6	7.1	6.9	7.1	7.3	7.1	7.0	6.6	6.3	5.9	6.0	6.4	6.8
Sweden	6.5	6.0	5.9	6.0	6.1	5.9	5.8	5.4	5.1	4.5	4.4	4.9	5.5
Switzerland	2.9	2.7	2.7	2.7	2.9	2.7	2.7	2.4	2.2	1.8	1.9	2.2	2.5
Turkey	10.8	10.0	10.1	10.3	10.3	9.8	9.4	8.7	7.9	7.3	7.2	7.9	9.1
UK	4.2	4.0	3.9	4.0	4.1	3.9	3.9	3.6	3.5	3.1	3.2	3.3	3.7
United States	2.9	2.7	2.7	2.8	2.8	2.7	2.7	2.5	2.4	2.2	2.3	2.5	2.6
Average	6.9	6.5	6.3	6.5	6.6	6.4	6.2	5.8	5.4	4.9	4.8	5.2	6.0

Source: Schneider & Buehn (2012) and own calculations.

In table 4 the size and development of tax evasion (in % of GDP) in 38 countries is shown if we only consider indirect taxation as driving force of tax evasion. Look at the average values of the 38 OECD countries first; we see – also true for single countries –a negative trend, meaning that the size of tax evasion had decreased during the period 1999 to 2010. The average size of tax evasion across all 38 OECD countries was 2.0% of GDP in the year 1999 and had declined more or less steadily to 1.4% or 1.5% of official GDP in the years 2009 and 2010. If we consider single countries, the highest value of tax evasion (measured in % of GDP) has Bulgaria with an average value of 3.9% over the period 1999 to 2010. Mexico has the second highest average level of tax evasion with an average value of 3.8% over that period, followed by Malta and Cyprus with average values of 3.2% and 3.0%, respectively. The lowest tax evasion level has the United States with an average tax evasion of 0.1% over the period 1999 to 2010, followed by Switzerland with an average value of 0.8% (also valid for Austria and Canada).

Table 4. *Size and development of tax evasion (in % of GDP) in 38 OECD countries*

Country	99	2000	01	02	03	04	05	06	07	08	09	2010	Average
Australia	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	0.9	0.8	0.9	1.0
Austria	0.9	0.8	0.8	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.8	0.8
Belgium	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.2	1.1	1.0	1.1	1.3
Bulgaria	4.6	4.3	4.3	4.3	4.4	4.2	4.0	3.7	3.5	3.3	3.0	3.3	3.9
Canada	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.7	0.8
Chile	2.3	2.2	2.1	2.2	2.2	2.1	2.1	1.9	1.8	1.7	1.8	1.9	2.0
Cyprus	3.5	3.2	3.1	3.2	3.3	3.2	3.1	2.9	2.8	2.6	2.4	2.5	3.0
Czech Rep.	2.0	1.8	1.8	1.8	1.9	1.8	1.7	1.6	1.4	1.2	1.2	1.3	1.6
Denmark	2.0	1.9	1.9	1.9	2.0	1.9	1.8	1.7	1.6	1.3	1.3	1.5	1.7
Estonia	-	2.9	2.8	2.8	2.8	2.7	2.6	2.4	2.3	1.9	2.2	2.2	2.5
Finland	1.8	1.6	1.6	1.6	1.7	1.6	1.6	1.5	1.4	1.2	1.2	1.3	1.5
France	1.3	1.2	1.1	1.2	1.2	1.1	1.1	1.1	1.0	0.9	0.9	1.0	1.1
Germany	1.3	1.2	1.2	1.2	1.3	1.2	1.2	1.1	1.0	0.9	0.9	1.0	1.1
Greece	2.0	2.0	1.9	1.9	1.9	1.9	1.8	1.7	1.6	1.5	1.4	1.5	1.8
Hungary	2.9	2.7	2.7	2.7	2.8	2.7	2.6	2.4	2.3	2.1	2.0	2.2	2.5
Iceland	2.1	2.0	1.9	2.0	2.1	1.9	1.9	1.8	1.6	1.4	1.4	1.6	1.8
Ireland	1.9	1.8	1.8	1.8	1.9	1.8	1.8	1.7	1.6	1.5	1.6	1.6	1.7
Italy	1.7	1.6	1.6	1.6	1.7	1.6	1.6	1.5	1.4	1.3	1.2	1.4	1.5
Korea, Rep.	2.5	2.3	2.3	2.3	2.4	2.3	2.2	2.1	2.0	1.8	1.6	1.8	2.1
Latvia	2.5	2.4	2.3	2.3	2.4	2.3	2.2	2.0	1.9	1.9	1.6	1.9	2.1
Lithuania	2.6	2.4	2.4	2.4	2.4	2.3	2.2	2.0	2.0	1.9	1.7	2.0	2.2
Luxembourg	1.1	1.0	1.0	1.0	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.9	1.0
Malta	3.6	3.4	3.3	3.4	3.5	3.5	3.4	3.2	3.0	2.8	2.6	3.0	3.2
Mexico	4.3	4.0	3.9	4.1	4.2	4.0	3.9	3.6	3.4	3.2	3.1	3.4	3.8
Netherlands	1.4	1.3	1.3	1.4	1.4	1.4	1.3	1.3	1.2	1.1	1.0	1.2	1.3
New Zealand	1.1	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.8	0.9
Norway	2.0	1.9	1.8	1.9	1.9	1.8	1.8	1.7	1.6	1.4	1.4	1.6	1.7
Poland	2.5	2.4	2.4	2.4	2.5	2.4	2.3	2.2	2.0	1.8	1.7	1.8	2.2
Portugal	2.3	2.1	2.1	2.2	2.2	2.2	2.2	2.0	1.9	1.7	1.6	1.8	2.0
Romania	2.8	2.6	2.5	2.6	2.6	2.5	2.4	2.2	2.1	2.0	1.8	2.1	2.4
Slovak Rep.	2.0	1.9	1.8	1.9	1.9	1.8	1.7	1.6	1.5	1.3	1.2	1.4	1.7
Slovenia	3.0	2.9	2.8	2.9	2.9	2.8	2.7	2.5	2.4	2.1	2.0	2.2	2.6
Spain	1.4	1.3	1.2	1.3	1.3	1.3	1.3	1.2	1.1	1.1	1.1	1.1	1.2
Sweden	2.0	1.8	1.8	1.8	1.9	1.8	1.8	1.6	1.5	1.4	1.4	1.5	1.7
Switzerland	0.9	0.8	0.8	0.8	0.9	0.8	0.8	0.8	0.7	0.6	0.6	0.7	0.8
Turkey	3.4	3.1	3.2	3.2	3.2	3.1	2.9	2.7	2.5	2.3	2.3	2.5	2.9
UK	1.3	1.2	1.2	1.2	1.3	1.2	1.2	1.1	1.1	1.0	1.0	1.0	1.1
United States	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average	2.0	1.9	1.9	1.9	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.5	1.8

Source: Own calculations.

In figure 2 the size and development of tax evasion (measured in % of official GDP) for France, Germany, Greece, Spain, Sweden and the United Kingdom is shown. We clearly see that Greece had the highest value of 2.0% in the year 2001, which had declined to 1.5% in the year 2010. All other countries show a similar declining pattern with a modest increase in the last two years.

The literature agrees that that self-employed can more easily evade taxes and supply labor in the shadow economy than employees. The impact of self-employment on the shadow economy though is less or only partly controllable by the government and may be ambiguous from a welfare perspective. A government can deregulate the economy or incentivize "to be your own entrepreneur", which would make self-employment easier, potentially reducing unemployment and positively contributing to efforts in controlling the size of the shadow economy. Such actions however need to be accompanied with a strengthening of institutions and tax morale to reduce the probability that self- employed shift reasonable proportions of their economic activities into the shadow economy or evade taxes on a large scale.
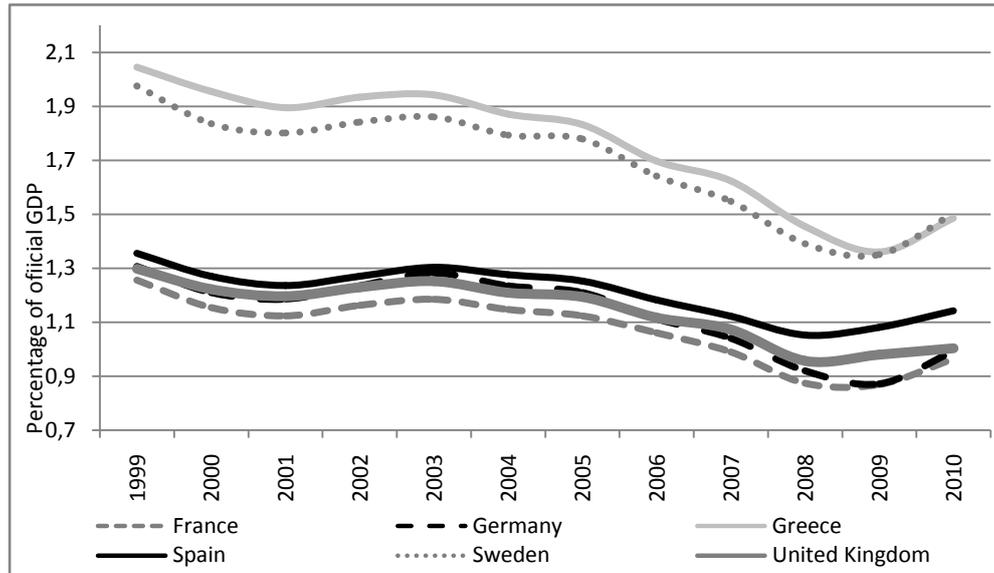
Figure 2: Size and development of tax evasion in selected countries (1999:2010)

Schneider & Buehn (2012) indeed show that self-employment is a very important determinant of the shadow economy, explaining approximately 17% of its variation. Seeing that self-employment is such an important determinant of the total shadow economy, one might argue that it of course determines "legal" shadow economic activities and also tax evasion. This suggests to also taking into account the relative impact of self-employment when calculating time series estimates of tax evasion. Table 5 shows higher tax evasion estimates for the 38 OECD countries over the period 1999 to 2010 that do not only account for the indirect tax burden but the impact of self-employment. Table 5 clearly shows a similar pattern like table 4. If we first look at the average values of the 38 countries and over the period 1999 to 2010 we get an average value of tax evasion of 3.2 % of official GDP. We again find for the average but also for the single countries a negative trend, meaning that the size of tax evasion is decreasing over the period 1999 to 2010. The average size of tax evasion of the 38 OECD countries in the year 1999 was 3.6 % of GDP and this value more or less steadily clines to 2.5% or 2.8 % of the official GDP in the years 2009 and 2010. If we consider single countries the highest value of tax evasion (measured in per cent of GDP) has Mexico with 6.8% as an average value of the period of 1999 to 2010. Turkey has the second highest average level of tax evasion with an average value over the period 1999 to 2010 of 6.7%, followed by Romania and Bulgaria with an average values over the period 1999 to 2010 of 6.0% und 5.7% respectively. The lowest tax evasion level have the United States with an average tax evasion of 0.5% over the period 1999 to 2010, followed by Luxembourg with an average value of 1.3% and Austria with one of 1.4%.

Table 5. *Size and development of tax evasion (in % of GDP) in 38 OECD countries accounting for self-employment*

Country	1999	2000	01	02	03	04	05	06	07	08	09	2010	Average
Australia	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.8	1.7	1.5	1.5	1.6	1.8
Austria	1.6	1.5	1.4	1.5	1.5	1.5	1.5	1.4	1.3	1.2	1.1	1.4	1.4
Belgium	2.8	2.6	2.6	2.6	2.7	2.6	2.6	2.4	2.2	2.0	1.9	2.1	2.4
Bulgaria	6.8	6.4	6.2	6.3	6.4	6.1	5.9	5.5	5.1	4.8	4.4	4.8	5.7
Canada	2.1	2.0	2.0	2.0	2.0	2.0	1.9	1.8	1.7	1.5	1.5	1.7	1.9
Chile	4.5	4.2	4.1	4.2	4.3	4.1	4.0	3.7	3.5	3.3	3.4	3.7	3.9
Cyprus	6.3	5.9	5.7	5.8	6.0	5.9	5.7	5.3	5.0	4.7	4.4	4.5	5.4
Czech Rep.	3.4	3.2	3.2	3.2	3.3	3.2	3.0	2.8	2.5	2.1	2.1	2.3	2.9
Denmark	2.6	2.4	2.4	2.5	2.5	2.4	2.4	2.2	2.0	1.7	1.7	1.9	2.2
Estonia	-	3.7	3.6	3.7	3.7	3.5	3.4	3.1	2.9	2.5	2.8	2.8	3.2
Finland	2.7	2.5	2.4	2.5	2.5	2.5	2.4	2.2	2.1	1.9	1.8	2.0	2.3
France	2.0	1.9	1.8	1.9	1.9	1.9	1.8	1.7	1.6	1.4	1.4	1.6	1.7
Germany	2.2	2.1	2.0	2.1	2.2	2.1	2.1	1.9	1.8	1.6	1.5	1.7	1.9
Greece	5.6	5.3	5.2	5.3	5.3	5.1	5.0	4.6	4.4	4.0	3.7	4.0	4.8
Hungary	4.5	4.2	4.1	4.1	4.2	4.1	4.0	3.7	3.6	3.2	3.0	3.3	3.8
Iceland	3.0	2.9	2.8	2.9	3.0	2.8	2.7	2.5	2.3	2.0	2.1	2.3	2.6
Ireland	3.1	2.9	2.8	2.9	3.0	2.9	2.8	2.6	2.6	2.4	2.5	2.6	2.8
Italy	4.6	4.2	4.1	4.2	4.4	4.3	4.2	4.0	3.8	3.4	3.3	3.6	4.0
Korea, Rep.	6.7	6.2	6.0	6.1	6.2	6.0	5.9	5.5	5.2	4.7	4.3	4.8	5.6
Latvia	3.7	3.5	3.4	3.4	3.4	3.3	3.2	2.9	2.7	2.7	2.3	2.7	3.1
Lithuania	4.1	3.9	3.8	3.8	3.8	3.6	3.5	3.2	3.1	3.1	2.7	3.2	3.5
Luxembourg	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.2	1.1	1.0	1.2	1.3
Malta	5.5	5.2	5.1	5.3	5.4	5.3	5.2	4.8	4.6	4.2	4.0	4.6	4.9
Mexico	7.7	7.1	7.1	7.3	7.5	7.2	7.1	6.5	6.1	5.8	5.6	6.2	6.8
Netherlands	2.3	2.1	2.1	2.2	2.3	2.2	2.2	2.0	1.9	1.7	1.7	1.9	2.0
New Zealand	2.1	1.9	1.9	1.9	1.9	1.8	1.8	1.7	1.6	1.5	1.4	1.6	1.8
Norway	2.8	2.7	2.6	2.7	2.7	2.6	2.6	2.4	2.3	2.0	2.0	2.2	2.5
Poland	4.9	4.6	4.6	4.7	4.8	4.6	4.5	4.2	3.8	3.4	3.2	3.5	4.2
Portugal	4.6	4.3	4.2	4.4	4.6	4.5	4.4	4.2	3.9	3.4	3.3	3.7	4.1
Romania	7.0	6.7	6.5	6.6	6.6	6.3	6.2	5.6	5.4	5.0	4.6	5.2	6.0
Slovak Rep.	2.8	2.7	2.6	2.7	2.7	2.6	2.5	2.3	2.1	1.9	1.8	1.9	2.4
Slovenia	5.0	4.7	4.6	4.7	4.8	4.6	4.5	4.1	4.0	3.5	3.2	3.6	4.3
Spain	3.2	3.0	2.9	3.0	3.0	3.0	2.9	2.8	2.6	2.5	2.5	2.7	2.8
Sweden	2.8	2.6	2.6	2.6	2.7	2.6	2.5	2.4	2.2	2.0	1.9	2.2	2.4
Switzerland	1.6	1.5	1.4	1.5	1.6	1.5	1.4	1.3	1.2	1.0	1.0	1.2	1.4
Turkey	7.8	7.3	7.4	7.5	7.5	7.1	6.8	6.3	5.7	5.3	5.3	5.7	6.7
UK	2.1	1.9	1.9	1.9	2.0	1.9	1.9	1.8	1.7	1.5	1.6	1.6	1.8
United States	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5
Average	3.6	3.4	3.4	3.4	3.5	3.4	3.3	3.1	2.9	2.6	2.5	2.8	3.2

Source: Own calculations.

4. Summary and Conclusions

For the first time we present time series on tax evasion for 38 OECD countries, derived from the MIMIC estimation approach of the size and development of the overall shadow economy. In general our results clearly show that it is possible to compute time series of in % of GDP. Considering the period 1999 to 2010, we observe a declining trend but find sizeable figures for most of the 38 OECD countries. In particular, we get the following empirical results:

(1) We find a declining trend for the size and development of tax evasion over the period 1999 to 2010.

(2) The average size of tax evasion varies between 6.8% for Mexico (highest value) and 0.5% for the United States (lowest value).

(3) For most countries we observe a slight increase from 2009 to 2010.

What type of policy conclusions can we draw from these figures?

(1) It is possible to develop time series figures of tax evasion, which could provide some help for every government to see how large tax evasion in a given country is and what can be against it.

(2) Of course, these are very preliminary estimates. They should be handled with great care. Nevertheless, they are a first attempt to present alternative measures of tax evasion and to construct empirically orientated time series for a sample of 38 highly developed OECD countries.

We will certainly improve our time series with more elaborate calculations but this will be done in the next paper.

References

Andreoni, J., Erard, B. & Feinstein, J. (1998), Tax Compliance, *Journal of Economic Literature*, 36(2), 818.860.

Feld, L.P. & Frey, B.S. (2007), Tax compliance as the result of a psychological tax contract: the role of incentives and responsive regulation, *Law and Policy*, 29(1), 102-120. doi. 10.1111/j.1467-9930.2007.00248.x

Feld, L.P. & Larsen, C. (2005), Black Activities in Germany in 2001 and 2004: A Compari-son Based on Survey Data, Study No. 12, The Rockwool Foundation Research Unit, Copenhagen.

Feld, L.P. & Larsen, C. (2011), Undeclared work, deterrence and social norms: the case of Germany, Berlin, Springer Publishing Company, 2011.

Feld, L.P., Schmidt, A.J. & Schneider, F. (2011), Deterrence policy and the size of the shadow economy in Germany: an institutional and empirical analysis, in Friedrich Schneider (editor) *Handbook on the Shadow Economy*, Cheltenham (UK): Edward Elgar. pp 409-440.

Feld, L.P. & Schneider, F. (2010), Survey on the shadow economy and undeclared earnings in OECD countries, *German Economic Review,* 11(2), 109-149. doi. 10.1111/j.1468-0475.2010.00509.x

Feld, L.P. & Torgler, B. (2007), Tax morale after the re-unification of Germany: results from a quasi-natural experiment, *CESifo Working Paper* No. 1921, February.

Lyssiotou, P., Pashardes, P. & Stengos, T. (2004), Estimates of the black economy based on consumer demand approaches, *Economic Journal*, 114(497), 622-640. doi. 10.1111/j.1468-0297.2004.00234.x

Pedersen, S. (2003), The Shadow Economy in Germany, Great Britain and Scandinavia: A Measurement Based on Questionnaire Service, Study No. 10, The Rockwool Foundation Research Unit, Copenhagen.

Schmölders, G. (1932), Steuermoral and Steuerbelastung, *Vierteljahresschrift für Steuer- und Finanzrecht*, 6(1), 151-161.

Schmölders, G. (1960), Das Irrationale in der öffentlichen Finanzwirtschaft, *Probleme der Finanzpsychologie*, Hamburg: Rowohlt, Verlag, 1960.

Schneider, F. (2011), Handbook of the Shadow Economy, Cheltenham (UK), Edward Elgar Publishing Company.

Schneider, F. & Buehn, A. (2012), Shadow economies in highly developed OECD countries: What are the driving forces?, *IZA discussion*, paper no. 6891, Institute for the study of labor, University of Bonn, Bonn.

Schneider, F. & Enste, D. (2000), Shadow Economies: Size, causes and consequences, *Journal of Economic Literature*, 38(1), 77-114. doi. 10.1257/jel.38.1.77

Thomas, J.J. (1999), Quantifying the Black Economy: Measurement without theory' yet again?, *Economic Journal*, 109(456), 381-389. doi. 10.1111/1468-0297.00441

Torgler, B. & Schneider, F. (2009), The impact of tax morale and institutional quality on the shadow economy, *Journal of Economic Psychology*, 30(2), 228-245. doi. 10.1016/j.joep.2008.08.004