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Article

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CESifo DICE Report

Provided in Cooperation with:

Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

Suggested Citation: Schneider, Friedrich (2016) : Estimating the Size of the Shadow Economies of Highly-developed Countries: Selected New Results, CESifo DICE Report, ISSN 1613-6373, ifo Institut - Leibniz-Institut für Wirtschaftsforschung an der Universität München, München, Vol. 14, Iss. 4, pp. 44-53

This Version is available at:

<https://hdl.handle.net/10419/167285>

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ESTIMATING THE SIZE OF THE SHADOW ECONOMIES OF HIGHLY-DEVELOPED COUNTRIES: SELECTED NEW RESULTS

FRIEDRICH SCHNEIDER¹

Introduction

Empirical research into the size and development of the global shadow economy has grown rapidly (Feld and Schneider 2010; Gerxhani 2003; Schneider 2011, 2015; Schneider and Williams 2013). The goal of this paper is to present the latest shadow economy estimates for 36 highly-developed countries over 2003–2016 and to discuss their different developments. The article begins with some theoretical considerations, including a definition of the shadow economy and a brief discussion of its main causes. This is followed by a short description of the various measurement methods and estimates of the size of the shadow economies of 36 highly-developed countries over 2003–2016. Finally, the last section offers a summary and some concluding remarks.

Theoretical considerations

Defining the shadow economy

Researchers attempting to measure the size of the shadow economy face the question of how to define it (Schneider 2015; Schneider and Enste 2000, 2002; Schneider and Williams 2013; Alm, Martinez-Vazquez and Schneider 2004; Feld and Schneider 2010). One commonly used working definition is all currently unregistered economic activities that would contribute to the officially calculated (or observed) Gross National Product if observed.² Smith (1994, 18) uses the definition

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² This definition is used, for example, by Feige (1989, 1994) and Schneider (2011, 2015). Do-it-yourself activities are not included. For estimates of the shadow economy and do-it-yourself activities for Germany, see Buehn, Karmann and Schneider (2009).

“market-based production of goods and services, whether legal or illegal, that escapes detection in the official estimates of GDP.” One of the broadest definitions includes: “those economic activities and the income derived from them that circumvent government regulation, taxation or observation” (Dell’Anno 2003; Dell’Anno and Schneider 2004).

This article uses the following, narrower, definition of the shadow economy.³ The shadow economy includes all market-based legal production of goods and services that are deliberately concealed from public authorities for the following reasons:

- (1) to avoid payment of taxes, e.g. income taxes or value added taxes,
- (2) to avoid payment of social security contributions,
- (3) to avoid certain legal labor market standards, such as minimum wages, maximum working hours, safety standards, etc., and
- (4) to avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms.

Theorizing about the shadow economy

Individuals are rational calculators who weigh up costs and benefits when considering breaking the law. Their decision to partially or completely participate in the shadow economy is a choice overshadowed by uncertainty, as it involves a trade-off between gains if their activities are not discovered and losses if they are discovered and penalized. Shadow economic activities SE thus negatively depend on the probability of detection p and potential fines f , and positively on the opportunity costs of remaining formal denoted as B . The opportunity costs are positively determined by the burden of taxation T and high labor costs W – individual income generated in the shadow economy is usually categorized as labor income rather than capital income – due to labor market regulations. Hence, the higher the tax burden and labor costs, the more incentives individuals have to avoid these costs by working in the shadow economy.

³ Compare also the excellent discussion of the definition of a shadow economy in Pedersen (2003) and Kazemier (2006).

The probability of detection p itself depends on enforcement actions A taken by the tax authority and on facilitating activities F accomplished by individuals to reduce the detection of shadow economic activities. This discussion suggests the following structural equation:

$$SE = SE \left[\overset{-}{p} \left(\overset{+}{A}, \overset{-}{F} \right); \overset{-}{f}; \overset{+}{B} \left(\overset{+}{T}, \overset{+}{W} \right) \right]$$

Hence, shadow economic activities may be defined as those economic activities and income earned that circumvent government regulation, taxation or observation. More narrowly, the shadow economy includes monetary and non-monetary transactions of a legal nature; hence all productive economic activities that would generally be taxable were they reported to the state (tax) authorities. Such activities are deliberately concealed from public authorities to avoid payment of income, value added or other taxes and social security contributions, or to avoid compliance with certain legal labor market standards such as minimum wages, maximum working hours, or safety standards and administrative procedures. The shadow economy thus focuses on productive economic activities that would normally be included in the national accounts, but which remain underground due to tax or regulatory burdens.⁴ Although such legal activities would contribute to a country's value added, they are not captured in national accounts because they are produced in illicit ways. Informal household economic activities such as do-it-yourself activities and neighborly help are typically excluded from the analysis of the shadow economy.⁵

What are the most important determinants influencing the shadow economy? Table 1 offers an overview of these factors.

Methods for estimating the size of the shadow economy

Estimating the size of a shadow economy is a difficult and challenging task. This article only outlines various procedures for estimating the size of a shadow economy.⁶ Three different categories of measurement methods are most widely used, and each is briefly discussed.

Direct approaches

These are microeconomic approaches that either employ well-designed surveys and samples based on voluntary replies, or tax auditing and other compliance methods. Sample surveys designed to estimate the shadow economy are widely used.⁷ The main disadvantages of this method are the flaws inherent in all surveys. For example, the average precision and results depend heavily on the respondent's willingness to cooperate, it is difficult to assess the amount of undeclared work from a direct questionnaire, most interviewees hesitate to confess to fraudulent behavior, and responses are of uncertain reliability.

Indirect approaches

These approaches, which are also called indicator approaches, are mostly macroeconomic and use various economic and other indicators that contain information about the development of the shadow economy over time. Relating them to the definition of the shadow economy, they provide value added figures. In most cases, legally-bought material is often included; hence, they provide upper-bound estimates with the danger of a double counting problem due to the inclusion of the legally-bought material. Therefore a wide (broad) definition of the shadow economy is applied; especially as some criminal activities like human trafficking are also included. There are currently five indicators that leave some traces of the shadow economy.⁸

⁴ Although classical crime activities such as drug dealing are independent of increasing taxes and the causal variables included in the empirical models are only imperfectly linked (or causal) to classical crime activities, the footprints used to indicate shadow economic activities such as currency in circulation also apply for classic crime. Hence, macroeconomic shadow economy estimates do not typically distinguish legal from illegal underground activities; but instead represent the whole informal economy spectrum.

⁵ From a social perspective, maybe even from an economic one, soft forms of illicit employment such as moonlighting (e.g. construction work in private homes) and its contribution to aggregate value added may be assessed positively. For a discussion of these issues, see Thomas (1992) and Buehn, Karmann and Schneider (2009).

⁶ The extensive discussion over the pros and cons of the various methods used to measure/estimate the shadow economy is not documented here due to space reasons; compare, for example, Feld and Schneider (2010), Schneider (2015) and Schneider and Williams (2013).

⁷ The direct method of voluntary sample surveys was extensively used for the first time for Norway by Isachsen, Klovland and Strom (1982), and Isachsen and Strom (1985). For Denmark this method is used by Mogensen et al. (1995) in which they report "estimates" of the shadow economy of 2.7% of GDP for 1989, 4.2% of GDP for 1991, 3.0% of GDP for 1993 and 3.1% of GDP for 1994. See also newer studies like Feld and Larsen (2005, 2008, 2009) that estimate similar sizes for the shadow economy of Germany. The advantages and disadvantages of this method are extensively dealt with by Pedersen (2003), Mogensen (1985) and Mogensen et al. (1995) in their excellent and very carefully conducted investigations.

⁸ Due to space constraints, these approaches are merely given a mention and not explored in greater detail. Compare Schneider (2015).

Table 1

The main causes determining the shadow economy

Causal variable	Theoretical reasoning	References
(1) Tax and social security contribution burdens	The distortion of the overall tax burden affects labor-leisure choices and may stimulate labor supply in the shadow economy. The bigger the difference between the total labor cost in the official economy and after-tax earnings (from work), the greater the incentive to reduce the tax wedge and work in the shadow economy. This tax wedge depends on social security burden/payments and the overall tax burden, making them a key determinant in the existence of the shadow economy.	E.g. Johnson, Kaufmann and Zoido-Lobaton (1998a,b); Giles (1999a); Tanzi (1999); Schneider (2003, 2005, 2015); Dell'Anno (2007); Dell'Anno, Gomez-Antonio and Alanon Pardo (2007); Schneider and Williams (2013).
(2) Quality of public institutions	The quality of public institutions is another key factor in the development of the informal sector. In particular, the efficient and discretionary application of the tax code and government regulations plays a crucial role in the decision to work underground. A bureaucracy with highly corrupt government officials tends to be associated with greater unofficial activity, while good rule of law through secure property rights and contract enforceability increases the benefits of having a formal status. The likelihood of an informal sector developing thanks to the failure of political institutions in promoting an efficient market economy, and entrepreneurs going underground due to inefficient public goods provision, may be reduced if institutions can be strengthened and fiscal policy is more closely aligned with the median voter's preferences.	E.g. Johnson et al. (1998a,b); Friedman, Johnson, Kaufmann and Zoido-Lobaton (2000); Dreher and Schneider (2009); Dreher, Kotsoyannis and McCorriston (2009); Schneider (2010, 2015); Teobaldelli (2011); Teobaldelli and Schneider (2013); Schneider and Williams (2013).
(3) Regulations	Regulations such as labor market regulations or trade barriers for example, are another important factor that reduces freedom (of choice) for individuals in the official economy. They lead to a substantial increase in labor costs in the official economy and thus provide another incentive to work in the shadow economy; countries that are more heavily regulated tend to have a higher share of the shadow economy in total GDP.	E.g. Johnson, Kaufmann and Shleifer (1997); Johnson, Kaufmann and Zoido-Lobaton (1998b); Friedman, Johnson, Kaufmann and Zoido-Lobaton (2000); Kucera and Roncolato (2008); Schneider (2011, 2015).
(4) Public sector services	An increase in the shadow economy may lead to lower state revenues, which in turn reduce the quality and quantity of publicly-provided goods and services. Ultimately, this may raise tax rates for firms and individuals, although the quality of the public goods (such as public infrastructure) and of the administration may continue to deteriorate. The result is an even stronger incentive for participating in the shadow economy.	E.g. Johnson, Kaufmann and Zoido-Lobaton (1998a,b); Feld and Schneider (2010).
(5) Tax morale	The efficiency of the public sector also has an indirect effect on the size of the shadow economy because it affects tax morale. Tax compliance is driven by a psychological tax contract that entails rights and obligations on the part of taxpayers and citizens on the one hand, but also on the part of the state and its tax authorities on the other hand. Taxpayers are more inclined to pay their taxes honestly if they receive valuable public services in exchange. The treatment of taxpayers by the tax authority also plays a role. If taxpayers are treated like partners in a (tax) contract instead of subordinates in a hierarchical relationship, taxpayers will fulfil the obligations of the psychological tax contract more readily. Hence, (better) tax morale and (stronger) social norms may reduce the probability of individuals working underground.	E.g. Feld and Frey (2007); Kirchner (2007); Torgler and Schneider (2009); Feld and Larsen (2005, 2009); Feld and Schneider (2010).
(6) Development of the official economy	The development of the official economy is another key factor in the shadow economy. The higher (lower) the unemployment quota (GDP-growth), the higher the incentive to work in the shadow economy, ceteris paribus.	Schneider and Williams (2013); Feld and Schneider (2010).
(7) Self-employment	The higher the rate of self-employment, the more activities can be performed in the shadow economy, ceteris paribus.	Schneider and Williams (2013); Feld and Schneider (2010).

Source: The author.

(1) *The discrepancy between national expenditure and income statistics*

This approach is based on discrepancies between income and expenditure statistics. In national accounting the income measure of GNP should be equal to the expenditure measure of GNP. Thus, if an independent estimate of the expenditure side of the national accounts is available, the gap between the expenditure measure and the income measure can be used as an indicator of the extent of the shadow economy.⁹

(2) *The discrepancy between the official and actual labor force*

A decline in labor force participation in the official economy can be seen as an indication of increased activity in the shadow economy. If total labor force participation is assumed to be constant, then a decreasing official rate of participation can be seen as an indicator of increased shadow economic activities, *ceteris paribus*.¹⁰

(3) *The transactions approach*

This approach has been fully developed by Feige.¹¹ It is based upon the assumption that there is a constant relation over time between the volume of transactions and official GNP, as summarized by the well-known Fisher quantity equation, or $M*V = p*T$ (with M money, V velocity, p prices, and T total transactions). Assumptions also have to be made about the velocity of money and about the relationships between the total value of transactions $p*T$ and total (official + unofficial) nominal GNP. Relating total nominal GNP to total transactions, the GNP of the shadow economy can be calculated by subtracting official GNP from total nominal GNP.¹²

(4) *The currency demand approach*

The currency demand approach was first used by Cagan (1958), who considered the correlation between currency demand and tax pressure (as one cause of the shadow

economy) for the United States over the period 1919 to 1955. Cagan's approach was further developed by Tanzi (1980, 1983), who econometrically estimated a currency demand function for the United States for the period 1929 to 1980 in order to calculate the size of the shadow economy. His approach assumes that shadow (or hidden) transactions are undertaken in the form of cash payments so as to leave no observable traces for the authorities. An increase in the size of the shadow economy will therefore increase the demand for currency. To isolate the resulting excess demand for currency, an equation for currency demand is estimated over time. All possible conventional factors, such as the development of income, payment habits, interest rates, credit and other debt cards as a substitute for cash and so on, are controlled for. Additionally, variables such as direct and indirect tax burdens, government regulation, etc., which are assumed to be major factors causing people to work in the shadow economy, are included in the estimation equation.¹³

(5) *The physical input (electricity consumption) method*

(i) *The Kaufmann - Kaliberda Method*

To measure overall (official and unofficial) economic activity in an economy, Kaufmann and Kaliberda (1996) assume that electric power consumption is regarded as the single best physical indicator of overall (or official plus unofficial) economic activity. Overall economic activity and electricity consumption have been empirically observed throughout the world to move in lock-step with an electricity-to-GDP elasticity usually close to one. This means that the growth of total electricity consumption is an indicator for growth of overall (official and unofficial) GDP. By having this proxy measurement for the overall economy and then subtracting from this overall measure the estimates of official GDP, Kaufmann and Kaliberda (1996) derive an estimate of unofficial GDP.

(ii) *The Lackó method*

Lackó (1998, 1999, 2000a,b) assumes that a certain part of the shadow economy is associated with the household consumption of electricity. This part comprises so-called household production, do-it-yourself activities, and other non-registered production and services. Lackó further assumes that in countries where the por-

⁹ See, for example, Franz (1983) for Austria; MacAfee (1980), O'Higgins (1989) and Smith (1985) for Great Britain; Petersen (1982) and Del Boca (1981) for Germany; Park (1979) for the United States. For a critical survey, see Thomas (1992).

¹⁰ Such studies have been made for Italy, see for example Contini (1981) and Del Boca (1981); for the United States, see O'Neill (1983), for later studies, see Williams (2009, 2013), Williams and Lansky (2013) and Williams and Rodgers (2013), for a critical survey, see Thomas (1992).

¹¹ For an extended description of this approach, see Feige (1996); for a further application for the Netherlands, Boeschoten and Fase (1984) and for Germany, Langfeldt (1984).

¹² For a detailed criticism of the transaction approach, see Boeschoten and Fase (1984), Frey and Pommerehne (1984), Kirchgässner (1984), Tanzi (1982a,b, 1986), Dallago (1990), Thomas (1986, 1992, 1999) and Giles (1999a).

¹³ The estimation of such a currency demand equation has been criticized by Thomas (1999), but part of this criticism has been considered by the work of Giles (1999a,b) and Bhattacharyya (1999), who both use the latest econometric techniques.

Table 2

Size of the shadow economy of the 28 EU-countries, 2003 – 2016 (in % of official GDP)														
Country / Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria	10.8	11.0	10.3	9.7	9.4	8.1	8.5	8.2	7.9	7.6	7.5	7.8	8.2	7.8
Belgium	21.4	20.7	20.1	19.2	18.3	17.5	17.8	17.4	17.1	16.8	16.4	16.1	16.2	16.1
Bulgaria	35.9	35.3	34.4	34.0	32.7	32.1	32.5	32.6	32.3	31.9	31.2	31.0	30.6	30.2
Croatia	32.3	32.3	31.5	31.2	30.4	29.6	30.1	29.8	29.5	29.0	28.4	28.0	27.7	27.1
Czech Republic	19.5	19.1	18.5	18.1	17.0	16.6	16.9	16.7	16.4	16.0	15.5	15.3	15.1	14.9
Denmark	17.4	17.1	16.5	15.4	14.8	13.9	14.3	14.0	13.8	13.4	13.0	12.8	12.0	11.6
Estonia	30.7	30.8	30.2	29.6	29.5	29.0	29.6	29.3	28.6	28.2	27.6	27.1	26.2	25.4
Finland	17.6	17.2	16.6	15.3	14.5	13.8	14.2	14.0	13.7	13.3	13.0	12.9	12.4	12.0
France	14.7	14.3	13.8	12.4	11.8	11.1	11.6	11.3	11.0	10.8	9.9	10.8	12.3	12.6
Germany ¹⁾	16.7	15.7	15.0	14.5	13.9	13.5	14.3	13.5	12.7	12.5	12.1	11.6	11.2	10.8
Greece	28.2	28.1	27.6	26.2	25.1	24.3	25.0	25.4	24.3	24.0	23.6	23.3	22.4	22.0
Hungary	25.0	24.7	24.5	24.4	23.7	23.0	23.5	23.3	22.8	22.5	22.1	21.6	21.9	22.2
Ireland	15.4	15.2	14.8	13.4	12.7	12.2	13.1	13.0	12.8	12.7	12.2	11.8	11.3	10.8
Italy	26.1	25.2	24.4	23.2	22.3	21.4	22.0	21.8	21.2	21.6	21.1	20.8	20.6	20.2
Latvia	30.4	30.0	29.5	29.0	27.5	26.5	27.1	27.3	26.5	26.1	25.5	24.7	23.6	22.9
Lithuania	32.0	31.7	31.1	30.6	29.7	29.1	29.6	29.7	29.0	28.5	28.0	27.1	25.8	24.9
Luxembourg (Grand-Duché)	9.8	9.8	9.9	10.0	9.4	8.5	8.8	8.4	8.2	8.2	8.0	8.1	8.3	8.4
Malta	26.7	26.7	26.9	27.2	26.4	25.8	25.9	26.0	25.8	25.3	24.3	24.0	24.3	24.0
Netherlands	12.7	12.5	12.0	10.9	10.1	9.6	10.2	10.0	9.8	9.5	9.1	9.2	9.0	8.8
Poland	27.7	27.4	27.1	26.8	26.0	25.3	25.9	25.4	25.0	24.4	23.8	23.5	23.3	23.0
Portugal	22.2	21.7	21.2	20.1	19.2	18.7	19.5	19.2	19.4	19.4	19.0	18.7	17.6	17.2
Romania	33.6	32.5	32.2	31.4	30.2	29.4	29.4	29.8	29.6	29.1	28.4	28.1	28.0	27.6
Slovakia	18.4	18.2	17.6	17.3	16.8	16.0	16.8	16.4	16.0	15.5	15.0	14.6	14.1	13.7
Slovenia	26.7	26.5	26.0	25.8	24.7	24.0	24.6	24.3	24.1	23.6	23.1	23.5	23.3	23.1
South-Cyprus	28.7	28.3	28.1	27.9	26.5	26.0	26.5	26.2	26.0	25.6	25.2	25.7	24.8	24.2
Spain	22.2	21.9	21.3	20.2	19.3	18.4	19.5	19.4	19.2	19.2	18.6	18.5	18.2	17.9
Sweden	18.6	18.1	17.5	16.2	15.6	14.9	15.4	15.0	14.7	14.3	13.9	13.6	13.2	12.6
United Kingdom	12.2	12.3	12.0	11.1	10.6	10.1	10.9	10.7	10.5	10.1	9.7	9.6	9.4	9.0
28 EU-countries / Average (unweighted)	22.6	22.3	21.8	21.1	20.3	19.6	20.1	19.9	19.6	19.3	18.8	18.6	18.3	17.9

¹⁾ The shadow economy values for Germany have been adjusted due to a change in the official GDP statistics of the German national accounts.

Source: Author's calculations, December 2015; values for 2015 and 2016 are projections on the basis of preliminary values.

tion of the shadow economy associated with household electricity consumption is high, the rest of the hidden economy (or the part Lackó cannot measure) will also be high. Lackó (1996, 19 ff.) assumes that in each country a part of the household consumption of electricity is used in the shadow economy.

The model approach

All of the methods described to date consider just one indicator to capture all effects of the shadow economy. However, shadow economy effects show up simultaneously in production, labor and money markets. The model approach explicitly considers multiple causes of the existence and growth of the shadow economy, as well as the multiple effects of the shadow economy over time. The empirical method used is quite different from those deployed to date. It is based on the statistical theory of unobserved variables, which considers multiple causes and multiple indicators of the phenomenon to be measured.

As the size of the shadow economy is an unknown (hidden) figure, a latent estimator approach using the MIMIC (i.e. multiple indicators, multiple causes estimation) procedure is applied. This method is based on the statistical theory of unobserved variables. The statistical idea behind such a model is to compare a sample covariance matrix, that is, a covariance matrix of observable variables, with the parametric structure imposed on this matrix by a hypothesized model. Using covariance information among the observable variables, the first step consists of linking the unobservable variable to observable variables in a factor analytical model, also called a measurement model. Secondly, relationships between the unobservable variable and observable variables are specified through a structural model. Therefore, a MIMIC model is the simultaneous specifi-

cation of a factor and a structural model. In this sense, the MIMIC model tests the consistency of a “structural” theory through data and is thus a confirmatory, rather than an exploratory technique. An economic theory is thus tested examining the consistency of actual data with the hypothesized relationships between the unobservable (latent) variable or factor and the observable (measurable) variables.

Size of the shadow economies of 31 European and five other OECD countries

In the Tables 2 to 4 the size and development of 31 European and of five non-European shadow economies over the period 2003–2016 are presented.¹⁴ If we first consider the results for the average size of the shadow economy of the 28 European Union countries in Table 2, we realize that the shadow economy in the year 2003 was 22.6% (of official GDP), which decreased to 19.6% in 2008 and increased to 20.1% in 2009 and then decreased again to 17.9% in 2016.¹⁵ With respect to a decrease or increase in 2016, the development of the shadow economy in the individual countries will not be uniform. In most EU-countries (25 out of 28) the shadow economy will further decrease, but in the remaining three countries it will increase. The 25 EU-countries where the shadow economy will further decrease are Austria, Belgium, Bulgaria, Croatia, the Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Ireland,

¹⁴ The size and development of the shadow economy is calculated using the MIMIC (Multiple Indicators and Multiple Causes) estimation procedure. Using the MIMIC estimation procedure one gets only relative values and one needs other methods like the currency demand approach or the income discrepancy method, to calibrate the MIMIC values into absolute ones. For a detailed explanation of these calculation methods, see Schneider (2011) and Schneider and Williams (2013). Due to space constraints, the econometric estimation results are not shown here; compare for example Buehn and Schneider (2012).

¹⁵ The calculated values for 2015 are projections for some countries, for 2016 they are projections for all countries, based on the forecasts of the official figures (GDP, unemployment, etc.) of these countries.

Table 3

Size of the shadow economy of three European countries (non-EU Members), 2003 – 2016 (in % of official GDP)

Country / Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Norway	18.6	18.2	17.6	16.1	15.4	14.7	15.3	15.1	14.8	14.2	13.6	13.1	13.0	12.6
Switzerland	9.5	9.4	9.0	8.5	8.2	7.9	8.3	8.1	7.8	7.6	7.1	6.9	6.5	6.2
Turkey	32.2	31.5	30.7	30.4	29.1	28.4	28.9	28.3	27.7	27.2	26.5	27.2	27.8	29.2
Three non-EU countries / Average	20.1	19.7	19.1	18.3	17.6	17.0	17.5	17.2	16.8	16.3	15.7	15.7	15.8	16.0
Unweighted average of all 31 European countries	22.4	22.1	21.6	20.9	20.1	19.4	19.9	19.7	19.3	19.0	18.5	18.3	18.0	17.8

Source: Author's calculations, December 2015; values for 2015 and 2016 are projections on the basis of preliminary values.

Table 4

Size of the shadow economy of five highly-developed non-European countries, 2003 – 2016 (in % of official GDP)

Country / Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Australia	13.7	13.2	12.6	11.4	11.7	10.6	10.9	10.3	10.1	9.8	9.4	10.2	10.3	9.8
Canada	15.3	15.1	14.3	13.2	12.6	12.0	12.6	12.2	11.9	11.5	10.8	10.4	10.3	10.0
Japan	11.0	10.7	10.3	9.4	9.0	8.8	9.5	9.2	9.0	8.8	8.1	8.2	8.4	8.5
New Zealand	12.3	12.2	11.7	10.4	9.8	9.4	9.9	9.6	9.3	8.8	8.0	7.8	8.0	7.8
United States	8.5	8.4	8.2	7.5	7.2	7.0	7.6	7.2	7.0	7.0	6.6	6.3	5.9	5.6
Other OECD countries / Unweighted average	12.2	11.9	11.4	10.4	10.1	9.6	10.1	9.7	9.5	9.2	8.6	8.6	8.6	8.3

Source: Author's calculations, December 2015; values for 2015 and 2016 are projections on the basis of preliminary values.

Italy, Latvia, Lithuania, Malta, the Netherlands, Poland, Portugal, Romania, Slovenia, South-Cyprus, Spain, Slovakia, Sweden and the United Kingdom, whereas the shadow economy will increase in France, Hungary and Luxembourg. The strongest increase will take place in France from 12.3% of official GDP (2015) to 12.6% in 2016 and in Hungary from 21.9% of GDP in 2015 to 22.2% in 2016; the strongest decrease will be in Lithuania from 25.8% (2015) to 24.9% in 2016.

To summarize, in the vast majority of the 28 EU countries the shadow economy will continue to shrink, averaging 17.9% of official GDP in 2016. If we compare these results to the average size of the shadow economy of the 31 European countries, it was 22.4% in 2003, which shrank to 19.4% in 2008, then increased to 19.9% in 2009 and subsequently decreased to 18.0% in 2015 (see Table 3). In 2016 the average size will further decrease to 17.8%. When looking at the individual countries again, the shadow economy will decrease in Norway and Switzerland, whereas it will increase in Turkey from 27.8% (2015) to 29.2% of official GDP in 2016.

If we consider the development of the shadow economy of the highly-developed non-European OECD countries Australia, Canada, Japan, New Zealand and the US, we

find a similar movement over time (see Table 4); in 2003 the shadow economies of these five countries had an average size of 12.2%, in 2008 this value was only 9.6%. In 2009 it increased to 10.1% and then decreased again to 8.6% of GDP in 2015. In 2016 the shadow economy will decrease in Australia, Canada, New Zealand and the US and it will increase in Japan from 8.4% (2015) to 8.5% in 2016, respectively. On average in 2016 the size of the shadow economy in these five countries will decrease to a value of 8.3%.

If we consider the size of the shadow economies over the last two years (2015 and 2016) and compare it to that of 2008/09, we realize that, in most countries, we will again see a decrease in the size and development of the shadow economy, which is due to the recovery from the worldwide economic and financial crises. Hence, the most important reason for this decrease is that, if the official economy is recovering or booming, people have fewer incentives to undertake additional activities in the shadow economy and to earn extra “black” money.

In short, there are four different developments with respect to the size of the shadow economy of these 36 European and non-European countries:

Table 5

Size of the shadow economy of various unweighted averages, 2003 – 2016 (in % of official GDP)

Average / Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
28 EU-countries / Average (unweighted)	22.6	22.3	21.8	21.1	20.3	19.6	20.1	19.9	19.6	19.3	18.8	18.6	18.3	17.9
Three non-EU countries / Average (unweighted)	20.1	19.7	19.1	18.3	17.6	17.0	17.5	17.2	16.8	16.3	15.7	15.7	15.8	16.0
Five other OECD countries / Average (unweighted)	12.2	11.9	11.4	10.4	10.1	9.6	10.1	9.7	9.5	9.18	8.6	8.6	8.6	8.3
All 36 countries / Average (unweighted)	21.0	20.7	20.2	19.4	18.7	18.0	18.5	18.3	18.0	17.6	17.1	17.0	16.7	16.4

Source: Author's calculations, December 2015; values for 2015 and 2016 are projections on the basis of preliminary values.

Figure 1

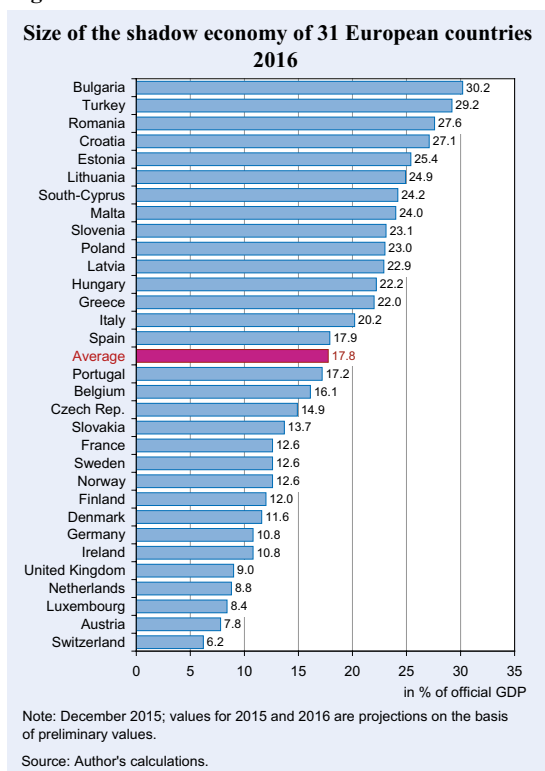
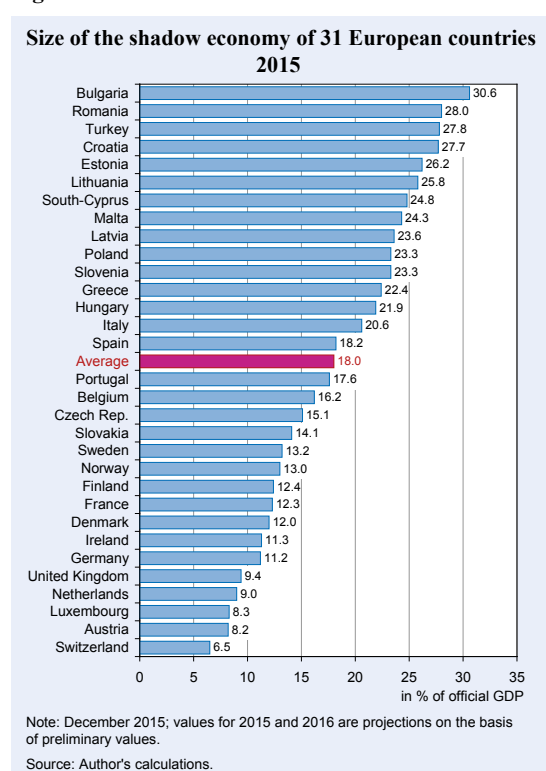


Figure 2



- (1) In general, the shadow economy continues to shrink in 31 out of the 36 highly-developed countries, which is mainly due to a further recovery of the official economy. In five countries, by contrast, the shadow economy is growing due to a sluggish official economy or policy decisions that boosted the shadow economy.
- (2) The eastern or central European countries and/or the “new” European Union members, such as Bulgaria, Cyprus, the Czech Republic, Latvia, Lithuania and Poland have higher shadow economies than the “old” European Union countries, like Austria, Belgium, Germany and Italy. Hence, the size of the shadow economy grows from west to east.
- (3) An increase in the size and development of the shadow economy can also be seen from north to south. On average, the southern European countries have considerably larger shadow economies than those of central and western Europe. This can also be demonstrated by Figures 1 and 2.
- (4) The five non-European highly-developed OECD countries (Australia, Canada, Japan, New Zealand and the United States) have lower shadow economies that account for around 10.1% of GDP in 2009,

which will decrease to 8.3% in 2016 (compare Tables 4 and 5).

Summary and concluding remarks: problems and open questions

This article briefly presents the various methods for estimating the size of the shadow economy and shows the latest estimates of the size of the shadow economies of 36 highly-developed countries over 2005 to 2016. Differences in the development of the shadow economies of these 36 countries are also discussed.

What conclusions can be drawn?

- (1) Besides a general decrease in the size of the shadow economy from 2002 to 2008, we see an increase from 2008 to 2009/2010.
- (2) Since 2011 there has been no homogeneous development in the size of the shadow economy in these 36 countries over time.
- (3) To reduce the size of a shadow economy, different incentive-oriented measures should be used, such as temporarily exempting the value-added tax on labor-intensive products.

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