Shadow Economies all over the World: New Estimates for 162 Countries from 1999 to 2007[1]

Friedrich Schneider[2]

Andreas Buehn[3]

and

Claudio E. Montenegro[4]

Version as of: Monday, 01 February 2010 5:00 p.m.

Abstract

Estimations of the shadow economies for 162 countries, including developing, Eastern Europe and Central Asian and high income OECD countries over 1996 to 2007 are presented. The average size of the shadow economy (as a percent of "official" GDP) in 2006 in 98 developing countries is 38.7%, in 21 Eastern and Central Asian (mostly transition) countries 38.1% and in 25 high income OECD countries 18.7%. An increased burden of taxation (direct and indirect ones), combined with (labor market) regulations and the quality of public goods and services as well as the state of the "official" economy are the driving forces of the shadow economy.

JEL-class: O17, O5, D78, H2, H11, H26.

Keywords: shadow economy of 162 countries, tax burden, quality of state institutions, regulation, MIMIC and other estimation methods

[1] Responsibility for the contents of this paper is ours and should not be attributed to our affiliated institutions. Background paper for the World Bank study of the informal sector in Central, Southern Europe and the Baltic countries (Task number P112988).

[2] Friedrich Schneider, Department of Economics, Johannes Kepler University of Linz, A-4040 Linz-Auhof, Austria. Phone: 0043-732-2468-8210, Fax: -8209. E-mail: friedrich.schneider@jku.at, http://www.econ.jku.at/schneider.

[3] Andreas Buehn, Technische Universität Dresden, Faculty of Business and Economics, Chair for Economics, esp. Monetary Economics, 01062 Dresden, Email: andreas.buehn@tu-dresden.de.

[4] Claudio E. Montenegro, Development Research Group, Poverty Unit, The World Bank; and Department of Economics, Universidad de Chile. Email: cmontenegro@worldbank.org.

Contents

1 Introduction

As shadow economic activities are facts of life around the world, most societies attempt to control these activities through various measures such as punishment, prosecution, economic growth or education. Gathering information about the extent of the shadow economy, who is engaged in underground activities, the frequency of these activities, and the magnitude of them, is crucial for making effective and efficient decisions regarding the allocations of a country's resources in this area. Unfortunately, it is very difficult to get accurate information about shadow economy activities on the goods and labor market, because all individuals engaged in these activities do not wish to be identified. Hence, doing research in this area can be considered as a scientific passion for knowing the unknown.

Although substantial literature[5] exists on single aspects of the hidden or shadow economy and comprehensive surveys have been written by Schneider and Enste (2000), and Feld and Schneider (2009), the subject is still quite controversial as there are disagreements about the definition of shadow economic activities, the estimation procedures and the use of their estimates in economic analysis and policy aspects.[6] Nevertheless, there are some indications for an increase of the shadow economy around the world, but little is known about the development and the size of the shadow economies in developing, Eastern European and Central Asian (mostly the former transition countries), and high income OECD countries over the period 1999 to 2007. This study is an attempt to fill this gap by using the same estimation technique and almost the same data sample.

Hence, the goal of this paper is twofold: (i) to undertake the challenging task of estimating the shadow economy for 162 countries all over the world[7] and (ii) to provide some insights into the main causes of the shadow economy. To our knowledge, such an attempt has not been undertaken so far; hence, we provide a unique database of the size and trend of the shadow economy for 162 countries over the period 1999 to 2007. This is an improvement compared to previous work, because we successfully "created" a unique dataset and used the MIMIC estimation method for all countries with the explicit goal to have a comparable shadow economy data set.

According to our analysis, the shadow economy has reached a remarkably large size of an average value of 34.5% of official GDP over 162 countries between 1999 and 2007. The

[5] The literature about the "shadow", "underground", "informal", "second", "cash-" or "parallel", economy is increasing. Various topics, on how to measure it, its causes, its effect on the official economy are analyzed. See for example, survey type publications by Frey and Pommerehne (1984); Thomas (1992); Loayza (1996); Pozo (1996); Lippert and Walker (1997); Schneider (1994a, 1994b, 1997, 1998a, 2003, 2005, 2007); Johnson, Kaufmann, and Shleifer (1997), Johnson, Kaufmann and Zoido-Lobatón (1998a, 1998b); Belev (2003); Gerxhani (2004) and Pedersen (2003). For an overall survey of the global evidence of the size of the shadow economy see Bajada and Schneider (2005), Schneider and Enste (2000, 2002) and Alm, Martinez and Schneider (2004), Kazemier (2005a), Enste and Schneider (2006), and Feld and Schneider (2009).

[6] Compare the different opinions of Tanzi (1999), Thomas (1999), Giles (1999a,b) and Pedersen (2003), and Janisch and Brümmerhoff (2005).

[7] This paper focuses on the size and trend of the shadow economy for countries and does not show any disaggregated values for specific regions, e.g. for the EU regions an estimation was done by Herwartz, Schneider and Tafenau (2009). Lately some first studies were undertaken to measure the size of the shadow economy as well as the "grey" or "shadow" labor force for urban regions or states (e.g. California). Compare e.g. Marcelli, Pastor and Joassart (1999), Marcelli (2004), Chen (2004), Williams (2004a, b, 2005a, b, 2006), Williams and Windebank (1999, 2001a, b), Flaming, Haydamack, and Jossart (2005) and Alderslade, Talmage and Freeman (2006), and Brueck, Haisten-DeNew and Zimmermann (2006).

average size of the shadow economies in all of these 162 countries (developing, Eastern European and Central Asian and high income OECD countries) increased only modestly from 33.7% of official GDP in 1999 to 35.5% of official GDP in 2007. Comparing the results across the 7 different specifications we estimated, it turns out that the variation in the estimates is relatively low; across all countries. All models predict almost the same size of the shadow economy for each country and that our results are quite robust for most of the countries over the period 1999 to 2007. Our results further show that an increased burden of taxation combined with (labor market) regulations and the quality of public goods and services as well as the state of the "official" economy are the driving forces of the shadow economy. According to specification 7 – the empirical model covering a broad set of countries and all important driving forces of the shadow economy – reducing the tax burden is the best policy measure to reduce the shadow economy followed by a lessening of fiscal and business regulation. The estimated coefficients indicate that a unit improvement of these driving forces reduce the shadow economy by 0.15 and 0.08 units, respectively. The relative importance of these driving forces however changes significantly across different country groups, as shown in the results section of our paper.

The rest of the paper is organized as follows. In section 2 we make an attempt to define the shadow economy. The same section also includes some theoretical considerations about the reasons why it is increasing. Section 3 presents the econometric estimation results and the calculation of the size of the shadow economy in 162 countries over the period 1996 to 2006 or 2007, depending on data availability. In section 4, a summary is given and some policy conclusions are drawn. Finally, appendix 1 presents the currency demand method approach; appendix 2 presents the variable definitions and the data sources; appendix 3 presents the descriptive statistics; and appendix 4 presents the ranking for the 162 countries in alphabetic order.

2 Some Theoretical Considerations about the Shadow Economy

This section makes an attempt to define the shadow economy followed by theoretical considerations about the shadow economy's most important determinants. It finally addresses the difficulty to decide whether a variable is a cause or indicator of the shadow economy. Although section 2 refers to various articles from the literature it does not review the literature comprehensively. Rather, we will be drawing the most important explanations and findings from the literature and using these to motivate the choice of variables (causes and indicators) in the empirical models.

2.1 Defining the Shadow Economy

Most authors trying to measure the shadow economy face the difficulty of how to define it. One commonly used working definition is all currently unregistered economic activities that contribute to the officially calculated (or observed) Gross National Product.[8] Smith (1994, p. 18) defines it as "market-based production of goods and services, whether legal or illegal, that escapes detection in the official estimates of GDP." Or to put it in another way, one of the

[8] This definition is used for example, by Feige (1989, 1994), Schneider (1994a, 2003, 2005, 2007), Feld and Schneider (2009) and Frey and Pommerehne (1984). Do-it-yourself activities are not included. For estimates of the shadow economy and the do-it-yourself activities for Germany see Karmann (1986, 1990), and Buehn, Karmann and Schneider (2009).

broadest definitions of it includes…"those economic activities and the income derived from them that circumvent or otherwise avoid government regulation, taxation or observation."[9]

In this paper the following more narrow definition of the shadow economy is used:[10] the shadow economy includes all market-based legal production of goods and services that are deliberately concealed from public authorities for any of the following reasons:

(1) to avoid payment of income, value added or other taxes,
(2) to avoid payment of social security contributions,
(3) to avoid having to meet 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.

Hence, in this paper, we will not deal with typical underground, economic (classical crime) activities, which are all illegal actions that fit the characteristics of classical crimes like burglary, robbery, drug dealing, etc. We also exclude the informal household economy which consists of all household services and production. This paper also does not focus on tax evasion or tax compliance, because it would get too long, and moreover tax evasion is a different subject, where already a lot of research has been undertaken.[11]

2.2 Main Causes of the Shadow Economy

2.2.1 Tax and Social Security Contribution Burdens

In almost all studies it has been ascertained that the overall tax and social security contribution burdens are among the main causes for the existence of the shadow economy.[12] Since taxes affect labor-leisure choices, and also stimulate labor supply in the shadow economy, the distortion of the overall tax burden is a major concern for economists. The bigger the difference between the total cost of labor in the official economy and the after-tax earnings (from work), the greater is the incentive to avoid this difference and to work in the shadow economy. Since this difference depends broadly on the social security burden/payments and the overall tax burden, the latter are key features of the existence and the increase of the shadow economy.

Empirical results of the influence of the tax burden on the shadow economy is provided in the studies of Schneider (1994b, 2000, 2004, 2005, 2007) and Johnson, Kaufmann and Zoido-Lobatón (1998a, 1998b); they all found statistically significant evidence for the influence of taxation on the shadow economy. This strong influence of indirect and direct taxation on the shadow economy is further demonstrated by discussing empirical results in the case of Austria and the Scandinavian countries. For Austria the driving force for shadow economic

[9] This definition is taken from Dell'Anno (2003), Dell'Anno and Schneider (2004) and Feige (1989); see also Thomas (1999), Fleming, Roman and Farrell (2000).

[10] Compare also the excellent discussion of the definition of the shadow economy in Pedersen (2003, pp.13-19) and Kazemier (2005a) who use a similar one.

[11] Compare, e.g. the survey of Andreoni, Erard and Feinstein (1998) and the paper by Kirchler, Maciejovsky and Schneider (2002), as well as the survey by Feld and Schneider (2009).

[12] See Thomas (1992); Lippert and Walker (1997); Schneider (1994a,b, 1997, 1998a,b, 2000, 2003b, 2005, 2007); Johnson, Kaufmann, and Zoido-Lobatón (1998a,1998b); Tanzi (1999); Giles (1999a); Mummert and Schneider (2001); Giles and Tedds (2002) and Dell'Anno (2003), as well as Feld and Schneider (2009), just to quote a few.

activities is the direct tax burden (including social security payments); it has the biggest influence, followed by the intensity of regulation and complexity of the tax system. A similar result has been found by Schneider (1986) for the Scandinavian countries (Denmark, Norway and Sweden). In all three countries various tax variables: average direct tax rate, average total tax rate (indirect and direct tax rate) and marginal tax rates have the expected positive effect (on currency demand) and are highly statistically significant. These findings are supported by studies of Kirchgaessner (1983, 1984) for Germany, and by Klovland (1984) for Norway and Sweden.

The concrete measurement of the tax and social security contribution burdens is not easy to define, because the tax and social security systems are vastly different among the countries. In order to have some general comparable proxies for this, we use the following causal variables:

(1) Indirect taxes as a proportion of total overall taxation (positive sign expected),
(2) Share of direct taxes: direct taxes as proportion of overall taxation (positive sign expected),
(3) Size of government: general government final consumption expenditures (in percent of GDP, which includes all government current expenditures for purchases of goods and services; positive sign expected),
(4) Fiscal freedom, which is a subconent of the Heritage Foundation's economic freedom index, which measures the fiscal burden in an economy; i.e. top tax rates on individual and corporate income. The index ranges from 0 to 100, where 0 is least fiscal freedom and 100 maximum degree of fiscal freedom (negative sign expected).

2.2.2 Intensity of Regulations

Increased intensity of regulations is another important factor which reduces the freedom (of choice) for individuals engaged in the official economy. One can think of labor market regulations such as minimum wages or dismissal protections, trade barriers such as import quotas, and labor market restrictions for foreigners such as restrictions regarding the free movement of foreign workers. Johnson, Kaufmann, and Zoido-Lobatón (1998b) find significant overall empirical evidence of the influence of (labor) regulations on the shadow economy; and the impact is clearly described and theoretically derived in other studies, e.g. for Germany (Deregulation Commission 1990/91). Regulations lead to a substantial increase in labor costs in the official economy. But since most of these costs can be shifted to the employees, these costs provide another incentive to work in the shadow economy, where they can be avoided. Their empirical evidence supports the model of Johnson, Kaufmann, and Shleifer (1997), which predicts, inter alia, that countries with more general regulation of their economies tend to have a higher share of the unofficial economy in total GDP. Johnson, Kaufmann, and Zoido-Lobatón (1998b) conclude that it is the enforcement of regulation which is the key factor for the burden levied on firms and individuals, and not the overall extent of regulation - mostly not enforced - which drives firms into the shadow economy. Friedman et al. (2000) reach a similar conclusion. In their study every available measure of regulation is significantly correlated with the share of the unofficial economy and the estimated sign of the relationship between their measures of regulation and the shadow economy is unambiguously positive: more regulation is associated with a larger shadow economy. These findings show that governments should put more emphasis on improving enforcement of laws and regulations, rather than increasing their number. Some governments, however, prefer this policy option (more regulations and laws), when trying to reduce the shadow economy, mostly because it leads to an increase in power for the bureaucrats and to a higher rate of employment in the public sector.

To measure the intensity of regulation or the impact of regulation on the decision of whether to work in the official or unofficial economy is a difficult task, and we try to model this by using the following causal variables:

(1) Business freedom: it is a subcomponent of the Heritage Foundation's economic freedom index; it measures the time and efforts of business activity. It ranges from 0 to 100, where 0 is least business freedom and 100 maximum business freedom (negative sign expected),
(2) Economic freedom: Heritage Foundation economic freedom index which ranges from 0 to 100, where 0 is least economic freedom and 100 maximum economic freedom (negative sign expected),
(3) Regulatory quality: World Bank´s regulatory quality index which includes measures of the incidents of market-unfriendly policies, such as price controls or inadequate bank supervision, as well as perceptions of the burdens imposed by excessive regulation in areas, such as foreign trade and business development. The index scores between -2.5 and +2.5 with higher scores corresponding to better outcomes (negative sign expected).

2.2.3 Public Sector Services

An increase of the shadow economy can lead to reduced state revenues which in turn reduce the quality and quantity of publicly provided goods and services. Ultimately, this can lead to an increase in the tax rates for firms and individuals in the official sector, quite often combined with a deterioration in the quality of the public goods (such as the public infrastructure) and of the administration, with the consequence of even stronger incentives to participate in the shadow economy. Johnson, Kaufmann, and Zoido-Lobatón (1998a/b) present a simple model of this relationship. Their findings show that smaller shadow economies appear in countries with higher tax revenues if achieved by lower tax rates, fewer laws and regulations, and less corruption. Countries with a better rule of law, which is financed by tax revenues, also have smaller shadow economies. Transition countries have higher levels of regulation leading to a significantly higher incidence of bribery, higher effective taxes on official activities, and a large discretionary regulatory framework and consequently a higher shadow economy. Their overall conclusion is that "wealthier countries of the OECD, as well as some in Eastern Europe, find themselves in the 'good equilibrium' of relatively low tax and regulatory burden, sizeable revenue mobilization, good rule of law and corruption control, and a [relatively] small unofficial economy. By contrast, a number of countries in Latin American and the former Soviet Union exhibit characteristics consistent with a 'bad equilibrium': tax and regulatory discretion and burden on the firm is high, the rule of law is weak, and there is a high incidence of bribery and a relatively high share of activities in the unofficial economy." (Johnson, Kaufmann, and Zoido-Lobatón ,1998a, p. 1).

The provision and especially the quality of the public sector services is also a crucial causal variable for people's decision to work or not work in the shadow economy. To capture this effect, we have the following variable: Government Effectiveness from the World Bank´s Worldwide Governance Indicators. It captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of government's commitment to such policies. The scores of this index lie between -2.5 and +2.5 with higher scores corresponding to better outcomes (negative sign expected).

2.2.4 Official Economy

As it has been shown in a number of studies (Bajada and Schneider, 2005, Schneider and Enste, 2006, and Feld and Schneider, 2009) the situation of the official economy also plays a crucial role of people's decision to work or not to work in the shadow economy. In a booming official economy, people have a lot of opportunities to earn a good salary and "extra money" in the official economy. This is not the case in an economy facing a recession and more people try to compensate their losses of income from the official economy through additional shadow economy activities.[13] In order to capture this, we will use the following variables:

(1) GDP per capita: GPD per capita based on Purchasing Power Parity (PPP), measured in constant 2005 US$. PPP as gross domestic product converted to international dollars using Purchasing Power Parity rates (negative sign expected),
(2) Unemployment rate: unemployment, total (in percent of total labour force). Unemployment refers to the share of labour force that is without work but available for and seeking employment (positive sign expected),
(3) Inflation rate: GDP deflator (annual rate in percent); inflation is measured by the annual growth rate of the GDP implicit deflator, it shows the rate of price changes in the economy as a whole (positive sign expected),
(4) Openness: openness corresponds to trade (in percent of GDP). Trade is the sum of exports and imports of goods and services, measured as a share of gross domestic product (negative sign expected).

2.3 Indicators of the Shadow Economy

As we know that the shadow economy cannot be directly measured, we have to use indicators, in which shadow economy activities are reflected. Here, we use the following indicators:

2.3.1 Monetary Indicators

Given that people who engage in shadow economy transactions do not want to leave traces, they conduct these activies in cash. Hence, most shadow economy activities are reflected in an additional use of cash (or currency). To take into account this, we use the following two indicators:

(1) M0 over M1: M0 corresponds to the currency outside the banks and for M1, the usual definition is M0 plus deposits.
(2) Currency over M2: It corresponds to the currency outside the banks as a proportion of M2.

[13] There is however a body of empirical evidence showing that movements into (informal) self-employment are procyclical. For example, Taylor (1996) suggests a "pull" of aspiring entrepreneurs into self employment when unemployment is low and offers of salaried employment are abundant. In good times, individuals may choose to become self employed knowing that if their venture fails, an offer of formal salaried employment will not be hard to find. Workers considering self employment wait for a favorable business climate to leave a protected salaried job. Thus in good economic times when aggregate demand is high and businesses are more likely to flourish there is always a wage-employment safety net that lowers the risks of becoming an entrepreneur. Maloney (1998a,b) presents evidence of pro-cyclical movement into self employment in Mexico, Arango and Maloney (2000) find that the share of self employed in Argentina increases as economic conditions improve, while Fiess, Maloney and Shankar (2000) show similar increases in the share of self employed in Colombia, Brazil and Chile during periods of expansion.

2.3.2 Labour Market Indicators

Shadow economy activities are also reflected in labour market indicators. We use the following two:

(1) Labour force participation rate: Labour force participation rate is a proportion of the population that is economically active, all people who supply labour for the production of goods and services during a specified period.
(2) Growth rate of the total labour force: Total labour force compromises people aging 15 and older who meet the International Labor Organisation´s (ILO) definition of the economically active population: all people who supply labour for the production of goods and services during a specified period.

2.3.3 State of the Official Economy

Also, shadow economy activities are reflected in the state of the official economy. We use the following two indicators:

(1) GDP per capita: GDP per capita is gross domestic product converted to international dollars using Purchasing Power Parity rates, divided by the population.
(2) Growth rate of GDP per capita, as (1), but the annual growth rate of the GDP per capita.

2.4 The Problem of Identifying Indicator versus Cause Variables

Finally, we want to explicitly mention that when using the MIMIC method, there is not a clear division between causal variables, which directly influence (drive) the shadow economy and indicator variables, in which shadow economy activities are reflected. In other words, one caveat of the MIMIC method is that, unfortunately, there is not a clear-cut division (or theoretically oriented guiding rule) between indicator and causal variables. In particular, the state of the official economy, when e.g. in a recession with high unemployment, people have a stronger incentive to work in the shadow economy, maybe seen as a causal variable, but on the other side, GDP per capita and other measures are also used as indicator variables, in which shadow economy activities are reflected. Hence, we recognize that there is some arbitrariness whether to use a certain variable as causal or indicator one. In our paper, we tried to be consistent, but we admit that we use, for instance, GDP per capita as causal variable in some cases, and as indicator variable in other cases.

3 The Size of the Shadow Economy for 162 Countries

3.1 Econometric Methodology

Estimating the size and trend of a shadow economy is a difficult and challenging task. Methods – designed to estimate the size and trend of the shadow economy – such as the currency demand approach or the electricity approach consider just one indicator that ”must” capture all effects of the shadow economy. However, it is obvious that shadow economy effects show up simultaneously in the production, labor, and money markets. An even more important critique is that the causes that determine the size of the shadow economy are taken into account only in some of the monetary approach studies that usually consider one cause,

the burden of taxation. The empirical method used in this paper is different: It is based on the statistical theory of unobserved variables, which considers multiple causes and multiple indicators of the phenomenon to be measured, i.e. it explicitly considers multiple causes leading to the existence and growth of the shadow economy, as well as the multiple effects of the shadow economy over time.[14] In particular, we use a Multiple Indicators Multiple Causes (MIMIC) model – a particular type of a structural equations model (SEM) – to analyze and estimate the shadow economies of 162 countries around the world.[15]

The main idea behind SEM is to examine the relationships among unobserved variables in terms of the relationships among a set of observed variables by using the covariance information of the latter. In particular, SEM compare a sample covariance matrix, i.e. the covariance matrix of the observed variables, with the parametric structure imposed on it by a hypothesized model.[16] The relationships among the observed variables are described in terms of their covariances and it is assumed that they are generated by (a usually smaller number of) unobserved variables. In MIMIC models, the shadow economy is the unobserved variable and is analyzed with respect to its relationship to the observed variables using the covariance matrix of the latter. For this purpose, the unobserved variable is in a first step linked to the observed indicator variables in a factor analytical model also called measurement model. Second, the relationships between the unobserved variable and the observed explanatory (causal) variables are specified through a structural model. Thus, a MIMIC model is the simultaneous specification of a factor model and a structural model. In this sense, the MIMIC model tests the consistency of a "structural" theory through data and is thus a rather confirmatory than exploratory technique. In fact, in a confirmatory factor analysis a model is constructed in advance; whether a unobserved (latent) variable or factor influences an observed variable is specified by the researcher, and parameter constraints are often imposed. Thus, an economic theory is tested by examining the consistency of actual data with the hypothesized relationships between observed (measured) variables and the unobserved variable.[17] Such a confirmatory factor analysis has two goals: (i) estimating the parameters (coefficients, variances, etc.) and (ii) assessing the fit of the model. Applying this to the shadow economy research, these two goals mean (i) measuring the relationships of a set of observed causes and indicators to the shadow economy (latent variable), and (ii) testing if the

[14] The pioneers of this approach are Weck (1983), Frey and Weck-Hannemann (1984), who applied this approach to cross-section data from the 24 OECD countries for various years. Before turning to this approach they developed the concept of "soft modeling" (Frey, Weck, and Pommerehne (1982), Frey and Weck (1983a,b), an approach which has been used to provide a ranking of the relative size of the shadow economy in different countries.

[15] The latest papers dealing extensively with the MIMIC approach, its development and its weaknesses are from Giles (1999a, 1999b, 1999c), Giles, Tedds and Werkneh (2002), Dell'Anno (2003), and the excellent study by Giles and Tedds (2002), as well as Bajada and Schneider (2005), Breusch (2005a, 2005b), Schneider (2005, 2007), Pickhardt and Sardà Pons (2006), Chatterjee, Chaudhury and Schneider (2006), Buehn, Karmann, and Schneider (2009), and for a detailed discussion of the strengths and weaknesses see Dell'Anno and Schneider (2009).

[16] Estimation of a SEM with latent variables can be done by means of a computer program for the analysis of covariance structures, such as LISREL (Linear Structural Relations). A useful overview of the LISREL software package in an economics journal is Cziraky (2004). General overviews about the SEM approach are given in e.g. Hayduk (1987), Bollen (1989), Hoyle (1995), Maruyama (1997), Byrne (1998), Muthen (2002), Cziraky (2005).

[17] On the contrary, in an exploratory factor analysis a model is not specified in advance, i.e. beyond the specification of the number of latent variables (factors) and observed variables the researcher does not specify any structure of the model. This means assuming that all factors are correlated, all observed variables are directly influenced by all factors, and measurement errors are all uncorrelated with each other. In practice however, the distinction between a confirmatory and an exploratory factor analysis is less strong. Facing poorly fitting models, researchers using SEM techniques or a confirmatory factor analysis often modify their models in an exploratory way in order to improve the fit. Thus, most applications fall between the two extreme cases of confirmatory (non-specified model structure) and exploratory (ex-ante specified model) factor analysis.

researcher's theory or the derived hypotheses, as a whole, fit the data used.

Formally, the MIMIC model consists of two parts: the structural equation model and the measurement model. The structural equation model is given by:

$$\eta = \gamma' \mathbf{x} + \varsigma \ , \ (1)$$

where $\mathbf{x}' = (x_1, x_2, \ldots, x_q)$ is a $(1 \times q)$ vector and each $x_i \ , i = 1, \ldots, q$ is a potential cause of the latent variable η and $\gamma' = (\gamma_1, \gamma_2, \ldots, \gamma_q)$ is a $(1 \times q)$ vector of coefficients describing the relationships between the latent variable and its causes. Thus, the latent variable η is determined by a set of exogenous causes. Since these causes only partially explain the latent variable η, the error term ς represents the unexplained component. The variance of ς is denoted by ψ. $\mathbf{\Phi}$ is the $(q \times q)$ covariance matrix of the causes $\mathbf{x}$. The measurement model represents the link between the latent variable and its indicators, i.e. the latent variable determines its indicators. The measurement model is specified by:

$$\mathbf{y} = \boldsymbol{\lambda} \eta + \varepsilon \ , \ (2)$$

where $\mathbf{y}' = (y_1, y_2, \ldots, y_p)$ is a $(1 \times p)$ vector of several indicator variables. $\boldsymbol{\lambda}$ is the vector of regression coefficients, and $\boldsymbol{\varepsilon}'$ is a $(1 \times p)$ vector of white noise disturbances. Their $(p \times p)$ covariance matrix is given by $\mathbf{\Theta}_{\varepsilon}$. Figure 1 shows the structure of the MIMIC model using a path diagram.

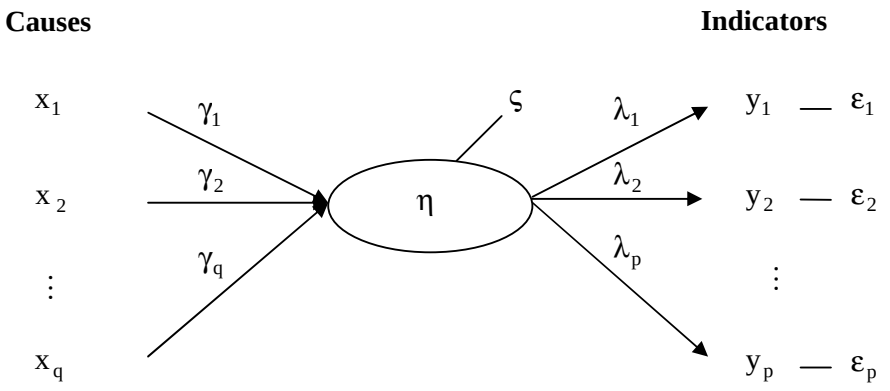

Figure 3.1. General Structure of a MIMIC Model

Using equation (1) in equation (2) yields a reduced form multivariate regression model where the endogenous variables $y_j \ , j = 1, \ldots, p$ are the latent variable η's indicators and the exogenous variables $x_i \ , i = 1, \ldots, q$ its causes. This model is given by:

$$\mathbf{y} = \mathbf{\Pi x} + \mathbf{z} \ , \ (3)$$

where $\mathbf{\Pi} = \boldsymbol{\lambda} \gamma'$ is a matrix with rank equal to 1 and $\mathbf{z} = \boldsymbol{\lambda} \zeta + \boldsymbol{\varepsilon}$. The error term $\mathbf{z}$ in equation (3) is a $(p \times 1)$ vector of linear combinations of the white noise error terms ς and $\boldsymbol{\varepsilon}$ from the

structural equation and the measurement model, i.e. $\mathbf{z} \sim (\mathbf{0}, \mathbf{\Omega})$. The covariance matrix $\mathbf{\Omega}$ is given by $\mathbf{Cov}(\mathbf{z}) = \mathbf{E}[(\lambda\varsigma + \boldsymbol{\varepsilon})(\lambda\varsigma + \boldsymbol{\varepsilon})'] = \lambda\lambda'\psi + \mathbf{\Theta}_{\varepsilon}$ and is similarly constrained like $\mathbf{\Pi}$. The identification and estimation of the model therefore requires the normalization of one of the elements of the vector λ to an *a priori* value (Bollen 1989). From equations (1) and (2) we can derive the MIMIC model's covariance matrix $\mathbf{\Sigma}(\boldsymbol{\theta})$. This matrix describes the relationship between the observed variables in terms of their covariances. Decomposing the matrix yields the structure between the observed variables and the latent variable. This covariance matrix is given by:

$$\mathbf{\Sigma}(\boldsymbol{\theta}) = \begin{pmatrix} \lambda(\gamma'\mathbf{\Phi}\gamma + \psi) + \mathbf{\Theta}_{\varepsilon} & \lambda\gamma'\mathbf{\Phi} \\ \mathbf{\Phi}\gamma\lambda' & \mathbf{\Phi} \end{pmatrix}, \quad (4)$$

where $\mathbf{\Sigma}(\boldsymbol{\theta})$ is a function of the parameters λ and γ and of the covariances contained in $\mathbf{\Phi}$, $\mathbf{\Theta}_{\varepsilon}$, and ψ. If the hypothesized model is correct and the parameters are known, the population covariance matrix $\mathbf{\Sigma}$ would be exactly reproduced by estimation of the model, i.e $\mathbf{\Sigma}$ will equal $\mathbf{\Sigma}(\theta)$. In practice, one does however not know either the population variances and covariances, or the parameters but uses the sample covariance matrix of the observed variables, i.e. of $\mathbf{y}$ (vector of indicators) and $\mathbf{x}$ (vector of causes), and sample estimates of the unknown parameters for estimation of the model. The goal of the estimation procedure then is to estimate the parameters and covariances that produce an estimate for $\mathbf{\Sigma}(\boldsymbol{\theta})$, $\hat{\mathbf{\Sigma}} = \mathbf{\Sigma}(\hat{\boldsymbol{\theta}})$ that is as close as possible to the sample covariance matrix of the observed causes and indicators. The function that measures how close a given $\mathbf{\Sigma}^*$ is to the sample covariance matrix $\mathbf{S}$ is called fitting function $\mathrm{F}\left(\mathbf{S}; \mathbf{\Sigma}^*\right)$. The most widely used fitting function for SEM is the Maximum Likelihood (ML) function:

$$\mathrm{F}_{\mathrm{ML}} = \log\left|\mathbf{\Sigma}(\theta)\right| + tr\left[\mathbf{S}\mathbf{\Sigma}^{-1}(\theta)\right] - \log|\mathbf{S}| - (\mathrm{p} + \mathrm{q}) \ , \quad (5)$$

where $\log|\ |$ is the log of the respective matrix's determinant and $(\mathrm{p} + \mathrm{q})$ is the number of observable variables. In general, no closed form or explicit solution for the structural parameters that minimize F_{ML} exists. Hence, the estimates that minimize the fitting function are derived applying iterative numerical procedures (see appendix 4C in Bollen (1989) for details).

In summary, the first step in the MIMIC model estimation is to confirm the hypothesized relationships between the shadow economy (the latent variable) and its causes and indicators. Once the relationships are identified and the parameters estimated, the MIMIC model results are used to calculate the MIMIC index. This analysis however provides only relative estimates, hence not ones of the absolute size of the shadow economy. Therefore an additional procedure so called benchmarking or calibration procedure is required in order to calculate absolute values of the size of the shadow economy. These values are presented in subsection 3.3. The next subsection first presents the MIMIC model estimations results.

3.2 Econometric Results

3.2.1 Remarks about the Different Estimation Specifications

As we argued in the introduction, one of our major goals is to use a coherent data set for a maximum number of countries to produce consistent data of the size and trend of the shadow economies of these countries. Doing this, we face the problem that still there are severe data limitations and due to this, we present in the following table 3.1 seven different specifications. We do this because we think it is interesting to see which variables turn out to be significant, especially if one uses subsamples of countries, where more and different causal variables are available. This is the reason why we have two additional specifications for the developing countries (in one case 98, in the other case 88), a specification for transition countries and two specifications for 25 high income OECD countries and eventually two specifications for the total sample of 151 and 120 countries. We believe that it is interesting to see which variables have an influence on the size and trend of the shadow economy, if we have more and better data available. Of course, we do provide a consistent estimation for 151 and 120 countries, specification 6 and 7 in table 3.1, from which we can also calculate the size and trend of the shadow economy. The ideal situation of course would be, if a large data set (many causal and indicator variables) would be available for all countries over the total period 1996 up to 2007. Unfortunately, this is not the case and this is (as already argued) the sole reason for the different specifications. The sources and definitions of the variables we have used in the estimations are elaborated in appendix 2. Appendix 3 presents the descriptive statistics of the variables for each of the estimated seven specifications.

3.2.2 Econometric Findings

All results of our MIMIC model estimations are presented in table 3.1. For the total sample two estimations are shown, one for the 151 countries over 1996 to 2007 and, with more causal variables, one sample for 120 countries over 1996 to 2006. In addition to the total sample estimations, econometric estimations using the MIMIC approach (latent estimation approach) are presented for 98 (88) developing countries, 21 Eastern European and Central Asian (mostly former transition) countries; and 25 high income OECD-countries.[18] This grouping was necessary because the available data is different for these countries and for time periods. For the developing countries, two estimations with and without the direct tax burden rate as causal variable are presented; without direct tax burden rate the number of development countries increase from 88 to 98. For the high income OECD countries again two estimations are shown, one over the period 1996 to 2006 and one over the period 1996 to 2007. For the 98 (88) developing countries and the 21 Eastern European and Central Asian countries, the estimation was done over the period 1994 to 2006 and for the 25 OECD countries over the period 1996 to 2007. For the total sample of 151(120) countries we use data for the period from 1996 up to 2007(2006).

For the developing countries we use as cause variables the following six: share of direct taxation (direct taxes in percent of overall taxation), size of government (general government final consumption expenditure, in percent of GDP) as proxy for indirect taxation and a variable, fiscal freedom (an index consisting of top individual income tax rate, top individual corporal tax rate, and total tax revenues as percent of GDP) as three tax burden variables in a

[18] Due to data reasons, the three different categories of these countries do not add up to 151 countries. The classification which country is a developing, or an Eastern European and Central Asian or a High Income OECD country follows the one done by the World Bank (2002) e.g. using a benchmark per capita income of USD 9.265 or less for developing countries.

wide sense; regulatory intensity for state regulation, and the business freedom index (which is composed of the following components: time to open a business, financial costs to start a business, minimum capital stock to start a business, and costs for obtaining a licence), the state of economy with the two variables: the unemployment rate and GDP per capita. As indicator variables we use growth rate of GDP per capita, the labor force participation rate (people over 15 economically active in % of total population), and as currency we use M0 divided by M1.[19] For the Eastern European and Central Asian (mostly former transition) countries, we use as cause variables the size of government, the fiscal freedom index, for state regulation the business freedom index, and for the state of the economy the unemployment rate, inflation rate and openness (sum of export and imports of goods and services, in percent of GDP). As indicator variables, we use the growth rate of GDP per capita, the growth rate of total labor force, and the ratio M0 over M1. For the 25 high income OECD countries, we use the total tax burden (total tax revenues in percent of GDP), the fiscal and business freedom indices, a regulatory quality index, and the unemployment rate. As indicator variables, we use GDP per capita, the labor force participation rate and a measure for currency (M0 over M2). For the total sample of 151 countries we use as cause variables the size of the government, the unemployment rate, government effectiveness, and the GDP per capita. As indicator variables we use currency (M0 over M1), the growth rate of GDP per capita, and the labor force participation rate. For the 120 countries, we have additional causal variables. Here we include the size of the government, the fiscal freedom index, the share of direct taxation, the business freedom index, the unemployment rate, government effectiveness, and the GDP per capita. As indicator variables we use currency (M0 over M1), the growth rate of GDP per capita, and the growth rate of total labor force.

The estimations results for the 98 developing countries, excluding the direct tax burden over the period 1994 up to 2006 are shown in specification 1, and the estimation results for the 88 developing countries (including direct taxation) over the same period are shown in specification 2. In both estimations, all estimated coefficients of the cause variables have the theoretically expected signs. Except for the unemployment rate, all other cause variables are statistically significant, at least at the 90-percent confidence level. The share of direct taxation and the size of government are highly statistically significant, as well as the fiscal freedom and the business freedom variable. Also, the GDP per capita is in both equations highly statistically significant with the expected negative sign. If we turn to the indicator variables, the labor force participation rate and the growth rate of GDP per capita are in both equations highly statistically significant. The test statistics are also quite satisfactory.

In specification 3, the MIMIC estimation result for the 21 Eastern European and Central Asian (mostly former transition) countries over the period 1994 to 2006 is shown. If we begin with the cause variables, the size of government and the fiscal freedom variable (both capturing the overall state burden), they are highly statistically significant and have the expected signs. Turning to regulation, the economic freedom variable has the expected negative sign and is statistically significant. As these countries experienced periods of high inflation, we include the inflation rate which has the expected positive sign and is highly statistically significant. The variable openness, modelling in a certain way the transition process, is also statistically significant. Considering the indicator variables, the growth rate of the total labor force is statistically significant, as well as the growth rate of GDP per capita. Also, here the test statistics are quite satisfactory.

[19] Here we have the problem that in many developing and Eastern European and Central Asian countries, the US Dollar (or the Euro) is also a widely used currency, which is not considered here, because we could not obtain any reliable figures of the amount of US Dollar (Euro) in these countries.

In specifications 4 and 5, the estimation results for the 25 high income OECD countries are shown. Specification 4 shows the estimation over the period 1996 to 2006, and specification 5 results over the period 1996 up to 2007.[20] If we consider first specification 4, the results over the period 1996 to 2006, the two variables capturing government burden (total tax burden and fiscal freedom) are highly statistically significant and have the expected sign. The unemployment rate has the expected sign and is at 95 percent confidence level statistically significant. The two variables capturing the regulatory burden, business freedom and regulatory quality have the expected signs and are highly statistically significant. Turning to the indicator variables, the labor force participation rate and currency (ratio of M0 over M2) are both highly statistically significant. Also, the test statistics for this equation are quite satisfactory. Turning to specification 5, where we present the results over the period 1996 to 2007, we use the same set of causal variables but exclude fiscal and business freedom which allows us to estimate the model up to the year 2007. We can see that all causal variables are highly statistically significant and all have the expected signs. as the same is true for the indicator variables.

Finally, in specifications 6 and 7, we present two estimations of a total sample of 151 and 120 countries, respectively. In specification 6 we present the results of 151 countries estimated over the period 1996 to 2007. Turning first to the causal variables, we see that the size of government has the expected positive sign and is highly statistically significant. The same holds for the two variables which describe the state of the economy, the unemployment variable, statistically significant with a positive sign, and GDP per capita, which is highly statistically significant with the expected negative sign. Turning to the indicator variables, the growth rate of GDP per capita and the labor force participation rate have the expected signs and are highly statistically significant. If we reduce this sample to 120 countries, we can include more causal variables and the results are presented in specification 7. Here, we see that as we have three variables capturing the burden of taxation (in a wide sense): the size of government, fiscal freedom and share of direct taxation. All three have the expected signs and are statistically significant. As regulatory variables we have business freedom and government effectiveness which, again, have the expected negative signs and are statistically significant. For the state of the economy, we have the unemployment rate, which is not statistically significant, and GDP per capita with the expected negative sign, which is highly statistically significant. For the indicator variables, we have the same three (currency defined as M0 over M1), labour force participation rate and GDP per capita, the latter two being highly statistically significant and showing the expected sign.

Summarizing the econometric (MIMIC) results, we can say that for all groups of countries, the theoretical considerations of the causes of the shadow economy in section 2 behave according to our expectations. Tax burden variables (direct and/or indirect and/or overall tax burden) as well as indices measuring the fiscal freedom in a country are driving forces for the growth of the shadow economy in all three types of countries. The same can be said about the measures of regulation (measured through the business freedom variable, the economic freedom variable, and regulatory quality), and about the measures of the official economy, the unemployment rate, and for the developing countries, GDP per capita. However, the estimated coefficients in table 3.1 are quite different in magnitude from one specification to the next. For example, the coefficient on fiscal freedom is twice the size in specification 3 as it is in specification 7 and the difference in the coefficient of the unemployment rate is also significant between specifications. Because it is rather difficult to come up with an explanation for the exact differences in the magnitude of the coefficients, we only present a

[20] A number of variables is not available for 2007, hence we have two different sets of cause variables.

general interpretation for this observation. With respect to the indices measuring regulation in one way or the other, i.e the fiscal freedom and business/economic freedom indices, our results suggest that regulation is a much more important determinant in developed and transition countries than in developing ones. It seems that – for the reason that the burden of regulation is on average higher in developed and transition countries as more rules, regulations, and administrative procedures are in place – the importance of regulation being a determinant of the shadow economy increases with the level of development. On the contrary, in developing countries in which regulation is often less burdensome, the coefficients of the fiscal and business freedom indices are much smaller and hence regulation is a less important determinant of the shadow economy. Regarding the unemployment rate, the results are comparable. It does not influence the shadow economies in developing countries (specifications 1 and 2) but is determinining the shadow economies in transition and the OECD countries (specifications 3 and 4/5 respectively). It seems that higher unemployment rates due to on average more regulated and hence less flexible labor markets significantly contribute to the size and trend of the shadow economies in OECD countries. In developing countries however, unemployment is not a significant determinant of the shadw economy. In these countries, the income earned in the shadow economy rather guarantees subsistence of families. Finally, comparing specifications 3 and 5 it turns out that the unemployment rate is a more important determinant in OECD than in transition countries.

Table 3.1. MIMIC Model Estimation Results

Independent variables	**Specification 1 98 Developing Countries (1994 - 2006)**	**Specification 2 88 Developing Countries (1994 - 2006)**	**Specification 3 21 Transition Countries (1994 - 2006)**	**Specification 4 25 High Income OECD Countries (1996 - 2006)**	**Specification 5 25 High Income OECD Countries (1996 - 2007)**	**Specification 6 151 Countries (1996 - 2007)**	**Specification 7 120 Countries (1996 - 2006)**
Causal variables							
Size of government	0.14 (5.97)***	0.15 (5.57)***	0.18 (3.49)***			0.05 (2.64)***	0.10 (3.77)***
Share of direct taxation		0.06 (2.57)**					0.05 (2.39)**
Total tax burden				0.05 (2.05)**	0.06 (1.78)*		
Fiscal freedom	-0.06 (2.90)***	-0.03 (1.69)*	-0.08 (1.68)*	-0.07 (2.84)***			-0.04 (2.08)**
Business freedom	-0.05 (2.18)**	-0.05 (2.33)**		-0.23 (5.93)***			-0.04 (1.84)*
Economic freedom			-0.09 (1.91)*				
Unemployment rate	0.01 (0.67)	-0.00 (0.06)	0.08 (1.84)*	0.05 (1.89)*	0.11 (3.16)***	0.04 (2.08)**	0.02 (0.89)
GDP per capita	-0.27 (8.79)***	-0.26 (6.87)***				-0.38 (15.89)***	-0.33 (9.15)***
Regulatory quality				-0.21 (5.45)***	-0.31 (6.50)***		
Government effectiveness						-0.05 (2.64)***	-0.04 (2.11)**
Openness			-0.15 (2.47)**				
Inflation rate			0.22 (2.83)***				
Indicator variables							
Growth rate of GDP per capita	-1.01 (7.88)***	-1.39 (6.70)***	-0.76 (4.41)***			-0.79 (10.93)***	-0.99 (8.42)***
GDP per capita				-1.52 (6.71)***	-1.25 (8.36)***		
Labor force participation rate	0.05 (0.59)	0.02 (0.14)		-1.11 (5.45)***	-1.03 (7.70)***	-0.19 (3.15)***	
Growth rate of labor force			-0.83 (3.90)***				-0.16 (1.76)*
Currency	1	1	1	1	1	1	1
Statistical tests							
RMSEA (*p*-value)	0.03 (0.99)	0.03 (0.99)	0.00 (1.00)	0.00 (0.88)	0.00 (0.99)	0.03 (1.00)	0.02 (1.00)
Chi-square (*p*-value)	38.70 (0.00)	44.43 (0.02)	17.75 (0.91)	17.74 (0.60)	3.55 (0.94)	29.95 (0.00)	51.82 (0.03)
AGFI	0.98	0.98	0.97	0.95	0.99	0.99	0.98
Degrees of freedom	20	27	27	20	9	13	35
Number of observations	1045	741	213	145	243	1563	942

Note: Absolute z-statistics in parentheses. ***, **, * denote significance at the 1, 5, and 10% significance level. All variables are used as their standardized deviations from mean. According to the MIMIC models identification rule (see also section 3.1), one indicator has to be fixed to an a prior value. We have consistently chosen the currency variable. The degrees of freedom are determined by $0.5(p+q)(p+q+1)-t$; with p= number of indicators; q = number of causes; t = the number for free parameters.

The estimation results further show a slightly different impact of "policy" causal variables compared to non-policy "economic" causal variables across the different groups of countries. In general economic variables, i.e. the level of development and the state of the economy measured by the GDP per capital and the unemployment rate are very important determinants of the shadow economy. The estimated coefficient indicate that an improvement of economic conditions would reduce the size of the shadow economy at most. Of course, for the unemployment rate this is only true for transition and highly developed OECD countries. Comparing the impact of the policy variables such as the different measures of the tax burdern and regulation on the shadow economy across the estimated specifications also reveals interesting results. For example, one could expect that a reduction of the regulatory burden and improvement of business/economic freedom in transition and highly developed OECD countries leads to a much higher reduction of the shadow economy than it would in developing countries; which is clearly indicated by the (much) larger coefficients of these variables. Fiscal freedom, however, is similarily important across all groups of countries.

The actual interpretation of the estimation parameters is straitforward and akin to that of regression coefficients in conventional regression analysis. Their magnitude shows the resulting change of the shadow economy for a unit change in a causal variable, all other variables being equal. Thus according to specification 1, a one percent reduction of the size of government, the proxy for the burden of indirect taxation, would on average reduce the shadow economy by 0.14 percent in developing countries. In transition countries the one percent reduction of the size of government reduces the shadow economy by 0.18 percent. For example, this means that reducing the burden of indirect taxation in developing and transition countries by one percent would on average reduce the shadow economy from 38.6 and 38.1 percent in 2006 to 38.4 and 37.9 percent in 2007. An improvement of the measures indicating the regulatory burden in these countries, i.e. the business and economic freedom indices of the Heritage Foundation, by one unit reduces the shadow economy by 0.05 percent in developing countries and 0.09 percent in transition countries. This effect is however stronger in developed countries. In these countries, an improvement of the business environment – measured by the business freedom index of the Heritage Foundation – by one unit reduces the shadow economy by 0.23 precent. Thus, in developed countries the shadow would on average decrease from 18.7 percent in 2006 to 18.4 percent in 2007.

3.3 The Size of the Shadow Economies for 162 Countries from 1999 to 2006/2007

The estimated MIMIC coefficients allow us to determine only relatively estimated sizes of the shadow economy, which describe the pattern of the shadow economy in a particular country over time. In order to calculate the size and trend of the shadow, we must convert the MIMIC index into "real world" figures measured in percentage of official GDP. This final step requires an additional procedure so called benchmarking or calibration procedure. Unfortunately, no consensus exists in the literature which benchmarking procedure to use. The methodology we use was promoted by Dell'Anno and Schneider (2006), Dell'Anno (2007), and Dell'Anno and Solomon (2008). In the first step, the MIMIC model index of the shadow economies is calculated using the structural equation (1), i.e. by multiplying the coefficients of the significant causal variables with the respective time series. For the numerical example of specification 1 the structural equation is given as

$$\tilde{\eta}_t = 0.14 \cdot x_{1t} - 0.06 \cdot x_{2t} - 0.05 \cdot x_{3t} - 0.27 \cdot x_{4t}.$$[21] (6)

Secondly, this index is converted into absolute values of the shadow economies which take up a base values in a particular base year. The base values necessary for this final step of the calibration procedure are from the year 2000 and taken from Schneider (2007) who presents estimates of the shadow economies in 145 countries around the world using the MIMIC and the currency demand approach.[22] Thus, the size of the shadow economy $\hat{\eta}_t$ at time t is given as:

$$\hat{\eta}_t = \frac{\tilde{\eta}_t}{\tilde{\eta}_{2000}} \eta^*_{2000}, \quad (7)$$

where $\tilde{\eta}_t$ denotes the value of the MIMIC index at t according to equation (6), $\tilde{\eta}_{2000}$ is the value of this index in the base year 2000, and η^*_{2000} is the exogenous estimate (base value) of the shadow economies in 2000. Applying this benchmarking procedure, the final estimates of the shadow economies are calculated for each specification 1 to 7.[23]

Of course, when showing the size of the shadow economies over the periods 1999 to 2006/07 for the 162 countries which are quite different in location and developing stage, one should be aware that such country comparisons give only a rough picture of the ranking of the size of the shadow economy in these countries and over time, because the MIMIC and the currency demand methods have shortcomings.[24] Due to these shortcomings a detailed discussion of the (relative) ranking of the size of the shadow economies is not conducted.

[21] x_{1t} equals size of government, x_{2t} and x_{3t} denote the fiscal and business freedom index, and x_{4t} represents GDP per capita.

[22] Appendix 1 discusses the the currency demand approach in detail. Again, the MIMIC model treats hidden output as a latent variable, and uses several (measurable) causal and indicator variables. The cash-demand equation is not used as an input to determine the variation in the hidden economy over time – it is used only to obtain the long-run average value of hidden output (base value), so that the index for this ratio predicted by the MIMIC model can be used to calculate a level and the percentage units of the shadow economy. Overall, this latest combination of the currency demand and MIMIC approach clearly shows that some progress in the estimation technique of the shadow economy has been achieved and a number of critical points have been overcome. However, objections can also be raised against the MIMIC method, i.e. (i) instability in the estimated coefficients with respect to sample size changes, (ii) instability in the estimated coefficients with respect to alternative specifications, (iii) difficulty of obtaining reliable data on cause variables other than tax variables, and (iv) the reliability of the variables grouping into "causes" and "indicators" in explaining the variability of the shadow economy.

[23] Calibration is performed separately for each country. The base values typically originate from the year 2000. Regarding the developing countries, we sometimes opted for base values originating from the year 2005 because of data availability.

[24] See also Thomas (1992, 1999), Tanzi (1999), Pedersen (2003) and Ahumada et al. (2004), Janisch and Brümmerhoff (2005), Schneider (2005) and Breusch (2005a, 2005b).

3.3.1 98 (88) Developing Countries[25]

As we presented two different MIMIC estimates with respect to the developing countries due to the fact that the direct taxation variable was only available for a smaller country sample (88 developing countries instead of 98), the calibration of the size and trend of the shadow economy of the developing countries is done for both sets of estimations. In table 3.3.1 we present the size of the shadow economy in 98 developing countries (excluding the direct taxation variable in the MIMIC estimation). The countries are ordered with respect to the size of the shadow economy. If we first consider the trend of the average of these 98 countries over time, in the year 1999 the size was 36.6% and modestly increased up to 38.6% in the year 2007. The three countries with the smallest shadow economy are Singapore, China and Vietnam with an average country size of 13.2, 13.4 and 16.0 percent respectively.[26] The middle of the distribution includes Nepal, Jamaica, and Mauritania; with an average size of 37.0, 37.1 and 37.2 percent of GDP. The highest shadow economies includes Peru, Panama and Bolivia; with a size of 61.1, 64.6 and 67.7 percent of GDP.

Table 3.3.1. Ranking of 98 Developing Countries According to Size of the Shadow Economy

No.	Country	Years								Country Average
		1999	2000	2001	2002	2003	2004	2005	2006	
1	Singapore	13.1	13.1	12.8	12.9	13.1	13.4	13.7	13.7	13.2
2	China	13.2	13.1	13.1	13.1	13.3	13.6	14.0	14.1	13.4
3	Vietnam	15.4	15.6	15.7	15.9	15.9	16.1	16.5	16.7	16.0
4	Saudi Arabia	18.2	18.4	18.1	18.2	18.9	19.3	19.7	19.6	18.8
5	Bahrain	18.2	18.4	18.5	18.6	19.1	19.4	19.5	-	18.8
6	Mongolia	18.4	18.4	18.4	18.5	18.7	19.2	19.8	20.0	18.9
7	Oman	18.5	18.9	19.0	19.1	19.2	19.4	19.9	20.3	19.3
8	Indonesia	19.5	19.4	19.3	19.0	19.1	19.2	19.7	19.6	19.3
9	Iran, Islamic Rep.	19.2	18.9	18.8	19.3	19.6	20.0	20.2	20.4	19.5
10	Syrian Arab Republic	19.6	19.3	19.4	19.7	19.4	19.2	19.8	20.1	19.6
11	Jordan	19.3	19.4	19.6	19.8	19.9	20.4	21.2	21.2	20.1
12	Chile	19.7	19.8	19.8	19.6	20.0	20.3	20.8	21.1	20.2
13	Kuwait	20.2	20.1	20.0	20.0	20.5	20.8	21.0	21.2	20.5
14	Israel	21.5	21.9	21.5	20.8	21.1	21.7	22.4	22.8	21.7
15	Mauritius	22.9	23.1	23.7	23.7	23.7	23.7	23.8	24.1	23.6
16	India	22.9	23.1	23.3	23.6	24.1	24.4	24.8	25.1	23.9
17	Argentina	25.6	25.4	24.7	24.9	25.6	26.2	26.5	26.7	25.7
18	Costa Rica	26.6	26.2	25.7	25.4	25.7	26.0	26.7	27.0	26.2
19	Malta	26.6	27.1	26.4	26.7	26.4	26.2	26.6	26.7	26.6
20	United Arab Emirates	26.2	26.4	25.9	25.5	26.4	27.2	27.3	28.7	26.7
21	Yemen, Rep.	27.1	27.4	27.3	27.4	27.6	27.9	28.5	28.6	27.7
22	Cyprus	28.1	28.7	28.5	28.2	28.2	28.9	29.0	29.0	28.6
23	South Africa	28.1	28.4	28.4	28.7	28.5	28.8	29.5	30.0	28.8
24	Mexico	29.9	30.1	29.8	29.8	30.0	30.5	31.1	31.7	30.4
25	Malaysia	30.8	31.1	30.4	30.3	30.4	30.7	31.3	31.6	30.8
26	Lao PDR	30.3	30.6	31.1	31.2	31.5	31.9	32.6	32.7	31.5
27	Lesotho	31.1	31.3	31.4	31.7	31.6	31.9	32.3	33.1	31.8
28	Dominican Republic	32.0	32.1	32.0	32.1	32.3	32.5	33.3	32.9	32.4
29	Namibia	30.7	31.4	31.7	32.3	32.6	33.3	33.6	34.4	32.5

[25] For an extensive and excellent literature survey of the research about the shadow economy in developing countries see Gerxhani (2004),who stresses thoroughout her paper that the distinction between developed and developing countries with respect to the shadow economy is of great importance. Due to space reasons this point is not further elaborated here; nor are the former results and literature discussed. Compare Schneider and Enste (2000) for this.

[26] It should be mentioned that Mainland China and Vietnam are still communist countries with partly market economies, so that the figures of these two countries may be biased.

30	Cameroon	32.7	32.8	32.7	32.9	33.1	33.6	34.1	34.3	33.3
31	Venezuela, RB	33.6	33.6	33.5	32.5	31.1	32.7	34.5	35.4	33.4
32	Botswana	33.0	33.4	33.3	33.5	33.8	33.9	33.9	33.9	33.6
33	Equatorial Guinea	32.5	32.8	33.4	33.5	33.8	34.4	33.9	34.3	33.6
34	Guyana	33.9	33.6	34.2	33.8	33.5	33.9	34.5	34.6	34.0
35	Sudan	34.1	-	-	-	-	-	-	-	34.1
36	Kenya	34.3	34.3	34.3	33.4	33.1	33.7	35.2	36.4	34.3
37	Lebanon	34.6	34.1	34.0	34.2	34.4	34.8	35.2	35.3	34.6
38	Fiji	34.5	33.6	33.6	34.3	34.5	35.5	35.9	36.0	34.7
39	Ecuador	33.2	34.4	34.4	34.6	34.6	35.4	36.6	36.5	34.9
40	Trinidad and Tobago	33.6	34.4	34.1	34.4	35.1	35.6	36.3	36.7	35.0
41	Algeria	33.3	34.1	34.0	34.2	35.0	35.6	37.0	37.1	35.0
42	Togo	35.8	35.1	34.8	35.7	35.3	35.2	35.2	35.6	35.4
43	Egypt, Arab Rep.	35.3	35.1	34.9	34.7	35.4	35.7	36.3	37.4	35.6
44	Bangladesh	35.4	35.6	35.8	35.5	35.3	35.5	36.2	36.5	35.7
45	Cape Verde	35.6	36.1	36.7	36.7	36.3	36.6	36.6	37.3	36.5
46	Papua New Guinea	37.1	36.1	-	-	-	-	-	-	36.6
47	Pakistan	36.3	36.8	36.2	36.2	36.7	37.3	37.1	37.7	36.8
48	Nepal	36.7	36.8	36.7	36.7	36.9	36.8	37.5	37.5	37.0
49	Jamaica	36.7	36.4	36.4	36.3	37.1	37.4	38.3	38.0	37.1
50	Mauritania	36.7	36.1	36.2	36.4	36.4	37.2	37.9	40.8	37.2
51	Morocco	36.6	36.4	36.8	37.1	37.7	37.8	38.2	39.4	37.5
52	Madagascar	39.6	39.6	39.5	37.3	37.1	38.7	39.8	39.8	38.9
53	Malawi	40.3	40.3	39.1	38.1	38.2	38.1	38.8	40.0	39.1
54	Guinea-Bissau	38.9	39.6	39.5	39.1	39.3	39.3	39.3	39.6	39.3
55	Tunisia	38.3	38.4	38.6	38.4	39.2	39.9	41.1	41.2	39.4
56	Burundi	40.4	40.3	40.1	40.0	39.9	39.8	39.7	39.1	39.9
57	Brazil	39.1	39.8	39.6	39.5	39.8	40.3	40.7	41.1	40.0
58	Colombia	38.8	39.1	39.2	39.5	39.7	40.3	41.4	42.3	40.0
59	Guinea	39.7	39.6	39.9	40.0	40.0	40.5	41.0	41.5	40.3
60	Rwanda	40.1	40.3	40.0	40.7	39.9	40.4	41.4	41.5	40.5
61	Mozambique	39.5	40.3	40.2	40.8	40.8	40.9	41.6	42.0	40.8
62	Suriname	39.7	39.8	40.1	40.5	40.8	41.7	42.2	43.0	41.0
63	Paraguay	41.8	39.8	40.1	40.0	41.0	42.0	42.1	43.4	41.3
64	Ethiopia	40.5	40.3	41.3	41.0	40.2	41.8	43.2	44.4	41.6
65	Burkina Faso	41.8	41.4	41.2	41.2	42.2	42.4	42.8	43.3	42.0
66	Ghana	41.8	41.9	42.1	42.0	41.2	41.7	42.3	43.4	42.0
67	Swaziland	39.4	41.4	41.5	41.8	42.5	42.7	43.4	43.8	42.1
68	Côte d'Ivoire	44.2	43.2	43.2	42.4	42.2	42.4	42.9	42.5	42.9
69	Mali	42.1	42.3	43.6	43.4	43.3	43.3	43.4	43.6	43.1
70	Uganda	42.1	43.1	43.0	42.6	43.0	43.2	43.9	44.4	43.2
71	Angola	40.8	41.5	42.2	42.9	43.6	44.3	45.0	46.3	43.3
72	Niger	42.1	41.9	43.0	43.7	44.4	43.2	44.4	45.6	43.5
73	Belize	42.3	43.8	43.9	43.5	43.9	44.2	44.6	44.8	43.9
74	Sierra Leone	42.3	43.0	43.7	44.4	44.5	44.4	44.3	45.0	43.9
75	Philippines	42.5	43.3	43.6	44.2	44.8	45.8	46.6	47.0	44.7
76	Sri Lanka	44.5	44.6	44.9	45.4	46.4	46.3	46.7	45.6	45.5
77	Nicaragua	44.5	45.2	45.4	45.4	45.8	46.0	46.7	46.9	45.7
78	Senegal	44.3	45.1	45.5	44.9	45.8	46.3	47.5	47.4	45.8
79	Gambia, The	44.8	45.1	45.8	44.5	46.0	47.1	47.3	48.4	46.1
80	El Salvador	46.4	46.3	46.1	46.3	46.6	46.8	47.6	48.0	46.8
81	Congo, Dem. Rep.	48.0	-	-	-	-	-	-	-	48.0
82	Central African Republic	-	-	49.3	48.6	47.8	47.8	46.9	48.7	48.2
83	Chad	46.1	46.2	46.7	46.9	48.0	51.6	50.5	50.1	48.3
84	Congo, Rep.	46.4	48.2	48.3	48.5	48.7	48.7	50.1	51.5	48.8
85	Gabon	48.8	48.0	47.9	48.3	49.2	49.0	50.0	49.7	48.9
86	Benin	48.3	49.1	49.1	48.6	48.6	48.8	49.8	49.9	49.0
87	Zambia	48.7	48.9	49.7	49.7	50.0	49.1	50.3	50.9	49.7
88	Honduras	49.5	49.6	49.4	49.6	50.0	50.5	51.7	52.4	50.3

89	Guatemala	51.5	51.5	50.4	50.8	50.9	51.2	52.5	53.1	51.5
90	Uruguay	51.5	51.1	50.3	49.6	50.1	52.4	53.9	54.5	51.7
91	Thailand	52.2	52.6	52.6	53.1	54.0	54.0	54.2	54.6	53.4
92	Haiti	55.9	55.4	54.4	54.1	54.3	54.9	54.9	54.7	54.8
93	Myanmar	53.6	52.6	53.7	54.5	56.3	56.2	57.4	-	54.9
94	Nigeria	57.8	57.9	58.0	58.2	59.5	60.8	62.1	62.9	59.6
95	Tanzania	57.2	58.3	58.9	59.4	59.8	60.3	61.6	62.4	59.7
96	Peru	59.6	59.9	59.5	60.8	61.0	62.0	62.4	63.4	61.1
97	Panama	63.4	64.1	63.5	63.1	63.9	64.7	66.4	68.1	64.6
98	Bolivia	67.2	67.1	66.5	66.5	66.4	67.1	69.5	70.8	67.7
	Time Average	36.6	36.6	36.8	36.8	37.1	37.5	38.1	38.6	

In table 3.3.2, the size and trend of the shadow economy of 88 developing countries are presented using the MIMIC estimation for the developing countries with the direct taxation. The size of the shadow economies of those countries are in both samples quite similar. The average size of the shadow economy of these 88 developing countries was 35.7% in 1999 and modestly increased to 35.7% in the year 2006. The lowest size of the shadow economy average of the period 1999 to 2006 include again Singapore, China and Vietnam; the middle position now include Papua New Guinea, Mauritania and Pakistan with 36.3, 36.6 and 36.9%. The highest shadow economies now include Peru, Panama, and Bolivia with 60.8, 64.3 and 67.3%.

Large shadow economies in some developing countries is only to some extent an issue of tax burden and regulation, given the simple fact that the limited local economy means that citizens are often unable to earn a living wage in a legitimate manner. Working in the shadow economy is often the only way of achieving a minimal standard of living. It should also be noted that the average size of the Asian shadow economies are smaller than the shadow economies of African and Latin American countries.

Table 3.3.2. Ranking of 88 Developing Countries According to Size of the Shadow Economy

		Years								Country
No.	Country	1999	2000	2001	2002	2003	2004	2005	2006	Average
1	Singapore	13.2	13.1	12.8	12.8	13.1	13.5	13.7	13.7	13.2
2	China	13.2	13.1	13.1	13.1	13.3	13.6	13.9	14.1	13.4
3	Vietnam	15.5	15.6	15.6	15.8	15.8	15.9	16.3	-	15.8
4	Saudi Arabia	18.1	18.4	17.9	17.9	18.8	19.2	19.6	-	18.6
5	Bahrain	18.2	18.4	18.3	18.4	18.8	19.2	19.6	-	18.7
6	Mongolia	18.6	18.4	18.5	18.7	18.9	19.4	20.0	-	18.9
7	Oman	18.4	18.9	19.0	18.9	18.8	19.2	19.7	-	19.0
8	Indonesia	19.5	19.4	19.3	19.2	19.1	18.9	19.7	-	19.3
9	Syrian Arab Republic	19.6	19.3	19.4	19.4	19.4	19.2	19.8	-	19.4
10	Iran, Islamic Rep.	19.4	18.9	18.8	19.3	19.6	19.9	19.9	20.1	19.5
11	Jordan	19.3	19.4	19.5	19.7	19.8	20.4	21.3	21.1	20.1
12	Chile	19.8	19.8	19.8	19.5	19.9	20.2	20.6	20.8	20.1
13	Kuwait	19.9	19.8	19.7	19.7	20.1	20.4	20.7	20.8	20.1
14	Israel	21.6	21.9	21.4	21.0	21.3	22.0	22.6	22.8	21.8
15	Mauritius	22.8	23.1	23.5	23.4	23.4	23.4	23.4	23.5	23.3
16	India	22.9	23.1	23.3	23.6	24.1	24.4	24.7	24.9	23.9
17	Argentina	25.6	25.4	24.6	25.1	25.8	26.3	26.6	-	25.6
18	Costa Rica	26.5	26.2	25.6	25.3	25.6	25.9	26.6	27.0	26.1
19	United Arab Emirates	26.3	26.4	25.7	25.3	26.3	27.4	27.7	-	26.4
20	Malta	26.8	27.1	26.3	26.7	26.1	26.1	26.7	26.6	26.5
21	Yemen, Rep.	27.0	27.4	27.2	27.1	27.3	27.5	28.0	-	27.3
22	Cyprus	28.0	28.7	28.5	28.2	28.2	29.1	29.1	29.0	28.6
23	South Africa	28.2	28.4	28.3	28.5	28.3	28.8	29.4	29.8	28.7
24	Mexico	29.7	30.1	30.1	30.0	30.1	30.3	30.9	-	30.2

25	Malaysia	30.6	31.1	30.3	30.4	30.4	30.8	31.2	-	30.7
26	Lao PDR	30.3	30.6	31.2	31.4	32.0	32.3	33.0	-	31.6
27	Lesotho	31.2	31.3	31.4	31.5	31.4	31.9	32.4	33.2	31.8
28	Dominican Republic	32.0	32.1	31.8	31.9	31.9	32.6	33.3	33.1	32.3
29	Namibia	30.9	31.4	31.6	32.4	32.5	33.6	34.0	-	32.3
30	Cameroon	32.1	32.8	32.4	32.5	32.5	32.8	33.4	-	32.7
31	Venezuela, RB	33.8	33.6	33.5	32.7	31.5	33.1	34.5	-	33.3
32	Botswana	33.2	33.4	33.2	33.3	33.5	34.0	34.1	-	33.5
33	Sudan	34.1	-	-	-	-	-	-	-	34.1
34	Kenya	34.1	34.3	34.4	33.3	32.6	33.4	34.8	35.9	34.1
35	Lebanon	34.4	34.1	33.8	34.1	34.3	34.7	34.9	34.8	34.4
36	Trinidad and Tobago	-	-	33.5	33.9	34.3	34.8	35.2	35.4	34.5
37	Ecuador	33.1	34.4	33.9	34.4	34.4	35.3	36.6	-	34.6
38	Fiji	34.6	33.6	33.9	34.7	34.9	35.8	36.1	-	34.8
39	Togo	35.2	35.1	34.5	35.7	34.9	35.0	34.8	-	35.0
40	Algeria	33.3	34.1	34.0	34.2	35.4	36.0	37.4	37.5	35.2
41	Bangladesh	35.3	35.6	35.9	35.1	34.8	34.9	35.7	-	35.3
42	Egypt, Arab Rep.	35.4	35.1	34.8	34.8	35.3	35.6	36.1	36.7	35.5
43	Papua New Guinea	36.5	36.1	-	-	-	-	-	-	36.3
44	Mauritania	36.3	36.1	36.1	36.5	36.3	37.1	37.8	-	36.6
45	Pakistan	36.3	36.8	36.2	36.3	36.9	37.5	37.1	37.7	36.9
46	Nepal	36.7	36.8	36.6	36.4	36.8	36.7	37.4	37.5	36.9
47	Jamaica	36.5	36.4	36.7	36.7	36.9	37.3	38.0	38.0	37.1
48	Morocco	36.2	36.4	36.9	37.4	37.9	37.8	38.1	-	37.2
49	Cape Verde	-	-	-	-	-	-	36.8	38.0	37.4
50	Madagascar	39.3	39.6	39.6	36.9	37.2	38.4	39.6	-	38.6
51	Malawi	40.1	40.3	39.0	38.1	38.5	38.6	38.8	-	39.1
52	Tunisia	38.3	38.4	38.5	38.3	38.8	39.5	40.4	40.7	39.1
53	Brazil	39.0	39.8	39.9	39.8	39.4	40.3	40.6	-	39.8
54	Guinea	39.2	39.4	39.6	39.8	40.1	40.2	41.0	-	39.9
55	Colombia	38.7	39.1	39.2	39.2	39.6	40.6	41.5	42.5	40.1
56	Burundi	40.7	40.5	40.4	40.2	40.0	39.9	39.7	-	40.2
57	Rwanda	40.4	40.3	39.9	40.9	39.8	40.3	41.0	-	40.4
58	Mozambique	39.6	40.3	40.0	40.5	40.6	40.9	41.0	-	40.4
59	Ethiopia	40.7	40.3	41.1	40.5	39.7	41.6	43.1	-	41.0
60	Swaziland	39.3	41.4	41.6	41.9	42.1	-	-	-	41.2
61	Paraguay	41.3	39.8	40.3	39.9	41.2	42.1	42.2	43.2	41.2
62	Ghana	41.3	41.9	42.3	41.4	40.6	41.1	41.9	-	41.5
63	Burkina Faso	41.8	41.4	41.4	41.1	41.6	41.8	42.2	-	41.6
64	Sierra Leone	41.0	41.6	42.2	42.8	42.9	42.6	-	-	42.2
65	Mali	42.1	42.3	43.5	43.3	42.8	43.0	43.0	43.2	42.9
66	Uganda	42.6	43.1	42.9	42.3	42.7	42.7	43.3	43.8	42.9
67	Côte d'Ivoire	44.4	43.2	43.6	42.8	42.7	43.0	43.0	42.5	43.1
68	Niger	42.4	41.9	42.9	43.9	44.6	43.1	44.1	-	43.3
69	Philippines	42.8	43.3	43.6	44.2	44.8	45.7	46.7	47.2	44.8
70	Sri Lanka	44.3	44.6	44.7	45.2	46.0	46.2	46.5	44.8	45.3
71	Senegal	45.2	45.1	46.0	-	-	-	-	-	45.4
72	Nicaragua	44.8	45.2	45.3	45.1	45.2	45.4	46.2	46.3	45.5
73	El Salvador	46.3	46.3	46.3	46.2	46.6	46.8	47.1	47.4	46.6
74	Central African Republic	-	-	48.8	48.4	47.4	47.5	46.9	-	47.8
75	Congo, Dem. Rep.	48.0	-	-	-	-	-	-	-	48.0
76	Chad	45.6	46.2	46.9	47.0	48.1	51.4	50.7	-	48.0
77	Congo, Rep.	46.0	48.2	48.3	48.4	48.9	48.7	50.5	-	48.4
78	Zambia	48.3	48.6	48.9	48.6	48.7	48.2	49.3	49.8	48.8
79	Honduras	49.0	49.6	49.0	49.0	49.3	50.0	50.5	-	49.5
80	Benin	48.8	49.8	49.7	49.9	50.0	50.2	51.2	-	50.0
81	Guatemala	52.0	51.5	50.6	50.9	51.0	51.6	52.6	53.0	51.7
82	Uruguay	51.8	51.1	50.7	50.0	51.1	53.1	54.5	55.2	52.2
83	Thailand	52.3	52.6	52.6	53.1	53.9	53.8	54.0	54.1	53.3

84	Myanmar	53.3	52.6	53.7	54.4	55.2	55.4	56.8	-	54.5
85	Tanzania	57.4	58.3	59.0	59.8	60.2	61.2	61.8	-	59.6
86	Peru	59.6	59.9	59.4	60.4	60.5	61.3	62.1	62.9	60.8
87	Panama	63.7	64.1	63.3	62.9	63.9	65.3	67.0	-	64.3
88	Bolivia	66.9	67.1	66.6	66.3	66.2	66.8	68.5	69.8	67.3
	Time Average	35.7	35.8	35.9	35.8	36.0	36.4	36.9	37.0	

3.3.2 21 Eastern European and Central Asian (mostly former transition) Countries

The measurement of the size and trend of the shadow economies in the transition countries has been undertaken since the late 1980s starting with the works of Kaufmann and Kaliberda (1996), Johnson, Kaufmann, and Shleifer (1997), and Lacko (2000). They all use the physical input (electricity) method and come up with quite large figures. In the works of Alexeev and Pyle (2003) and Belev (2003) the above mentioned studies are critically evaluated arguing that the estimated sizes of the unofficial economies are to a large extent a historical phenomenon and partly determined by institutional factors.

In table 3.3.3 the size and trend of 21 Eastern European and Central Asian (mostly former transition) countries in percent of GDP are shown. If we first consider the average of the shadow economy of these 21 Eastern European and Central Asian countries, it was 35.8% in 1999 and increased to 38.1% in 2006. The three countries with the smallest shadow economy are the Czech and Slovak Republics, and Hungary with an average size over the period 1999 to 2006 of 18.7, 19.5 and 25.0 percent. In the middle position are Macedonia, Romania and Albania with 35.1, 35.4 and 36.1 percent. The highest shadow economies include the Russian Federation, Ukraine, and Georgia; with 46.5, 52.5 and 65.9 percent, respectively.

Table 3.3.3 Ranking of 21 Transition Countries According to Size of the Shadow Economy

		Years								Country
No.	Country	1999	2000	2001	2002	2003	2004	2005	2006	Average
1	Czech Republic	18.7	19.1	18.7	18.4	18.2	18.5	19.1	19.3	18.7
2	Slovak Republic	18.7	18.9	19.1	19.2	19.4	19.6	20.3	20.5	19.5
3	Hungary	24.9	25.1	25.1	24.8	24.7	25.0	25.3	25.3	25.0
4	Slovenia	27.0	27.1	26.8	27.0	27.2	27.5	28.2	28.0	27.4
5	Poland	27.4	27.6	27.7	27.4	27.4	27.8	27.9	28.1	27.7
6	Lithuania	30.0	30.3	30.9	31.4	31.9	32.0	32.6	32.9	31.5
7	Turkey	31.5	32.1	31.4	31.3	31.6	32.2	32.7	32.9	32.0
8	Croatia	33.2	33.4	33.9	34.5	34.2	33.9	35.0	35.1	34.2
9	Macedonia, FYR	-	-	34.1	33.9	34.9	35.2	35.7	36.7	35.1
10	Romania	34.8	34.4	35.0	35.4	34.5	35.9	36.2	36.7	35.4
11	Albania	34.7	35.3	35.3	36.1	36.4	36.4	36.8	37.9	36.1
12	Bulgaria	36.7	36.9	37.2	37.1	37.7	38.2	39.1	39.4	37.8
13	Estonia	36.6	38.4	38.3	38.8	38.9	38.4	39.0	39.6	38.5
14	Latvia	39.6	39.9	40.1	40.3	41.6	41.9	42.6	42.8	41.1
15	Tajikistan	-	43.2	42.2	42.2	42.1	42.4	41.9	42.6	42.4
16	Kyrgyz Republic	-	-	-	41.2	42.7	42.8	44.1	44.6	43.1
17	Kazakhstan	43.1	43.2	42.5	43.4	43.3	44.1	44.8	45.2	43.7
18	Moldova	44.6	45.1	46.1	45.8	45.7	46.2	46.8	46.0	45.8
19	Russian Federation	46.4	46.1	46.0	46.3	46.6	46.6	47.3	46.4	46.5
20	Ukraine	51.2	52.2	51.6	52.4	52.5	53.6	53.3	52.8	52.5
21	Georgia	64.8	67.3	65.5	65.7	66.3	65.1	66.4	66.4	65.9
	Time Average	35.8	36.6	36.4	36.8	37.0	37.3	37.9	38.1	

3.3.3 25 High Income OECD-Countries

The size and trend of the shadow economies of 25 high income OECD countries is shown in table 3.3.4. We first analyze the average size of the shadow economies of the 25 high income OECD countries. It was 16.8% in 1996, and increased to 18.7% in 2006. Some high income OECD countries, like Greece has up's and down's, others (like Belgium, Australia) show a steady increase. The countries with the lowest shadow economies include Switzerland, the United States, and Austria; with an average size of the shadow economy over the period 1996 to 2006 of 8.4, 8.7 and 9.8 percent, respectively. The highest shadow economies among these 25 high income OECD countries include Mexico with 31.4, Greece with 29.5, and the Republic of Korea with 28.1 percent.

Table 3.3.4. Ranking of 25 OECD Countries According to Size of the Shadow Economy

No.	Country	Years								Country Average
		1996	1998	2000	2002	2003	2004	2005	2006	
1	Switzerland	8.0	8.4	8.6	8.6	8.4	8.3	8.7	8.6	8.4
2	United States	8.1	8.6	8.7	8.5	8.6	8.7	9.3	9.3	8.7
3	Austria	9.2	9.4	9.8	9.7	9.6	9.6	10.4	10.5	9.8
4	Luxembourg	9.1	9.4	9.8	9.9	9.8	9.8	10.3	10.4	9.8
5	Japan	10.8	10.9	11.2	10.6	11.0	11.1	11.9	11.9	11.2
6	United Kingdom	12.3	13.1	12.7	12.7	12.6	13.0	13.3	13.7	12.9
7	Netherlands	12.3	12.8	13.1	13.1	12.9	12.9	13.5	13.6	13.0
8	New Zealand	12.9	13.8	12.8	12.9	13.2	13.4	13.8	13.8	13.3
9	Australia	13.5	14.1	14.3	14.6	14.9	15.1	15.4	15.6	14.7
10	France	15.2	15.7	15.2	15.6	16.0	15.9	16.7	16.7	15.9
11	Germany	14.8	15.3	16.0	16.1	16.0	15.9	16.7	16.8	16.0
12	Ireland	14.7	15.5	15.9	16.0	15.9	15.8	16.7	17.1	16.0
13	Iceland	15.0	15.7	15.9	16.4	16.3	16.6	17.1	17.0	16.3
14	Canada	14.9	15.8	16.0	16.4	16.4	16.6	17.5	17.5	16.4
15	Finland	16.8	17.7	18.1	18.8	18.9	18.8	19.3	19.3	18.5
16	Denmark	17.0	17.9	18.0	19.0	19.1	19.1	18.9	19.4	18.5
17	Sweden	18.6	18.8	19.2	19.7	19.8	19.8	20.5	20.6	19.6
18	Norway	19.2	20.1	19.1	19.4	19.6	19.9	20.9	20.6	19.9
19	Spain	21.0	22.2	22.7	22.8	22.7	22.7	23.9	23.4	22.7
20	Belgium	21.5	21.6	22.2	22.8	23.0	23.1	24.0	24.4	22.8
21	Portugal	22.7	23.5	22.7	24.1	23.6	23.4	24.8	24.7	23.7
22	Italy	25.5	26.7	27.1	27.4	27.9	28.1	29.1	28.9	27.6
23	Korea, Rep.	27.3	26.3	27.5	28.4	27.9	28.1	29.9	29.6	28.1
24	Greece	28.1	27.7	28.7	29.8	30.2	29.2	31.4	30.8	29.5
25	Mexico	32.1	30.5	30.1	31.5	31.0	31.5	31.8	32.6	31.4
	Time Average	16.8	17.3	17.4	17.8	17.8	17.9	18.6	18.7	

In table 3.3.5 the size and trend of the shadow economies of the 25 high income OECD countries are presented over the period 1999 to 2007. Due to data reasons we use a different set of causal variables. The average size of these estimations of the shadow economy is thus somewhat different when compared to those presented in table 3.3.4. It was 16.4% in 1999 and increased up to 17.8% in 2001; then it decreased only slightly to 17.6% in 2007. The countries with the lowest shadow economies are Switzerland, United States, and Austria with an average size of 8.2, 8.4 and 9.5% of official GDP. The countries with the highest shadow economies are Mexico, Greece and the Republic of Korea with 30.3, 28.9 and 28.0 % of the GDP, respectively.

Table 3.3.5. Ranking of 25 OECD Countries According to the Size of the Shadow Economy

No.	Country	Years 1996	1998	2000	2002	2003	2004	2005	2006	2007	Country Average
1	Switzerland	7.7	8.3	8.6	8.5	8.3	8.2	8.0	8.0	8.2	8.2
2	United States	7.7	8.6	8.7	8.4	8.4	8.5	8.5	8.5	8.3	8.4
3	Austria	8.8	9.2	9.8	9.6	9.5	9.3	9.4	9.6	9.7	9.5
4	Luxembourg	8.9	9.3	9.8	9.8	9.7	9.6	9.5	9.6	9.7	9.5
5	Japan	10.9	11.1	11.2	10.9	11.5	11.6	11.7	11.7	-	11.3
6	Netherlands	11.3	12.6	13.1	12.9	12.6	12.6	12.3	12.4	12.7	12.5
7	United Kingdom	12.0	13.2	12.7	12.9	12.7	13.0	12.4	13.1	13.1	12.8
8	New Zealand	12.8	14.0	12.8	13.0	13.4	13.8	13.2	13.4	13.5	13.3
9	Australia	13.0	14.0	14.3	13.9	14.3	14.6	14.4	14.5	-	14.1
10	Germany	14.4	15.0	16.0	15.9	15.8	15.5	15.3	15.5	15.7	15.5
11	France	14.2	14.9	15.2	15.6	16.2	16.1	15.8	15.8	16.1	15.6
12	Ireland	14.2	15.4	15.9	16.0	15.8	15.6	15.5	16.2	16.1	15.6
13	Iceland	14.5	15.6	15.9	15.8	15.9	16.0	16.0	15.8	15.9	15.7
14	Canada	14.4	15.8	16.0	16.3	16.1	16.5	16.3	16.4	16.5	16.0
15	Finland	16.1	17.8	18.1	18.4	18.5	18.4	18.3	18.3	18.2	18.0
16	Denmark	16.6	17.9	18.0	18.3	18.4	18.4	18.0	18.6	18.9	18.1
17	Sweden	17.9	18.4	19.2	20.0	20.1	20.1	19.4	19.5	20.0	19.4
18	Norway	19.1	20.5	19.1	19.8	20.2	20.6	20.3	20.1	20.7	20.0
19	Spain	20.5	22.3	22.7	23.0	22.7	22.7	22.4	21.8	21.9	22.2
20	Belgium	20.9	21.1	22.2	23.0	22.7	23.0	22.3	22.8	23.2	22.4
21	Portugal	22.6	23.9	22.7	24.7	23.8	23.6	23.5	22.4	22.3	23.3
22	Italy	25.0	26.4	27.1	27.6	28.2	28.5	27.5	27.2	26.9	27.2
23	Korea, Rep.	27.6	25.8	27.5	28.7	28.0	28.7	28.6	28.1	29.0	28.0
24	Greece	27.7	27.4	28.7	30.1	30.5	29.0	29.3	28.8	-	28.9
25	Mexico	32.3	30.1	30.1	31.1	29.9	30.4	29.2	29.7	29.9	30.3
	Time Average	16.4	17.1	17.4	17.8	17.7	17.8	17.5	17.5	17.6	

3.3.4 The total sample of 151 (120) countries

Finally, we present the calibrated estimates of the shadow economies of the overall sample of 151 countries (table 3.3.6) and, with a larger number of cause variables and calibrated estimates for 120 countries (table 3.3.8). Looking at table 3.3.6 we see that the overall average of the shadow economy for the year 1999 is 32.9% and steadily increase to 35.5% in 2007. The three countries with the smallest shadow economy are Switzerland, the United States and Austria with an average size of the shadow economy (over 1999 to 2007) of 8.6, 8.8 and 9.8% of official GDP. In the middle of the distribution we found Bosnia and Herzegovina, Croatia, and the Fiji Islands, with an average size of the shadow economy of 34.6, 34.7 and 34.8%. The three countries with the largest shadow economies are Azerbaijan, Bolivia and Georgia; with an average size of the shadow economy of 63.3, 68.1 and 68.8%.

Table 3.3.6. Ranking of 151 Countries According to the Size of the Shadow Economy

No.	Country	Years									Country Average
		1999	2000	2001	2002	2003	2004	2005	2006	2007	
1	Switzerland	8.4	8.6	8.6	8.6	8.4	8.6	8.7	8.9	9.1	8.6
2	United States	8.6	8.7	8.7	8.6	8.7	8.8	8.9	8.9	9.0	8.8
3	Austria	9.6	9.8	9.9	9.8	9.8	9.8	9.8	10.0	10.1	9.8
4	Luxembourg	9.6	9.8	9.8	9.8	9.8	9.8	9.9	10.0	10.2	9.9
5	Japan	11.0	11.2	11.2	11.1	11.2	11.5	11.7	12.0	12.1	11.4
6	United Kingdom	12.6	12.7	12.8	12.8	12.9	13.0	13.0	13.1	13.2	12.9
7	Netherlands	12.9	13.1	13.1	13.0	12.9	13.0	13.0	13.0	13.2	13.0
8	New Zealand	12.6	12.8	13.0	13.2	13.4	13.6	13.5	13.5	13.6	13.2
9	Singapore	12.9	13.1	12.9	12.9	13.1	13.4	13.5	13.8	14.0	13.3
10	China	13.0	13.1	13.2	13.3	13.4	13.6	13.7	14.0	14.3	13.5
11	Macao, China	12.9	13.1	13.2	13.4	13.7	14.2	14.4	14.6	15.3	13.9
12	Australia	14.2	14.3	14.3	14.4	14.7	14.8	14.8	14.9	15.0	14.6
13	France	14.8	15.2	15.4	15.3	15.4	15.5	15.6	15.6	15.7	15.4
14	Ireland	15.7	15.9	15.9	15.9	15.8	16.0	16.2	16.3	16.4	16.0
15	Germany	15.6	16.0	16.1	16.0	15.8	15.9	16.0	16.4	16.7	16.0
16	Vietnam	15.4	15.6	15.7	15.9	16.0	16.1	16.5	16.6	16.8	16.1
17	Iceland	15.8	15.9	16.0	15.8	15.9	16.3	16.7	16.7	16.8	16.2
18	Canada	15.7	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.6	16.3
19	Hong Kong, China	16.2	16.6	16.6	16.6	16.8	17.3	17.7	18.2	18.6	17.2
20	Quatar	-	17.8	17.5	17.8	17.3	19.4	18.4	-	-	18.0
21	Denmark	17.7	18.0	18.0	18.0	18.0	18.2	18.4	18.9	19.0	18.3
22	Finland	17.8	18.1	18.3	18.4	18.5	18.6	18.8	19.1	19.2	18.5
23	Saudi Arabia	18.1	18.4	18.0	17.5	18.5	19.1	19.4	19.5	20.0	18.7
24	Bahrain	18.2	18.4	18.6	18.8	19.0	19.3	19.7	-	-	18.9
25	Mongolia	18.5	18.4	18.5	18.8	19.1	19.5	19.8	20.1	20.5	19.2
26	Oman	18.7	18.9	19.3	19.3	19.4	19.5	19.8	20.2	-	19.4
27	Norway	19.0	19.1	19.2	19.2	19.2	19.7	19.7	20.0	20.2	19.5
28	Iran, Islamic Rep.	18.7	18.9	18.8	19.1	19.6	19.9	19.7	20.1	20.5	19.5
29	Syrian Arab Republic	19.3	19.3	19.4	19.5	19.3	19.5	19.6	19.9	20.1	19.6
30	Sweden	18.9	19.2	19.3	19.4	19.6	19.9	19.8	20.2	20.4	19.6
31	Slovak Republic	18.9	18.9	19.0	19.2	19.5	19.7	20.2	20.6	21.1	19.7
32	Czech Republic	18.9	19.1	19.3	19.4	19.5	19.8	20.4	20.9	21.2	19.8
33	Indonesia	19.1	19.4	19.4	19.5	19.7	20.0	20.2	20.5	20.9	19.9
34	Chile	19.7	19.8	20.0	20.0	20.2	20.5	20.7	20.9	21.1	20.3
35	Jordan	19.4	19.4	19.6	19.9	20.1	20.6	20.9	21.4	21.7	20.3
36	Kuwait	20.1	20.1	19.9	19.9	20.9	21.5	22.2	22.5	-	20.9
37	Israel	21.2	21.9	21.6	21.1	21.2	21.7	22.0	22.6	23.0	21.8
38	Portugal	22.4	22.7	22.8	22.7	22.4	22.3	22.2	22.2	22.5	22.5
39	Belgium	21.7	22.2	22.3	22.4	22.4	22.6	22.6	22.9	23.1	22.5
40	Spain	22.4	22.7	22.9	23.0	23.0	22.9	23.0	23.0	23.1	22.9
41	Mauritius	22.9	23.1	23.3	23.2	23.5	23.8	23.8	24.0	24.3	23.5
42	India	23.0	23.1	23.4	23.6	24.0	24.2	24.5	25.0	25.6	24.0
43	Argentina	25.6	25.4	24.7	23.3	24.4	25.3	26.1	27.0	27.8	25.5
44	Hungary	24.8	25.1	25.4	25.7	25.8	26.1	26.2	26.5	26.4	25.8
45	Taiwan	25.1	25.4	25.1	25.4	25.6	26.0	26.2	26.6	26.9	25.8
46	Bahamas, The	26.1	26.2	26.0	26.0	25.5	25.1	25.8	26.2	26.2	25.9
47	Costa Rica	26.3	26.2	26.0	26.0	26.3	26.5	26.8	27.4	28.3	26.6
48	United Arab Emirates	26.5	26.4	25.8	25.3	26.5	27.5	28.0	29.4	-	26.9
49	Malta	26.8	27.1	26.9	27.0	26.7	26.7	26.9	27.2	27.7	27.0
50	Italy	26.5	27.1	27.5	27.4	27.2	27.2	27.1	27.3	27.4	27.2
51	Yemen, Rep.	27.1	27.4	27.5	27.6	27.7	27.8	28.2	28.0	28.0	27.7
52	Poland	27.5	27.6	27.6	27.5	27.7	27.9	28.3	28.7	29.1	28.0
53	Slovenia	26.9	27.1	27.5	27.6	27.8	28.0	28.4	28.9	29.5	28.0
54	Korea, Rep.	26.7	27.5	27.7	28.1	28.2	28.5	28.7	29.0	29.4	28.2
55	Cyprus	28.3	28.7	29.2	29.6	29.2	29.3	29.7	30.1	30.8	29.4
56	South Africa	28.4	28.4	28.4	28.8	29.0	29.7	30.4	30.9	31.7	29.5

57	Greece	28.9	28.7	29.2	29.4	30.0	30.4	30.6	31.0	31.0	29.9
58	Bhutan	29.2	29.4	29.6	29.7	30.1	30.1	30.5	30.6	31.1	30.0
59	Mexico	29.5	30.1	30.0	29.9	29.7	30.1	30.3	31.0	31.3	30.2
60	Maldives	30.3	30.3	30.6	31.2	31.4	31.8	31.0	31.3	32.1	31.1
61	Brunei Darussalam	30.8	31.1	31.2	32.0	32.3	31.0	30.4	31.4	31.0	31.3
62	Malaysia	30.1	31.1	30.6	30.7	31.0	31.4	31.7	32.2	32.6	31.3
63	Lao PDR	30.3	30.6	31.0	31.2	31.4	31.8	32.3	32.8	33.2	31.6
64	Lithuania	30.2	30.3	30.7	31.2	31.9	32.2	32.8	33.4	34.0	31.9
65	Lesotho	30.9	31.3	31.5	31.6	31.9	32.5	32.4	33.3	33.8	32.1
66	Dominican Republic	31.8	32.1	31.8	32.1	32.1	31.8	32.5	33.2	33.6	32.3
67	Namibia	31.4	31.4	31.6	31.5	32.2	33.1	33.3	34.1	34.4	32.5
68	Turkey	31.5	32.1	31.4	31.8	32.4	33.2	34.2	34.7	35.2	33.0
69	Solomon Islands	35.1	33.4	32.3	31.9	32.1	33.0	33.4	33.6	34.2	33.2
70	Venezuela, RB	33.4	33.6	33.7	31.7	30.2	32.3	33.7	35.3	36.3	33.3
71	Guyana	33.8	33.6	33.8	33.5	33.3	33.8	33.0	33.4	33.3	33.5
72	Cameroon	32.3	32.8	33.2	33.4	33.9	34.0	33.9	34.2	34.2	33.5
73	Botswana	33.0	33.4	33.6	33.5	33.8	34.0	34.1	34.5	34.8	33.8
74	Equatorial Guinea	33.0	32.8	33.7	34.1	34.4	34.9	35.1	35.0	35.5	34.3
75	Bosnia & Herzegovina	33.9	34.1	34.2	34.3	34.7	34.6	35.0	35.3	35.4	34.6
76	Croatia	33.0	33.4	33.6	34.2	34.7	35.2	35.5	36.0	36.5	34.7
77	Fiji	34.3	33.6	33.9	34.6	34.7	35.3	35.8	36.2	34.6	34.8
78	Lebanon	34.1	34.1	34.5	34.7	35.0	35.9	35.9	35.4	36.2	35.1
79	Egypt, Arab Rep.	34.7	35.1	35.0	34.5	34.8	35.2	35.4	36.1	37.0	35.3
80	Trinidad and Tobago	34.1	34.4	34.5	34.4	35.4	35.7	35.9	36.8	37.3	35.4
81	Papua New Guinea	36.7	36.1	35.4	35.1	35.1	35.2	34.9	35.1	35.7	35.5
82	Kenya	35.0	34.3	34.7	33.8	33.9	34.9	36.0	37.7	39.4	35.5
83	Algeria	34.0	34.1	34.4	34.9	35.8	36.6	37.3	37.3	37.1	35.7
84	Bangladesh	35.2	35.6	35.7	35.5	35.6	35.7	36.0	36.7	37.0	35.9
85	Macedonia, FYR	34.9	35.7	34.8	35.1	35.5	36.4	36.9	37.7	38.8	36.2
86	Albania	34.9	35.3	35.7	35.9	36.2	36.7	36.9	37.3	37.7	36.3
87	Romania	34.6	34.4	35.1	35.4	36.1	37.0	37.3	38.3	38.9	36.3
88	Ecuador	34.7	34.4	35.2	35.6	36.1	37.4	38.3	38.7	38.8	36.6
89	Libyan Arab Jamahiria	35.5	35.1	35.8	36.5	35.3	36.4	37.3	38.5	39.6	36.7
90	Cape Verde	35.7	36.1	36.3	36.3	36.5	36.4	36.8	38.0	38.7	36.8
91	Nepal	36.4	36.8	36.9	36.5	36.7	36.8	36.9	37.3	37.5	36.9
92	Pakistan	36.6	36.8	36.6	36.8	37.4	38.3	38.8	39.8	40.1	37.9
93	Morocco	36.3	36.4	37.1	37.3	37.8	38.7	37.9	39.8	39.8	37.9
94	Jamaica	36.4	36.4	36.6	36.6	38.6	39.1	38.9	40.2	40.5	38.1
95	Guinea-Bissau	38.8	39.6	39.6	38.5	37.7	37.3	37.5	37.7	37.6	38.3
96	Madagascar	39.1	39.6	40.4	34.7	36.0	37.7	38.5	39.5	40.6	38.5
97	Bulgaria	36.5	36.9	37.2	37.7	38.3	39.0	39.7	40.4	41.2	38.5
98	Malawi	40.7	40.3	38.3	36.5	37.5	38.3	38.2	39.4	41.1	38.9
99	Tunisia	38.1	38.4	38.9	39.0	39.4	39.9	40.0	40.9	41.4	39.5
100	Burundi	40.4	40.0	39.8	40.0	39.8	39.8	39.7	39.8	39.8	39.9
101	Guinea	39.5	39.6	39.9	40.4	40.4	40.6	40.8	40.3	40.0	40.2
102	Estonia	-	38.4	38.8	39.3	40.0	40.3	41.1	41.9	42.3	40.3
103	Eritrea	42.6	40.3	41.2	41.3	40.3	40.0	40.0	39.4	39.2	40.5
104	Brazil	38.8	39.8	39.7	39.7	40.0	40.9	41.1	41.8	43.0	40.5
105	Comoros	40.0	39.6	40.2	41.6	41.7	40.2	41.3	40.9	39.8	40.6
106	Paraguay	41.8	39.8	39.9	39.5	40.6	41.5	41.6	42.5	-	40.9
107	Colombia	38.8	39.1	39.3	39.4	40.4	41.2	42.3	43.4	45.1	41.0
108	Côte d'Ivoire	44.9	43.2	42.1	41.0	40.5	40.4	40.2	39.7	39.6	41.3
109	Latvia	39.6	39.9	40.4	40.9	41.4	42.0	42.7	43.7	44.3	41.6
110	Suriname	39.9	39.8	40.3	40.8	41.5	42.9	43.3	43.9	44.7	41.9
111	Kyrgyz Republic	41.0	41.2	41.6	41.0	41.9	42.6	42.4	42.6	43.6	42.0
112	Ethiopia	39.9	40.3	41.2	41.0	40.5	42.0	43.1	44.5	45.7	42.0
113	Burkina Faso	41.5	41.4	41.5	41.4	42.4	42.7	43.0	43.0	43.1	42.2
114	Liberia	42.3	43.2	43.2	43.3	41.6	41.2	41.6	42.0	42.3	42.3
115	Sierra Leone	40.3	40.2	41.2	43.3	43.8	44.2	44.3	45.0	45.6	43.1

116	Ghana	41.8	41.9	42.0	42.2	42.5	42.9	44.3	45.3	45.6	43.2
117	Angola	41.6	41.6	41.9	42.8	43.0	43.1	45.0	45.9	47.6	43.6
118	Uganda	42.7	43.1	43.3	43.3	43.7	43.8	44.0	45.1	45.8	43.9
119	Mali	42.1	42.3	43.8	44.4	44.7	44.0	44.5	44.7	44.7	43.9
120	Tajikistan	42.9	43.2	43.5	43.8	44.3	44.8	45.0	45.3	45.5	44.2
121	Belize	42.4	43.8	44.3	44.2	45.2	45.5	45.4	45.9	45.6	44.7
122	Philippines	42.7	43.3	43.6	44.1	44.7	45.0	46.6	47.2	48.4	45.1
123	Sri Lanka	44.0	44.6	44.6	45.1	45.3	45.2	45.7	46.2	47.0	45.3
124	Kazakhstan	42.6	43.2	43.9	44.5	45.4	45.9	46.7	47.7	48.2	45.3
125	Nicaragua	44.7	45.2	45.1	44.9	45.4	46.2	46.6	46.8	47.2	45.8
126	Gambia, The	44.1	45.1	45.5	43.1	44.8	46.4	46.6	47.8	49.3	45.9
127	Senegal	45.2	45.1	45.6	45.1	45.8	46.9	47.8	47.8	48.4	46.4
128	El Salvador	46.1	46.3	46.4	47.0	47.4	47.6	48.0	48.7	49.5	47.5
129	Gabon	49.9	48.0	48.7	48.4	48.5	48.0	48.3	48.0	48.8	48.5
130	Russian Federation	45.1	46.1	47.0	47.8	48.8	49.5	50.1	50.8	52.0	48.6
131	Armenia	46.0	46.3	47.2	48.1	48.8	49.1	50.0	50.7	51.7	48.7
132	Congo, Dem. Rep.	48.8	48.0	47.8	47.9	49.0	49.2	49.3	49.3	49.4	48.7
133	Chad	46.6	46.2	46.9	47.4	48.4	51.2	51.6	51.0	50.5	48.9
134	Central African Republic	51.5	51.7	51.2	50.1	46.9	46.5	46.9	48.1	48.9	49.1
135	Benin	48.5	49.4	49.8	50.0	50.2	50.1	49.8	50.0	50.4	49.8
136	Belarus	47.9	48.1	48.3	48.6	49.2	50.1	51.1	52.1	53.0	49.8
137	Congo, Rep.	46.8	48.2	49.2	49.7	49.7	50.3	51.9	53.3	52.0	50.1
138	Zambia	48.5	48.9	49.5	49.7	50.4	51.2	51.7	53.1	54.3	50.8
139	Honduras	48.9	49.6	49.4	49.6	50.3	50.9	52.0	53.1	54.2	50.9
140	Cambodia	49.8	50.1	50.6	50.2	51.0	51.4	52.4	53.4	54.2	51.5
141	Uruguay	51.7	51.1	50.5	48.2	48.6	51.1	53.0	53.7	56.0	51.5
142	Guatemala	51.4	51.5	51.4	51.8	52.3	52.5	52.7	53.9	55.0	52.5
143	Haiti	56.0	55.4	54.7	54.3	54.4	53.4	53.7	53.8	53.7	54.4
144	Thailand	51.8	52.6	52.8	53.8	55.1	55.8	56.4	56.9	57.2	54.7
145	Ukraine	51.7	52.2	53.0	53.7	55.0	55.9	57.0	57.5	58.1	54.9
146	Zimbabwe	59.2	59.4	57.4	56.1	55.2	56.6	56.8	56.6	56.1	57.0
147	Tanzania	58.0	58.3	58.9	59.7	60.1	60.6	61.3	61.9	63.0	60.2
148	Peru	59.7	59.9	59.6	60.8	61.2	61.9	62.7	64.2	66.3	61.8
149	Azerbaijan	60.2	60.6	60.9	61.2	62.2	62.7	64.7	67.6	69.6	63.3
150	Bolivia	67.2	67.1	66.6	66.5	66.5	67.3	69.9	71.3	70.7	68.1
151	Georgia	66.2	67.3	67.4	67.4	68.7	69.2	69.5	71.1	72.5	68.8
	Time Average	32.9	33.0	33.1	33.1	33.4	33.8	34.2	34.9	35.5	

Table 3.3.7 presents the calibrated estimation of the size of the shadow economy for 120 countries over the period 1999 to 2006. The countries are ordered by the size of the shadow economy. For these 120 countries, we have additional cause variables. As a consequence, the results are somewhat different. For the year 1999, when using the 151 sample, the overall average of the shadow economy was 32.9, and when using the sample with only 120 countries the same average is 31.2%, which is a rather modest difference.[27] The countries with the lowest shadow economy are now Switzerland, the United States, and Luxembourg; with an average value over the period 1999 to 2006 of 8.6, 8.8 and 9.8%. In the middle we found Namibia, Venezuela, and Turkey; with an average size of the shadow economy over 1999 to 2006 of 32.2, 32.6 and 33.0%. The three countries with the highest shadow economy are now Peru, Bolivia and Georgia; with an average value of the shadow economy over the period 1999 to 2006 of 61.5, 67.8 and 68.7%, respectively.

In general, comparing the calibrations of the two samples (sample with 151 observations and sample with 120 observations), we can see that the size and trend of the shadow economy are

[27] As we do have a lot of missing values in this specification for the year 2007, estimates for the year of 2007 are not shown here because it may be misleading as over a third of the countries do not have an estimate for the year 2007.

quite robust for most of the countries over the period 1999 to 2006. However, as usual, there are some minor differences.

Table 3.3.7. Ranking of 120 Countries According to the Size of the Shadow Economy

No.	Country	Years								Country Average
		1999	2000	2001	2002	2003	2004	2005	2006	
1	Switzerland	8.5	8.6	8.6	8.6	8.5	8.6	8.8	9.0	8.6
2	United States	8.6	8.7	8.7	8.7	8.8	8.9	9.0	9.1	8.8
3	Luxembourg	9.5	9.8	9.7	9.8	9.7	9.9	10.1	10.2	9.8
4	Austria	9.6	9.8	9.9	9.9	9.9	9.9	10.1	10.3	9.9
5	Japan	-	-	11.1	11.1	11.2	11.4	11.7	12.0	11.4
6	United Kingdom	12.7	12.7	12.7	12.8	12.9	13.1	13.1	13.1	12.9
7	Netherlands	12.9	13.1	13.1	13.0	12.9	13.1	13.3	13.2	13.1
8	New Zealand	12.7	12.8	13.0	13.3	13.4	13.5	13.4	13.3	13.2
9	Singapore	13.0	13.1	12.8	12.9	13.2	13.6	13.8	14.0	13.3
10	China	13.0	13.1	13.1	13.1	13.2	13.5	13.8	13.9	13.3
11	Australia	14.3	14.3	14.7	14.9	15.1	15.2	15.2	15.3	14.8
12	France	15.0	15.2	15.3	15.4	15.5	15.7	15.9	15.9	15.5
13	Vietnam	15.5	15.6	15.6	15.8	16.0	16.1	16.6	-	15.9
14	Ireland	15.8	15.9	15.8	15.8	15.8	15.9	16.4	16.5	16.0
15	Iceland	15.8	15.9	16.0	15.8	15.8	16.5	16.9	17.0	16.2
16	Germany	15.6	16.0	16.2	16.1	16.0	16.3	16.5	16.9	16.2
17	Canada	15.7	16.0	16.2	16.4	16.4	16.5	16.8	16.8	16.4
18	Hong Kong, China	16.0	16.6	16.7	16.7	17.0	17.3	17.8	-	16.9
19	Denmark	17.8	18.0	18.0	18.1	18.1	18.2	18.5	19.1	18.2
20	Saudi Arabia	18.2	18.4	17.9	17.6	18.8	19.2	19.5	-	18.5
21	Finland	17.8	18.1	18.4	18.5	18.7	18.8	19.1	19.4	18.6
22	Bahrain	18.4	18.4	18.5	18.6	19.0	19.4	19.7	-	18.9
23	Mongolia	18.6	18.4	18.5	18.9	19.1	19.6	20.1	-	19.0
24	Oman	18.6	18.9	19.2	19.1	19.1	19.2	19.5	-	19.1
25	Norway	19.1	19.1	19.0	19.0	19.0	19.3	19.6	19.7	19.2
26	Czech Republic	18.8	19.1	18.9	18.9	19.0	19.4	19.9	20.5	19.3
27	Indonesia	19.2	19.4	19.4	19.2	19.5	19.5	20.2	-	19.5
28	Slovak Republic	18.8	18.9	19.0	19.1	19.4	19.8	20.5	20.8	19.5
29	Iran, Islamic Rep.	19.0	18.9	18.9	19.4	19.7	20.0	20.1	20.3	19.5
30	Sweden	19.0	19.2	19.2	19.3	19.6	19.8	20.1	20.4	19.6
31	Syrian Arab Republic	19.5	19.3	19.6	19.7	19.6	19.8	20.0	-	19.7
32	Chile	19.8	19.8	19.9	19.8	20.0	20.2	20.5	20.5	20.1
33	Jordan	19.3	19.4	19.5	19.8	19.9	20.4	20.9	21.2	20.1
34	Kuwait	20.3	20.2	20.2	20.1	21.0	21.5	22.0	22.2	21.0
35	Israel	21.5	21.9	21.6	21.3	21.5	22.1	22.5	22.9	21.9
36	Belgium	21.9	22.2	22.2	22.1	22.3	22.6	23.0	23.4	22.5
37	Spain	22.3	22.7	22.8	22.6	22.6	22.4	22.6	22.6	22.6
38	Portugal	22.6	22.7	22.7	22.7	22.7	22.7	22.7	23.1	22.7
39	Mauritius	22.7	23.1	23.3	23.1	23.5	23.6	23.5	23.5	23.3
40	India	22.9	23.1	23.3	23.6	24.0	24.4	24.9	25.3	23.9
41	Argentina	25.7	25.4	24.5	23.3	24.2	25.1	26.0	-	24.9
42	Hungary	24.8	25.1	25.2	25.4	25.7	26.1	26.4	26.6	25.7
43	United Arab Emirates	26.7	26.4	25.7	25.2	26.4	27.6	27.7	-	26.5
44	Costa Rica	26.2	26.2	26.1	26.1	26.4	26.6	27.1	27.6	26.5
45	Malta	26.7	27.1	26.8	27.0	26.6	26.7	27.0	27.1	26.9
46	Italy	26.5	27.1	27.2	27.3	27.3	27.2	27.3	27.4	27.2
47	Yemen, Rep.	27.0	27.4	27.2	27.2	27.4	27.4	28.0	-	27.4
48	Slovenia	26.8	27.1	27.2	27.4	27.8	28.0	28.4	28.7	27.7
49	Korea, Rep.	27.0	27.5	27.6	28.1	28.0	28.2	28.6	28.8	28.0
50	Poland	27.3	27.6	27.7	27.7	27.9	28.2	28.8	28.9	28.0
51	South Africa	28.4	28.4	28.4	28.7	29.1	29.7	30.4	30.8	29.2
52	Greece	29.4	28.7	29.4	29.6	30.4	30.8	31.5	32.1	30.2

53	Mexico	29.4	30.1	30.3	30.2	30.4	30.7	31.2	-	30.3
54	Malaysia	30.3	31.1	30.5	30.8	30.9	31.3	31.6	-	30.9
55	Lithuania	30.1	30.3	30.8	31.0	31.7	31.9	32.7	33.2	31.5
56	Lao PDR	30.4	30.6	31.1	31.4	31.8	32.2	32.9	-	31.5
57	Lesotho	30.9	31.3	31.6	31.7	31.7	32.4	32.7	34.0	32.0
58	Dominican Republic	31.8	32.1	31.4	31.6	32.0	32.0	33.0	32.9	32.1
59	Namibia	31.0	31.4	31.4	31.8	32.2	33.8	33.9	-	32.2
60	Venezuela, RB	33.8	33.6	33.6	32.0	30.1	31.9	33.5	-	32.6
61	Turkey	31.5	32.1	31.3	32.2	33.0	33.8	34.7	35.5	33.0
62	Cameroon	32.0	32.8	32.8	33.1	33.3	33.7	34.1	-	33.1
63	Botswana	33.2	33.4	33.3	33.3	33.8	34.3	34.4	-	33.7
64	Albania	-	-	-	33.2	33.6	33.9	34.3	35.1	34.0
65	Croatia	32.9	33.4	33.8	34.6	34.7	35.0	35.8	36.2	34.6
66	Lebanon	34.5	34.1	34.0	34.4	34.7	35.3	35.5	35.2	34.7
67	Trinidad and Tobago	-		34.1	33.6	34.5	34.7	35.2	36.2	34.7
68	Kenya	34.5	34.3	34.8	34.0	33.7	34.8	36.1	37.6	35.0
69	Fiji	34.5	33.6	34.2	35.2	35.2	35.9	36.3	-	35.0
70	Bangladesh	35.0	35.6	35.8	35.1	35.0	35.0	35.7	-	35.3
71	Egypt, Arab Rep.	35.1	35.1	35.0	34.4	35.0	35.3	36.0	36.9	35.3
72	Ecuador	34.2	34.4	34.5	35.1	35.6	36.6	37.9	-	35.5
73	Algeria	34.0	34.1	34.3	34.7	35.9	36.4	37.4	37.3	35.5
74	Romania	34.8	34.4	35.2	35.9	36.1	37.5	38.4	39.2	36.4
75	Papua New Guinea	37.1	36.1	-	-	-	-	-	-	36.6
76	Nepal	36.5	36.8	36.9	36.7	37.1	37.0	37.5	37.7	37.0
77	Morocco	36.1	36.4	37.0	37.2	37.7	38.3	37.4	-	37.2
78	Pakistan	36.4	36.8	36.4	36.5	37.2	38.0	38.1	38.9	37.3
79	Cape Verde	-	-	-	-	-	-	36.8	37.9	37.4
80	Jamaica	36.5	36.4	36.7	36.6	38.0	38.4	38.9	39.5	37.6
81	Madagascar	38.9	39.6	40.0	34.8	36.3	38.2	39.2	-	38.2
82	Bulgaria	36.6	36.9	37.4	37.9	38.2	38.7	39.9	40.4	38.3
83	Malawi	39.9	40.3	38.7	37.2	37.8	38.6	38.7	-	38.7
84	Tunisia	38.3	38.4	38.8	38.5	39.1	39.6	40.3	40.8	39.2
85	Brazil	38.8	39.8	39.8	39.7	39.5	40.3	40.8	-	39.8
86	Guinea	38.9	39.3	39.6	39.8	40.1	40.5	41.0	-	39.9
87	Estonia	-	38.4	38.8	39.2	39.8	40.1	41.7	42.4	40.0
88	Colombia	38.7	39.1	39.2	39.1	39.8	40.8	41.8	43.2	40.2
89	Ethiopia	40.4	40.3	41.1	40.5	40.0	41.8	43.1	-	41.0
90	Paraguay	41.2	39.8	40.6	39.8	41.0	41.6	41.9	43.3	41.1
91	Latvia	39.4	39.9	40.3	40.7	41.5	41.7	42.8	43.5	41.2
92	Burkina Faso	41.5	41.4	41.1	41.0	41.8	41.7	42.1	-	41.5
93	Côte d'Ivoire	44.6	43.2	42.2	41.0	40.8	41.0	40.9	40.1	41.7
94	Kyrgyz Republic	41.0	41.2	41.6	41.9	42.3	42.7	43.1	43.5	42.2
95	Ghana	41.5	41.9	42.2	42.3	42.8	43.0	45.0	-	42.7
96	Sierra Leone	41.3	42.0	42.7	43.4	43.8	44.1	-	-	42.9
97	Uganda	42.0	43.1	43.5	43.1	43.7	43.4	43.7	44.8	43.4
98	Mali	42.2	42.3	43.8	44.2	44.2	43.9	43.8	44.0	43.6
99	Tajikistan	42.6	43.2	43.5	44.1	44.7	45.1	-	-	43.9
100	Kazakhstan	43.1	43.2	43.7	44.0	44.7	45.5	46.2	47.2	44.7
101	Philippines	42.5	43.3	43.6	44.3	45.0	45.4	46.7	47.3	44.8
102	Sri Lanka	44.0	44.6	44.4	45.1	45.6	45.6	46.1	45.5	45.1
103	Senegal	45.2	45.1	46.1	-	-	-	-	-	45.5
104	Nicaragua	44.6	45.2	45.4	45.2	45.5	45.9	46.6	46.7	45.7
105	El Salvador	45.9	46.3	46.5	46.7	47.4	47.5	48.2	48.8	47.2
106	Zambia	46.6	47.1	47.6	47.5	47.9	47.8	48.9	49.8	47.9
107	Chad	46.0	46.2	47.0	47.1	48.0	51.4	50.6	-	48.0
108	Central African Republic	-	-	50.5	49.8	47.3	47.2	46.9	-	48.3
109	Russian Federation	45.4	46.1	47.5	48.6	49.7	50.4	51.4	51.7	48.9
110	Benin	48.0	48.9	48.9	48.8	49.1	49.1	49.8	-	49.0
111	Congo, Rep.	46.6	48.2	48.9	49.6	49.9	50.5	51.8	-	49.4

112	Honduras	48.6	49.6	49.2	49.3	50.0	50.7	51.4	-	49.9
113	Uruguay	51.8	51.1	50.9	48.8	48.9	51.7	53.9	54.5	51.4
114	Guatemala	51.7	51.5	50.6	51.2	51.7	52.1	53.0	53.9	52.0
115	Ukraine	51.8	52.2	52.8	53.3	53.9	55.0	56.6	57.5	54.1
116	Thailand	52.0	52.6	52.7	53.7	55.2	55.5	56.0	56.4	54.3
117	Tanzania	57.6	58.3	58.9	59.8	60.0	60.9	61.5	-	59.6
118	Peru	59.8	59.9	59.6	61.5	61.7	62.6	62.8	63.7	61.5
119	Bolivia	67.0	67.1	66.8	66.3	66.1	67.0	70.4	71.5	67.8
120	Georgia	66.6	67.3	67.7	68.0	69.0	69.2	70.2	71.2	68.7
	Time Average	31.2	31.4	31.5	31.4	31.7	32.2	32.6	32.0	

Having estimated and calculated the size and trend of the shadow economy according to 7 different MIMIC model specifications, we finally compared how much the different estimates vary for each country given the different models. For this purpose, we calculated the range of the estimates for each country, i.e. the difference between the maximum and the minimum estimate. It turned out that the variation in the estimates is on average relatively low. However, in the Russian Federation (between specifications 3 and 6), Zambia (between specifications 2 and 6) and the Ukraine (specifications 3 and 6) the maximum differences in the range are 5.6%, 4.2%, and 4.0%, respectively. These rather large differences might be a consequence of the parsimony of specification 6. Except for these exemptions, all models estimated predict almost the same size of the shadow economy for each country. Calculating pairwise correlations, we find that the correlation coefficients are extremely high. For example, between specifications 1 and 6 they are for all years above 0.96; meaning that for each country the predicted sizes of the shadow economy are almost indistinguishable form each other, regardless of the specification used for prediction. Between specifications 3 and 6 the correlation coefficients are even higher and all above 0.98. This allows us to add 11 countries to our maximum sample estimation of 151 countries which are not included in specification 6 but for which we have calculated the size of the shadow economy using specification 1 and 3.[28] These countries are: Mauritania, Mozambique, Myanmar, Niger, Nigeria, Panama, Rwanda, Sudan, Swaziland, Togo (taken from table 3.3.1), and Moldova (taken from table 3.3.3). Appendix 4 finally presents alphabetically ordered shadow economy estimates for 162 countries around the world.

4 Summary and Conclusions

There are many obstacles to overcome when measuring the size of the shadow economy and when analyzing its consequences on the official economy. But, as this paper shows, some progress can be made. We provide estimates of the size of the shadow economies for 162 countries over the period 1994 to 2006 (or 2007) using the MIMIC procedure for the econometric estimation; and a benchmarking procedure for calibrating the estimated MIMIC into absolute values of the size of the shadow economy. Coming back to the headline of this paper, some new knowledge/insights are gained with respect to the size and trend of the shadow economy of 162 countries,[29] leading to two conclusions:

The first conclusion from these results is that for all countries investigated the shadow economy has reached a remarkably large size of an average value of 34.5% of official GDP

[28] The reason for this is that these specifications are based on a previous paper in which we used a slightly different set of countries (Schneider and Buehn, 2009).

[29] In the appendix some critical discussion of these two methods is given; they have well known weaknesses (compare also Pedersen (2003) and Feld and Schneider (2009)).

over 162 countries over 1999 to 2007. However, the average size of the shadow economies of all of these 162 countries (developing, Eastern European and Central Asian and high income OECD countries) increased only modestly from 33.7% of official GDP in 1999 to 35.5% of official GDP in 2007.

The second conclusion is that shadow economies are a complex phenomenon present to an important extent in all type of economies (developing, transition and highly developed). People engage in shadow economic activities for a variety of reasons. Among the most important are government actions, most notably, taxation and regulation.

Considering these two conclusions, it is obvious that one of the big challenges for every government is to undertake efficient incentive orientated policy measures in order to make work less attractive in the shadow economy and, hence, to make the work in the official economy more attractive. Successful implementation of such policies may lead to a stabilization, or even reduction, of the size of the shadow economy.

5 Appendix 1. The Currency Demand Approach

The currency demand approach, which is also called an ”indicator” approach, is a macroeconomic one and uses various economic and other indicators that contain information about the development of the shadow economy (over time), and leaves some ”traces” of the shadow economy. This approach was first used by Cagan (1958), who calculated a correlation of the currency demand and the tax pressure (as one cause of the shadow economy) for the United States over the period 1919 to 1955. 20 years later, Gutmann (1977) used the same approach, but without any statistical procedures. 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 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 econometrically estimated over time. All conventional possible factors, such as the development of income, payment habits, interest rates, and so on, are controlled for. Additionally, variables such as the direct and indirect tax burden, government regulation and the complexity of the tax system (which are assumed to be the major factors causing people to work in the shadow economy), are included in the estimation equation. The basic regression equation for the currency demand, proposed by Tanzi (1983), is the following:

$$\ln (C / M_2)_t = \beta_O + \beta_1 \ln (1 + TW)_t + \beta_2 \ln (WS / Y)_t + \beta_3 \ln R_t + \beta_4 \ln (Y / N)_t + u_t$$

with $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 < 0$, $\beta_4 > 0$

where:

ln denotes natural logarithms, C / M_2 is the ratio of cash holdings to current and deposit accounts, TW is a weighted average tax rate (to proxy changes in the size of the shadow economy), WS/Y is a proportion of wages and salaries in national income (to capture changing payment and money holding patterns), R is the interest paid on savings deposits (to capture the opportunity cost of holding cash); and Y/N is the per capita income.[30]

Any ”excess” increase in currency, or the amount unexplained by the conventional or normal factors (mentioned above) is, then, attributed to the rising tax burden and the other reasons leading people to work in the shadow economy. Figures for the size and trend of the shadow economy can be calculated, in a first step, by comparing the difference between the development of currency when the direct and indirect tax burden (and government regulations) are held at their lowest value, and the development of currency with the current (much higher) burden of taxation and government regulations. Assuming in a second step the same velocity for currency used in the shadow economy as for legal M1 in the official economy, the size of the shadow can be computed and compared to the official GDP.

[30] 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.

The currency demand approach is one of the most commonly used approaches. It has been applied to many OECD countries,[31] but has, nevertheless, been criticized on various grounds.[32] The most commonly raised objections to this method are:

(i) Not all transactions in the shadow economy are paid in cash. Isachsen and Strom (1985) used the survey method to find out that in Norway, in 1980, roughly 80% of all transactions in the hidden sector were paid in cash. The size of the total shadow economy (including barter) may thus be even larger than previously estimated.

(ii) Most studies consider only one particular factor, the tax burden, as a cause of the shadow economy. But others (such as the impact of regulation, taxpayers' attitudes toward the state, "tax morality" and so on) are not considered, because reliable data for most countries are not available. If, as seems likely, these other factors also have an impact on the extent of the hidden economy, it might again be higher than reported in most studies.[33]

(iii) As discussed by Garcia (1978), Park (1979), and Feige (1996), increases in currency demand deposits are due largely to a slowdown in demand deposits rather than to an increase in currency caused by activities in the shadow economy, at least in the case of the United States.

(iv) Blades (1982) and Feige (1986, 1996), criticize Tanzi's studies on the grounds that the US dollar is used as an international currency. Instead, Tanzi should have considered (and controlled) the presence of US dollars, which are used as an international currency and are held in cash abroad.[34] Moreover, Frey and Pommerehne (1984) and Thomas (1986, 1992, 1999) claim that Tanzi's parameter estimates are not very stable.[35]

(v) Most studies assume the same velocity of money in both types of economies. As argued by Hill and Kabir (1996) for Canada and by Klovland (1984) for the Scandinavian countries, there is already considerable uncertainty about the velocity of money in the official economy, and the velocity of money in the hidden sector is even more difficult to estimate. Without knowledge about the velocity of currency in the shadow economy, one has to accept the assumption of "equal" money velocity in both sectors.

---

[31] See Karmann (1986 and 1990), Schneider (1997, 1998a, 2005), Johnson, Kaufmann, and Zoido-Lobatón (1998a), and Williams and Windebank (1995).

[32] See Thomas (1992, 1999); Feige (1986); Pozo (1996); Pedersen (2003) and Ahumada et al. (2004); Janisch and Brümmerhof (2005); and Breusch (2005a,b).

[33] One (weak) justification for the use of only the tax variable is that this variable has by far the strongest impact on the size of the shadow economy in the studies known to the authors. The only exception is the study by Frey and Weck-Hannemann (1984) where the variable "tax immorality" has a quantitatively larger and statistically stronger influence than the direct tax share in the model approach. In the study of Pommerehne and Schneider (1985), for the U.S., besides various tax measures, data for regulation, tax immorality, minimum wage rates are available, the tax variable has a dominating influence and contributes roughly 60-70% of the size of the shadow economy. See also Zilberfarb (1986).

[34] In another study by Tanzi (1982, esp. pp. 110-113) he explicitly deals with this criticism. A very careful investigation of the amount of US dollars used abroad and in the shadow economy and to "classical" crime activities has been undertaken by Rogoff (1998), who concludes that large denomination bills are the major driving force for the growth of the shadow economy and classical crime activities are due largely to reduced transactions costs.

[35] However in studies for European countries Kirchgaessner (1983, 1984) and Schneider (1986) reach the conclusion that the estimation results for Germany, Denmark, Norway and Sweden are quite robust when using the currency demand method. Hill and Kabir (1996) find for Canada that the rise of the shadow economy varies with respect to the tax variable used; they conclude "when the theoretically best tax rates are selected and a range of plausible velocity values is used, this method estimates underground economic growth between 1964 and 1995 at between 3 and 11 percent of GDP." (Hill and Kabir [1996, p. 1553]).

(vi) Ahumada, Alvaredo, Canavese A., and P. Canavese (2004) show that the currency approach, together with the assumption of equal income velocity of money in both the reported and the hidden transaction is only correct if the income elasticity is 1. As this is not the case for most countries, the calculation has to be corrected.

(vii) Finally, the assumption of no shadow economy in a base year is open to criticism. Relaxing this assumption would again imply an upward adjustment of the size of the shadow economy.

5 Appendix 2. Variable Definitions and Data Sources

BUSINESS FREEDOM: Subcomponent of the Economic Freedom Index. It measures the time and efforts of business activity. It ranges from 0 to 100, where 0 = least business freedom, and 100 = maximum business freedom.
Source: Heritage Foundation.

ECONOMIC FREEDOM: Economic Freedom Index. It ranges from 0 to 100, where 0 = least economic freedom, and 100 = maximum economic freedom.
Source: Heritage Foundation.

FISCAL FREEDOM: Subcomponent of the Economic Freedom Index. It measures the fiscal burden in an economy, i.e., top tax rates on individual and corporate income. It ranges from 0 to 100, where 0 = least fiscal freedom, and 100 = maximum degree of fiscal freedom.
Source: Heritage Foundation.

CURRENCY: M0 over M1. It corresponds to the currency outside the banks (M0) as a proportion of M1.
Source: International Monetary Fund.
In specification 4 and 5 we use currency over M2 because of higher data availability.
Source: ECB.

LABOR FORCE PARTICIPATION RATE: It corresponds to the labor force participation rate, total (% of total population). Labor force participation rate is the proportion of the population that is economically active: all people who supply labor for the production of goods and services during a specified period.
Source: International Labor Organization, Estimates and Projections of the Economically Active Population database. The data for Taiwan was obtained from the Taiwan's Statistical Office website.

GDP PER CAPITA (PPP): It corresponds to the GDP per capita based on purchasing power parity (PPP), (constant 2005 international $). GDP PPP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2005 international dollars.
Source: World Bank, International Comparison Program database.

UNEMPLOYMENT RATE: Unemployment, total (% of total labor force). Unemployment refers to the share of the labor force that is without work but available for and seeking employment. Definitions of labor force and unemployment differ by country.
Source: International Labor Organization, Key Indicators of the Labor Market database. Given that this data set contains many missing values, the source was complemented with data from the PRS Group and also with data from some national statistical offices' websites, and also from the World Bank's Development Data Platform.

UNEMPLOYMENT RATE ESTIMATED: In spite of all the efforts to fill in the gaps many missing values still remained. To fill them up, a structural model of the determinants of the

unemployment rate was estimated. In this model the dependent variable is the unemployment rate and the predictors are:
- The employment rate of the female population that are 15 years or older
- The employment rate of the male population that are 15 years of older
- The female labor force participation rate
- The male labor force participation rate
- The proportion of the population 15-64 that is female
- The proportion of the population 15-64 that is male
- The GDP growth rate of the previous period
- And the regression also included country fixed effects

The predictors were selected so that they would be relevant to explain the unemployment rate, but also that they would be available for most of the countries in the sample. The model had an excellent predictive power. Using this model we came up with unemployment estimates for some of the missing unemployment rates.

SIZE OF GOVERNMENT: General government final consumption expenditure (% of GDP). General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditure on national defense and security, but excludes government military expenditures that are part of government capital formation.
Source: United Nations Statistical Database. Available on line at http://unstats.un.org/unsd/snaama/dnllist.asp. The data for Taiwan comes from the World Bank's Development Data Platform.

SHARE OF DIRECT TAXES: Direct taxes as a proportion of total overall taxation.
Source: World Bank and Penn World Table (PWT 6.2).

REGULATORY QUALITY: Regulatory Quality. It includes measures of the incidence of market-unfriendly policies such as price controls or inadequate bank supervision, as well as perceptions of the burdens imposed by excessive regulation in areas such as foreign trade and business development. The scores of this index lie between -2.5 and 2.5, with higher scores corresponding to better outcomes.
Source: Worldwide Governance Indicators: 1996-2009, World Bank. Available on line at: web.worldbank.org.

GOVERNMENT EFFECTIVENESS: Government effectiveness. It capturres perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The scores of this index lie between -2.5 and 2.5, with higher scores corresponding to better outcomes.
Source: Worldwide Governance Indicators: 1996-2009, World Bank. Available on line at: web.worldbank.org.

INFLATION RATE: Inflation, GDP deflator (annual %). Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency. Source: United Nations Statistical Database. Available on line at http://unstats.un.org/unsd/snaama/dnllist.asp.

OPENNESS: It corresponds to trade (% of GDP). Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.

Source: United Nations Statistical Database. Available on line at http://unstats.un.org/unsd/snaama/dnllist.asp.

TOTAL POPULATION AGES 15 TO 64: It corresponds to total population ages 15-64.
Source: World Bank staff estimates from various sources including census reports, the United Nations Population Division's World Population Prospects, national statistical offices, household surveys conducted by national agencies, and Macro International. For Taiwan the data comes from the National Statistical Office.

POPULATION TOTAL: Population, total. Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin. The values shown are midyear estimates.
Source: World Bank staff estimates from various sources including census reports, the United Nations Population Division's World Population Prospects, national statistical offices, household surveys conducted by national agencies, and Macro International.

TOTAL LABOR FORCE: Labor force, total. Total labor force comprises people ages 15 and older who meet the International Labor Organization definition of the economically active population: all people who supply labor for the production of goods and services during a specified period. It includes both the employed and the unemployed. While national practices vary in the treatment of such groups as the armed forces and seasonal or part-time workers, in general the labor force includes the armed forces, the unemployed and first-time job-seekers, but excludes homemakers and other unpaid caregivers and workers in the informal sector. Source: International Labor Organization, using World Bank population estimates.

5 Appendix 3. Descriptive Statistics

Variable	Mean	Standard Deviation	Min	Max
Specification 1				
SIZE OF GOVERNMENT	14.47	6.41	2.95	59.65
FISCAL FREEDOM	81.28	9.81	32.56	100.00
BUSINESS FREEDOM	43.11	17.73	10.00	94.58
UNEMPLOYMENT RATE	12.43	9.51	0.00	64.07
GDP PER CAPITA	6383.75	8243.83	319.38	51586.21
GROWTH RATE OF GDP PER CAPITA	2.19	3.94	-30.03	19.02
LABOR FORCE PARTICIPATION RATE	67.46	10.37	43.90	92.40
CURRENCY (M0 OVER M1)	44.00	16.91	1.20	92.99
Specification 2				
SIZE OF GOVERNMENT	14.22	5.57	3.59	44.61
SHARE OF DIRECT TAXATION	26.79	13.76	2.44	82.40
FISCAL FREEDOM	82.55	9.03	52.91	100.00
BUSINESS FREEDOM	44.67	17.75	10.00	94.58
UNEMPLOYMENT RATE	11.51	8.04	0.00	39.70
GDP PER CAPITA	6806.64	8374.87	319.38	48810.29
GROWTH RATE OF GDP PER CAPITA	2.31	3.64	-17.61	16.24
LABOR FORCE PARTICIPATION RATE	66.87	10.26	44.00	92.20
CURRENCY (M0 OVER M1)	43.74	17.65	1.20	92.99
Specification 3				
SIZE OF GOVERNMENT	17.82	4.26	8.54	26.80
FISCAL FREEDOM	80.61	9.47	41.00	96.04
ECONOMIC FREEDOM	57.83	8.96	33.71	79.51
UNEMPLOYMENT RATE	11.80	6.45	1.00	40.00
OPENNESS	95.97	34.58	29.45	199.68
INFLATION	29.22	99.08	-0.92	953.46
GROWTH RATE OF GDP PER CAPITA	4.67	4.83	-22.55	13.69
GROWTH RATE OF LABOR FORCE	0.00	0.02	-0.14	0.07
CURRENCY (M0 OVER M1)	48.26	18.06	16.27	90.82
Specification 4				
TOTAL TAX BURDEN	35.96	7.76	16.57	51.79
FISCAL FREEDOM	70.76	9.03	51.12	88.10
BUSINESS FREEDOM	64.92	16.60	30.00	97.96
UNEMPLOYMENT RATE	6.28	2.98	2.04	21.96
GDP PER CAPITA	28412.90	9397.76	7273.22	75597.47
REGULATORY QUALITY	1.34	0.41	0.32	2.01
LABOR FORCE PARTICIPATION RATE	72.28	6.31	58.30	87.50
CURRENCY (M0 OVER M2)	5.37	3.11	0.28	14.98

Variable	Mean	Standard Deviation	Min	Max
Specification 5				
TOTAL TAX BURDEN	37.18	7.15	17.34	51.79
UNEMPLOYMENT RATE	6.51	3.20	1.80	21.96
REGULATORY QUALTIY	1.39	0.37	0.33	2.01
GDP PER CAPITA	30988.48	8732.90	11485.83	72783.16
LABOR FORCE PARTICIPATION RATE	72.30	6.36	58.30	87.50
CURRENCY (M0 OVER M2)	5.19	2.84	0.34	14.87
Specification 6				
SIZE OF GOVERNMENT	15.20	7.09	2.86	75.40
GDP PER CAPITA	9386.87	11276.40	101.00	66597.70
UNEMPLOYMENT RATE	9.02	6.35	0.00	39.15
GOVERNMENT EFFECTIVENESS	-0.09	0.90	-2.51	2.64
GROWTH RATE OF GDP PER CAPITA	2.83	4.29	-33.07	25.11
LABOR FORCE PARTICIPATION RATE	68.48	9.48	44.00	92.40
CURRENCY (M0 OVER M1)	42.01	19.62	0.00	97.93
Specification 7				
SIZE OF GOVERNMENT	14.66	5.94	3.19	38.09
SHARE OF DIRECT TAXATION	29.71	17.20	2.44	92.00
FISCAL FREEDOM	81.48	9.45	50.29	100.00
BUSINESS FREEDOM	48.01	18.75	10.00	100.00
UNEMPLOYMENT RATE	8.81	5.72	0.00	39.15
GDP PER CAPITA	10361.04	10986.63	340.18	48810.29
GOVERNMENT EFFECTIVENESS	0.12	0.90	-1.59	2.64
GROWTH RATE OF GDP PER CAPITA	2.81	3.65	-17.15	16.24
GROWTH RATE OF LABOR FORCE	0.02	0.02	-0.14	0.11
CURRENCY (M0 OVER M1)	40.84	18.93	0.02	90.82

5 Appendix 4. Ranking of 162 Countries in Alphabetical Order

No.	Country	Years									Country Average
		1999	2000	2001	2002	2003	2004	2005	2006	2007	
1	Albania	34.9	35.3	35.7	35.9	36.2	36.7	36.9	37.3	37.7	36.3
2	Algeria	34	34.1	34.4	34.9	35.8	36.6	37.3	37.3	37.1	35.7
3	Angola	41.6	41.6	41.9	42.8	43	43.1	45	45.9	47.6	43.6
4	Argentina	25.6	25.4	24.7	23.3	24.4	25.3	26.1	27	27.8	25.5
5	Armenia	46	46.3	47.2	48.1	48.8	49.1	50	50.7	51.7	48.7
6	Australia	14.2	14.3	14.3	14.4	14.7	14.8	14.8	14.9	15	14.6
7	Austria	9.6	9.8	9.9	9.8	9.8	9.8	9.8	10	10.1	9.8
8	Azerbaijan	60.2	60.6	60.9	61.2	62.2	62.7	64.7	67.6	69.6	63.3
9	Bahamas, The	26.1	26.2	26	26	25.5	25.1	25.8	26.2	26.2	25.9
10	Bahrain	18.2	18.4	18.6	18.8	19	19.3	19.7	-	-	18.9
11	Bangladesh	35.2	35.6	35.7	35.5	35.6	35.7	36	36.7	37	35.9
12	Belarus	47.9	48.1	48.3	48.6	49.2	50.1	51.1	52.1	53	49.8
13	Belgium	21.7	22.2	22.3	22.4	22.4	22.6	22.6	22.9	23.1	22.5
14	Belize	42.4	43.8	44.3	44.2	45.2	45.5	45.4	45.9	45.6	44.7
15	Benin	48.5	49.4	49.8	50	50.2	50.1	49.8	50	50.4	49.8
16	Bhutan	29.2	29.4	29.6	29.7	30.1	30.1	30.5	30.6	31.1	30.0
17	Bolivia	67.2	67.1	66.6	66.5	66.5	67.3	69.9	71.3	70.7	68.1
18	Bosnia & Herzegovina	33.9	34.1	34.2	34.3	34.7	34.6	35	35.3	35.4	34.6
19	Botswana	33	33.4	33.6	33.5	33.8	34	34.1	34.5	34.8	33.9
20	Brazil	38.8	39.8	39.7	39.7	40	40.9	41.1	41.8	43	40.5
21	Brunei Darussalam	30.8	31.1	31.2	32	32.3	31	30.4	31.4	31	31.2
22	Bulgaria	36.5	36.9	37.2	37.7	38.3	39	39.7	40.4	41.2	38.5
23	Burkina Faso	41.5	41.4	41.5	41.4	42.4	42.7	43	43	43.1	42.2
24	Burundi	40.4	40	39.8	40	39.8	39.8	39.7	39.8	39.8	39.9
25	Cambodia	49.8	50.1	50.6	50.2	51	51.4	52.4	53.4	54.2	51.5
26	Cameroon	32.3	32.8	33.2	33.4	33.9	34	33.9	34.2	34.2	33.5
27	Canada	15.7	16	16.1	16.2	16.3	16.4	16.5	16.6	16.6	16.3
28	Cape Verde	35.7	36.1	36.3	36.3	36.5	36.4	36.8	38	38.7	36.8
29	Central African Republic	51.5	51.7	51.2	50.1	46.9	46.5	46.9	48.1	48.9	49.1
30	Chad	46.6	46.2	46.9	47.4	48.4	51.2	51.6	51	50.5	48.9
31	Chile	19.7	19.8	20	20	20.2	20.5	20.7	20.9	21.1	20.3
32	China	13	13.1	13.2	13.3	13.4	13.6	13.7	14	14.3	13.5
33	Colombia	38.8	39.1	39.3	39.4	40.4	41.2	42.3	43.4	45.1	41.0
34	Comoros	40	39.6	40.2	41.6	41.7	40.2	41.3	40.9	39.8	40.6
35	Congo, Dem. Rep.	48.8	48	47.8	47.9	49	49.2	49.3	49.3	49.4	48.7
36	Congo, Rep.	46.8	48.2	49.2	49.7	49.7	50.3	51.9	53.3	52	50.1
37	Costa Rica	26.3	26.2	26	26	26.3	26.5	26.8	27.4	28.3	26.6
38	Côte d'Ivoire	44.9	43.2	42.1	41	40.5	40.4	40.2	39.7	39.6	41.3
39	Croatia	33	33.4	33.6	34.2	34.7	35.2	35.5	36	36.5	34.7
40	Cyprus	28.3	28.7	29.2	29.6	29.2	29.3	29.7	30.1	30.8	29.4
41	Czech Republic	18.9	19.1	19.3	19.4	19.5	19.8	20.4	20.9	21.2	19.8
42	Denmark	17.7	18	18	18	18	18.2	18.4	18.9	19	18.2
43	Dominican Republic	31.8	32.1	31.8	32.1	32.1	31.8	32.5	33.2	33.6	32.3
44	Ecuador	34.7	34.4	35.2	35.6	36.1	37.4	38.3	38.7	38.8	36.6
45	Egypt, Arab Rep.	34.7	35.1	35	34.5	34.8	35.2	35.4	36.1	37	35.3
46	El Salvador	46.1	46.3	46.4	47	47.4	47.6	48	48.7	49.5	47.4
47	Equatorial Guinea	33	32.8	33.7	34.1	34.4	34.9	35.1	35	35.5	34.3
48	Eritrea	42.6	40.3	41.2	41.3	40.3	40	40	39.4	39.2	40.5
49	Estonia	-	38.4	38.8	39.3	40	40.3	41.1	41.9	42.3	40.3
50	Ethiopia	39.9	40.3	41.2	41	40.5	42	43.1	44.5	45.7	42.0
51	Fiji	34.3	33.6	33.9	34.6	34.7	35.3	35.8	36.2	34.6	34.8
52	Finland	17.8	18.1	18.3	18.4	18.5	18.6	18.8	19.1	19.2	18.5
53	France	14.8	15.2	15.4	15.3	15.4	15.5	15.6	15.6	15.7	15.4

54	Gabon	49.9	48	48.7	48.4	48.5	48	48.3	48	48.8	48.5
55	Gambia, The	44.1	45.1	45.5	43.1	44.8	46.4	46.6	47.8	49.3	45.9
56	Georgia	66.2	67.3	67.4	67.4	68.7	69.2	69.5	71.1	72.5	68.8
57	Germany	15.6	16	16.1	16	15.8	15.9	16	16.4	16.7	16.1
58	Ghana	41.8	41.9	42	42.2	42.5	42.9	44.3	45.3	45.6	43.2
59	Greece	28.9	28.7	29.2	29.4	30	30.4	30.6	31	31	29.9
60	Guatemala	51.4	51.5	51.4	51.8	52.3	52.5	52.7	53.9	55	52.5
61	Guinea	39.5	39.6	39.9	40.4	40.4	40.6	40.8	40.3	40	40.2
62	Guinea-Bissau	38.8	39.6	39.6	38.5	37.7	37.3	37.5	37.7	37.6	38.3
63	Guyana	33.8	33.6	33.8	33.5	33.3	33.8	33	33.4	33.3	33.5
64	Haiti	56	55.4	54.7	54.3	54.4	53.4	53.7	53.8	53.7	54.4
65	Honduras	48.9	49.6	49.4	49.6	50.3	50.9	52	53.1	54.2	50.9
66	Hong Kong, China	16.2	16.6	16.6	16.6	16.8	17.3	17.7	18.2	18.6	17.2
67	Hungary	24.8	25.1	25.4	25.7	25.8	26.1	26.2	26.5	26.4	25.8
68	Iceland	15.8	15.9	16	15.8	15.9	16.3	16.7	16.7	16.8	16.2
69	India	23	23.1	23.4	23.6	24	24.2	24.5	25	25.6	24.0
70	Indonesia	19.1	19.4	19.4	19.5	19.7	20	20.2	20.5	20.9	19.9
71	Iran, Islamic Rep.	18.7	18.9	18.8	19.1	19.6	19.9	19.7	20.1	20.5	19.5
72	Ireland	15.7	15.9	15.9	15.9	15.8	16	16.2	16.3	16.4	16.0
73	Israel	21.2	21.9	21.6	21.1	21.2	21.7	22	22.6	23	21.8
74	Italy	26.5	27.1	27.5	27.4	27.2	27.2	27.1	27.3	27.4	27.2
75	Jamaica	36.4	36.4	36.6	36.6	38.6	39.1	38.9	40.2	40.5	38.1
76	Japan	11	11.2	11.2	11.1	11.2	11.5	11.7	12	12.1	11.4
77	Jordan	19.4	19.4	19.6	19.9	20.1	20.6	20.9	21.4	21.7	20.3
78	Kazakhstan	42.6	43.2	43.9	44.5	45.4	45.9	46.7	47.7	48.2	45.3
79	Kenya	35	34.3	34.7	33.8	33.9	34.9	36	37.7	39.4	35.5
80	Korea, Rep.	26.7	27.5	27.7	28.1	28.2	28.5	28.7	29	29.4	28.2
81	Kuwait	20.1	20.1	19.9	19.9	20.9	21.5	22.2	22.5	-	20.9
82	Kyrgyz Republic	41	41.2	41.6	41	41.9	42.6	42.4	42.6	43.6	42.0
83	Lao PDR	30.3	30.6	31	31.2	31.4	31.8	32.3	32.8	33.2	31.6
84	Latvia	39.6	39.9	40.4	40.9	41.4	42	42.7	43.7	44.3	41.7
85	Lebanon	34.1	34.1	34.5	34.7	35	35.9	35.9	35.4	36.2	35.1
86	Lesotho	30.9	31.3	31.5	31.6	31.9	32.5	32.4	33.3	33.8	32.1
87	Liberia	42.3	43.2	43.2	43.3	41.6	41.2	41.6	42	42.3	42.3
88	Libyan Arab Jamahiria	35.5	35.1	35.8	36.5	35.3	36.4	37.3	38.5	39.6	36.7
89	Lithuania	30.2	30.3	30.7	31.2	31.9	32.2	32.8	33.4	34	31.9
90	Luxembourg	9.6	9.8	9.8	9.8	9.8	9.8	9.9	10	10.2	9.9
91	Macao, China	12.9	13.1	13.2	13.4	13.7	14.2	14.4	14.6	15.3	13.9
92	Macedonia, FYR	34.9	35.7	34.8	35.1	35.5	36.4	36.9	37.7	38.8	36.2
93	Madagascar	39.1	39.6	40.4	34.7	36	37.7	38.5	39.5	40.6	38.5
94	Malawi	40.7	40.3	38.3	36.5	37.5	38.3	38.2	39.4	41.1	38.9
95	Malaysia	30.1	31.1	30.6	30.7	31	31.4	31.7	32.2	32.6	31.3
96	Maldives	30.3	30.3	30.6	31.2	31.4	31.8	31	31.3	32.1	31.1
97	Mali	42.1	42.3	43.8	44.4	44.7	44	44.5	44.7	44.7	43.9
98	Malta	26.8	27.1	26.9	27	26.7	26.7	26.9	27.2	27.7	27.0
99	Mauritania	36.7	36.1	36.2	36.4	36.4	37.2	37.9	40.8	-	37.2
100	Mauritius	22.9	23.1	23.3	23.2	23.5	23.8	23.8	24	24.3	23.5
101	Mexico	29.5	30.1	30	29.9	29.7	30.1	30.3	31	31.3	30.2
102	Moldova	44.6	45.1	46.1	45.8	45.7	46.2	46.8	46	-	45.8
103	Mongolia	18.5	18.4	18.5	18.8	19.1	19.5	19.8	20.1	20.5	19.2
104	Morocco	36.3	36.4	37.1	37.3	37.8	38.7	37.9	39.8	39.8	37.9
105	Mozambique	39.5	40.3	40.2	40.8	40.8	40.9	41.6	42	-	40.8
106	Myanmar	53.6	52.6	53.7	54.5	56.3	56.2	57.4	-	-	54.9
107	Namibia	31.4	31.4	31.6	31.5	32.2	33.1	33.3	34.1	34.4	32.6
108	Nepal	36.4	36.8	36.9	36.5	36.7	36.8	36.9	37.3	37.5	36.9
109	Netherlands	12.9	13.1	13.1	13	12.9	13	13	13	13.2	13.0
110	New Zealand	12.6	12.8	13	13.2	13.4	13.6	13.5	13.5	13.6	13.2
111	Nicaragua	44.7	45.2	45.1	44.9	45.4	46.2	46.6	46.8	47.2	45.8
112	Niger	42.1	41.9	43	43.7	44.4	43.2	44.4	45.6	-	43.5

113	Nigeria	57.8	57.9	58	58.2	59.5	60.8	62.1	62.9	-	59.7
114	Norway	19	19.1	19.2	19.2	19.2	19.7	19.7	20	20.2	19.5
115	Oman	18.7	18.9	19.3	19.3	19.4	19.5	19.8	20.2	-	19.4
116	Pakistan	36.6	36.8	36.6	36.8	37.4	38.3	38.8	39.8	40.1	37.9
117	Panama	63.4	64.1	63.5	63.1	63.9	64.7	66.4	68.1	-	64.7
118	Papua New Guinea	36.7	36.1	35.4	35.1	35.1	35.2	34.9	35.1	35.7	35.5
119	Paraguay	41.8	39.8	39.9	39.5	40.6	41.5	41.6	42.5	-	40.9
120	Peru	59.7	59.9	59.6	60.8	61.2	61.9	62.7	64.2	66.3	61.8
121	Philippines	42.7	43.3	43.6	44.1	44.7	45	46.6	47.2	48.4	45.1
122	Poland	27.5	27.6	27.6	27.5	27.7	27.9	28.3	28.7	29.1	28.0
123	Portugal	22.4	22.7	22.8	22.7	22.4	22.3	22.2	22.2	22.5	22.5
124	Quatar	-	17.8	17.5	17.8	17.3	19.4	18.4	-	-	18.0
125	Romania	34.6	34.4	35.1	35.4	36.1	37	37.3	38.3	38.9	36.3
126	Russian Federation	45.1	46.1	47	47.8	48.8	49.5	50.1	50.8	52	48.6
127	Rwanda	40.1	40.3	40	40.7	39.9	40.4	41.4	41.5	-	40.5
128	Saudi Arabia	18.1	18.4	18	17.5	18.5	19.1	19.4	19.5	20	18.7
129	Senegal	45.2	45.1	45.6	45.1	45.8	46.9	47.8	47.8	48.4	46.4
130	Sierra Leone	40.3	40.2	41.2	43.3	43.8	44.2	44.3	45	45.6	43.1
131	Singapore	12.9	13.1	12.9	12.9	13.1	13.4	13.5	13.8	14	13.3
132	Slovak Republic	18.9	18.9	19	19.2	19.5	19.7	20.2	20.6	21.1	19.7
133	Slovenia	26.9	27.1	27.5	27.6	27.8	28	28.4	28.9	29.5	28.0
134	Solomon Islands	35.1	33.4	32.3	31.9	32.1	33	33.4	33.6	34.2	33.2
135	South Africa	28.4	28.4	28.4	28.8	29	29.7	30.4	30.9	31.7	29.5
136	Spain	22.4	22.7	22.9	23	23	22.9	23	23	23.1	22.9
137	Sri Lanka	44	44.6	44.6	45.1	45.3	45.2	45.7	46.2	47	45.3
138	Sudan	34.1	-	-	-	-	-	-	-	-	34.1
139	Suriname	39.9	39.8	40.3	40.8	41.5	42.9	43.3	43.9	44.7	41.9
140	Swaziland	39.4	41.4	41.5	41.8	42.5	42.7	43.4	43.8	-	42.1
141	Sweden	18.9	19.2	19.3	19.4	19.6	19.9	19.8	20.2	20.4	19.6
142	Switzerland	8.4	8.6	8.6	8.6	8.4	8.6	8.7	8.9	9.1	8.7
143	Syrian Arab Republic	19.3	19.3	19.4	19.5	19.3	19.5	19.6	19.9	20.1	19.5
144	Taiwan	25.1	25.4	25.1	25.4	25.6	26	26.2	26.6	26.9	25.8
145	Tajikistan	42.9	43.2	43.5	43.8	44.3	44.8	45	45.3	45.5	44.3
146	Tanzania	58	58.3	58.9	59.7	60.1	60.6	61.3	61.9	63	60.2
147	Thailand	51.8	52.6	52.8	53.8	55.1	55.8	56.4	56.9	57.2	54.7
148	Togo	35.8	35.1	34.8	35.7	35.3	35.2	35.2	35.6	-	35.3
149	Trinidad and Tobago	34.1	34.4	34.5	34.4	35.4	35.7	35.9	36.8	37.3	35.4
150	Tunisia	38.1	38.4	38.9	39	39.4	39.9	40	40.9	41.4	39.6
151	Turkey	31.5	32.1	31.4	31.8	32.4	33.2	34.2	34.7	35.2	32.9
152	Uganda	42.7	43.1	43.3	43.3	43.7	43.8	44	45.1	45.8	43.9
153	Ukraine	51.7	52.2	53	53.7	55	55.9	57	57.5	58.1	54.9
154	United Arab Emirates	26.5	26.4	25.8	25.3	26.5	27.5	28	29.4	-	26.9
155	United Kingdom	12.6	12.7	12.8	12.8	12.9	13	13	13.1	13.2	12.9
156	United States	8.6	8.7	8.7	8.6	8.7	8.8	8.9	8.9	9	8.8
157	Uruguay	51.7	51.1	50.5	48.2	48.6	51.1	53	53.7	56	51.5
158	Venezuela, RB	33.4	33.6	33.7	31.7	30.2	32.3	33.7	35.3	36.3	33.4
159	Vietnam	15.4	15.6	15.7	15.9	16	16.1	16.5	16.6	16.8	16.1
160	Yemen, Rep.	27.1	27.4	27.5	27.6	27.7	27.8	28.2	28	28	27.7
161	Zambia	48.5	48.9	49.5	49.7	50.4	51.2	51.7	53.1	54.3	50.8
162	Zimbabwe	59.2	59.4	57.4	56.1	55.2	56.6	56.8	56.6	56.1	57.0
	Time Average	33.7	33.8	33.9	33.9	34.2	34.6	35.0	35.6	35.5	

6 References

Ahumada, H., Alvaredo, F., Canavese A.. and Canavese, P. (2004). The Demand for Currency Approach and the Size of the Shadow Economy: A Critical Assessment. Discussion Paper. Delta Ecole. Normale Superieure, Paris.

Alexeev, M. and Pyle, W. (2003). A Note on Measuring the Unofficial Economy in the Former Soviet Republics. Economics of Transition, 11(1): 1–23.

Alderslade, J., Talmage, J. and Freeman Y. (2006). Measuring the Informal Economy: One Neighborhood at a Time. Discussion Paper. The Brooking Institution Metropolitan Policy Program, Washington D.C., September 2006.

Alm, J., Martinez-Vazquez, J. and Schneider F. (2004). 'Sizing the Problem of the Hard-To- Tax'. Working Paper. Georgia State University: USA.

Andreoni, J., Erard, B. and Feinstein, J. (1998). Tax Compliance. Journal of Economic Literature, 36: 818–860.

Bajada, C. and Schneider F. (2005). Size, Causes and Consequences of the Underground Economy: An International Perspective. Aldershot (GB): Ashgate Publishing Company.

Belev, B. (2003). The Informal Economy in the EU Accession Countries: Size, Scope, Trends and Challenges to the Process of EU Enlargement. Center for Study of Democracy, Sofia.

Bhattacharyya, D.K. (1999). On the Economic Rationale of Estimating the Hidden Economy, The Economic Journal 109(456): 348–359.

Blades, D. (1982). The Hidden Economy and the National Accounts. OECD (Occasional Studies), Paris, pp. 28–44.

Bollen, K.A. (1989). Structural Equations with Latent Variables. New York: Wiley.

Breusch, T. (2005a). The Canadian Underground Economy: An Examination of Giles and Tedds. Canadian Tax Journal, 53(2): 367–391.

Breusch, Trevor (2005b). Estimating the Underground Economy, Using MIMIC Models. Working Paper. National University of Australia, Canberra, Australia.

Brueck, T., Haisten-DeNew, J. B. and Zimmermann, K. F. (2006). Creating Low-Skilled Jobs by Subsidizing Market Contracted Household Work, Applied Economics 38(4): 899–911.

Buehn, A., Karmann, A. and Schneider F. (2009). Shadow Economy and do-it-yourself Activities: The German Case. Journal of Institutional and Theoretical Economics, 164(4): 701-722.

Byrne, B.M. (1998). Structural Equation Modelling with LISREL, PRELIS and SIMPLIS: Basic Concepts, Applications and Programming. Mahwah, NJ: Lawrence Erlbaum Associates.

Cagan, P. (1958). The Demand for Currency Relative to the Total Money Supply. Journal of Political Economy, 66(3): 302–328.

Chatterjee, S., Chaudhury K. and Schneider, F. (2006). The Size and Development of the Indian Shadow Economy and a Comparison with other 18 Asian Countries: An Empirical Investigation. Forthcoming in the Journal of Development Economics, April 2006.

Chen, M. (2004). Rethinking the Informal Economy: Linkages with the Formal Economy and the Formal Regulatory Environment. Paper presented at the EGDI-WIDR Conference 'unleashing human potential: linking the informal and formal sectors, Helsinki, Finland, 2004.

Cziraky, D. (2004). LISREL 8.54: A Program for Structural Equation Modelling with Latent Variables. Journal of Applied Econometrics, 19: 135-141.

Cziraky, D. (2005). A Unifying Statistical Framework for Dynamic Structural Equation Models with Latent Variables. Available under: http://stats.lse.ac.uk/ciraki/framework.pdf.

Dell'Anno, R. (2003). Estimating the Shadow Economy in Italy: A Structural Equation Approach. Discussion Paper, Department of Economics and Statistics, University of Salerno.

Dell'Anno, R. (2007). The Shadow Economy in Portugal: An Analysis with the MIMIC Approach. Journal of Applied Economics, 10: 253-277.

Dell'Anno, R. and Schneider, F. (2004). The Shadow Economy of Italy and other OECD Countries: What Do We Know? Linz: University of Linz, Department of Economics. Discussion Paper. Published in Journal of Public Finance and Public Choice, 2005.

Dell'Anno, R. and Schneider, F. (2005). Estimating the Underground Economy by Using MIMIC Models: A Response to T.Breuschs Critic. Discussion Paper. Department of Economics, University of Linz, Linz.

Dell'Anno, R. Schneider, F. (2006). Estimating the Underground Economy: A Response to T. Breusch's Critique. Discussion Paper, Johannes Kepler University Linz, Department of Economics, Linz.

Dell'Anno, R. and Solomon, O. H. (2008). Shadow Economy and Unemployment Rate in USA: Is there a Structural Relationship? An Empirical Analysis. Applied Economics, 40: 2537-2555.

Dell'Anno, R. and Schneider, F. (2009). A Complex Approach to Estimate the Shadow Economy: The Structural Equation Modelling. Marzia Faggini and Thomas Lux (eds.), Coping with the Complexity of Economics, Heidelberg: Springer Publ. Comp., pp. 110– 130.

Enste, D. and Schneider, F. (2006). Wie groß ist die Schattenwirtschaft? Des Rätsels Lösung. Wirtschaftsdienst—Zeitschrift für Wirtschaftspolitik 86(2): 185–191.

Feige, E. L. (1986). A Re-Examination of the "Underground Economy" in the United States. IMF Staff Papers, 33(4). Supplement to Public Finance/ Finances Publiques, 49: 119–136.

Feige, E. L. (1996). Overseas Holdings of U.S. Currency and the Underground Economy. Pozo, Susan (ed.): Exploring the Underground Economy. Kalamazoo, Michigan, pp. 5–62.

Feld, L. and Frey, B. S. (2002a). The Tax of Authority and the Taxpayer: And Exploratory Analysis. Unpublished Manuscript, University of Zurich, Switzerland.

Feld, L. and Frey, B. S. (2002b). Trust Preeds Trust: How Taxpayers are Treated. Economics of Governments, 3(1): 87–89.

Feld, L. and Larsen, C. (2005). Black Activities in Germany in 2001 and 2004: A Comparison Based on Survey Data. The Rockwool Foundation Research Unit, Copenhagen (DK), 2005.

Feld, L. and Schneider, F. (2009). Survey on the Shadow Economy and Undeclared Work in OECD Countries, Paper written for possible publication in the German Economic Review, Department of Economics, University of Linz, Linz, Austria.

Fiess, N., Maloney, W.F. and Shankar, R. (2000). The Informal Sector, Wage Rigidities, and Real Exchange Rates. World Bank, Poverty Reduction and Economic Management Department, Washington, D.C.

Flaming, D., Hayolamak, B. and Jossart, P. (2005). Hopeful Workers, Marginal Jobs: LA's Off-The-Books Labour Force. Economic Roundtable, Los Angeles, CA, 2005.

Fleming, M.H., Roman, J. and Farrel, G. (2000). The Shadow Economy. Journal of International Affairs, Spring 2000, No. 53(2): 64–89.

Frey, B. S. (1997). Not just for the Money: An Economic Theory of Personal Motivation. Cheltonham (UK): Edward Elgar.

Frey, B. S. and Weck, H. (1983a). Bureaucracy and the Shadow Economy: A Macro-Approach. Horst Hanusch (ed.): Anatomy of Government Deficiencies. Berlin: Springer, pp. 89–109.

Frey, B. S. and Weck, H. (1983b). Estimating the Shadow Economy: A 'Naive' Approach. Oxford Economic Papers, 35: 23–44.

Frey, B. S. and Weck-Hannemann, H. (1984). The Hidden Economy as an "Unobserved" Variable. European Economic Review, 26(1): 33–53.

Frey, B. S. and Pommerehne, W. (1984). The Hidden Economy: State and Prospect for Measurement. Review of Income and Wealth, 30(1): 1–23.

Frey, B. S., Weck H. and Pommerehne, W. W. (1982). Has the Shadow Economy Grown in Germany? An exploratory study, Weltwirtschaftliches Archiv, 118(4): 499–524.

Friedman, E., Johnson, S., Kaufmann, D. and Zoido-Labton, P. (2000). Dodging the Grabbing hand: The Determinants of Unofficial Activity in 69 Countries. Journal of Public Economics, 76(4): 459–493.

Garcia, G. (1978). The Currency Ratio and the Subterranean Economy. Financial Analysts Journal, 69(1): 64–66.

Gerxhani, K. (2004). The Informal Sector in Developed and Less-Developed Countries: A Literature Survey. Public Choice, 114(3-4): 295–318.

Giles, David, E.A. (1999a). Measuring the Hidden Economy: Implications for Econometric Modelling. The Economic Journal, 109(456): 370–380.

Giles, David, E.A. (1999b): Modelling the Hidden Economy in the Tax-Gap in New Zealand. Empirical Economics 24(4): 621–640.

Giles, David, E.A. (1999c). The Rise and Fall of the New Zealand Underground Economy: Are the Reasons

Symmetric? Applied Economic Letters 6: 185–189.

Giles, David, E.A. and Tedds, L. M. (2002). Taxes and the Canadian Underground Economy. Canadian Tax Paper No. 106, Canadian Tax Foundation, Toronto/Ontario.

Giles, David, E.A., Tedds, L. M. and Werkneh, G. (2002). The Canadian Underground and Measured Economies. Applied Economics, 34(4): 2347–2352.

Gutmann, P. M. (1977). The Subterranean Economy. Financial Analysts Journal, 34(1): 24–27.

Hayduk, L. A. (1987). Structural Equation Modelling with LISREL. Essential and Advances. London: The Johns Hopkins University Press.

Herwartz, H., Schneider, F. and Tafenau, E. (2009). One Share Fits All? Regional Variations in the Extent of Shadow Economy in Europe, Department of Economics, University of Linz and Kiel, Discussion Paper.

Hoyle, R. H. (ed.) (1995). Structural Equation Modeling: Concepts, Issues, and Applications. Thousand Oaks, CA: Sage Publications.

Hill, R. and Kabir, M. (1996). Tax Rates, the Tax Mix, and the Growth of the Underground Economy in Canada: What can we Infer? Canadian Tax Journal/ Revue Fiscale Canadienne, 44(6): 1552–1583.

IRS (1979). Estimates of Income Unreported on Individual Tax Reforms. Washington D.C.: Internal revenue service, U.S. Department of the Treasury.

IRS (1983). Income Tax Compliance Research: Estimates for 1973–81. Washington D.C.: Internal revenue service, U.S. Department of the Treasury.

Isachsen, A. J. and Strom, S. (1985). The Size and Growth of the Hidden Economy in Norway. Review of Income and Wealth, 31(1): 21–38.

Janisch, U. and Brümmerhoff, D. (2005). Möglichkeiten und Grenzen der Schätzung der Schattenwirtschaft: Eine kritische Auseinandersetzung mit den Schätzergebnissen der Bargeldmethode nach Schneider. Diskussionspapier, Universität Rostock.

Johnson, S., Kaufmann, D. and Shleifer, A. (1997). The Unofficial Economy in Transition. Brookings Papers on Economic Activity, Fall, Washington D.C.

Johnson, S., Kaufmann, D. and Zoido-Lobatón, P. (1998a). Regulatory Discretion and the Unofficial Economy. The American Economic Review, 88(2): 387–392.

Johnson, S., Kaufmann, D. and Zoido-Lobatón, P. (1998b). Corruption, Public Finances and the Unofficial Economy. Washington, D.C.: The World Bank, Discussion Paper.

Karmann, A. (1986). Monetäre Ansätze zur Erfassung der Schattenwirtschaft: Ein Vergleich verschiedener Messansätze. Kredit und Kapitel 19(3): 233–247.

Karmann, A. (1990). Schattenwirtschaft und ihre Ursachen: Eine empirische Analyse zur Schwarzwirtschaft und Selbstversorgung in der Bundesrepublik Deutschland. Zeitschrift für Wirtschafts- und Sozialwissenschaften (ZWS) 110(3) 1990: 185–206.

Kaufmann, D. and Kaliberda, A. (1996). Integrating the Unofficial Economy into the Dynamics of Post Socialist Economies: A framework of Analyses and Evidence. In: B. Kaminski (ed.), Economic Transition in Russia and the New States of Eurasia, London: M.E. Sharpe, pp.81–120.

Kazemier, Brugt, (2005a). The Undergroud Economy: A Survey of Methods and Estimates. Discussion Paper, Statistics Netherlands, Voorburg, Netherlands

Kazemier, B. (2005b). Monitorying the Underground Labour Market: What Surveys can do. Discussion Paper, Statistics Netherlands, Voorburg, Netherlands

Kirchgaessner, G. (1983). Size and Development of the West German Shadow Economy, 1955– 1980. Zeitschrift für die gesamte Staatswissenschaft, 139(2). 197–214.

Kirchgaessner, G. (1984). Verfahren zur Erfassung des in der Schattenwirtschaft erarbeiteten Sozialprodukts. Allgemeines Statistisches Archiv, 68(4): 378–405.

Kirchler, E., Maciejovsky, B. and Schneider, F. (2002), Everyday Representations of Tax Avoidance, Tax Evasion and Tax Flight: Do legal Differences Matter? Economic Psychology, 8(3): 1–19.

Klovland, J. (1984). Tax Evasion and the Demand for Currency in Norway and Sweden: Is there a Hidden Relationship? Scandinavian Journal of Economics, 86(4): 423–39.

Lackó, M. (2000). Hidden Economy—An Unknown Quantity: Comparative Analysis of Hidden Economics in Transition Countries 1989–95. Economics of Transition 8(1): 117–149.

Lippert, O. and Walker, M. (eds.) (1997). The Underground Economy: Global Evidences of its Size and Impact. Vancouver, B.C.: The Frazer Institute.

Lizzeri, C. (1979). Mezzogiorno in Controluce. Enel, Naples. Loayza, N. V. (1996). The Economics of the Informal Sector: A Simple Model and some Empirical Evidence from Latin America. Carnegie-Rochester Conference Series on Public Policy 45: 129–162.

Maloney, W.F. (1998a). The Structure of the Labor Market in Developing Countries: Time Series Evidence and Competing Views. Policy Research Working Paper No. 1940, World Bank, Washington D.C.

Maloney, W.F. (1998b). Are Labor Markets in Developing Countries Dualistic? Policy Research Working Paper No. 1941, World Bank, Washington D.C.

Marcelli, E. A. (2004). Unauthorized Mexican Immigration, the Labour and other Lower-Wage Informal Employment in California. Regional Studies 38(1): 1–13.

Marcelli, Enrico A., Manuel Pastor jr. and Pascale M. Joassart (1999): Estimating the Effects of Informal Economic Activity: Evidence from Los Angeles County, Journal of Economic Issues 33/3, pp.579–607.

Maruyama, G. M. (1997). Basic of Structural Equation Modeling. Thousand Oaks, CA: Sage Publications.

Mummert, A. and Schneider, F. (2001). The German Shadow Economy: Parted in a United Germany? Finanzarchiv, 58(3): 260–285.

Muthen, B. O. (2002). Beyond SEM: General Latent Variable Modeling. *Behaviormetrika*, 29: 81-117.

Park, T. (1979). Reconciliation between Personal Income and Taxable Income. Mimeo, Washington D.C.: Bureau of Economic Analysis, pp. 1947–77.

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

Pickhardt, M. and Sardà Pons, J. (2006). Size and Scope of the Shadow Economy in Germany. Applied Economics 38(4): 1707–1713.

Pozo, S. (ed.) (1996). Exploring the Underground Economy: Studies of Illegal and Unreported Activity. Michigan: W.E. Upjohn, Institute for Employment Research.

Rogoff, K. (1998). Blessing or Curse? Foreign and Underground Demand for Euro Notes. Economic policy: The European Forum 26: 261–304.

Schneider, F. (1986). Estimating the Size of the Danish Shadow Economy Using the Currency Demand Approach: An Attempt. The Scandinavian Journal of Economics, 88(4): 643–668.

Schneider, F. (1994a). Measuring the Size and Development of the Shadow Economy. Can the Causes be Found and the Obstacles be Overcome? Brandstaetter, Hermann, and Güth, Werner (eds.): Essays on Economic Psychology, Berlin, Heidelberg, Springer Publishing Company, pp. 193–212.

Schneider, F. (1994b). Can the Shadow Economy be Reduced through Major Tax Reforms? An Empirical Investigation for Austria. Supplement to Public Finance/ Finances Publiques 49: 137–152.

Schneider, F. (1997). The Shadow Economies of Western Europe. Journal of the Institute of Economic Affairs, 17(3): 42–48.

Schneider, F. (1998a). Further Empirical Results of the Size of the Shadow Economy of 17 OECD-Countries over Time. Paper to be presented at the 54. Congress of the IIPF Cordowa, Argentina and discussion paper, Department of Economics, University of Linz, Linz, Austria.

Schneider, F. (1998b). Stellt das Anwachsen der Schwarzarbeit eine wirtschaftspolitische Herausforderung dar? Einige Gedanken aus volkswirtschaftlicher Sicht. Linz, Mitteilungen des Instituts für angewandte Wirtschaftsforschung (IAW), I/98: 4–13.

Schneider, F. (2000). The Increase of the Size of the Shadow Economy of 18 OECD-Countries: Some Preliminary Explanations. Paper presented at the Annual Public Choice Meeting, March 10–12, 2000, Charleston, S.C.

Schneider, F. (2003). The Shadow Economy. In: Charles K. Rowley and Friedrich Schneider (eds.), Encyclopedia of Public Choice, Kluwer Academic Publishers, Dordrecht.

Schneider, F. (2004). Arbeit im Schatten: Wo Deutschlands Wirtschaft wirklich wächst. Wiesbaden, Gabler Verlag

Schneider, F. (2005). Shadow Economies Around the World: What do we Really Know? European Journal of Political Economy, 21(3): 598–642.

Schneider, F. (2007): Shadow Economies and Corruption all Over the World: New Estimates for 145 Countries. Economics, 2007–9, July 2007.

Schneider, F. and Enste, D. (2000). Shadow Economies: Size, Causes, and Consequences. The Journal of Economic Literature, 38(1): 77–114.

Schneider, F. and Enste, D. (2002). The Shadow Economy: Theoretical Approaches, Empirical Studies, and Political Implications. Cambridge (UK): Cambridge University Press.

Schneider, F. and Buehn, A. (2009). Shadow Economies and Corruption All Over the World: Revised Estimates for 120 Countries. Economics: The Open-Access, Open-Assessment E-Journal, 1, 2007-9 (Version 2).

Smith, P. (1994). Assessing the Size of the Underground Economy: The Statistics Canada Perspectives. Canadian Economic Observer, Catalogue No.: 11-010, 3.16-33, at 3.18.Spiro, Peter S. (1993): "Evidence of a Post-GST Increase in the Underground Economy;" Canadian Tax Journal/ Revue Fiscale Canadienne, 41(2): 247–258.

Tanzi, V. (1980). The Underground Economy in the United States: Estimates and Implications. Banca Nazionale del Lavoro, 135(4): 427–453.

Tanzi, V. (1982a) (ed.). The Underground Economy in the United States and Abroad, Lexington (Mass.), Lexington.

Tanzi, Vito (1982b): A Second (and more Skeptical) Look at the Underground Economy in the United States. In: Tanzi, V. (1982) (ed.): The underground economy in the United States and abroad, Lexington (Mass.), Lexington, pp. 38–56.

Tanzi, V. (1983). The Underground Economy in the United States: Annual Estimates, 1930– 1980. IMF-Staff Papers, 30(2): 283–305.

Tanzi, V. (1999). Uses and Abuses of Estimates of the Underground Economy. The Economic Journal 109(456): 338–340.

Taylor, M.P. (1996). Earnings, Independence or Unemployment: Why Become Self Employed? Oxford Bulletin of Economics and Statistics, 58(2): 253–265.

Thomas, J. J. (1986). The Underground Economy in the United States: A Comment on Tanzi. IMF-Staff Papers, Vol. 33(4): 782–789.

Thomas, J. J. (1992). Informal Economic Activity. LSE, Handbooks in Economics, London: Harvester Wheatsheaf.

Thomas, J. J. (1999). Quantifying the Black Economy: Measurement without Theory Yet Again? The Economic Journal 109(456): 381–389.

Torgler, B. and Schneider, F. (2005). Attitudes Towards Paying Taxes in Austria: An Empirical Analysis. Empirica, pp.204–225.

Weck, H. (1983). Schattenwirtschaft: Eine Möglichkeit zur Einschränkung der öffentlichen Verwaltung? Eine ökonomische Analyze. Bern-Frankfurt.

Williams, C. C. (2004a). Cash-In-Hand Work: The Underground Sector and the Hidden Economy of Favours. Haunddemills/Hampshire (GB), Palgrave McMillan Publishing Company, 2004.

Williams, C. C. (2004b). Geographical Variations in the Nature of Undecleared Work. Geographisca Analer 86(B3): 187–200.

Williams, C. C. (2005a). Forstering Community Engagement and Tackling Undeclared Work: The Case for an Evidence—Based "joint-up & CloseCurlyQuote. Public Policy Approach, Regional Studies 39(8): 1145–1155.

Williams, C. C. (2005b). Small Business and the Informal Economy: Making the Transition to the Informal Economy—The Evidence Base. Small Business Service, London.

Williams, C. C. (2006). What is to be Done about Undecleared Work? Evaluating the Policy Options, Policy and Politics 34(1). 91–113.

Williams, C. C. and Windebank, J. (1995). Black Market Work in the European Community: Peripheral Work for Peripheral Localities? International Journal of Urban and Regional Research, 19(1): 23–39.

Williams, C. C. and Windebank, J. (1998). Informal Employment in the Advanced Economies: Implication for Work and Welfare. Routledge, London.

Williams, Colin C. and Windebank, J. (2001a). Beyond Profit Motivated Exchange: Some Lessons from the Study of Paid Informal Work. European Urban and Regional Studies 8(1): 49–61.

Williams, C. C. and Windebank, J. (2001b). Reconceptualizing Paid Informal Exchance: Some Lessons from English Cities. Environment and Planning A 33(1): 121–140.

Zilberfarb, B-Z. (1986). Estimates of the Underground Economy in the United States, 1930–80. IMF-Staff Papers, 33(4): 790–798.