

Shadow Economies and Corruption All Over the World: New Estimates for 145 Countries

Friedrich Schneider

Johannes Kepler University of Linz, Austria

Abstract:

Estimations of the shadow economies for 145 countries, including developing, transition and highly developed OECD economies over 1999 to 2005 are presented. The average size of the shadow economy (as a percent of "official" GDP) in 2004/05 in 96 developing countries is 36.7%, in 25 transition countries 38.8% and in 21 OECD countries 14.8%. An increased burden of taxation and social security contributions, combined with a labour market regulation are the driving forces of the shadow economy. Furthermore, the results show that the shadow economy reduces corruption in high income countries, but increases corruption in low income countries. Finally, the various estimation methods are discussed and critically evaluated.

JEL: O17, O5, D78, H2, H11, H26

Keywords: shadow economy of 145 countries, tax burden, tax moral, quality of state institutions, regulation, DYMIMIC and other estimation methods

Correspondence:

Professor of Economics, Dr.Dr.h.c. mult. Friedrich Schneider, Department of Economics, Johannes Kepler 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>.

..

www.economics-ejournal.org/economics/journalarticles

Contents

1	Introduction	3
2	Some Theoretical Considerations about the Shadow Economy	4
2.1	<i>Defining the Shadow Economy</i>	4
2.2	<i>The Main Causes of the Shadow Economy</i>	5
2.2.1	Tax and Social Security Contribution Burdens	5
2.2.2	Intensity of Regulations	6
2.2.3	Public Sector Services	7
3	The Size of the Shadow Economy for 145 Countries	7
3.1	<i>Econometric Results</i>	7
3.2	<i>The Size of the Shadow Economies for 145 Countries for 1999/2000 to 2004/2005.....</i>	14
3.2.1	Developing Countries.....	14
3.2.2	Transition Countries.....	18
3.2.3	Highly developed OECD-Countries.....	19
3.2.4	South West Pacific Islands.....	20
3.2.5	Communist Countries.....	21
4	Corruption and the Shadow Economy: Substitutes or Compliments?')	22
5	Summary and Conclusions	26
6	Appendix 1: Methods to Estimate the Size of the Shadow Economy: The DYMIMIC and Currency Demand Approach	28
6.1	<i>The Currency Demand Approach</i>	28
6.2	<i>The Model Approach</i>	31
6.3	<i>The Size and Development of the Shadow Economies of 145 Countries over 1999/2000 to 2004/2005</i>	34
7	Appendix 2: Definition of the variables and data sources	38
8	References.....	41

1 Introduction

As corruption and shadow economic activities are a fact of life around the world, most societies attempt to control these activities through various measures like punishment, prosecution, economic growth or education. To gather information about the extent of corruption and the shadow economy and its relationship or who is engaged in corrupt and/or underground activities, the frequency with which these activities are occurring and their 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 the relationship between corruption and shadow economy activities on the goods and labour market, because all individuals engaged in these activities wish not to be identified. Hence, doing research in these two areas can be considered as a scientific passion for knowing the unknown.

Although substantial literature¹⁾ exists on single aspects of the hidden or shadow economy and a comprehensive survey has been written by Schneider (the author of this paper) and Enste (2000), the subject is still quite controversial²⁾ as there are disagreements about the definition of shadow economy activities, the estimation procedures and the use of their estimates in economic analysis and policy aspects³⁾. Nevertheless around the world, there are some indications for an increase of the shadow economy but little is known about the development and the size of the shadow economies in transition, developing and developed countries over the latest period 1999 to 2005.

Hence, the goal of this paper is threefold: (i) to undertake the challenging task of estimating the shadow economy for 145 countries all over the world⁴⁾, (ii) to provide some insights into

¹⁾ 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-Lobaton (1998a, 1998b); Belev (2003); Gerxhani (2003) 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, 2006) and Alm, Martinez and Schneider (2004), and Kazemier (2005a)

²⁾ Compare e.g. in the Economic Journal, vol. 109, no. 456, June 1999 the feature "controversy: on the hidden economy".

³⁾ Compare the different opinions of Tanzi (1999), Thomas (1999), Giles (1999a,b) and Pedersen (2003), and Janisch and Brümmerhoff (2005).

⁴⁾ This paper focuses on the size and development of the shadow economy for countries and does not show any disaggregated values for specific regions. Lately some first studies were undertaken to measure the size of the

the main causes of the shadow economy, and (iii) to explore the relationship between shadow and corruption. In section 2 an attempt is made to define the shadow economy and 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 145 countries in the period 1999/2000 to 2004/05. In section 4 two hypotheses about the relationship between the shadow economy and corruption are derived and some empirical results are shown. In section 5 a summary is given and some policy conclusions are drawn. Finally in the three appendices (chapters 6, 7 and 8) the various methods to estimate the shadow economy are presented and critically evaluated, a definition of the variables and data sources are given, and the descriptive statistics of the variables are shown.

2 Some Theoretical Considerations about the Shadow Economy

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 Product⁵⁾. 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 broadest definitions of it includes..."those economic activities and the income derived from them that circumvent or otherwise avoid government regulation, taxation or observation"⁶⁾.

In this paper the following more narrow definition of the shadow economy is used⁷⁾: The shadow economy includes all market-based legal production of goods and services that are deliberately concealed from public authorities for the following reasons:

shadow economy as well as the "grey" or "shadow" labour 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).

⁵⁾ This definition is used for example, by Feige (1989, 1994), Schneider (1994a, 2003, 2005, 2007) 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 (2007).

⁶⁾ This definition is taken from Del'Anno (2003), Del'Anno and Schneider (2004) and Feige (1989); see also Thomas (1999), Fleming, Roman and Farrell (2000).

⁷⁾ 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.

- (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 labour 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, I 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. I 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 undertaken⁸⁾.

2.2 The Main Causes of the Shadow Economy

2.2.1 Tax and Social Security Contribution Burdens

In almost all studies⁹⁾ 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. Since taxes affect labour-leisure choices, and also stimulate labour 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 labour 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, they 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) 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

⁸⁾ Compare, e.g. the survey of Andreoni, Erard and Feinstein (1998) and the paper by Kirchler, Maciejovsky and Schneider (2002).

⁹⁾ 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), just to quote a few recent ones.

Scandinavian countries. For Austria the driving force for the shadow economy 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, too.

In this study an attempt will be made to investigate the influence of the direct and indirect tax burden as well as the social security payments on the shadow economy for developing, transition and highly developed countries over the period 1999 to 2005.

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 labour market regulations, trade barriers, and labour restrictions for foreigners. Johnson, Kaufmann, and Zoido-Lobaton (1998b) find significant overall empirical evidence of the influence of (labour) 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 labour 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. Empirical evidence supporting 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, is found in their empirical analysis. They 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, Johnson, Kaufmann and Zoido-Lobaton (1999) 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 is unambiguous: more regulation is correlated with a larger shadow economy.

These findings demonstrate 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.

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-Lobaton (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 bribery facing enterprises. 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-Lobaton 1998a p. I). First results of the influence of corruption on the shadow economy and vice versa are reported in chapter 4 of this section.

3 The Size of the Shadow Economy for 145 Countries

3.1 Econometric Results

In tables 3.1 to 3.3 the econometric estimations using the DYMIMIC approach (latent estimation approach) are presented for the 96 developing countries, the 28 (25) transition and

3 communist countries and the 21 industrialized (highly developed) OECD-countries of our sample¹⁰). This grouping was necessary because the available data is different for these countries. For the 96 developing countries and the 28 transition and communist countries the estimation was done for five different points of time 1999/2000, 2001/02 2002/03, 2003/04 and 2004/05 and for the 21 OECD countries I have eight data points of time 1990/91, 1994/95, 1997/98, 1999/2000, 2001/02, 2002/03, 2003/04 and 2004/05. For the developing and transition countries I use as cause variables the following: share of direct and indirect taxation (including custom duties in % of GDP) as the two tax burden variables; burden of state regulation (Index of regulation, Heritage Foundation, 2006), unemployment quota and GDP per capita as three cause variables for the status of the "official" economy. As indicator values I use the employment quota (in % of the population between 18 and 64), annual rate of GDP, and annual rate of local currency per capita¹¹). For the OECD countries I use as additional cause variables the burden of social security payments, the tax morale, quality of state institutions and an index of the regulation of the labour market, and an additional indicator variable average working time per week.

The estimation results for the 96 developing countries in Middle and South America, Africa, Asia and the South West Pacific Islands are shown in table 3.1. All estimated coefficients of the independent cause variables are statistically significant and have the theoretically expected signs. If one first considers the two tax burden variables, one realizes that the share of direct taxation is just statistically significant (90% confidence level) and the size of the estimated coefficient has roughly half the size of the value of the share of indirect taxation and custom duties, which is statistically highly significant. One can interpret this that direct taxation is a less important for the development of the shadow economy in developing countries, compared to indirect taxation and custom duties. If one turns to the burden of state regulation, this variable is highly significant statistically, like the two variables, measuring the official economy, unemployment quota and GDP per capita. As a single independent variable, the burden of state regulation has the quantitatively largest impact on the size of the shadow economy, showing that state regulation is the most important factor for the size of the shadow economy in developing countries. But also the official labour market is quite important: the unemployment quota has the second largest estimated coefficient and influence on the shadow

¹⁰) The classification which country is a developing country follows the one done by the World Bank (2002) using a benchmark per capita income of USD 9.265 or less. The others with a higher income are either transition or industrialized countries (here 21 OECD countries). The grouping of the transition countries is done following the grouping in the OECD country studies (Paris, various years).

¹¹) Here I have the problem, that in some developing and transition countries the US-\$ (or Euro) is also a widely used currency, which is not considered here, because I got no reliable figures of the amount of US-\$ (Euro) in

economy in the 96 developing countries in Middle and South America, Africa, Asia and the South West Pacific Islands. If we turn to the indicator variables, we see that the employment quota, as well as the change of local currency per capita, have the expected negative and positive influence and are highly statistically significant, respectively¹²⁾.

In table 3.2 the DYMIMIC estimation results are presented for the 25 transition countries in Central and East Europe, former Soviet Union countries and 3 communist countries¹³⁾. Again all estimated coefficients of the cause variables are statistically significant and similar: as in the case of the developing countries. The two tax burden variables have together the quantitatively largest impact on the size of the shadow economy. Contrary to the results found in the 96 developing countries, the cause variable, "share of direct taxation" (including social security payments) has a highly significant statistical influence with the expected positive effect on the shadow economy. Also the independent variable "share of indirect taxation" has now a highly significant statistical influence, but the estimated coefficient is somewhat smaller than compared to the one the share of direct taxation (including social security payments). The variable, "unemployment quota" has also the expected positive influence, is highly statistically significant, and has the second largest estimated coefficient. The indicator variables, "employment quota", and, "the annual rate of currency per capita" have the theoretically expected signs and are statistically highly significant.

Finally, in table 3.3 the results for 21 highly developed OECD countries are shown. For these countries the availability of data is somewhat better: Not only have I more data points over time, but also I have three additional cause variables, tax morale (an index)¹⁴⁾, quality of state institutions and now, as a separate variable, the burden of social security payments (in % of official GDP). The additional indicator variable is the average working time (per week)¹⁵⁾. The estimated coefficients of all eight cause variables are statistically significant and have the theoretically expected signs. The tax and social security burden variables are quantitatively the most important ones, followed by the tax morale variable which has the single biggest

these developing and transition countries.

¹²⁾ The estimation results are in general robust, if other indicator variables are used as residuum; e.g. if the variable currency per capita is used as residuum the share of direct taxation becomes insignificant as well as the variable GDP per capita.

¹³⁾ How useful it is to conclude the three communist countries in this estimation, is an open and debatable question, as these countries have only a somewhat limited market system. Hence they may not fit in this sample, which may be a point of criticism. Hence the calculated shadow economy figures may have a different meaning and should be interpreted with great care.

¹⁴⁾ The importance of this variable with respect to theory and empirical importance is also shown in Feld and Frey (2002, 2002a and 2005), Frey (1997), and Torgler and Schneider (2005).

¹⁵⁾ Using this indicator variable one has the problem that, of course, this variable is influenced by state regulation, so that this variable is not really exogenous; hence the estimation may be biased.

influence; hence the tax payers' attitude towards the state institutions/government is quite important to determine whether one is engaged in shadow economy activities or not. Also the development of the official economy measured in unemployment and GDP per capita has a quantitatively important influence on the shadow economy. Turning to the four indicator variables they all have a statistically significant influence and the estimated coefficients have the theoretically expected signs. The quantitatively most important independent variables are the employment quota and change of currency per capita¹⁶⁾.

Summarizing, the econometric results demonstrate that for all three groups of countries the theoretical considerations about the causes of the shadow economy in section 2 can be confirmed: The direct tax (and social security) payment and indirect tax (+ customs tariff) burden variables are the driving forces of the growth of the shadow economy for all three types of countries (developing, transition and highly developed OECD countries), followed by the measure of state (labour market) regulation and, as measures of the official economy, the unemployment quota and GDP per capita. In the developing countries the largest influence has the burden of state regulation, followed by the unemployment quota and the share of indirect taxation. In the transition countries direct taxation (including social security payments) has the largest influence, followed by the unemployment quota and share of indirect taxation. In the highly developed OECD countries, the social security contributions and the share of direct taxation wield the biggest influence, followed by tax morale and the quality of state institutions. From these results we see that there are some differences, which influence the shadow economy according to these three different country groups.

In order to calculate the size and development of the shadow economies of 145 countries, I have to overcome the disadvantage of the DYMIMIC approach, which is that one gets only relatively estimated sizes of the shadow economy and one has to use another approach to get absolute figures. In order to calculate absolute figures of the size of the shadow economies from these DYMIMIC estimation results, I use the already available estimations from the currency demand approach for Australia, Austria, Germany, Hungary, Italy, India, Peru, Russia and the United States (from studies of Chatterjee, Chaudhury and Schneider (2006), Del'Anno and Schneider (2004), Bajada and Schneider (2003, 2005), Alexeev and Pyle (2003), Schneider and Enste (2002) and Lacko (2000)). As I have absolute values of the shadow economy (in % of GDP) for various years for the above mentioned countries, I can

¹⁶⁾ The variable currency per capita or annual change of currency per capita is heavily influenced by banking innovations; hence this variable is pretty unstable with respect to the length of the estimation period. Similar

use a benchmark procedure to transform the index of the shadow economy from the DYMIMIC estimations into absolute values.¹⁷⁾

Table 3.1: DYMIMIC Estimations of the size of the shadow economy of 96 developing countries in Middle and South America, Africa, Asia and the South West Pacific Islands 1999/00, 2001/02, 2002/03, 2003/04 and 2004/05

Cause Variables	Estimated Coefficients
Share of direct taxation (in % of GDP)	$\lambda_1 = 0.14^{(*)}$ (1.70)
Share of indirect taxation and customs duties (in % of GDP)	$\lambda_2 = 0.234^{**}$ (3.01)
Burden of state regulation (Index, Heritage Foundation: score 1 most economic freedom, 5 least economic freedom)	$\lambda_3 = 0.274^{**}$ (2.61)
Unemployment quota (%)	$\lambda_4 = 0.317^{**}$ (4.12)
GDP per capita (in US-\$)	$\lambda_5 = -0.143^*$ (-2.21)
Lagged endogenous variable	$\lambda_6 = 0.241^{(*)}$ (1.31)
Indicator Variables	
Employment quota (in % of population 18-64)	$\lambda_7 = -0.603^*$ (-2.86)
Annual rate of GDP	$\lambda_8 = -1$ (Residuum)
Change of local currency per capita	$\lambda_9 = 0.371^{**}$ (4.07)
Test-statistics	RMSE ¹⁾ = 0.0010 ^(*) (p-value = 0.903) Chi-square ²⁾ = 8.50 (p-value = 0.913) TMNCV ³⁾ = 0.056 AGFI ⁴⁾ = 0.721 N = 480 D.F. ⁵⁾ = 41

Notes: t-statistics are given in parentheses (*); *, ** means the t-statistics are statistically significant at the 90%, 95%, or 99% confidence level.

1) Steigers Root Mean Square Error of Approximation (RMSEA) for test of close fit; RMSEA < 0.05; the RMSEA-value varies between 0.0 and 1.0.

2) If the structural equation model is asymptotically correct, then the matrix S (sample covariance matrix) will be equal to $\Sigma(\theta)$ (model implied covariance matrix). This test has a statistical validity with a large sample (N \geq 100) and multinomial distributions; both are given for all three equations in tables 3.1-3.3 using a test of multi normal distributions.

3) Test of Multivariate Normality for Continuous Variables (TMNCV); p-values of skewness and kurtosis.

4) Test of Adjusted Goodness of Fit Index (AGFI), varying between 0 and 1; 1 = perfect fit.

5) 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.

problems are already mentioned by Giles (1999a) and Giles and Tedds (2002).

¹⁷⁾ This procedure is described in great detail in the paper Del'Anno and Schneider (2005).

Table 3.2: DYMIC Estimation of the Shadow Economy of 25 Central and East European and former Soviet Union Countries and 3 Communist Countries, 1999/00, 2001/02, 2002/03, 2003/04 and 2004/05

Cause Variables	Estimated Coefficients
Share of direct taxation + share of social security payments (in % of GDP)	$\lambda_1 = 0.387^{**}$ (3.03)
Share of indirect taxation + customs duties (in % of GDP)	$\lambda_2 = 0.294^*$ (2.62)
Burden of state regulation (Index, Heritage Foundation: score 1 most economic freedom, 5 least economic freedom)	$\lambda_3 = 0.202^*$ (2.56)
Unemployment quota (%)	$\lambda_4 = 0.345^{**}$ (3.21)
GDP per capita (in US-\$)	$\lambda_5 = -0.194^{**}$ (-2.88)
Lagged endogenous variable	$\lambda_6 = 0.214(^*)$ (1.80)
Indicator Variables	
Employment quota (as % of total population 18-64)	$\lambda_7 = -0.612^{**}$ (-3.57)
Annual rate of GDP	$\lambda_8 = -1.00$ (Residuum)
Change of local currency per capita	$\lambda_9 = 0.406^{**}$ (3.20)
Test-statistics	$RMSE^1 = 0.0010(^*)$ (p-value = 0.889) $Chi-square^2 = 342.66$ (p-value = 0.701) $TMCV^3 = 0.084$ $AGFI^4 = 0.682$ $N = 140$ $D.F.^5 = 34$

Notes: t-statistics are given in parentheses (*); *, ** means the t-statistics are statistically significant at the 90%, 95%, or 99% confidence level.

1) Steigers Root Mean Square Error of Approximation (RMSEA) for test of close fit; $RMSEA < 0.05$; the RMSEA-value varies between 0.0 and 1.0.

2) If the structural equation model is asymptotically correct, then the matrix S (sample covariance matrix) will be equal to $\Sigma(\theta)$ (model implied covariance matrix). This test has a statistical validity with a large sample ($N \geq 100$) and multinomial distributions; both are given for all three equations in tables 3.1.1-3.1.3 using a test of multi normal distributions.

3) Test of Multivariate Normality for Continuous Variables (TMNCV); p-values of skewness and kurtosis.

4) Test of Adjusted Goodness of Fit Index (AGFI), varying between 0 and 1; 1 = perfect fit.

5) 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.

Table 3.3: DYMIC Estimation of the Shadow Economy of 21 highly developed OECD Countries, 1990/91, 1994/95, 1997/98, 1999/2000, 2001/02, 2002/03, 2003/04 and 2004/05

Cause Variables	Estimated Coefficients
Share of direct taxation (in % of GDP)	$\lambda_1 = 0.384^{**}$ (3.06)
Share of indirect taxation (in % of GDP)	$\lambda_2 = 0.196^{(*)}$ (1.84)
Share of social security contribution (in % of GDP)	$\lambda_3 = 0.506^{**}$ (3.86)
Burden of state regulation (index of labour market regulation, Heritage Foundation, score 1 least regular, score 5 most regular)	$\lambda_4 = 0.213^{(*)}$ (1.96)
Quality of state institutions (rule of law, World Bank, score -3 worst and +3 best case)	$\lambda_5 = -0.307^{**}$ (-2.61)
Tax morale (WUS and EUS, Index, Scale tax cheating always justified =1, never justified =10)	$\lambda_6 = -0.582^{**}$ (-3.66)
Unemployment quota (%)	$\lambda_7 = 0.324^{**}$ (2.61)
GDP per capita (in US-\$)	$\lambda_8 = -0.106^{**}$ (-3.04)
Lagged endogenous variable	$\lambda_9 = -0.165^{(*)}$ (-1.66)
Indicator Variables	Estimated Coefficients
Employment quota (in % of population 18-64)	$\lambda_{10} = -0.626^{**}$ (-2.72)
Average working time (per week)	$\lambda_{11} = -1.00$ (Residuum)
Annual rate of GDP (adjusted for the mean of all 22 OECD countries)	$\lambda_{12} = -0.274^{**}$ (-3.03)
Change of local currency per capita	$\lambda_{13} = 0.312^{**}$ (3.74)
Test-statistics	RMSE ¹⁾ = 0.0016* (p-value = 0.903) Chi-square ²⁾ = 26.43 (p-value = 0.906) TMCV ³⁾ = 0.049 AGFI ⁴⁾ = 0.763 N = 168 D.F. ⁵⁾ = 67
Notes: t-statistics are given in parentheses (*); *, ** means the t-statistics are statistically significant at the 90%, 95%, or 99% confidence level. 1) Steigers Root Mean Square Error of Approximation (RMSEA) for test of close fit; RMSEA < 0.05; the RMSEA-value varies between 0.0 and 1.0. 2) If the structural equation model is asymptotically correct, then the matrix S (sample covariance matrix) will be equal to $\Sigma(\theta)$ (model implied covariance matrix). This test has a statistical validity with a large sample (N \geq 100) and multinomial distributions; both are given for all three equations in tables 3.1.1-3.1.3 using a test of	

multi normal distributions.

- 3) Test of Multivariate Normality for Continuous Variables (TMNCV); p-values of skewness and kurtosis.
- 4) Test of Adjusted Goodness of Fit Index (AGFI), varying between 0 and 1; 1 = perfect fit.
- 5) 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.

3.2 The Size of the Shadow Economies for 145 Countries for 1999/2000 to 2004/2005

When showing the size of the shadow economies over the five periods of time (1999/2000, 2001/2002, 2002/2003, 2003/2004 and 2004/2005) for the 145 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 DYMIMIC and the currency demand methods have shortcomings; these are discussed in appendix (chapter 6)¹⁸⁾. Due to these shortcomings a detailed discussion of the (relative) ranking of the size of the shadow economies is not conducted.

3.2.1 Developing Countries¹⁹⁾

The results of the shadow economies for developing countries are divided by continent into Africa, Asia, and Central and South America, and are shown in Tables 3.2.1-3.2.3. The results for thirty-seven African countries are shown in Table 3.2.1. If we first consider the development of the shadow economies in these thirty-seven African countries from 1999/2000 to 2004/2005, we realize that shadow economies in these African nations have increased. On average, the size of these thirty-seven African shadow economies was 41.3% (of official GDP) in 1999-2000, and increased to 42.8% in 2004/2005 but highest average value with 43.2 occurred in the years 2002/03 and 2003/04, since then we have a slight decrease to 42.8% in 2004/05. Turning to the latest results for 2004/2005, Zimbabwe, Nigeria and Tanzania (with 64.6, 59.5 and 58.2% respectively) have by far the largest shadow economies, and the country in the median position is Mozambique with 43.5%. South Africa has the lowest shadow economy, with 28.2%, followed by Lesotho with 32.3%, and Namibia with 32.4%.

¹⁸⁾ See also Thomas (1992, 1999), Tanzi (1999), Pedersen (2003) and Ahumada, Alveredo, Cavanese A and P. Cavanese (2004), Janisch and Brümmerhoff (2005), Schneider (2005) and Breusch (2005a, 2005b).

¹⁹⁾ For an extensive and excellent literature survey of the research about the shadow economy in developing countries see Gerxhani (2003), who stresses throughout 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)

The large shadow economy in Africa (and in other developing countries) is only to some extent an issue of tax burdens 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.

Table 3.2.1: The Size of the Shadow Economy in Thirty-Seven African Countries

No.	Country	Shadow Economy (in % of official GDP) using the DYMIMIC and Currency Demand Method				
		1999/00	2001/02	2002/03	2003/04	2004/05
1	Algeria	34.1	35.0	35.6	34.8	33.9
2	Angola	43.2	44.1	45.2	45.3	45.0
3	Benin	47.3	48.2	49.1	49.3	49.8
4	Botswana	33.4	33.9	34.6	34.2	33.8
5	Burkina Faso	41.4	42.6	43.3	43.8	43.1
6	Burundi	36.9	37.6	38.7	39.4	39.7
7	Cameroon	32.8	33.7	34.9	34.4	33.6
8	Central African Republic	44.3	45.4	46.1	46.3	46.9
9	Chad	46.2	47.1	48.0	48.4	47.8
10	Congo, Dem. Rep.	48.0	48.8	49.7	50.4	50.8
11	Republic of Congo	48.2	49.1	50.1	50.5	51.1
12	Cote d'Ivoire	43.2	44.3	45.2	45.4	44.7
13	Egypt, Arabian Republic	35.1	36.0	36.9	36.3	35.4
14	Ethiopia	40.3	41.4	42.1	42.7	42.0
15	Ghana	41.9	42.7	43.6	43.8	43.2
16	Guinea	39.6	40.8	41.3	41.7	41.0
17	Kenya	34.3	35.1	36.0	35.4	34.8
18	Lesotho	31.3	32.4	33.3	32.8	32.3
19	Madagascar	39.6	40.4	41.6	41.9	41.2
20	Malawi	40.3	41.2	42.1	42.7	41.9
21	Mali	42.3	43.9	44.7	44.0	43.2
22	Mauritania	36.1	37.2	38.0	37.4	36.8
23	Morocco	36.4	37.1	37.9	37.3	36.7
24	Mozambique	40.3	41.3	42.4	42.9	43.5
25	Namibia	31.4	32.6	33.4	33.0	32.4
26	Niger	41.9	42.6	43.8	44.1	44.2
27	Nigeria	57.9	58.6	59.4	59.6	59.5
28	Rwanda	40.3	41.4	42.2	42.4	41.6
29	Senegal	45.1	46.8	47.5	47.8	48.2
30	Sierra Leone	41.7	42.8	43.9	44.1	44.3
31	South Africa	28.4	29.1	29.5	29.0	28.2
32	Tanzania	58.3	59.4	60.2	59.1	58.2
33	Togo	35.1	39.2	40.4	40.6	39.4
34	Tunisia	38.4	39.1	39.9	39.4	38.3
35	Uganda	43.1	44.6	45.4	45.8	44.9
36	Zambia	48.9	49.7	50.8	50.2	49.3
37	Zimbabwe	59.4	61.0	63.2	63.9	64.6
Unweighted Average		41.3	42.3	43.2	43.2	42.8

Source: Own calculations.

In Table 3.2.2, the results for twenty-eight Asian countries are shown. It is somewhat difficult to treat all Asian countries equally, because some, such as Israel, Singapore, and Hong Kong, are highly developed, while others, such as Thailand and Nepal, are still developing. The average shadow economy in the region increased from 28.5% in 1999/2000, to 29.8% of official GDP in 2004/2005; however in 2002/03 the shadow economies of most Asian countries reached a peak value with 30.4% (average value over the 28 countries) which decreased to 29.8% (average) in 2004/05. Looking at individual countries²⁰⁾ for the year 2004/2005, with 53.6% Thailand has by far the largest shadow economy, followed by Cambodia with 52.2%, and Sri Lanka with 48.8% of official GDP. The median country is the Republic of South Korea with 27.6% of official GDP, surrounded by Yemen with 27.3% and United Arab Emirates with 26.5%. Singapore, Hong Kong and Saudi Arabia have the lowest shadow economies with 12.1%, 15.6%, and 18.4% of official GDP, respectively.

It is somewhat astonishing that the average size of the Asian shadow economies is considerably smaller than the shadow economies of African and Latin American states—this is partly due to the fact that there are a greater number of developed countries, which have smaller shadow economies located in Asia. It should be noted, however, that the average increase of shadow economies in the region is slightly more rapid than in Africa. This is not surprising, given that the size of the average African shadow economy is already more than eleven percentage points higher than its Asian counterpart. There is simply more room for growth in Asia.

In Table 3.2.3, the sizes of shadow for twenty-one Central and South American countries are shown. Averaging the figures over all twenty-one Central and South American countries, the shadow economy increased from 41.1% in the year 1999/2000 to 42.2% of official GDP in 2004/2005; however, in 2002/03 the shadow economies of most Central and South American countries reached a peak value with 43.4% (average of over the 21 countries), which decreased then to 42.2% (average) in 2004/05. If I turn to the size of the shadow economy for single countries for 2004/2005, Bolivia has the largest shadow economy with 67.2%, followed by Panama with 62.2% and Peru with 58.2% of official GDP. The median country is Brazil with 41.8% and at the lower end is Chile with 19.4%, Costa Rica with 26.3%, and Argentina with 27.2% of official GDP.

The sizes of the shadow economies of African and Central and South American countries are generally similar. This is partly due to the factors mentioned earlier; for the

²⁰⁾ The case of India has been extensively investigated by Chatterjee, Chaudhury and Schneider (2006).

majority of citizens in many of these countries, the only way to ensure a decent standard of living is to turn to the black market. As income inequality is much more pronounced in most Central and South American countries, compared to Africa, the rate of increase in shadow economy activity in Central and South America is higher.

Table 3.2.2: The Size of the Shadow Economy in Twenty-Eight Asian Countries

No.	Country	Shadow Economy (in % of official GDP) using the DYMIMIC and Currency Demand Method				
		1999/00	2001/02	2002/03	2003/04	2004/05
1	Bangladesh	35.6	36.5	37.7	38.3	38.0
2	Bhutan	29.4	30.5	31.7	32.7	33.1
3	Cambodia	50.1	51.3	52.4	52.9	52.2
4	Hong Kong, China	16.6	17.1	17.2	16.4	15.6
5	India	23.1	24.2	25.6	25.9	25.1
6	Indonesia	19.4	21.8	22.9	23.6	24.0
7	Iran, Islamic Republic	18.9	19.4	19.9	20.2	19.7
8	Israel	21.9	22.8	23.9	23.2	22.6
9	Jordan	19.4	20.5	21.6	21.2	20.4
10	Korea, Republic	27.5	28.1	28.8	28.2	27.6
11	Kuwait	20.1	20.7	21.6	21.2	20.7
12	Lebanon	34.1	35.6	36.2	36.5	37.1
13	Malaysia	31.1	31.6	32.2	32.0	31.4
14	Mongolia	18.4	19.6	20.4	20.6	21.2
15	Nepal	38.4	39.7	40.8	40.2	39.3
16	Oman	18.9	19.4	19.8	19.2	18.6
17	Pakistan	36.8	37.9	38.7	39.2	39.5
18	Papua New Guinea	36.1	37.3	38.6	38.0	37.3
19	Philippines	43.4	44.5	45.6	45.1	44.3
20	Saudi Arabia	18.4	19.1	19.7	19.3	18.4
21	Singapore	13.1	13.4	13.7	13.0	12.1
22	Sri Lanka	44.6	45.9	47.2	48.3	48.8
23	Syrian Arab Republic	19.3	20.4	21.6	21.7	21.2
24	Taiwan, China	25.4	26.6	27.7	27.0	26.3
25	Thailand	52.6	53.4	54.1	54.3	53.6
26	Turkey	32.1	33.2	34.3	33.9	33.2
27	United Arab Emirates	26.4	27.1	27.8	27.2	26.5
28	Yemen, Rep.	27.4	28.4	29.1	28.2	27.3
Unweighted Average		28.5	29.5	30.4	30.3	29.8

Source: Own calculations.

Table 3.2.3: The Size of the Shadow Economy in Twenty-One Central and South American Countries

No.	Country	Shadow Economy (in % of official GDP) using the DYMIMIC and Currency Demand Method				
		1999/00	2001/02	2002/03	2003/04	2004/05
1	Argentina	25.4	27.1	28.9	28.6	27.2
2	Bolivia	67.1	68.1	68.3	68.0	67.2
3	Brazil	39.8	40.9	42.3	42.6	41.8
4	Chile	19.8	20.3	20.9	20.3	19.4
5	Colombia	39.1	41.3	43.4	43.0	42.7
6	Costa Rica	26.2	27.0	27.8	27.1	26.3
7	Dominican Republic	32.1	33.4	34.1	34.4	34.8
8	Ecuador	34.4	35.1	36.7	36.1	35.2
9	El Salvador	46.3	47.1	48.3	48.1	47.2
10	Guatemala	51.5	51.9	52.4	51.1	50.3
11	Haiti	55.4	57.1	58.6	59.3	59.6
12	Honduras	49.6	50.8	51.6	50.8	49.3
13	Jamaica	36.4	37.8	38.9	39.2	38.4
14	Mexico	30.1	31.8	33.2	32.6	31.7
15	Nicaragua	45.2	46.9	48.2	48.8	48.1
16	Panama	64.1	65.1	65.3	64.1	62.2
17	Paraguay	27.4	29.2	31.4	32.4	33.1
18	Peru	59.9	60.3	60.9	59.1	58.2
19	Puerto Rico	28.4	29.4	30.7	29.6	28.2
20	Uruguay	51.1	51.4	51.9	50.8	49.2
21	Venezuela, RB	33.6	35.1	36.7	36.1	35.4
Unweighted Average		41.1	42.2	43.4	43.0	42.2

Source: Own calculations.

3.2.2 Transition Countries

The measurement of the size and development of the shadow economies in the transition countries has been undertaken since the late 1980s starting with the work of Kaufmann and Kaliberda (1996), Johnson et al. (1997) and Lacko (2000). They all use the physical input (electricity) method (see Appendix 7.1.2.5) and come up with quite large figures. In the work 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 3.2.4 the size and development of the shadow economy of 25 East and Central European and former Soviet Union countries are presented. Turning again first to the development of the size of the shadow economy over time, the average size of the shadow economy of these 25 East and Central European countries was 38.1% of official GDP in 1999/2000 and increased to 38.8% in 2004/2005; however, the average size of the shadow economies of these 25 East and Central

European and Former Soviet Union countries reached a peak value of 40.1% in 2002/03 and since then declined to 38.8% in 2004/05. The highest shadow economies are in Georgia, Azerbaijan and the Ukraine with 66.4%, 59.4% and 55.3%. The median country is Bulgaria, surrounded by Serbia and Montenegro with 37.3% and Romania with 35.4%. At the lower end are the Czech Republic with 18.3%, the Slovak Republic with 18.2% and Hungary with 24.3% of official GDP.

Table 3.2.4: The Size of the Shadow Economy in 25 East and Central European and Former Soviet Union Countries

No.	Country	Shadow Economy (in % of official GDP) using the DYMIMIC and Currency Demand Method				
		1999/00	2001/02	2002/03	2003/04	2004/05
1	Albania	33.4	34.6	35.3	35.0	34.3
2	Armenia	46.3	47.8	49.1	48.4	47.6
3	Azerbaijan	60.6	61.1	61.3	60.8	59.4
4	Belarus	48.1	49.3	50.4	50.5	50.8
5	Bosnia and Herzegovina	34.1	35.4	36.7	36.2	35.3
6	Bulgaria	36.9	37.1	38.3	37.4	36.5
7	Croatia	33.4	34.2	35.4	34.7	34.1
8	Czech Republic	19.1	19.6	20.1	19.2	18.3
9	Estonia	38.4	39.2	40.1	39.1	38.2
10	Georgia	67.3	67.6	68.0	67.3	66.4
11	Hungary	25.1	25.7	26.2	25.3	24.3
12	Kazakhstan	43.2	44.1	45.2	45.4	44.6
13	Kyrgyz Republic	39.8	40.3	41.2	41.4	40.6
14	Latvia	39.9	40.7	41.3	40.4	39.4
15	Lithuania	30.3	31.4	32.6	31.3	30.2
16	Macedonia, FYR	34.1	35.1	36.3	36.8	36.9
17	Moldova	45.1	47.3	49.4	49.5	49.1
18	Poland	27.6	28.2	28.9	28.2	27.3
19	Romania	34.4	36.1	37.4	36.2	35.4
20	Russian Federation	46.1	47.5	48.7	48.2	47.3
21	Serbia and Montenegro	36.4	37.3	39.1	38.2	37.3
22	Slovak Republic	18.9	19.3	20.2	19.1	18.2
23	Slovenia	27.1	28.3	29.4	28.2	27.3
24	Ukraine	52.2	53.6	54.7	54.9	55.3
25	Uzbekistan	34.1	35.7	37.2	36.3	35.4
Unweighted Average		38.1	39.1	40.1	39.5	38.8

Source: Own calculations.

3.2.3 Highly developed OECD-Countries

The size and development of the shadow economies of 21 highly developed OECD countries are shown in table 3.2.5.

Table 3.2.5: The Size of the Shadow Economy in 21 OECD Countries

	Country	Shadow Economy (in % of official GDP) using the DYMIMIC and Currency Demand Method				
		1999/00	2001/02	2002/03	2003/04	2004/05
1	Australia	14.3	14.1	13.5	13.1	12.8
2	Austria	9.8	10.6	10.9	10.1	9.3
3	Belgium	22.2	22.0	21.0	20.4	19.6
4	Canada	16.0	15.8	15.2	14.8	14.1
5	Denmark	18.0	17.9	17.3	16.7	16.1
6	Finland	18.1	18.0	17.4	16.4	15.8
7	France	15.2	15.0	14.5	13.8	13.2
8	Germany	16.0	16.3	16.8	16.1	15.3
9	Greece	28.7	28.5	28.2	27.4	26.3
10	Ireland	15.9	15.7	15.3	14.8	14.1
11	Italy	27.1	27.0	25.7	24.8	23.2
12	Japan	11.2	11.1	10.8	9.4	8.8
13	Netherlands	13.1	13.0	12.6	12.0	11.1
14	New Zealand	12.8	12.6	12.3	11.6	10.9
15	Norway	19.1	19.0	18.4	17.6	16.8
16	Portugal	22.7	22.5	21.9	21.1	20.4
17	Spain	22.7	22.5	22.0	21.2	20.5
18	Sweden	19.2	19.1	18.3	17.2	16.3
19	Switzerland	8.6	9.4	9.4	9.0	8.5
20	United Kingdom	12.7	12.5	12.2	11.7	10.3
21	United States	8.7	8.7	8.4	8.2	7.9
	Unweighted Average	16.8	16.7	16.3	15.6	14.8

Source: Own calculations.

If I consider again the development of the size of the shadow economies of these 21 OECD countries, I realize for the first time that the size of the shadow economy of these countries has decreased over the period 1999/2000 to 2004/2005. The average size of the shadow economy in 1999/2000 of these countries was 16.8% of official GDP; it decreased to 14.8% in 2004/2005. If I consider single countries, Greece, Italy and Spain have by far the largest shadow economy in 2004/2005 with 26.3%, 23.2% and 20.5% of official GDP. The median country is Ireland with 14.1% of official GDP surrounded by Germany with 15.3%²¹⁾ and Canada with 14.1%. At the lower end are the United States, Switzerland and Japan with a shadow economy of 7.9%, 8.5% and 8.8% of official GDP.

3.2.4 South West Pacific Islands

The size and development of the shadow economies of 10 South West Pacific islands are presented in table 3.2.6.

²¹⁾ Pickhardt and Sarda-Pous (2006) reach very similar values of the shadow economy for Germany using a

Table 3.2.6.: The Size of the Shadow Economy in 10 South West Pacific Islands

	Country	Shadow Economy (in % of official GDP) using the DYMIMIC and Currency Demand Method				
		1999/00	2001/02	2002/03	2003/04	2004/05
1	Fiji	33.6	34.3	35.1	34.6	33.8
2	Kiribati	34.1	35.0	35.3	34.8	34.0
3	Maldives	30.3	31.4	32.0	31.6	30.9
4	Marshall Islands	28.1	29.0	29.6	28.7	27.9
5	Micronesia, Fed. Sts.	31.3	32.1	33.2	32.6	31.9
6	Palau	28.4	29.2	30.0	29.2	28.4
7	Samoa	31.4	32.6	33.5	33.1	32.8
8	Solomon Islands	33.4	34.5	35.3	34.6	34.0
9	Tonga	35.1	36.3	37.4	36.8	35.8
10	Vanuatu	30.9	31.7	32.5	32.0	31.4
Unweighted Average		31.7	32.6	33.4	32.8	32.1

Source: Own calculations.

If I again consider the development over time, the average size of the shadow economy of these 10 South West Pacific islands countries increased from 31.7% in the year 1999/2000 to 32.1% in the year 2004/2005; however, the average value of these 10 West Pacific Islands reached a peak value of 33.4% in 2002/03 and since then declined to 32.1% in 2004/05. Considering 2004/05, the largest shadow economy is in Tonga, with 35.8%, followed by the Solomon Islands with 34.0% and Kiribati with 34.0%. In the middle field is Micronesia and Samoa with a shadow economy of 31.9% and 32.8% of official GDP. The lowest shadow economy have the Marshall Islands and Palau with a shadow economy of 27.9% and 28.4%.

3.2.5 Communist Countries

In this last section the size and development of the shadow economies of three communist countries (China, Laos and Vietnam) are presented. The results are shown in table 3.2.7.

Table 3.2.7: The Size of the Shadow Economy in 3 Communist Countries

No.	Country	Shadow Economy (in % of official GDP) using the DYMIMIC and Currency Demand Method				
		1999/00	2001/02	2002/03	2003/04	2004/05
1	China	13.1	14.4	15.6	16.1	16.6
2	Lao PDR	30.6	31.9	33.4	33.9	33.2
3	Vietnam	15.6	16.9	17.9	16.9	16.1
Unweighted Average		19.8	21.1	22.3	22.3	22.0

Source: Own calculations.

The average size of the shadow economy in the above mentioned countries in 1999/2000 was 19.8%, and by 2004/2005 had increased to 22.0%. Laos has the largest shadow economy with 33.2% and Vietnam the lowest with 16.1%. It should be clear that the shadow economy in these countries, and especially in China (16.6%), which is partly a market economy and yet still a planned socialist economy, is difficult to interpret. It should be more seen as a parallel economy, where especially farmers and small firms in rural regions produce additional products to earn some (extra) money. It is an open question whether the findings of these shadow economies can be compared to others. That is one reason why they are shown in this paper in an extra section and should be interpreted with caution with respect to their size and the label "shadow" or "grey" economy.

4 Corruption and the Shadow Economy: Substitutes or Compliments?²²⁾

Quite often shadow economy and corruption²³⁾ are seen as "twins", who need each other or fight against each other. This means for a social scientist that, theoretically, corruption and the shadow economy can be either complements or substitutes. Choi and Thum (2004) present a model where the option of entrepreneurs to go underground constrains a corrupt official's ability to ask for bribes. Dreher, Kotsogiannis and McCorrison (2005a/b) extend the model to the explicit specification of institutional quality. The model shows that corruption and shadow economy are substitutes in the sense that the existence of the shadow economy reduces the propensity of officials to demand graft.

Johnson et al. (1998), on the contrary, model corruption and the shadow economy as complements. In their full-employment model, labour can be either employed in the official sector or in the underground economy. Consequently, an increase in the shadow economy always decreases the size of the official market. In their model, corruption increases the shadow economy, as corruption can be viewed as one particular form of taxation and regulation (driving entrepreneurs underground). Hindriks et al. (1999) also show that the

²²⁾ This section is taken from Dreher and Schneider (2006), pages 4, 5 and 14 as well as table 4.1.

²³⁾ According to Dreher and Schneider (2006), corruption is commonly defined as the misuse of public power for private benefit.

shadow economy is a complement to corruption. This is because, in this case, the tax payer colludes with the inspector so the inspector under-reports the tax liability of the tax payer in exchange for a bribe²⁴⁾.

Theoretically, the relationship between corruption and the shadow economy is thus unsettled. There is, however, reason to believe that the relationship might differ among high and low income countries. In high income countries, the official sector provides public goods like the rule of law, enforcement of contracts, and protection by an efficient police. Usually, only craftsmen or very small firms have (or take) the option of going underground. In this case, the shadow economy is hidden from tax inspectors and other officials. In other words, there are no bribes necessary or possible to buy the way out of the official sector. In high income countries – typically showing comparably small levels of corruption – individuals confronted with a corrupt official always have the choice to bring the official to court. Moreover, in high income countries corruption quite often takes place, for example, to bribe officials to get a (huge) contract from the public sector (e.g. in the construction sector). This contract is then handled in the official economy and not in the shadow economy. Hence, corruption in high income countries can be a means to achieve certain benefits which make work in the official economy easier, e.g., winning a contract from a public authority, getting a licence (e.g. for operating taxes or providing other services or getting the permission to convert land into "construction ready" land, etc.). In high income countries people thus bribe in order to be able to engage in more official economic activities. As Schneider and Enste (2000) point out, at least two thirds of the income earned in the shadow economy is immediately spent in the official sector. The shadow economy and the official sector might thus be complements. The corresponding increase in government revenue and strengthened institutional quality is likely to decrease corruption. The prediction of a negative (substitutive) relation between corruption and the shadow economy is in line with the models of Choi and Thum (2004) and Dreher, Kotsogiannis and McCorriston (2005a).²⁵⁾

In low income countries, on the contrary, we expect different mechanisms to prevail. Instead of working partly in the official sector and offering additional services underground as in high-income countries, enterprises completely engage in underground activity. Examples for enterprises operating completely underground are restaurants, bars, or haircutters – and even

²⁴⁾ See Dreher and Siemers (2005) for a formalization of this argument.

²⁵⁾ Consequently, Dreher, Kotsogiannis and McCorriston (2005a) test their model employing data for OECD countries only.

big production companies. One reason for this is that public goods provided by the official sector are, in many developing countries, less efficient compared to high income countries. Big companies, however, are comparably easy to detect and – in order to escape taxation and punishment – they have to bribe officials, thereby increasing corruption. Corruption often takes place in order to pay for activities in the shadow economy, so that the shadow economy entrepreneur can be sure not to be detected by public authorities. Here, shadow economy and corruption are likely to reinforce each other, as corruption is needed to expand shadow economy activities and – at the same time – underground activities require bribes and corruption. To get some additional income from the shadow economy entrepreneur, it is natural for public officials to ask for bribes and thus benefit from the shadow market. In low income countries, we therefore expect a positive (complementary) relationship between corruption and the shadow economy. This corresponds to the predictions of the models of Hindriks et al. (1999) and Johnson et al. (1997).

In summary, following Dreher and Schneider (2006), I expect:

Hypothesis 1: In low income countries, shadow economy activities and corruption are complements.

Hypothesis 2: In high income countries, shadow economy activities and corruption are substitutes.

These two hypotheses are tested for a cross-section of 120 countries and a panel of 70 countries for the period 1994 to 2002.²⁶⁾ Table 4.1 summarizes the empirical results of Dreher and Schneider (2006). Overall, they show that an increase in perceived corruption over time also increases the shadow economy. This confirms the models of Johnson et al. (1998) and Hindriks et al. (1999). Across countries, however, greater perceived corruption does not lead to a greater shadow economy. To some extent this also supports the results of Méon and Sekkat (2004) showing the within-country variation to be important in their analysis of corruption on foreign direct investment and exports.

Regarding the impact of the shadow economy on perceived corruption, these results for the overall sample are similar to those for the other way round. In the cross-country regressions, all coefficients are completely insignificant. An increase in the shadow economy over time increases corruption according to the fixed and random effects estimator, but not when the

²⁶⁾ For the description of the data, the estimation techniques used, and the various specification see Dreher and

endogeneity of the shadow is controlled. Turning to the sub-samples, the results show that higher perceived corruption significantly reduces the shadow economy in high income countries, confirming the models of Choi and Thum (2004) and Dreher, Kotsogiannis and McCorrison (2005a). In low income countries, on the contrary, corruption tends to increase with a higher shadow economy, again confirming the models of Johnson et al. (1998) and Hindriks et al. (1999). This is true for the impact of perceived corruption in the within-groups specification and actual corruption in all specifications.

Table 4.1: Empirical Results of the Relationship between the Shadow Economy and Corruption

Dependent Variable:	Shadow Economy			Corruption		
Independent Variable:	Corruption			Shadow Economy		
Estimation technique	All	Low	High	All	Low	High
ICRG index of corruption						
OLS	1.88 (1.20)	3.57 (1.34)	-0,84 (0.97)	0.00 (0.41)	0.01 (1.14)	-0.07 (3.57***)
Robust regression	1.32 (0.82)	-	-	0.00 (0.43)	-	-
IV, set 1	3.72 (1.17)	3.12 (0.86)	5.41 (1.40)	-0.03 (1.28)	-0.01 (0.42)	-0.09 (1.57)
IV, set 2	-4.04 (1.33)	5.14 (0.78)	-1.85 (1.91*)	-0.02 (0.66)	-0.02 (0.46)	-0.11 (1.45)
Panel, fixed effects	1.34 (2.63**)	1.36 (1.42)	0.69 (1.98**)	0.09 (2.88***)	0.10 (2.77***)	0.09 (0.76)
Panel, random effects	1.59 (4.81***)	-	-	0.02 (2.64***)	-	-
Panel IV	3.46 (3.48***)	-	-	0.01 (0.12)	-	-
TI index of corruption						
OLS	-	-	-	-	-	-0.06 (2.35**)
World Bank Index of corruption						
OLS	-	-	-	-	-	-0.01 (2.76**)
DKM index of corruption						
OLS	-	-	-	0.04 (1.77*)	0.06 (2.49**)	-0.10 (1.50)
Robust regression	-	-	-	0.04 (1.69*)	-	-
IV, set 1	-	-	-	0.14 (2.59**)	0.10 (2.65**)	-0.32 (1.22)
IV, set 2	-	-	-	0.12 (2.45**)	0.12 (2.50**)	0.04 (0.19)

Notes: Higher values represent more corruption; corruption indices used: ICRG International Country Risk Guide; TI=Transparency International; World Bank Index of Corruption; and DKM-Index of Dreher, Kotsogiannis and McCorrison.

Instruments for the shadow economy are: (1) Credit Market Regulations (Fraser), Minimum Wage Regulation (Fraser), Government Effectiveness (World Bank); (2) Starting a Business (Duration), Starting a Business (Costs), Flexibility to Hire, Flexibility to Fire.

Instruments for corruption are: (1) Fiscal Burden (Heritage), Regulation of Prices (Fraser), Rule of Law (World Bank), Democracy; (2) Ethnic Fractionalization, Religious Fractionalization, Latitude, French Legacy, Socialist Legacy, German Legacy, Scandinavian Legacy.

*** denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level**

Source: Dreher and Schneider (2006, table 12).

5 Summary and Conclusions

There have been many obstacles to overcome to measure the size of the shadow economy, to analyze its consequences on the official economy and the interaction between corruption and the shadow economy, but as this paper shows some progress has been made. I provided estimates of the size of the shadow economies for 145 countries for five periods of time (1999/2000, 2001/2002, 2002/2003, 2003/04 and 2004/05) using the DYMIMIC and for the econometric estimation the currency demand approach for calibrating the values into absolute ones. Coming back to the headline of this paper, some new knowledge/insights are gained with respect to the size and development of the shadow economy of 145 countries,²⁷⁾ and to the relationship between the shadow economy and corruption leading to four conclusions:

The first conclusion from these results is that for all countries investigated the shadow economy has reached a remarkably large size; the summarized results are shown in table 5.1. This table clearly shows that the average size of the shadow economies of all seven groups of countries (mostly developing countries in Africa, Central and South America, Asia, Transition countries, highly developed OECD countries, South Pacific Islands and Communist Countries) reached a peak value of 35.2% of official GDP in 2002/03 and since then declined to 34.5% in 2004/05. Hence the first conclusion is that in later years the shadow economies of most of these countries is modestly shrinking!

²⁷⁾ In the appendix some critical discussion of these two methods is given; they have well known weaknesses (compare also Pedersen, 2003).

Table 5.1: Average Size of the Shadow Economy for Developing, Transition and OECD-Countries in % of official GDP

Countries/Year	Average Size of the Shadow Economy – Value added in % of official GDP using DYMIMIC for estimation and Currency Demand method for calibration (<i>Number of Countries</i>)				
	1999/2000	2000/2001	2002/2003	2003/2004	2004/2005
Mostly developing countries:					
Africa	41.3 (37)	42.3 (37)	43.2 (37)	43.2 (37)	42.8 (37)
Central and South America	41.1 (21)	42.1 (21)	43.4 (21)	43.0 (21)	42.2 (21)
Asia	28.5 (28)	29.5 (28)	30.4 (28)	30.3 (28)	29.8 (28)
Transition countries	38.1 (25)	39.1 (25)	40.1 (25)	39.5 (25)	38.8 (25)
Highly developed OECD Countries	16.8 (21)	16.7 (21)	16.3 (21)	15.6 (21)	14.8 (21)
South Pacific Islands	31.7 (10)	32.6 (10)	33.4 (10)	32.8 (10)	32.1 (10)
Communist Countries	19.8 (3)	21.1 (3)	22.3 (3)	22.3 (3)	22.0 (3)
Unweighted Average over 145 Countries	33.6	34.5	35.2	34.9	34.3

Source: Own calculations.

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 activity for a variety of reasons, among the most important of which we can count are government actions, most notably, taxation and regulation.

Considering a public choice perspective a **third conclusion** for highly developed countries is that a government may not have a great interest to reduce the shadow economy due to the fact that:

- (i) tax losses may be moderate, as at least 2/3 of the the income earned in the shadow economy is immediately spent in the official economy,
- (ii) income earned in the shadow economy increases the standard of living of at least 1/3 of the working population,

(iii) between 40 and 50% of the shadow economy activities have a complementary character, which means that additional value added has been created, which increases the official (overall) GDP, and

(iv) people who work in the shadow economy have less time for other things like going to demonstrations, etc.

Considering these three 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. In a number of OECD countries this policy direction has been successfully implemented and this has led to a reduction of the shadow economy.

The fourth conclusion is that the shadow economy reduces corruption in high income countries (substitution effect) and increases corruption in low income countries (complementary effect).

6 Appendix 1: Methods to Estimate the Size of the Shadow Economy: The DYMIMIC and Currency Demand Approach

As has already been mentioned in chapter 3, estimating the size and development of a shadow economy is a difficult and challenging task. In this appendix, I give a short but comprehensive overview of the currency demand and the DYMIMIC-approach; each is briefly discussed as well as critically evaluated.²⁸⁾

6.1 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 leave some "traces" of the shadow economy. It 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

²⁸⁾ A discussion and critical evaluation of all used approaches is given in Schneider (2005, 2007).

(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. Additionally, such variables 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:

$$\ln (C / M_2)_t = \beta_0 + \beta_1 \ln (1 + TW)_t + \beta_2 \ln (WS / Y)_t + \beta_3 \ln R_t + \beta_4 \ln (Y / N)_t + u_t$$

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.²⁹⁾

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 development 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

²⁹⁾ 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.

same income 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.

The currency demand approach is one of the most commonly used approaches. It has been applied to many OECD countries,³⁰⁾ but has nevertheless been criticized on various grounds.³¹⁾ 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.³²⁾
- (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.³³⁾ Moreover, Frey and Pommerehne (1984) and

³⁰⁾See Karmann (1986 and 1990), Schneider (1997, 1998a, 2005), Johnson, Kaufmann and Zoido-Lobaton (1998a), and Williams and Windebank (1995).

³¹⁾See Thomas (1992, 1999); Feige (1986); Pozo (1996); Pedersen (2003) and Ahumada, Alvareda, Canavese A. and P. Canavese (2004); Janisch and Brümmerhof (2005); and Breusch (2005a,b).

³²⁾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).

³³⁾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-\$ used abroad and the US currency used 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

Thomas (1986, 1992, 1999) claim that Tanzi's parameter estimates are not very stable.³⁴⁾

- (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.
- (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.

6.2 The Model Approach³⁵⁾

All methods described so far that are designed to estimate the size and development of the shadow economy 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, labour, 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 model

to reduced transactions costs.

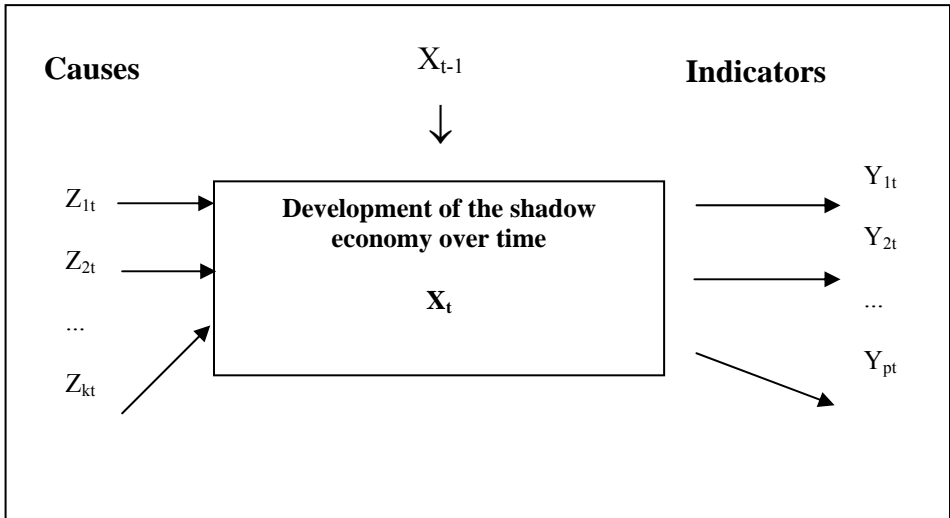
³⁴⁾ However in studies for European countries Kirchgaessner (1983, 1984) and Schneider (1986) reach the conclusion that the estimation results for Germany, Denmark, Norway and Sweden are quite robust when using the currency demand method. Hill and Kabir (1996) find for Canada that the rise of the shadow 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]).

³⁵⁾ This part is derived from a longer study by Aigner, Schneider, and Ghosh (1988, p. 303), applying this approach for the United States over time; for Germany this approach has been applied by Karmann (1986 and 1990). 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 and 1983b)), an approach which has been used to provide a ranking of the relative size of the shadow economy in different countries.

approach 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.

The empirical method used is quite different from those used so far. It is based on the statistical theory of unobserved variables, which considers multiple causes and multiple indicators of the phenomenon to be measured. For the estimation, a factor-analytic approach is used to measure the hidden economy as an unobserved variable over time. The unknown coefficients are estimated in a set of structural equations within which the "unobserved" variable cannot be measured directly. The DYMIMIC (dynamic multiple-indicators multiple-causes) model consists in general of two parts, with the measurement model linking the unobserved variables to observed indicators.³⁶⁾ The structural equations model specifies causal relationships among the unobserved variables. In this case, there is one unobserved variable, or the size of the shadow economy; this is assumed to be influenced by a set of indicators for the shadow economy's size, thus capturing the structural dependence of the shadow economy on variables that may be useful in predicting its movement and size in the future. The interaction over time between the causes Z_{it} ($i = 1, 2, \dots, k$) the size of the shadow economy X_t , in time t and the indicators Y_{jt} ($j = 1, 2, \dots, p$) is shown in Figure 6.1.

Figure 6.1: Development of the shadow economy over time.



There is a large body of literature³⁷⁾ on the possible causes and indicators of the shadow economy, in which the following three types of causes are distinguished:

³⁶⁾ The latest papers dealing extensively with the DYMIMIC or MIMIC approach, its development and its weaknesses are from Del'Anno (2003) and the excellent study by Giles and Tedds (2002), as well as Breusch (2005a, 2005b), Schneider (2005), and Pickhardt and Sarda-Pous (2006).

³⁷⁾ Thomas (1992); Schneider (1994a, 1997, 2003, 2005); Pozo (1996); Johnson, Kaufmann and Zoido-Lobaton

Causes

- (i) The burden of direct and indirect taxation, both actual and perceived. A rising burden of taxation provides a strong incentive to work in the shadow economy.
- (ii) The burden of regulation as proxy for all other state activities. It is assumed that increases in the burden of regulation give a strong incentive to enter the shadow economy.
- (iii) The "tax morality" (citizens' attitudes toward the state), which describes the readiness of individuals (at least partly) to leave their official occupations and enter the shadow economy: it is assumed that a declining tax morality tends to increase the size of the shadow economy.³⁸⁾

Indicators

A change in the size of the shadow economy may be reflected in the following indicators:

- (i) Development of monetary indicators. If activities in the shadow economy rise, additional monetary transactions are required.
- (ii) Development of the labour market. Increasing participation of workers in the hidden sector results in a decrease in participation in the official economy. Similarly, increased activities in the hidden sector may be expected to be reflected in shorter working hours in the official economy.
- (iii) Development of the production market. An increase in the shadow economy means that inputs (especially labour) move out of the official economy (at least partly), and this displacement might have a depressing effect on the official growth rate of the economy.

The latest use of the model approach has been undertaken by Giles (1999a, 1999b, 1999c) and by Giles, Tedds and Werkneh (2002), Giles and Tedds (2002), Chatterjee, Chaudhury and Schneider (2006), Bajada and Schneider (2005), and Pickhardt and Sarda-Pous (2006). They basically estimate a comprehensive (sometime dynamic) MIMIC model to get a time series index of the hidden/measured output of New Zealand, Canada, Germany, India or Australia, and then estimate a separate "cash-demand model" to obtain a benchmark for converting this

(1998a, 1998b); Giles (1997a, 1997b, 1999a, 1999b, 1999c); Giles and Tedds (2002), Giles, Tedds and Werkneh (2002), Del'Anno (2003) and Del'Anno and Schneider (2004).

³⁸⁾ When applying this approach for European countries, Frey and Weck-Hannemann (1984) had difficulty in obtaining reliable data for the cause series, besides the ones for the direct and indirect tax burden. Hence, their study was criticized by Helberger and Knepel (1988), who argue that the results were unstable with respect to

index into percentage units. Unlike earlier empirical studies of the hidden economy, they paid proper attention to the non-stationary, and possible co-integration of time series data in both models. Again this DYMIMIC model treats hidden output as a latent variable, and uses several (measurable) causal variables and indicator variables. The former include measures of the average and marginal tax rates, inflation, real income and the degree of regulation in the economy. The latter include changes in the (male) labour force participation rate and in the cash/money supply ratio. In their cash-demand equation they allow for different velocities of currency circulation in the hidden and recorded economies. Their 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/measured output, so that the index for this ratio predicted by the DYMIMIC 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 DYMIMIC 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 (DY)MIMIC method, i.e.:

- (1) instability in the estimated coefficients with respect to sample size changes,
- (2) instability in the estimated coefficients with respect to alternative specifications,
- (3) difficulty of obtaining reliable data on cause variables other than tax variables, and
- (4) the reliability of the variables grouping into "causes" and "indicators" in explaining the variability of the shadow economy.

6.3 The Size and Development of the Shadow Economies of 145 Countries over 1999/2000 to 2004/2005

Finally, the results of the size and development of the shadow economies of 145 countries are shown (and the countries are listed in alphabetical order) in table 6.3.

Table 6.3: The Size of the Shadow Economy of 145 Countries

No.	Country	Shadow Economy (in % of official GDP) using the DYMIMIC and Currency Demand Method				
		1999/00	2001/02	2002/03	2003/04	2004/05
1	Albania	33.4	34.6	35.3	35.0	34.3
2	Algeria	34.1	35.0	35.6	34.8	33.9
3	Angola	43.2	44.1	45.2	45.3	45.0

changing variables in the model and over the years.

No.	Country	Shadow Economy (in % of official GDP) using the DYMIMIC and Currency Demand Method				
		1999/00	2001/02	2002/03	2003/04	2004/05
4	Argentina	25.4	27.1	28.9	28.6	27.2
5	Armenia	46.3	47.8	49.1	48.4	47.6
6	Australia	14.3	14.1	13.5	13.1	12.8
7	Austria	9.8	10.6	10.9	10.1	9.3
8	Azerbaijan	60.6	61.1	61.3	60.8	59.4
9	Bangladesh	35.6	36.5	37.7	38.3	38.0
10	Belarus	48.1	49.3	50.4	50.5	50.8
11	Belgium	22.2	22.0	21.0	20.4	19.6
12	Benin	47.3	48.2	49.1	49.3	49.8
13	Bhutan	29.4	30.5	31.7	32.7	33.1
14	Bolivia	67.1	68.1	68.3	68.0	67.2
15	Bosnia and Herzegovina	34.1	35.4	36.7	36.2	35.3
16	Botswana	33.4	33.9	34.6	34.2	33.8
17	Brazil	39.8	40.9	42.3	42.6	41.8
18	Bulgaria	36.9	37.1	38.3	37.4	36.5
19	Burkina Faso	41.4	42.6	43.3	43.8	43.1
20	Burundi	36.9	37.6	38.7	39.4	39.7
21	Cambodia	50.1	51.3	52.4	52.9	52.2
22	Cameroon	32.8	33.7	34.9	34.4	33.6
23	Canada	16.0	15.8	15.2	14.8	14.1
24	Central African Republic	44.3	45.4	46.1	46.3	46.9
25	Chad	46.2	47.1	48.0	48.4	47.8
26	Chile	19.8	20.3	20.9	20.3	19.4
27	China	13.1	14.4	15.6	16.1	16.6
28	Colombia	39.1	41.3	43.4	43.0	42.7
29	Congo, Dem. Rep.	48.0	48.8	49.7	50.4	50.8
30	Costa Rica	26.2	27.0	27.8	27.1	26.3
31	Cote d'Ivoire	43.2	44.3	45.2	45.4	44.7
32	Croatia	33.4	34.2	35.4	34.7	34.1
33	Czech Republic	19.1	19.6	20.1	19.2	18.3
34	Denmark	18.0	17.9	17.3	16.7	16.1
35	Dominican Republic	32.1	33.4	34.1	34.4	34.8
36	Ecuador	34.4	35.1	36.7	36.1	35.2
37	Egypt, Arabian Republic	35.1	36.0	36.9	36.3	35.4
38	El Salvador	46.3	47.1	48.3	48.1	47.2
39	Estonia	38.4	39.2	40.1	39.1	38.2
40	Ethiopia	40.3	41.4	42.1	42.7	42.0
41	Fiji	33.6	34.3	35.1	34.6	33.8
42	Finland	18.1	18.0	17.4	16.4	15.8
43	France	15.2	15.0	14.5	13.8	13.2
44	Georgia	67.3	67.6	68.0	67.3	66.4
45	Germany	16.0	16.3	16.8	16.1	15.3
46	Ghana	41.9	42.7	43.6	43.8	43.2
47	Greece	28.7	28.5	28.2	27.4	26.3
48	Guatemala	51.5	51.9	52.4	51.1	50.3
49	Guinea	39.6	40.8	41.3	41.7	41.0
50	Haiti	55.4	57.1	58.6	59.3	59.6
51	Honduras	49.6	50.8	51.6	50.8	49.3
52	Hong Kong, China	16.6	17.1	17.2	16.4	15.6

No.	Country	Shadow Economy (in % of official GDP) using the DYMIMIC and Currency Demand Method				
		1999/00	2001/02	2002/03	2003/04	2004/05
53	Hungary	25.1	25.7	26.2	25.3	24.3
54	India	23.1	24.2	25.6	25.9	25.1
55	Indonesia	19.4	21.8	22.9	23.6	24.0
56	Iran, Islamic Republic	18.9	19.4	19.9	20.2	19.7
57	Ireland	15.9	15.7	15.3	14.8	14.1
58	Israel	21.9	22.8	23.9	23.2	22.6
59	Italy	27.1	27.0	25.7	24.8	23.2
60	Jamaica	36.4	37.8	38.9	39.2	38.4
61	Japan	11.2	11.1	10.8	9.4	8.8
62	Jordan	19.4	20.5	21.6	21.2	20.4
63	Kazakhstan	43.2	44.1	45.2	45.4	44.6
64	Kenya	34.3	35.1	36.0	35.4	34.8
65	Kiribati	34.1	35.0	35.3	34.8	34.0
66	Korea, Republic	27.5	28.1	28.8	28.2	27.6
67	Kuwait	20.1	20.7	21.6	21.2	20.7
68	Kyrgyz Republic	39.8	40.3	41.2	41.4	40.6
69	Lao PDR	30.6	31.9	33.4	33.9	33.2
70	Latvia	39.9	40.7	41.3	40.4	39.4
71	Lebanon	34.1	35.6	36.2	36.5	37.1
72	Lesotho	31.3	32.4	33.3	32.8	32.3
73	Lithuania	30.3	31.4	32.6	31.3	30.2
74	Macedonia, FYR	34.1	35.1	36.3	36.8	36.9
75	Madagascar	39.6	40.4	41.6	41.9	41.2
76	Malawi	40.3	41.2	42.1	42.7	41.9
77	Malaysia	31.1	31.6	32.2	32.0	31.4
78	Maldives	30.3	31.4	32.0	31.6	30.9
79	Mali	42.3	43.9	44.7	44.0	43.2
80	Marshall Islands	28.1	29.0	29.6	28.7	27.9
81	Mauritania	36.1	37.2	38.0	37.4	36.8
82	Mexico	30.1	31.8	33.2	32.6	31.7
83	Micronesia, Fed. Sts.	31.3	32.1	33.2	32.6	31.9
84	Moldova	45.1	47.3	49.4	49.5	49.1
85	Mongolia	18.4	19.6	20.4	20.6	21.2
86	Morocco	36.4	37.1	37.9	37.3	36.7
87	Mozambique	40.3	41.3	42.4	42.9	43.5
88	Namibia	31.4	32.6	33.4	33.0	32.4
89	Nepal	38.4	39.7	40.8	40.2	39.3
90	Netherlands	13.1	13.0	12.6	12.0	11.1
91	New Zealand	12.8	12.6	12.3	11.6	10.9
92	Nicaragua	45.2	46.9	48.2	48.8	48.1
93	Niger	41.9	42.6	43.8	44.1	44.2
94	Nigeria	57.9	58.6	59.4	59.6	59.5
95	Norway	19.1	19.0	18.4	17.6	16.8
96	Oman	18.9	19.4	19.8	19.2	18.6
97	Pakistan	36.8	37.9	38.7	39.2	39.5
98	Palau	28.4	29.2	30.0	29.2	28.4
99	Panama	64.1	65.1	65.3	64.1	62.2
100	Papua New Guinea	36.1	37.3	38.6	38.0	37.3
101	Paraguay	27.4	29.2	31.4	32.4	33.1
102	Peru	59.9	60.3	60.9	59.1	58.2

No.	Country	Shadow Economy (in % of official GDP) using the DYMIMIC and Currency Demand Method				
		1999/00	2001/02	2002/03	2003/04	2004/05
103	Philippines	43.4	44.5	45.6	45.1	44.3
104	Poland	27.6	28.2	28.9	28.2	27.3
105	Portugal	22.7	22.5	21.9	21.1	20.4
106	Puerto Rico	28.4	29.4	30.7	29.6	28.2
107	Republic of Congo	48.2	49.1	50.1	50.5	51.1
108	Romania	34.4	36.1	37.4	36.2	35.4
109	Russian Federation	46.1	47.5	48.7	48.2	47.3
110	Rwanda	40.3	41.4	42.2	42.4	41.6
111	Samoa	31.4	32.6	33.5	33.1	32.8
112	Saudi Arabia	18.4	19.1	19.7	19.3	18.4
113	Senegal	45.1	46.8	47.5	47.8	48.2
114	Serbia and Montenegro	36.4	37.3	39.1	38.2	37.3
115	Sierra Leone	41.7	42.8	43.9	44.1	44.3
116	Singapore	13.1	13.4	13.7	13.0	12.1
117	Slovak Republic	18.9	19.3	20.2	19.1	18.2
118	Slovenia	27.1	28.3	29.4	28.2	27.3
119	Solomon Islands	33.4	34.5	35.3	34.6	34.0
120	South Africa	28.4	29.1	29.5	29.0	28.2
121	Spain	22.7	22.5	22.0	21.2	20.5
122	Sri Lanka	44.6	45.9	47.2	48.3	48.8
123	Sweden	19.2	19.1	18.3	17.2	16.3
124	Switzerland	8.6	9.4	9.4	9.0	8.5
125	Syrian Arab Republic	19.3	20.4	21.6	21.7	21.2
126	Taiwan, China	25.4	26.6	27.7	27.0	26.3
127	Tanzania	58.3	59.4	60.2	59.1	58.2
128	Thailand	52.6	53.4	54.1	54.3	53.6
129	Togo	35.1	39.2	40.4	40.6	39.4
130	Tonga	35.1	36.3	37.4	36.8	35.8
131	Tunisia	38.4	39.1	39.9	39.4	38.3
132	Turkey	32.1	33.2	34.3	33.9	33.2
133	Uganda	43.1	44.6	45.4	45.8	44.9
134	Ukraine	52.2	53.6	54.7	54.9	55.3
135	United Arab Emirates	26.4	27.1	27.8	27.2	26.5
136	United Kingdom	12.7	12.5	12.2	11.7	10.3
137	United States	8.7	8.7	8.4	8.2	7.9
138	Uruguay	51.1	51.4	51.9	50.8	49.2
139	Uzbekistan	34.1	35.7	37.2	36.3	35.4
140	Vanuatu	30.9	31.7	32.5	32.0	31.4
141	Venezuela, RB	33.6	35.1	36.7	36.1	35.4
142	Vietnam	15.6	16.9	17.9	16.9	16.1
143	Yemen, Rep.	27.4	28.4	29.1	28.2	27.3
144	Zambia	48.9	49.7	50.8	50.2	49.3
145	Zimbabwe	59.4	61.0	63.2	63.9	64.6
Unweighted Average		33.6	34.5	35.2	34.9	34.3

Source: Own calculations.

7 Appendix 2: Definition of the variables and data sources

(1) GDP per capita on PPP basis

GDP per capita is based on purchasing power parity [PPP]. PPP GDP 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 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 current dollars.

Source: World Bank, International Comparison Programme database, various years.

(2) Annual GDP per capita Growth Rate

Out of this GDP per capita values for the observed 145 countries the independent variable annual GDP per capita Growth Rate has been calculated using the formula

$$\text{Per Capita Growth} = \frac{(GDPpc_t - GDPpc_{t-1})}{GDPpc_{t-1}}$$

Source: World Bank, International Comparison Programme database; own calculation by authors.

(3) Shadow Economy

The variable Shadow Economy is defined as the informal sector [shadow economy] in percent of official GDP. The estimations for the size of the shadow economy are undertaken using the DYMIMIC and the currency demand approaches; using the values calculated in section 3. This variable is available for five points in time namely the years 1999/00, 2001/02, 2002/03, 2003/04 and 2004/05.

Source: Own calculation by the author.

(4) Share of Direct Taxation (in % of GDP)

Source: OECD, Paris 2006, Taxing Wages and World Bank (Washington D.C.), 2006, Governance Indicators.

(5) Share of Indirect Taxation and Custom Duties in % of GDP

Source: See Share of Direct Taxation.

(6) Burden of State Regulation

Burden of State regulation, index of regulation, where a score of 1 signifies an economic environment most conducive to economic freedom, whereas a score of 5 signifies least economic freedom. Source: Heritage Foundation 2006, Index of Economic Freedom, Washington, D.C.

(7) Employment Quota (in % of population between 18 and 64)

Source: OECD, Paris, various years, Employment Outlook.

(8) Unemployment Quota (% of unemployed in the working force)

Source: OECD various years, Employment Outlook.

(9) Change of Currency per Capita, Annual Rate of Currency per Capita

Source: World Bank National Accounts Data and OECD National Accounts Data Files, Washington and Paris, various years.

(10) Tax Morale (Index)

Source: European Values Study, EUROPEAN VALUES STUDY, various years/Release 1, The Netherlands, Germany: Tilburg University, Zentralarchiv für Empirische Sozialforschung, Cologne (ZA), Netherlands Institute for Scientific Information Services (NIWI), Amsterdam [producer], 2006. Germany: Zentralarchiv für Empirische Sozialforschung, Cologne [distributor], 2006. Inglehart, Ronald et.al. World Values Surveys and European Values Surveys, 1981-1984, 1990-1993 and 1995-1997 [Computer file].

(11) Quality of Institutions

index =0 lowest quality, =100 highest quality, Source World Bank, various years.

(12) Social Security Burden

Definition: social security payments (employers and employees) in % of GDP, Source OECD, Paris, various years.

(13) Quality of State Institutions

Quality of state institutions, World Bank rule of law index, ranges from -3 to +3, with higher scores showing better environments, i.e. the higher the score the better is the rule of law in that respective country. Source: Index development; Kaufmann, D.; Kraay, A. and M. Mastruzzi, 2003, Governments Matters III: Governments Indicators for 1996/2002, World Bank Policy Research Working Papers 3106, World Bank, Washington D.C.; source index World Bank, Washington, various years.

8 References

- Ahumada, Hildegard, Alvaredo, Facundo, Canavese Alfredo. and Paula. Canavese (2004): The demand for currency approach and the size of the shadow economy: A critical assessment, *Discussion Paper*, Delta Ecole. Normale Superieure, Paris. [Further information](#)
- Adam, Markus, C. and Victor Ginsburgh, (1985), The effects of irregular markets on macroeconomic policy: Some estimates for Belgium, *European Economic Review*, 29/1, pp. 15-33. [Further information in IDEAS/RePEc](#)
- Aigner, Dennis; Schneider, Friedrich and Damayanti Ghosh (1988): Me and my shadow: estimating the size of the US hidden economy from time series data, in W. A. Barnett; E. R. Berndt and H. White (eds.): *Dynamic econometric modeling*, Cambridge (Mass.): Cambridge University Press, pp. 224-243. [Further information](#)
- Alexeev, Michael and Pyle, William (2003): A note on measuring the unofficial economy in the former Soviet Republics, *Economics of Transition*, 11/1, p.1-23. [Further information in IDEAS/RePEc](#)
- Alderslade, Jamie, John Talmage and Yusef Freeman (2006): Measuring the Informal Economy: One Neighborhood at a Time, Discussion Paper, The Brooking Institution Metropolitan Policy Program, Washington D.C., September 2006. [Further information](#)
- Alm, James, Martinez-Vazquez, Jorge and Friedrich Schneider (2004), 'Sizing the problem of the hard-to-tax', Working Paper, Georgia State University: USA. [Further information](#)
- Andreoni, James; Erard, Brian, and Jonathan Feinstein (1998): Tax compliance. *Journal of Economic Literature*, 36, pp. 818-860. [Further information in IDEAS/RePEc](#)
- Asea, Patrick K. (1996): The informal sector: baby or bath water? Carnegie-Rochester Conference Series on Public Policy, 45., pp. 163-171. [Further information in IDEAS/RePEc](#)
- Bajada Christopher (2002): Australia's Cash Economy: A Troubling Issue for Policy Makers. Aldershot (Great Britain), Ashgate Publishing Company. [Further information](#)
- Bajada, Christopher and Friedrich Schneider (2003): The size and development of the shadow economies in the Asia-Pacific, *Discussion Paper*, Department of Economics, University of Linz, Austria, published in the *Asian Pacific Economic Journal*, 2005. [Further information in IDEAS/RePEc](#)
- Bajada, Christopher and Friedrich Schneider (2005): Size, Causes and Consequences of the Underground Economy: An International Perspective, Aldershot (GB): Ashgate Publishing Company. [Further information](#)
- Barro, Robert. J. and Sala-i-Martin, Xavier. (1995), 'Economic Growth', McGraw-Hill: USA. [Further information](#)
- Belev, Boyan (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. [Further information](#)
- Bhattacharyya, D.K. (1999): On the economic rationale of estimating the hidden economy, *The Economic Journal* 109/456, pp. 348-359. [Further information in IDEAS/RePEc](#)
- Blades, Derek (1982): "The hidden economy and the national accounts", *OECD (Occasional Studies)*, Paris, pp. 28-44.
- Boeschoten, Werner C. and Marcel M.G. Fase (1984): *The Volume of Payments and the Informal Economy in the Netherlands 1965-1982*, M. Nijhoff, Dordrecht.
- Brehm, J.W. (1966): *A Theory of Psychological Reactance*. New York (Academic Press).
- Brehm, J.W. (1972): *Responses to Loss of Freedom. A Theory of Psychological Reactance*. Morristown (General Learning Press).
- Breusch, Trevor (2005a): "The Canadian Underground Economy: An Examination of Giles and Tedds", *Canadian Tax Journal*, 53/2, pp.367-391. [Further information](#)
- Breusch, Trevor (2005b): "Estimating the Underground Economy, Using MIMIC Models", Working Paper, National University of Australia, Canberra, Australia. [Further information in IDEAS/RePEc](#)
- Brueck, Tilman, John B. Haisten-DeNew and Klaus F. Zimmermann (2006): Creating low-skilled Jobs by Subsidizing Market Contracted Household Work, *Applied Economics* 38/4, pp.899-911. [Further information in IDEAS/RePEc](#)
- Buehn, Andreas, Karmann, Alexander and Friedrich Schneider (2007), Shadow Economy and Do-it-yourself Activities: The German Case, Discussion Paper, Department of Economics, University of Linz.
- Cagan, Phillip (1958): "The demand for currency relative to the total money supply," *Journal of Political Economy*, 66:3, pp. 302-328.

- Chatterjee, S.; Chaudhury K. and F. Schneider (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. [Further information](#)
- Chen, Martha (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. [Further information](#)
- Choi, J. and M. Thum, 2004, Corruption and the shadow economy, *International Economic Review* 12/4, pp.308-342. [Further information in IDEAS/RePEc](#)
- Clotefelter, Charles T. (1983): Tax evasion and tax rates: An analysis of individual return, *Review of Economic Statistics*, 65/3, pp. 363-373. [Further information in IDEAS/RePEc](#)
- Contini, Bruno (1981): Labour market segmentation and the development of the parallel economy – the Italian experience, *Oxford Economic Papers*, 33/4, pp. 401-12. [Further information](#)
- Dallago, Bruno (1990): The irregular economy: The "underground economy" and the "black labour market", Dartmouth (U.K.), Publishing Company.
- Del'Anno, Roberto (2003): Estimating the shadow economy in Italy: A structural equation approach, *Discussion Paper*, Department of Economics and Statistics, University of Salerno. [Further information in IDEAS/RePEc](#)
- Del'Anno, Roberto and Friedrich Schneider (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.
- Del'Anno, Roberto and Friedrich Schneider (2005): Estimating the Underground Economy by Using MIMIC Models: A Response to T.Breusch's Critic, Discussion Paper, Department of Economics, University of Linz, Linz. [Further information in IDEAS/RePEc](#)
- Del Boca, Daniela. (1981): Parallel economy and allocation of time, *Micros (Quarterly Journal of Microeconomics)*, 4/2, pp. 13-18.
- Del Boca, Daniela and Francesco Forte (1982): Recent empirical surveys and theoretical interpretations of the parallel economy in Italy; Tanzi, Vito (1982) (ed.): *The underground economy in the United States and abroad*, Lexington (Mass.), Lexington, pp. 160-178.
- Dreher, Axel; Christos Kotsogiannis and Steve McCorriston, 2005a, How do Institutions Affect Corruption and the Shadow Economy? University of Konstanz and University of Exeter, mimeo. [Further information in IDEAS/RePEc](#)
- Dreher, Axel; Christos Kotsogiannis and Steve McCorriston, 2005b, Corruption around the World: Evidence from a Structural Model, University of Konstanz and University of Exeter, mimeo. [Further information in IDEAS/RePEc](#)
- Dreher, Axel and Lars-H.R. Siemers, 2005, The Intriguing Nexus Between Corruption and Capital Account Restrictions, KOF Working Paper 113, Swiss Federal Institute of Technology (ETH Zurich). [Further information in IDEAS/RePEc](#)
- Dreher, Axel and Friedrich Schneider (2006): Corruption and Shadow Economy: An Empirical Analysis, Discussion Paper, Department of Economics, University of Linz, 2006. [Further information in IDEAS/RePEc](#)
- Enste, Dominik and Friedrich Schneider (2006), Wie groß ist die Schattenwirtschaft? Des Rätsels Lösung, Wirtschaftsdienst – Zeitschrift für Wirtschaftspolitik 86/2, pp.185-191. [Further information](#)
- Feige, Edgar L. (1986): A re-examination of the "Underground Economy" in the United States. *IMF Staff Papers*, 33/ 4, pp. 768-781.
- Feige, Edgar L. (1989) (ed.): *The Underground Economies. Tax Evasion and Information Distortion*. Cambridge, New York, Melbourne, Cambridge University Press. [Further information](#)
- Feige, Edgar L. (1994): The underground economy and the currency enigma, *Supplement to Public Finance/Finances Publiques*, 49, pp. 119-136. [Further information in IDEAS/RePEc](#)
- Feige, Edgar L. (1996): Overseas holdings of U.S. currency and the underground economy, in: Pozo, Susan (ed.): *Exploring the Underground Economy*. Kalamazoo, Michigan, pp. 5-62. [Further information in IDEAS/RePEc](#)
- Flaming, Daniel; Breut Hayolamak and Pascale Jossart (2005), Hopeful Workers, Marginal Jobs: LA's Off-The-Books Labour Force, Economic Roundtable, Los Angeles, CA, 2005. [Further information](#)
- Fleming, M.H.; Roman, J. and G. Farrel (2000): The shadow economy, *Journal of International Affairs*, Spring 2000, No. 53/2, pp.64-89. [Further information](#)

- Franz, A. (1983): Wie groß ist die "schwarze" Wirtschaft?, *Mitteilungsblatt der Österreichischen Statistischen Gesellschaft*, 49/1, pp. 1-6.
- Feld, Lars, and Bruno S. Frey (2002), The Tax of Authority and the Taxpayer: And Exploratory Analysis, Unpublished Manuscript, University of Zürich, Switzerland [Further information](#)
- Feld, Lars, and Bruno S. Frey (2002a), Trust preeds trust: How Taxpayers are treated, *Economics of Governments*, 3/1, pp 87-89. [Further information in IDEAS/RePEc](#)
- Feld, Lars and Claus Larsen (2005): Black Activities in Germany in 2001 and 2004: A Comparison Based on Survey Data, The Rockwool Foundation Research Unit, Copenhagen (DK), 2005. [Further information](#)
- Feld, Lars, and Bruno S. Frey, (2005), "Tax Complains as the Result of a Psychological Tax Contract: The Role of Incentives and Responsioe Regulation", *Discussion Paper*, University of Marburg, Germany [Further information in IDEAS/RePEc](#)
- Frey, Bruno S, (1997), *Not just for the Money: An Economic Theory of Personal Motivation*, Cheltonham (UK): Edward Elgar [Further information](#)
- Frey, Bruno S. and Hannelore Weck (1983a): "Bureaucracy and the Shadow Economy: A Macro-Approach", in Horst Hanusch (ed.): *Anatomy of Government Deficiencies*. Berlin: Springer, pp. 89-109.
- Frey, Bruno S. and Hannelore Weck (1983b): "Estimating the Shadow Economy: A 'Naive' Approach," *Oxford Economic Papers*, 35, pp. 23-44.
- Frey, Bruno S. and Hannelore Weck-Hannemann (1984): The hidden economy as an "unobserved" variable, *European Economic Review*, 26/1, pp. 33-53.
- Frey, Bruno S. and Werner Pommehne (1984): The hidden economy: State and prospect for measurement, *Review of Income and Wealth*, 30/1, pp. 1-23. [Further information in IDEAS/RePEc](#)
- Frey, Bruno S., Weck Hannelore and Werner W. Pommehne (1982): Has the shadow economy grown in Germany? An exploratory study, *Weltwirtschaftliches Archiv*, 118/4, pp. 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, pp.459-493. [Further information in IDEAS/RePEc](#)
- Garcia, Gillian (1978): "The currency ratio and the subterranean economy," *Financial Analysts Journal*, 69:1, pp. 64-66.
- Gerxhani, Klarita (2003): The informal sector in developed and less-developed countries: A literature survey, *Public Choice*, 114/3-4, pp.295-318. [Further information in IDEAS/RePEc](#)
- Giles, David, E.A. (1997a): Causality between the measured and underground economies in New Zealand, *Applied Economic Letters* 4, pp.63-67. [Further information in IDEAS/RePEc](#)
- Giles, David, E.A. (1997b): Testing the asymmetry in the measured and underground business cycles in New Zealand, *Economic Record* 71/1, pp.225-232. [Further information in IDEAS/RePEc](#)
- Giles, David, E.A. (1999a): Measuring the hidden economy: Implications for econometric modelling, *The Economic Journal*, 109/456, pp.370-380. [Further information in IDEAS/RePEc](#)
- Giles, David, E.A. (1999b): Modelling the hidden economy in the tax-gap in New Zealand, *Empirical Economics* 24/4, pp.621-640. [Further information in IDEAS/RePEc](#)
- Giles, David, E.A. (1999c): The rise and fall of the New Zealand underground economy: are the reasons symmetric?, *Applied Economic Letters* 6, pp. 185-189. [Further information in IDEAS/RePEc](#)
- Giles, David, E.A. and Lindsay M. Tedds (2002): Taxes and the Canadian Underground Economy, Canadian Tax Paper No. 106, Canadian Tax Foundation, Toronto/Ontario.
- Giles, David, E.A., Tedds, Lindsay, M. and Werkneh, Gugsu (2002): The Canadian underground and measured economies, *Applied Economics*, 34/4, pp.2347-2352. [Further information in IDEAS/RePEc](#)
- Gutmann, Pierre M. (1977): "The subterranean economy," *Financial Analysts Journal*, 34:1, pp. 24-27.
- Halla, Martin and Friedrich Schneider (2005), "Taxes and Benefits: Two Distuct Options to Cheal on the Stole?," *Discussion Paper*, Institute of Economics, University of Linz, Linz (Austria) [Further information in IDEAS/RePEc](#)
- Helberger, Claus and Hans Knepel (1988): "How big is the shadow economy? A re-analysis of the unobserved-variable approach of B. S. Frey and H. Weck-Hannemann", *European Economic Journal*, 32, pp. 965-76. [Further information in IDEAS/RePEc](#)
- Hill, Roderick and Muhammed Kabir (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, pp. 1552-1583.

- Hindriks, J.; A. Muthoo and M. Keen, 1999, Corruption, extortion and evasion, *Journal of Public Economics* 74: 395-430. Further information in IDEAS/RePEc
- IRS (1979): *Estimates of Income Unreported on Individual Tax Returns*, 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, Arne J. and Steinar Strom (1985): The size and growth of the hidden economy in Norway, *Review of Income and Wealth*, 31/1, pp. 21-38. Further information in IDEAS/RePEc
- Isachsen, Arne J.; Klovland, Jan and Steinar Strom (1982): The hidden economy in Norway, in: Tanzi Vito (ed.): *The underground economy in the United States and Abroad*, Heath, Lexington, pp. 209-231.
- Janisch Urban and Dieter Brümmerhoff, (2005) Möglichkeiten und Grenzen der Schätzung der Schattenwirtschaft: Eine kritische Auseinandersetzung mit den Schätzergebnissen der Bargeldmethode nach Schneider, Diskussionspapier, Universität Rostock. Further information in IDEAS/RePEc
- Johnson, Simon; Kaufmann, Daniel; and Andrei Shleifer (1997): *The unofficial economy in transition*, Brookings Papers on Economic Activity, Fall, Washington D.C.
- Johnson, Simon; Kaufmann, Daniel and Pablo Zoido-Lobaton (1998a): Regulatory discretion and the unofficial economy. *The American Economic Review*, 88/ 2, pp. 387-392. Further information in IDEAS/RePEc
- Johnson, Simon; Kaufmann, Daniel and Pablo Zoido-Lobaton (1998b): Corruption, public finances and the unofficial economy. Washington, D.C.: The World Bank, discussion paper. Further information in IDEAS/RePEc
- Karmann, Alexander (1986), Monetäre Ansätze zur Erfassung der Schattenwirtschaft: Ein Vergleich verschiedener Messansätze, Kredit und Kapital 19/3, pp.233-247.
- Karmann, Alexander (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, pp.185-206.
- Kaufmann, Daniel and Kaliberda, Aleksander (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. Further information in IDEAS/RePEc
- Kazemier, Brugt, (2005a), The Undergroud Economy: A Survey of Methods and Estimates, Discussion Paper, Statistics Netherlands, Voorburg, Netherlands
- Kazemier, Brugt, (2005b), Monitoring the Underground Labour Market: What Surveys can do, Discussion Paper, Statistics Netherlands, Voorburg, Netherlands
- Kirchgaessner, Gebhard (1983): Size and development of the West German shadow economy, 1955-1980, *Zeitschrift für die gesamte Staatswissenschaft*, 139/2, pp. 197-214.
- Kirchgaessner, Gebhard (1984): Verfahren zur Erfassung des in der Schattenwirtschaft erarbeiteten Sozialprodukts, *Allgemeines Statistisches Archiv*, 68/4, pp. 378-405.
- Kirchler, E.; Maciejovsky, B. and F. Schneider (2002): Everyday representations of tax avoidance, tax evasion and tax flight: Do legal differences matter?, *Economic Psychology*, 8/3, pp.1-19. Further information in IDEAS/RePEc
- Klovland, Jan (1984): "Tax evasion and the demand for currency in Norway and Sweden: Is there a hidden relationship?" *Scandinavian Journal of Economics*, 86:4, pp. 423-39. Further information in IDEAS/RePEc
- Lackó Mária (1996): *Hidden economy in East-European countries in international comparison*, Laxenburg: International Institute for Applied Systems Analysis (IIASA), working paper.
- Lackó Mária (1998): *The hidden economies of Visegrad countries in international comparison: A household electricity approach*, In: Halpern, L. and Wyplosz, Ch. (eds.), Hungary: Towards a market economy, Cambridge (Mass.): Cambridge University Press, p.128-152.
- Lackó Mária (1999): *Hidden economy an unknown quantity? Comparative analyses of hidden economies in transition countries in 1989-95*, Working paper 9905, Department of Economics, University of Linz, Austria.
- Lackó Mária (2000), Hidden Economy – An unknown quantity: Comparative analysis of hidden economics in Transition countries 1989-95, *Economics of Transition* 8/1, pp.117-149. Further information in IDEAS/RePEc
- Langfeldt, Enno (1984): The unobserved economy in the Federal Republic of Germany, in: Feige, Edgar L. (ed.): *The unobserved economy*, Cambridge University Press., pp. 236-260.

- Lippert, Owen and Michael Walker (eds.) (1997): *The Underground Economy: Global Evidences of its Size and Impact*, Vancouver, B.C.: The Frazer Institute. [Further information](#)
- Lizzeri, C. (1979): *Mezzogiorno in controtuce*. 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, pp. 129-162. [Further information in IDEAS/RePEc](#)
- MacAfee, Kerrick (1980): A Glimpse of the hidden economy in the national accounts, *Economic Trends*, 136, pp. 81-87.
- Marcelli, Enrico A. (2004): Unauthorized Mexican Immigration, the Labour and other Lower-Wage Informal Employment in California, *Regional Studies* 38/1, pp.1-13. [Further information in IDEAS/RePEc](#)
- 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. [Further information](#)
- Mauleon, Ignacio (1998): Quantitative estimation of the Spanish underground economy, *Discussion paper*, Department of Economics and History, University of Salamanka, Salamanka, Spain.
- Méon, Pierre-Guillaume and Khalid Sekkat, 2004, Does the Quality of Institutions Limit the MENA's Integration in the World Economy? *The World Economy* 27, 9: 1475-1498. [Further information in IDEAS/RePEc](#)
- Mogensen, Gunnar V.; Kvist, Hans K.; Körmendi, Eszter and Soren Pedersen (1995): *The shadow economy in Denmark 1994: Measurement and results*, Study no. 3, Copenhagen: The Rockwool Foundation Research Unit.
- Morris, B. (1993), *Editorial Statement*. International Economic Insides, IV, International Statistical Yearbook, Budapest.
- Mummert, Annette and Friedrich Schneider (2001): The German shadow economy: Parted in a united Germany?, *Finanzarchiv*, 58/3, pp.260-285. [Further information in IDEAS/RePEc](#)
- Neck, Reinhard, Hofreither, Markus and Friedrich Schneider (1989): The consequences of progressive income taxation for the shadow economy: Some theoretical considerations, in Boes, Dieter and Felderer, Bernhard (eds.), *The political economy of progressive taxation*, Heidelberg: Springer publishing company, pp. 149-176.
- O'Higgins, Michael (1989): Assessing the underground economy in the United Kingdom, in: Feige, E.L. (ed.): *The underground economies: tax evasion and information distortion*, Cambridge: Cambridge University Press, pp. 175-195. [Further information](#)
- O'Neill, David M. (1983): Growth of the underground economy 1950-81: Some evidence from the current population survey, *Study for the Joint Economic Committee*, U.S. Congress, Joint Committee Print 98-122, U.S. Gov. Printing Office, Washington.
- Park, T. (1979): *Reconciliation between personal income and taxable income*, pp. 1947-77, mimeo, Washington D.C.: Bureau of Economic Analysis.
- Pelzmann, Linde (1988): *Wirtschaftspsychologie. Arbeitslosenforschung, Schattenwirtschaft, Steuerpsychologie*. Wien, New York (Springer). [Further information](#)
- Pedersen, Soren (2003): The Shadow Economy in Germany, Great Britain and Scandinavia: A Measurement Based on Questionnaire Service, Study No. 10, The Rockwool Foundation Research Unit, Copenhagen. [Further information](#)
- Petersen, H.-G.(1982): Size of the public sector, economic growth and the informal economy: Development trends in the Federal Republic of Germany, *Review of Income and Wealth*, 28/2, pp. 191-215. [Further information in IDEAS/RePEc](#)
- Pickhardt, Michael and Jose Sarda-Pous (2006): Size and Scope of the Shadow Economy in Germany, *Applied Economics* 38/4, pp.1707-1713. [Further information in IDEAS/RePEc](#)
- Pissarides, C. and Weber, G. (1988): An expenditure – based estimate of Britain's black economy, *CLE working paper* no. 104, London. [Further information in IDEAS/RePEc](#)
- Portes, Alejandro (1996): The informal economy, in: Pozo, Susan (ed.): *Exploring the underground economy*. Kalamazoo, Michigan, pp. 147-165.
- Pozo, Susan (ed.) (1996): *Exploring the Underground Economy: Studies of Illegal and Unreported Activity*, Michigan: W.E. Upjohn, Institute for Employment Research. [Further information](#)
- Quirk, Peter, J., (1996), Macroeconomic implications of money laundering, IMF working paper WP/96/66, Washington, D.C. [Further information in IDEAS/RePEc](#)

- Rogoff, Kenneth, (1998), Blessing or Curse? Foreign and underground demand for euro notes, *Economic policy: The European Forum* 26, pp. 261-304. Further information in IDEAS/RePEc
- Schneider, Friedrich (1986): Estimating the size of the Danish shadow economy using the currency demand approach: An attempt, *The Scandinavian Journal of Economics*, 88/4, pp. 643-668. Further information in IDEAS/RePEc
- Schneider, Friedrich (1994a): Measuring the size and development of the shadow economy. Can the causes be found and the obstacles be overcome? in: Brandstaetter, Hermann, and Güth, Werner (eds.): *Essays on Economic Psychology*, Berlin, Heidelberg, Springer Publishing Company, pp. 193-212.
- Schneider, Friedrich (1994b): Can the shadow economy be reduced through major tax reforms? An empirical investigation for Austria, *Supplement to Public Finance/ Finances Publiques*, 49, pp. 137-152.
- Schneider, Friedrich (1997): The shadow economies of Western Europe, *Journal of the Institute of Economic Affairs*, 17/3, pp. 42-48.
- Schneider, Friedrich (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 Cordoba, Argentina and discussion paper, Department of Economics, University of Linz, Linz, Austria.*
- Schneider, Friedrich (1998b): Stellt das Anwachsen der Schwarzarbeit eine wirtschaftspolitische Herausforderung dar? Einige Gedanken aus volkswirtschaftlicher Sicht. Linz, *Mitteilungen des Instituts für angewandte Wirtschaftsforschung (IAW)*, 1/98, pp. 4-13.
- Schneider, Friedrich (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. Further information in IDEAS/RePEc
- Schneider, Friedrich (2003): The shadow economy, in: Charles K. Rowley and Friedrich Schneider (eds.), *Encyclopedia of Public Choice*, Kluwer Academic Publishers, Dordrecht.
- Schneider, Friedrich (2004): Arbeit im Schatten: "Wo Deutschlands Wirtschaft wirklich wächst.", Wiesbaden, Gabler Verlag Further information
- Schneider, Friedrich (2005): Shadow Economies around the World: What do we really know?, *European Journal of Political Economy*, 21/3, pp. 598-642. Further information in IDEAS/RePEc
- Schneider, Friedrich (2007): Reducing the Shadow Economy in Germany: A Blessing or a Curse?, Discussion Paper, Department of Economics, University of Linz, Linz.
- Schneider, Friedrich, Markus F. Hofreither and Reinhard Neck, (1989), The consequences of a changing shadow economy for the official economy: Some empirical results for Austria, in Boes, Dieter and Bernhard Felderer (eds.), *The political economy of progressive taxation*, Heidelberg: Springer publishing company, pp. 181-211.
- Schneider, Friedrich and Dominik Enste (2000): Shadow economies: Size, causes, and consequences, *The Journal of Economic Literature*, 38/1, pp. 77-114. Further information in IDEAS/RePEc
- Schneider, F., Enste D. (2002). *The Shadow Economy: Theoretical Approaches, Empirical Studies, and Political Implications*, Cambridge (UK): Cambridge University Press. Further information
- Simon, C.B. and A.G. Witte (1982): *Beating the system: The underground economy*, Boston, (Mas.): Urban House.
- Smith, J.D (1985): Market motives in the informal economy, in: Gaertner, W. and Wenig, A. (eds.): *The economics of the shadow economy*, Heidelberg: Springer Publishing Company, pp. 161-177.
- Smith, Philip (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, pp. 247-258. Further information
- Tanzi, Vito (1980): "The underground economy in the United States: Estimates and implications," *Banca Nazionale del Lavoro*, 135:4, pp. 427-453.
- Tanzi, Vito (1982) (ed.): *The Underground Economy in the United States and Abroad*, Lexington (Mass.), Lexington.
- Tanzi, Vito (1982): A second (and more skeptical) look at the underground economy in the United States; in: Tanzi, Vito (1982) (ed.): *The underground economy in the United States and abroad*, Lexington (Mass.), Lexington, pp. 38-56.
- Tanzi, Vito (1983): "The underground economy in the United States: Annual estimates, 1930-1980," *IMF-Staff Papers*, 30:2, pp. 283-305.
- Tanzi, Vito (1986): The underground economy in the United States, Reply to comments by Feige, Thomas, and Zilberfarb. *IMF - Staff Papers*, 33/ 4, pp. 799-811.

- Tanzi, Vito (1999): Uses and abuses of estimates of the underground economy, *The Economic Journal* 109/456, pp.338-340. [Further information in IDEAS/RePEc](#)
- Thomas, Jim J. (1986): The underground economy in the United States: A comment on Tanzi, *IMF-Staff Papers*, Vol. 33, No. 4, pp. 782-789.
- Thomas, Jim J. (1992): *Informal Economic Activity*, LSE, Handbooks in Economics, London: Harvester Wheatsheaf.
- Thomas, Jim J. (1999): Quantifying the black economy: 'Measurement without Theory' Yet Again?, *The Economic Journal* 109/456, pp. 381-389. [Further information in IDEAS/RePEc](#)
- Torgler, Benno, (2002), "Speaking to Theorists and Searching for Facts: Tax Moral and Tax Compliance in Experiments", *Journal of Economic Surveys*, 16/5, p.657-683. [Further information in IDEAS/RePEc](#)
- Torgler, Benno and Friedrich Schneider, (2005), "Attitudes Towards Paying Taxes in Austria: An Empirical Analysis", *Empirica*, pp.204-225. [Further information in IDEAS/RePEc](#)
- Torgler, Benno and Friedrich Schneider (2007), Shadow Economy, Tax Morale, Governance and Institutional Quality: A Panel Analysis, CREMA Working Paper, Centre for Research in Economics, Management and the Arts, Basel, Switzerland. [Further information in IDEAS/RePEc](#)
- Weck, Hannelore (1983): *Schattenwirtschaft: Eine Möglichkeit zur Einschränkung der öffentlichen Verwaltung? Eine ökonomische Analyse*, Bern-Frankfurt.
- Williams, Colin C. (2004a): Cash-In-Hand Work: The Underground Sector and the Hidden Economy of Favours, Haunddemills/Hampshire (GB), Palgrave MacMillan Publishing Company, 2004. [Further information](#)
- Williams, Colin C. (2004b): Geographical Variations in the Nature of Undeclared Work, *Geographica Analer* 86/B/3, pp.187-200. [Further information](#)
- Williams, Colin C. (2005a): Forstering Community Engagement and Tackling Undeclared Work: The Case for an Evidence – Based "joint-up" Public Policy Approach, *Regional Studies* 39/8, pp.1145-1155. [Further information in IDEAS/RePEc](#)
- Williams, Colin C. (2005b): Small Business and the Informal Economy: Making the Transition to the Informal Economy – The Evidence Base, Small Business Service, London. [Further information](#)
- Williams, Colin C. (2006): What is to be done about Undeclared Work? Evaluating the Policy Options, *Policy and Politics* 34/1, pp.91-113. [Further information](#)
- Williams, Colin C. and Jan Windebank (1995): "Black market work in the European Community: Peripheral work for peripheral localities?", *International Journal of Urban and Regional Research*, 19/1, pp. 23-39.
- Williams, Colin C. and Jan Windebank (1998): *Informal Employment in the Advanced Economies: Implication for Work and Welfare*, Routledge, London. [Further information](#)
- Williams, Colin C. and Jan Windebank (2001a): Beyond Profit Motivated Exchange: Some Lessons from the Study of Paid Informal Work, *European Urban and Regional Studies* 8/1, pp.49-61. [Further information](#)
- Williams, Colin C. and Jan Windebank (2001b): Reconceptualizing Paid Informal Exchange: Some Lessons from English Cities, *Environment and Planning A* 33/1, pp.121-140.
- Witte, A.D. (1987): The nature and extend of unreported activity: A survey concentrating on a recent US-research, in: Alessandrini, S. and Dallago, B. (eds.): *The Unofficial Economy: Consequences and perspectives in different economic systems*, Gower: Aldershot.
- Zilberfarb, Ben-Zion (1986): *Estimates of the underground economy in the United States, 1930-80*. IMF-Staff Papers, 33/ 4, pp. 790-798.