

The Size of the Shadow Economy for 25 Transition Countries over 1999/00 to 2006/07: What do we know? *)

by
Friedrich Schneider)**

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*) Professor of Economics, Dr. Dr.h.c.mult. Friedrich Schneider, Department of Economics, Johannes Kepler University of Linz, A-4040 Linz-Auhof, Austria. Phone: 0043-732-2468-8210, Fax: -8209. E-mail: friedrich.schneider@jku.at, <http://www.econ.jku.at/schneider>.

1 Introduction

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 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 factors¹. In this short study, after discussing the estimation procedure, the MIMIC-method, in chapter 2, chapter 3 and 4, the size and development of the shadow economies of 25 transition countries from 1999/2000 to 2006/2007 are presented for the first time. Finally, in chapter 5, a summary is given and some policy conclusions are drawn.

2 The MIMIC/Model Approach

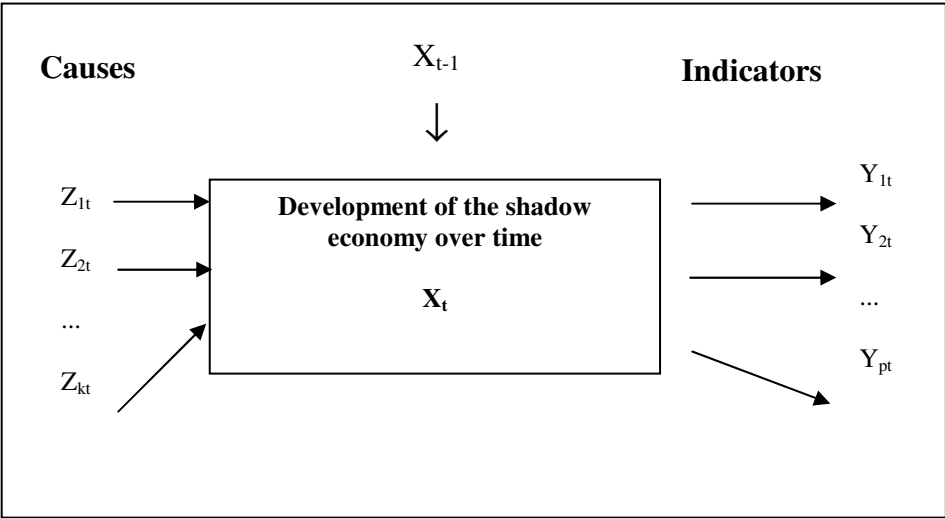
Most methods estimating the size of the shadow economy so far consider just one indicator that to capture all effects of the shadow economy². However, shadow economy effects show up simultaneously in the production, labor, and money markets. An even more important critique is that the causes that determine the size of the shadow economy are taken into account only in some of the monetary approach studies that usually consider one cause, the burden of taxation. The model approach explicitly considers multiple causes of the existence and growth of the shadow economy, as well as the multiple effects of the shadow economy over time. The empirical method used is quite different from those 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”

¹ For a critical evaluation of the various estimation and calibration methods see Schneider (2005).

² This summary 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), as well as Buehn, Karmann and Schneider (2009) and Dell’Anno (2007). 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

variable cannot be measured directly. The MIMIC (multiple-indicators multiple-causes) model consists in general of two parts, with the measurement model linking the unobserved variables to observed indicators.³⁾ 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 2.1.

Figure 2.1: Development of the shadow economy over time.



There is a large body of literature⁴⁾ on the possible causes and indicators of the shadow economy distinguishes three types of **causes**:

- (1) 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.
- (2) 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.
- (3) 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

been used to provide a ranking of the relative size of the shadow economy in different countries.
³⁾ One of the latest paper dealing extensively with the DYMIMIC approach, its development and its weaknesses is from Del'Anno (2003) as well as the study by Giles and Tedds (2002), Schneider and Dell'Anno (2008), and Breusch (2005a, 2005b).
⁴⁾ Thomas (1992); Schneider (1994a, 1997, 2003, 2005); Pozo (1996); Johnson, Kaufmann and Zoido-Lobaton (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).

economy: it is assumed that a declining tax morality tends to increase the size of the shadow economy.⁵⁾

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

- (1) Development of monetary indicators. If activities in the shadow economy rise, additional monetary transactions are required.
- (2) Development of the labor 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.
- (3) Development of the production market. An increase in the shadow economy means that inputs (especially labor) 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 approach has been used by Giles (1999a,b,c) and by Giles et al. (2002), Giles and Tedds (2002), Chatterjee et al. (2003) and Bajada and Schneider (2003), who obtain a time series index of the hidden/measured output of New Zealand, Canada, India or Australia, and then estimate a separate “cash-demand model” to obtain a benchmark for converting this index into percentage units. Unlike earlier empirical studies of the hidden economy, proper attention is directed to the non-stationary, and possible co-integration of time series data. Again this MIMIC 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) labor 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 MIMIC model can be used to calculate a level and the percentage units of the shadow economy. Overall, this latest combination of the currency demand and MIMIC approach

⁵⁾ When applying this approach for European countries, Frey and Weck-Hannemann (1984) had the difficulty in obtaining reliable data for the cause series, besides the ones of 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 changing variables in the model and over the years.

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, also against this method objections can be raised, which are

- (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 to obtain reliable data on cause variables other than tax variables,
- (4) the reliability of the variables grouping into “causes” and “indicators” in explaining the variability of the shadow economy, and
- (5) the calibration method to transform the relative estimates into absolute ones.

In spite of these objections and knowing that all other methods have their severe weaknesses, too, the MIMIC procedure is used to estimate the shadow economies of 25 former transition countries.

3 Econometric Results using the MIMIC-Method

In table 3.1 the econometric estimation using the MIMIC approach (latent estimation approach) is presented for the 25 transition countries over the period 1999/00 to 2006/07 (i.e. seven data points). For the transition countries I use as cause variables the following: share of direct and indirect taxation (including social security payments and including custom duties in % of GDP) as the two tax burden variables; burden of state regulation (Index of regulation, Heritage Foundation, 2007), 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 capita⁶.

In table 3.1 the MIMIC estimation results are presented for the 25 transition countries in Central and East Europe, former Soviet Union countries. All estimated coefficients of the cause variables are statistically significant and similar: the two tax burden variables have together the quantitatively largest impact on the size of the shadow economy. Especially 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 a highly significant statistical

⁶) Here I have the problem, that in some transition countries the US-\$ (or the 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 these

influence, too, 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. Finally, the indicator variables, "employment quota", and, "the annual rate of currency per capita" have the theoretically expected signs and are statistically highly significant.

In order to calculate the size and development of the shadow economies of 25 transition countries, I have to overcome the disadvantage of the MIMIC approach, which is that one gets only 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 MIMIC estimation results, I use the already available estimations from the currency demand approach for Hungary, Poland, Russia and Slovenia (from studies of Alexeev and Pyle (2003), Schneider and Enste (2002) and Lacko (2000)). As I have values of the shadow economy (in % of GDP) for various years for the above mentioned countries, I can use a benchmark procedure with the help of the currency demand estimation with figures to transform the index of the shadow economy from the MIMIC estimations into cardinal values.⁷⁾

transition countries.

⁷⁾ This procedure is described in great detail in the paper Del'Anno and Schneider (2005), and Schneider and Del'Anno (2009).

Table 3.1: MIMIC Estimation of the Shadow Economy of 25 Central and East European and Former Soviet Union Countries, 1999/00, 2001/02, 2002/03, 2003/04, 2004/05, 2005/06 and 2006/07

Cause Variables	Estimated Coefficients
Share of direct taxation + share of social security payments (in % of GDP)	$\lambda_1 = 0.490^{**}$ (3.94)
Share of indirect taxation + customs duties (in % of GDP)	$\lambda_2 = 0.433^{**}$ (3.71)
Burden of state regulation (Index, Heritage Foundation: score 1 most economic freedom, 5 least economic freedom)	$\lambda_3 = 0.258^*$ (2.66)
Unemployment quota (%)	$\lambda_4 = 0.467^{**}$ (4.50)
GDP per capita (in US-\$)	$\lambda_5 = -0.246^{**}$ (-3.90)
Indicator Variables	
Employment quota (as % of total population 18-64)	$\lambda_6 = -0.775^{**}$ (-5.91)
Annual rate of GDP	$\lambda_7 = -1.00$ (Residuum)
Annual change of local currency per capita	$\lambda_8 = 0.532^{**}$ (3.80)
Test-statistics	$RMSE^1 = 0.0002$ (p-value = 0.93) $Chi-square^2 = 421.91$ (p-value = 0.80) $TMCV^3 = 0.083$ $AGFI^4 = 0.701$ $N = 175$ $D.F.^5 = 29$
<p>Notes: t-statistics are given in parentheses (*); *, ** means the t-statistics are statistically significant at the 90 %, 95 %, or 99 % confidence level.</p> <p>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.</p> <p>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 these equation in tables 3.1.1 using a test of multi normal distributions.</p> <p>3) Test of Multivariate Normality for Continuous Variables (TMNCV); p-values of skewness and kurtosis.</p> <p>4) Test of Adjusted Goodness of Fit Index (AGFI), varying between 0 and 1; 1 = perfect fit.</p> <p>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 of time points.</p>	

4 The Size of the Shadow Economies for 25 Transition Countries for 1999/00 to 2006/07

When showing the size and development of the shadow economies over the period 1999/2000 to 2006/2007 for the 25 transition countries which are quite different in location and developing stage, one should be aware that such country comparisons give only a rough picture of the ranking of the size of the shadow economy in these countries and over time, because the MIMIC and the currency demand methods have shortcomings⁸⁾. Due to these shortcomings a detailed discussion of the (relative) ranking of the size of the shadow economies is not conducted.

In table 4.1 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 41.0 % in 2004/2005 which is an increase of 2.9 percentage points over these five years. Then the average value decreased to 39.9 % (size of the shadow economy) in 2006/07 – a reduction of 1.1 percentage points mainly due to the booming official economy in these countries. In 2006/07 the highest shadow economies are in Georgia, Azerbaijan and the Ukraine with 68.2 %, 61.5 % and 57.3 %. The median country is Bulgaria (39.4 %), surrounded by Serbia and Montenegro with a shadow economy of 41.4 % and Romania with 37.4 %. At the lower end are the Slovak Republic with 17.4 %, the Czech Republic with 18.2 % and Hungary with 24.4 % of official GDP.

⁸⁾ See also Thomas (1992, 1999), Tanzi (1999), Pedersen (2003) and Ahumada, Alveredo, Cavanese A and P. Cavanese (2004), Janisch and Brümmerhoff (2005), Schneider (2005), Breusch (2005a, 2005b), and Schneider and Del'Anno (2009).

Table 4.1: 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 MIMIC and Currency Demand Method						
		1999/00	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07
1	Albania	33.4	34.6	35.3	36.1	36.3	37.0	36.0
2	Armenia	46.3	47.8	49.1	50.6	51.2	52.6	52.0
3	Azerbaijan	60.6	61.1	61.3	61.5	61.9	62.3	61.5
4	Belarus	48.1	49.3	50.4	51.2	52.1	53.0	52.2
5	Bosnia and Herzegovina	34.1	35.4	36.7	37.2	38.1	39.0	38.2
6	Bulgaria	36.9	37.1	38.3	39.1	40.0	40.2	39.4
7	Croatia	33.4	34.2	35.4	36.1	37.2	37.3	36.5
8	Czech Republic	19.1	19.6	20.1	20.2	19.8	19.0	18.2
9	Estonia	38.4	39.2	40.1	39.4	38.6	37.2	36.0
10	Georgia	67.3	67.6	68.0	68.2	68.6	69.0	68.2
11	Hungary	25.1	25.7	26.2	26.4	26.1	25.3	24.4
12	Kazakhstan	43.2	44.1	45.2	46.3	47.0	47.3	46.5
13	Kyrgyz Republic	39.8	40.3	41.2	41.9	42.7	43.4	43.0
14	Latvia	39.9	40.7	41.3	40.6	39.8	38.2	37.1
15	Lithuania	30.3	31.4	32.6	31.3	30.4	29.1	28.2
16	Macedonia, FYR	34.1	35.1	36.3	37.3	38.4	39.0	38.3
17	Moldova	45.1	47.3	49.4	50.1	51.2	52.3	51.4
18	Poland	27.6	28.2	28.9	29.2	29.3	27.3	26.5
19	Romania	34.4	36.1	37.4	38.2	38.9	38.3	37.4
20	Russian Federation	46.1	47.5	48.7	49.3	50.1	50.3	49.4
21	Serbia and Montenegro	36.4	37.3	39.1	40.3	41.1	42.1	41.4
22	Slovak Republic	18.9	19.3	20.2	19.6	19.0	18.4	17.4
23	Slovenia	27.1	28.3	29.4	29.0	28.6	27.2	26.4
24	Ukraine	52.2	53.6	54.7	55.6	57.3	58.1	57.3
25	Uzbekistan	34.1	35.7	37.2	38.6	39.8	40.6	39.5
Unweighted Average		38.1	39.1	40.1	40.5	41.0	40.9	39.9

Source: Own calculations.

5 Summary and Conclusions

There have been many obstacles to overcome to measure the size of the shadow economy, but as this paper shows, some progress has been made. I provided estimates of the size of the shadow economies for 25 transition countries for five periods of time (1999/2000 to 2006/2007) using the MIMIC approach for the econometric estimation and the currency demand method for the calibration. Coming back to the question in the headline of this paper, some (new) knowledge/insights are gained with respect to the size and development of the shadow economy of transition countries, leading to four conclusions:

The first conclusion from these results is that for the 25 transition countries investigated the shadow economies have reached a remarkably large size; the average shadow economy of these 25 transition countries was 38.1 % (of official GDP) in 1999/00 and rose to 41.0 % in 2004/05, but decreased to 39.9 % in 2006/07 due to the booming official economy.

The second conclusion is that shadow economies are a complex phenomenon present to an important extent in all type of economies (here transition countries). 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. With these two insights/conclusions goes a **third**, no less important one: a government aiming to decrease shadow economic activity has to first and foremost analyze the complex relationships between the official and shadow economy – and even more important – among consequences of its own policy decisions.

Considering a public choice perspective a **fourth 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, and
- (iii) people who work in the shadow economy have less time for other things like going to demonstrations, etc.

Considering these three facts, 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.

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