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Mission Implausible III: Measuring the Informal Sector in a Transition Economy using Macro Methods

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Abstract

An easy and popular method for measuring the size of the underground economy is to use macro-data such as money demand or electricity demand to infer what the legitimate economy needs, and then to attribute the remaining consumption to the underground economy. Such inferences rely on the stability of parameters of the money demand and electricity demand equations, or at the very least on knowledge of how these parameters are changing. We argue that the pace of change of these parameters (such as velocity) is too variable in transition economies for the above methods of estimating the size of the underground economy to be applicable. We make our point by using the Czech Republic and other transition country data from the financial and electricity sectors.

Keywords: shadow economy, measureament of tax evasion, transition economies.

JEL classification: C53, C82, D12, D24, E26, E27, E41, H26, O47, P43

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1. Introduction

In 2000 Friedrich Schneider and Dominik Enste published a major survey of how the underground economy is measured. Most of the essay gave itself over to analysing macro-methods for measuring the underground economy. The macro-method roots out the size of the underground economy from a functional form in which some observable macro variable depends on another observable macro variable and on the unobservable underground economy. The researcher infers the size of the underground economy by manipulating the functional form and plugging into the observable macro-variables information on their levels. For example, the "currency-ratio" method of estimating the underground economy holds that there is a stable ratio of currency in the legal economy to demand deposits and that this ratio enters into an equation relating the size of the underground economy to the size of the official economy. All one need know is the currency ratio in the official economy, then one plugs measured GDP into the above-mentioned relation, and out pops the size of the underground economy. An undergraduate in a first year macroeconomics course could do the exercise in a few minutes.

Schneider and Enste (2000) as well as many other authors catalogued in a recent OECD (2002) handbook on measuring the underground economy are aware of the problems with this method of measuring it "on the cheap." The hunter of the underground economy must be confident that the functional relations he postulates between the dependent and independent variables are correct, and he has to believe that the parameter estimates with which he rounds out these equations (such as the ratio of currency to demand deposits) are accurate and stable. Without such assurance the researcher finds himself measuring with a yardstick that changes in unpredictable ways.

What neither Schneider and Enste, nor any other researchers we are aware of for that matter, do not emphasize is that the instability of parameters used in macro-methods may be of such size as to throw off estimates of the transition underground economies to the point where such estimates are nearly useless both as indicators of the absolute size of the underground economy, and, more seriously, useless as measures of the change in the size of the underground economy.

Transition economies have many of the characteristics of a developed western economy, such as high education levels and well-developed infrastructures, but these economies differ from developed western economies that they have gone suddenly from state-planning to a free market. Unlike underdeveloped economies, which might be quite stable, a transition economy's institutions are in a tumble. We shall review in detail two macro methods of estimating the underground sector---the money use and electricity consumption methods---and show that in a transition economy these methods are as reliable as trying to predict which way the wind will blow. In particular

1) Money use methods include the currency demand ratio method and currency demand method. Both are virtually useless for transition economies because of intensive financial innovation during transition. The number of financial products liable to affect currency demand grows at a much greater and more variable pace in transition economies than they do in mature western economies. One is tempted to infer from the huge growth in currency demand in the Czech and Slovak Republics in the 1990s that the underground economy was booming. We will show that growth in currency demand was related to factors that had nothing to do with the underground economy.
2) Using electricity consumption to measure the size of the underground economy is fraught with difficulties in transition economies where price deregulation and the introduction of long-overdue technologies moves electricity demand in ways difficult to attribute to underground economy growth.

We shall illustrate the above two critiques of macro methods with data from varying transition countries, but principally with reference to the Czech Republic. The Czech Republic is an interesting case because it can be argued that it has largely finished its transition and thus that the last twelve years of its economic history supply us with a completed experiment. We focus on the electricity and currency ratio methods because we have assembled detailed information on these sectors. Our plan is to lay bare the assumptions underlying the two methods and then to show why these assumptions have little value for transition economies.

This paper does not pretend to be an exhaustive survey of the validity of all macro methods of measuring the underground economy in transition, but we believe the critiques we level at the electricity and currency ratio methods may be extended to other macro methods.

2. Electricity as a Measure of the Underground Economy

The electricity method of measuring the underground economy holds that the underground economy can be measured by using a single economic indicator, namely, electricity consumption. Daniel Kaufman and Aleksandr Kaliberda (1996) are prominent champions of this method, though as Schneider and Enste (2000) point out Lizerri(1979) was already using this method. To measure the size of the underground economy in the Ukraine and other FSU countries, Kaufman and Kaliberda began with the assumption (based on previous studies of the Soviet economy) that in 1989, most of these countries had an underground sector of 12% of GDP. They also assume that electricity consumption reacts with unit elasticity to economic growth. If an economy had GDP of $100 billion in 1989, then it had an underground economy worth $12 billion. If electricity consumption economy grew 10% in the next year this must mean the true economy grew by ten 10%. So the true economy's size would be $123.2 billion in 1990. One would then subtract government estimates of the official economy to get at underground economy size as it was in 1990. To better see this consider Table 1 which is a reproduction of Table 3 in Kaufman and Kaliberda (1996):

Table 1: Ukraine's Electricity Consumption (as proxy of Overall GDP) and Official GDP---1989-94

	1989	1990	1991	1992	1993	1994
Growth rate in electricity consumption		0.0%	-2.2%	-6.2%	-7.8%	-11.7%
Estimate growth rate in overall GDP		0.0%	-2.2%	-6.2%	-7.8%	-11.7%
Overall GDP index	100.0	100.0	97.8	91.7	84.6	74.7
Official GDP index	88.8	84.5	73.2	60.4	51.4	38.8

Source: Page 12 in Kaufman and Kalibera (1996)

Based on the assumption that 12% of the economy is underground, Kaufman and Kaliberda find in the first column and last row of their table that official GDP index is 88. In 1990 the economy registered no change in electricity consumption, so that overall GDP should not have changed either. This is why the second row of their table mimics the first row. The difference between overall GDP (row 3) and official GDP (row 4) gives an idea of the size of the underground economy. By assuming a constant unitary elasticity between electricity consumption and GDP, Kaufman and Kaliberda estimated that by 1994 the underground economy had grown to 48.5% of official GDP (the difference between the overall GDP index in 1994 and the official index, divided by the overall index).

The ponderous nature of assuming a constant and identical elasticity for all the countries studied led Kaufman and Kaliberda to vary their assumptions about the unit elasticity relation between electricity and output by considering two scenarios. The conservative scenario held that CEE countries had in the upswing of their economies a 0.9 elasticity, the Baltics had unit elasticity, and the rest of the FSU states had an elasticity of 1.15 in the upswing of their economies. In their overall conservative scenario Kaufman and Kaliberda assumed that except for the Baltics, every transition country studied managed every year to decrease energy consumption by 5% for every

unit of good produced. The assumption of increasing efficiency was meant to account for a decreasing output of elasticity over time and so give the appearance that the authors have taken into account the dynamic context of energy consumption in transition economies.

A variant on the Kaufmann-Kaliberda method that has gained popularity in recent years is that of Maria Lacko (2000). Lacko also takes electric power consumption as a physical indicator of economic activity, but she focuses on household consumption of electricity, as she believes that household production is the major source of underground activity and that this activity is closely related to overall underground activity. She uses a two-stage regression technique (which we will describe later in the present paper) that relies on the assumption of a stable relationship between energy use and the underground economy in order to get an estimate of the underground economy's size.

In Table 2 we present Johnson, Kaufmann, and Schleifer (1997) as well as Lacko's estimates of the underground economy for four similar transition economies.

Table 2: Available estimates of the informal sector size for different methods

Period	1990	1991	1992	1993	1994	1995	Method	Source
Czech Republic	6.7	12.9	16.9	16.9	17.6	11.3	Electricity consumption	JKS 1997
	15.2		19.9		15.4		Household electricity consumption	L 2000
Hungary	28	32.9	30.6	28.5	27.7	29	Electricity consumption	JKS 1997
	26.7		34.8		31		Household electricity consumption	L 2000
Poland	19.6	23.5	19.7	18.5	15.2	12.6	Electricity consumption	JKS 1997
	30.8		33		32.8		Household electricity consumption	L 2000
Slovakia	7.7	15.1	17.6	16.2	14.6	5.8	Electricity consumption	JKS 1997
		11.2	14.7		22.3		Household electricity consumption	L 2000

Note: JKS stands for Johnson, Kaufmann, and Schleifer, and L stands for Lacko.

The table above documents that various methods yield diverse results. The variation in the estimates for the electricity consumption method and the Lacko method for the Czech Republic amounts to as much as 8.5%, which represents a 120% difference between the estimates.

Time consistency does not hold either. For Slovakia the first method estimates a decreasing evolution of informal sector activities between 1992 and 1995, whereas the second method shows an increasing size.

The differences in estimates consequently yield different rankings of the countries by estimated informal sectors. Table 3 below summarizes the discrepancies.

Table 3: Ranking by size of informal sector for two methods of estimation

Country	1990	1992	1994	Method	Source
Czech Republic	1	1	3	Electricity consumption	JKS 1997
	1	2	1	Household el. consumption	L1997
Hungary	3	4	4	Electricity consumption	JKS 1997
	2	4	3	Household el. consumption	L1997
Poland	2	3	2	Electricity consumption	JKS 1997
	3	3	4	Household el. consumption	L1997
Slovakia	N/A	2	1	Electricity consumption	JKS 1997
	N/A	1	2	Household el. consumption	L1997

The unsettling features of these electricity methods can be summarized as follows:

- Different variants of the method produce significantly different quantitative results for individual estimates.
- For an individual country the time trend of the estimated size of the informal economy differs for different methods used (see the Czech Republic).
- Comparing the rankings of countries produced by different methods we find that the qualitative results of different methods also vary significantly.

Even if there were no sign of contradictions in electricity measures of the underground economy we believe this method's assumptions are unrealistic for transition economies.

The most objectionable feature of electricity methods is that they postulate either a one-to-one relation between electricity consumption and GDP, or a stable relationship between electricity consumption and GDP, or in more sophisticated applications of these methods, such as Kaufman and Kaliberda (1996), the assumption that there is a steady rise in the efficient use of electricity so that the output elasticity of electricity consumption is decreasing at a constant rate.

The one-to-one or constant relationship between electricity use and GDP is a stylized-fact gleaned from developed economies where there is a stable sectoral composition of GDP. Each sector has its specific electricity demand for every $1 of GDP the sector produces. Developed economies have not known the sort of price fluctuation and massive restructuring of energy-use technologies that economies in transition have known.

In spite of Kaufman and Kaliberda's faith in their assumptions, a glance at some easily available macro-data from the Czech Republic, Hungary, Poland, and Slovakia makes evident that the electricity method's assumption of a stable relationship between GDP and electricity use does not apply to transition economies.

Table 4 below shows that in transition each of the named economies' total, and primary sector energy use fell radically and in irregular leaps during the 1990s whereas measures for the EU, the OECD, and the US show almost no change in these energy uses. Energy use fell in the transition countries listed in Table 3 because these countries decided to move away from their communist heritage of heavy industrial production. For example, between 1990 and 1997 iron and steel production in the Czech Republic fell from 21 million tons to six million tons. The drop in industrial production in turn lowered demand for railway transport, which was heavily dependent on electricity. For example, in the Czech Republic in 1990 railways transported 170 billion tons of goods whereas trucks carried 173 billion tons. In 2001 railways were carrying only 97 billion tons while trucks were carrying 440 billion tons.

Overall energy use will be correlated with electricity use, so that the challenge these numbers pose for the Kaufmann-Kaliberda method is that in such a shifting environment it is hard to pretend that there is a stable one-to-one relationship between GDP and electricity use or that there was a constant change in this relationship. Instead one must recognize that there was a *highly variable* reduction in the share of total electricity consumption going to the primary sector.

Table 4
Energy intensity of GDP

	EU			**OECD**			**Czech Republic**			**Hungary**			**Poland**			**USA**		
	TFEC	*TPES*	*LAG*	*TFEC*	*TPES*	*LAG*	*TFEC*	*TPES*	*LAG*	*TFEC*	*TPES*	*LAG*	*TFEC*	*TPES*	*LAG*	*TFEC*	*TPES*	*LAG*
1989	0.16	0.23	1.00	0.20	0.28	1.21	0.39	0.51	2.18	0.30	0.41	1.75	0.36	0.56	2.39	0.24	0.36	1.53
1990	0.16	0.23	1.00	0.19	0.27	1.20	0.37	0.50	2.16	0.29	0.39	1.72	0.32	0.52	2.25	0.24	0.35	1.51
1991	0.16	0.23	1.00	0.19	0.28	1.19	0.36	0.51	2.18	0.31	0.43	1.85	0.34	0.55	2.35	0.24	0.35	1.52
1992	0.16	0.23	1.00	0.19	0.27	1.20	0.35	0.53	2.32	0.28	0.40	1.76	0.33	0.53	2.31	0.23	0.35	1.54
1993	0.16	0.23	1.00	0.19	0.28	1.20	0.34	0.51	2.22	0.28	0.42	1.82	0.34	0.53	2.30	0.23	0.35	1.52
1994	0.16	0.22	1.00	0.19	0.27	1.22	0.32	0.47	2.13	0.27	0.39	1.76	0.31	0.48	2.15	0.23	0.34	1.54
1995	0.16	0.22	1.00	0.19	0.27	1.22	0.31	0.45	2.04	0.27	0.40	1.79	0.30	0.46	2.08	0.23	0.34	1.52
1996	0.16	0.23	1.00	0.19	0.27	1.19	0.28	0.45	1.99	0.27	0.40	1.76	0.30	0.47	2.07	0.22	0.33	1.47
1997	0.16	0.22	1.00	0.18	0.26	1.20	0.27	0.45	2.04	0.25	0.37	1.70	0.28	0.42	1.92	0.21	0.32	1.47
1998	0.15	0.22	1.00	0.18	0.26	1.19	0.27	0.44	2.05	0.24	0.35	1.63	0.25	0.37	1.72	0.20	0.31	1.43

Source: International Energy Agency, Energy Balances of OECD Countries (Paris: OECD, 2000), See also Key World Energy Statistics 2003

TFEC (Total Final Energy Consumption) in toe (tons of oil equivalents) per USD 1,000 of GDP using 1990 prices and purchasing power parity

TPES (Total Primary Energy Supply in toe per USD 1,000 of GDP using 1990 prices and purchasing power parity

LAG - Ratio of TPES for a given country and the same value for the EU

Even if electricity methods had correct information on the output elasticity of electricity consumption they would face a further challenge to their validity. *Electricity methods rest on the assumption that changes in electricity consumption reflect changes in the overall growth of the economy*. It is quite possible for electricity consumption to change for reasons that have nothing to do with output changes. Kaufman and Kaliberda (1996) recognize the problem and explain that these reasons for electricity consumption change fall into two negatively correlated categories that offset each other in biasing estimates of the underground economy. In the category of downward bias, consider that if an economy is changing its output-mix by moving from the primary to the secondary sector, electricity consumption will decline with no overall change in output. One might then wrongly infer that the underground economy has shrunk. We might be led into a similar bias if electricity prices are increasing relative to other energy prices, and if industry is becoming more efficient at using electricity. Factors that could bias estimates of the underground economy upward are the substitution of electricity for other sources, such as natural gas as well as higher overhead and fixed electricity use during an economic downswing. A glance at each of the listed items shows that they could belong to either category. If electricity prices are falling, then this factor should be taken out of the downward bias category and put into the upward bias category. If the output mix is shifting more towards the primary sector then it too should be placed into the upward bias category. One can play this logic game to show that all factors listed above might, under the right circumstances, be lumped into just one category. In such a case there would be no negative correlation between categories upon which Kaufman and Kaliberda could base their hope of producing estimates of the underground economy that are unbiased. An example from the Czech Republic that considers household electricity consumption and industry efficiency in electricity use shows that bias will exist and will exist in shifting directions.

Table 5 shows that in the Czech Republic, sometimes the price of electricity relative to natural gas and other sources rose and sometimes it fell. No stable pattern can be gleaned.

Table 5
Growth rate (in percent) of household price indexes in the Czech Republic

Indexes	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Electricity	69.7	0.0	5.1	9.0	12.0	14.8	15.3	44.1	0.0	15.1
Natural gas	126.7	0.0	6.5	10.0	10.5	15.2	15.2	47.6	0.0	15.1
Other heating (coal, etc.)	216.1	3.2	25.5	16.5	17.3	10.3	34.4	22.0	2.9	4.3

Source: Czech Statistical Office, Authors' computations

The unstable pattern in prices combined with changes in household production technologies to change demand for electricity in patterns that would have been hard to predict. During the early 1990s, citizens of the Czech Republic converted en masse from heating with domestic coal ovens to heating with gas and electricity. Czechs also began to invest heavily in durables such as refrigerators, washing machines, dishwashers, televisions, and home computers. These upgrades to domestic life may account for part of the rise in household consumption of electricity during the transition period. The steep rise in electricity prices in 1997 may account for the downward trend in electricity consumption later on. So in the early years electricity prices would have belonged to the upward bias category and in later years to the downward bias category.

Now consider industry efficiency. During transition Czech industry was rapidly finding new ways of reducing its energy consumption by adopting innovative production techniques. Table 6 shows that even though Czech electricity output was increasing, noxious emissions plummeted.

Table 6
Waste and electricity production

Year	SO2 (kT)	NOx (kT)	CO (kT)	Dust (kT)	Production of Electricity (TWh)
1980	2148	731	894	1267	53
1985	2161	795	899	1015	58
1990	1876	742	891	631	63
1991	1776	725	1101	592	61
1992	1538	698	1045	501	59
1993	1419	574	967	441	59
1994	1278	434	1026	355	59
1995	1091	412	874	201	61
1996	946	432	886	179	64
1997	700	423	877	128	65
1998	443	413	767	86	65
1999	269	390	686	67	65
2000	266	400	650	56	73
2001	251	332	649	54	74

Source: Czech Statistical Office, Ministry of Environment

The noxious emissions noted above come from electricity generation and industrial production. Part of the dive in pollution came from the Czech parliament's adoption of EU environmental regulations far ahead of the prescribed deadlines. It might be argued that environmental compliance leads to less efficient methods of producing electricity, but this ignores that in the period above the Czech Republic transformed itself into a net exporter of electricity. Industry was producing more output with less electricity. Increases in energy efficiency were continuous and would have biased underground economy calculations downward. When we combine this observation with the observation on household electricity demand we get both effects negating each other at first and negating each other later. The point is that we cannot blithely assume all forces governing electricity consumption will cancel the bias with which each threatens estimates of the underground economy.

Maria Lacko's (2000) estimates of the underground economy using household electricity consumption are subject to the same critiques that apply to Kaufman and Kaliberda's (1996) estimates, even though both methods seem miles apart. As mentioned earlier, Lacko examines a times series of cross sections of transition countries and postulates a regression between the size of the underground economy (which she calls H) and independent variables such as tax rates, level of government

spending, and number of people above 14 living in households. She also postulates a regression in which the size of the underground economy is an independent variable in a regression explaining household electricity consumption.[2] She then estimates the electricity regression and attributes that part of the dependent variable explained by her substitution from the H equation as being the size of the underground economy. Quite apart from the question of whether she has correctly formulated the H equation, her estimates rely on the assumption of stable regression estimates: that is, she is assuming that the manner in which people use electricity does not change. Our critique of the Kaufman-Kaliberda (1996) method was based on the overwhelming prevalence of such changes.

By not taking into account the changing reasons for electricity consumption that have nothing to do with underground economy growth, electricity methods produce estimates of the underground economy that have nothing to do with hidden economic activity. Efforts to explain the size of the underground economy using data that "code" irrelevant forces into the underground economy estimates can lead to absurd results such as the one we present in Table 7 with data taken from Eliat and Zinnes (2002). Put differently, false assumptions used to divine the size of the underground economy cause estimates of the shadow economy to be correlated with omitted factors, such as shifts in the weather.

[2] Her trick for getting estimates of H is to substitute the right hand side of the H regression, which consists of measurable variables and parameters that can be estimated as proxies for H, in the right hand side of the electricity regression.

Table 7
Explaining the share of the shadow economy by average winter temperature and relative changes (compared to EU level using PPP prices) for Visegrad countries

	Share of shadow economy on GDP		
	Plain OLS	**Plain OLS**	**Plain OLS in differences (~ Fixed effects)**
Average temperature in winter months (January-March, November to December)	2.90*** (0.89)	1.33 (0.83)	-1.53*** (0.40)
Ratio of total final energy consumption using 1990 prices (PPP) to EU level		-29.29*** (7.47)	7.34 (8.60)
Constant	19.26*** (2.11)	82.01*** (16.08)	
Number of observations	30	30	26
R-squared	0.27	0.54	0.39

(Standard errors are in parentheses)
** significant on 10% level, ** significant on 5% level, *** significant on 1% level*

The dependent variable is the underground economy estimated using electricity methods and the data come from the Czech Republic between 1990-1997, Hungary between 1990-1997, Poland between 1990-1996, and Slovakia between 1990-1996. Three categories of independent variables should appear in the right hand side of the above regression. As we discussed, electricity consumption will depend on weather, technological progress, and different patterns of price liberalization. If these forces are mistakenly subsumed in underground economy estimates based on electricity methods, we should find them significant in a regression in which these forces appear as variables explaining the size of the underground economy.

We were not able to get any variable that could be used as a cross-country consistent proxy for price liberalization in the energy sector, and so we used only two factors, average winter temperature, and a proxy for technological progress in electricity consumption (ratio of total final energy consumption using 1990 prices (PPP) to the EU level) to explain the size of the underground economy (the R-squared of our regressions suggests that even these two factors explain a great deal of variation in the underground economy).

The first and second columns of Table 7 refer to OLS estimation of the share of the shadow economy as a percent of GDP, as a function of average winter temperatures and as a proxy for technological progress in electricity consumption (the ratio of total final energy consumption using 1990 prices (PPP) to the EU level). Even when we ignore country effects, each of the factors we include could explain about 27 and 54 percent of the total variation, respectively. Results become even more striking if we take into account particular country effects and run a model (third column) in which we regress year-to-year increases in the share of the shadow economy on year-to-year changes in winter temperature, and on changes in the above discussed proxy for technological progress in the electricity sector. Column 3 clearly indicates that increases in macro estimates of the shadow economy are very well explained by decreases in average winter temperature. In other words, the regressions above show that weather fluctuations explain a significant part of the variation in the size of the underground economy, estimated via the electricity macro method. Such results suggest that electricity macro estimates of the underground economy should not be taken seriously.

In summary, because of the shifting reasons for electricity demand none of the electricity methods we have described above holds much promise for giving us an idea of the size of the underground economy, and more seriously of giving us an idea of how this economy is changing. As we shall see in the next section, similar critiques cripple monetary approaches to measuring the underground economy in transition economies.

3. Monetary Approach - Currency Ratio and Currency Demand Methods

As mentioned earlier, researchers have applied the currency ratio and money demand methods to measure the size of the informal sector. Almost all these studies, however, focus either on developing countries or on developed countries. We are aware of no single study which would have used currency methods to estimate the size of the underground economy in transition countries. Perhaps researchers are aware of the weakness of currency methods, or perhaps they have not got around to applying this method to transition economies. Whatever their reasons, we believe such an effort would be as misplaced as are efforts to measure the size of the underground economy

by electricity methods. To understand our misgivings about currency methods we must first have a look at how they work.

The currency ratio method, whose current popularity can be dated back to Gutmann (1977), measures the size of the underground economy by starting with the following simple relationship

$$\frac{Y_I}{Y_O} = \frac{C_I}{C_O + D}$$

Where Y_I represents total output of the informal sector, Y_O output of the official sector (O and I subscripts denote "official" and "informal"), C denotes total currency (i.e. $C=C_O+C_I$), and $D=D_O$ denotes total demand deposits equal to demand deposits in the official economy since the method assumes that in an informal economy there are no transactions in demand deposits. What the above equation says is that the ratio of the size of the informal to the formal economy is equal to the ratio of the monies used in either economy. No demand deposits appear in the informal economy because of the lack of a banking sector there. The problem in getting at the size of the informal economy from the above equation is that we have no information on how currency is divided between the sectors. We can play with the above equation to give the following:

$$Y_I = Y_O \frac{C - k_O D}{k_O D + D}$$

where k_0 is the ratio of currency in the official economy C_0 to demand deposits D in the official economy. Notice what this transformation has achieved. We know total currency C and demand deposits D, as we know the size of the official economy Y_0. All we need to get at Y_I from the above equation is an estimate of k_0. In order to obtain estimate of k_0 one has to assume that in some initial period the size of the informal economy is zero, and therefore that observed total currency equals currency in the official sector. Such an assumption allows us to calculate k_0 in the initial period. We then assume that this ratio is constant for the years that follow.

Guttman's currency ratio-method has a close ally in Tanzi's (1983) currency-demand method. The essence of this method is to estimate a money demand equation using conventional variables and to include variables that would be related to the underground

economy, such as the level of taxes and the complexity of the tax system. One then calculates the percentage of variation in money demand explained by these non-conventional variables in order to get at how much money is being used by the underground economy---a technique very similar in spirit to the one Lacko (2000) uses in her electricity method. To get at the size of the underground economy one then multiplies this underground money demand by the velocity of money. Here the key assumptions are of a constant velocity of money and of proper specification of the money demand equation.

Both currency methods described above have problems that parallel electricity methods. The assumption of a base year when the size of the underground economy was known, combined with the assumption of the constancy of some parameter seem like *deja vu* from the research of Kaufmann and Kaliberda (1996) and Lacko (2000).

Is there a base year for any transition economy, in which we have data on currency and demand deposits in an economy without an informal sector? The answer is an unequivocal "no." Researchers are frank about this limitation of the currency ratio method and see it as a major obstacle to measuring the level of the informal sector. Problems of estimating the informal sector using money-methods are compounded when we consider that the currency-demand deposit ratio and velocity are bound to be very unstable for transition economies. Instability in money demand is due to catch-up effects in the banking sector of transition economies. Many previously non-existent financial services and products find their way to market in a brief time. The pace of financial innovation may be much higher (though the level is no more advanced) than in developed economies. Financial innovation can destabilize money demand as these forces interfere with the motives for holding cash. To see this more clearly, consider the following. In the pre-transition period a handful of state-owned savings and loans type banks made up the banking sector. Due to a lack of competition the scope of banking services was very limited. Following transition foreign banks entered financial markets and introduced competition. Competition narrows the gap between the level of financial services provided in transition and developed economies. Obviously, some products such as cheques were never introduced in transition countries, as they were already outdated and superceded by credit and debit cards.

Money demand in transition countries can also change for the following reasons:

1) A lack of credit is a feature of early transition economies and forces people to hold cash. As credit widens (see Table 8 showing the growth in credit cards), cash holdings fall. There is also a commercial side to the instability in money demand. Bank failures during transition can force agents to change their cash-holding strategies towards holding increasing amounts of cash. At the same time transition economies experience great ups and downs in taxes. These taxes will in turn move people to transact in cash to avoid their obligations to government.

Table 8:
Year-to-year increases in the number of EC and MC (credit&debit cards)

Countries	96/95	97/96	98/97	99/98	00/99
Czech Rep.	58%	48%	33%	29%	129%
Hungary	149%	85%	70%	30%	24%
Poland	467%	143%	76%	153%	54%
Slovakia	31%	22%	13%	54%	31%
Total EC/MC	15%	18%	20%	13%	13%

Source: EC and MC statistics, authors' computation

2) At times the real interest rate was negative in several transition countries, including in the Czech Republic. A negative interest rate can force people out of demand deposits into cash holdings.

3) Artis and Lewis (1984) argue that in the UK in 1974, due to changes in banking regulations brought about by the *Competition and Credit Control Act*, the currency to demand deposit ratio changed in ways that are hard to measure. The same must be true of transition countries where regulations were in greater flux than they were in the UK. Many transition countries changed their regulations quite frequently, slowly introducing deposit insurance (with changed upper limits for the amount insured). A prominent example is the change in the minimum reserve requirements in the Czech Republic as Table 9 shows:

Table 9:
Czech Republic minimum reserve requirement rates 1992-2002

	Rates (percent) effective by:									
	10/92	2/93*	7/93	8/94	8/95	8/96	5/97	8/98	1/99	10/99
Demand deposits	9	9-12	9	12	8.5	11.5	9.5	7.5	5	2
Time deposits	3	3-4	3	12	8.5	11.5	9.5	7.5	5	2

* Lower rate was used for banks with deposits up to 25 billion CZK, otherwise the higher rate was applied. Source: CNB, Monetary indicators.

4) Almost all transition countries succumbed to banking crises in the 1990s. The loss and return of depositor confidence was bound to at first raise, and then depress the currency to demand deposit ratio in ways that are hard to measure. We can state that during two years (starting in the second half of 1995, ending in 1997) Czech banks saw an exodus of deposits, which can be attributed to a lack of trust in banks, after several bank failures. After several central bank interventions, the credit of banks was restored, and withdrawn money appeared in deposits again (giving an enormous rise in annual savings ratios in 1997 or early 1998).

To get a feeling for the volatility of currency to demand deposit ratios, consider Figure 1 and Table 10. The pattern of currency to demand deposit ratios is strikingly diverse for the transition countries. Whereas in the Czech and Slovak Republics the ratio increases with time, in Hungary and Poland the time trend is ambiguous. In the case of Poland the ratio is significantly volatile. In contrast, the figures for France and Canada, countries that are out of their transitions, are very stable. This supports the argument against the applicability of the macro method to transition economies. Especially in case of Hungary and Poland it is clear that volatility in the currency to demand ratio is not explainable alone by a surge in the informal sector but rather by shocks in the monetary and financial sectors.

Special attention should go to trends in the Czech and Slovak Republics. The time trends of both countries seem to be very close to each other, with a shock in Slovakia in 1995, which caused a temporary decrease of cash usage. In 1995 Slovakia introduced officially monitored cash registers in order to eliminate tax evasion and consequently fatten state coffers. Such a regulatory change is likely to show up as a temporarily lower demand for cash while participants in the informal economy accommodate this shock.

Figure 1:
Currency to demand ratios, Visegrad countries, France and Canada

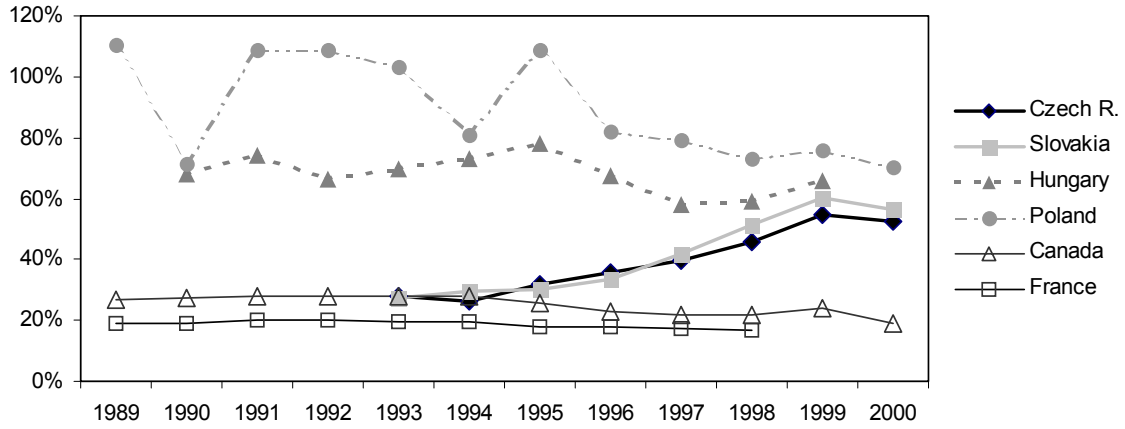

Table 10:
Currency to demand deposits ratio (in percentage points)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Czech Republic					29.2	27.2	33.5	37.5	39.9	46.1	54.7	52.6	44.8
Hungary	94.2	70.1	76.6	67.7	72.4	74.1	79.0	68.1	58.5	59.7	67.0	59.2	59.7
Poland	114.4	72.7	109.9	109.9	103.4	80.9	109.6	82.1	79.2	72.9	76.2	70.5	73.6
Slovakia					27.7	29.6	30.5	33.6	41.8	51.4	60.1	56.4	56.0

Source: IFS database. [C=currency outside domestic banks]

Conclusion

Measuring the underground economy is one of the last great frontiers of economics. This is not a bold statement, but rather, a lament. Nearly a thousand years ago the Norman conquerors of England did away with the Danegeld and replaced it with a tax based on the Domesday book. The "book" was a catalogue of the tax base of England. The Domesday book is, in the minds of the authors of the present work, one of the reasons for which England grew to be a powerful and just nation. A proper measurement of the tax base allows governments to distribute evenly and efficiently the burden for financing public projects. Economies in transition have no Norman conquerors that would insist on establishing an efficient system of taxation. There can be no will to spread taxes evenly if there is no reliable measure of who pays taxes and who evades these taxes.

"Macro" measures of tax evasion suffer two flaws. They do not finger who it is that evades, and they do not provide a consistent and reasonable estimate of the magnitude of evasion. Economists understand that everything has a price and that talk is cheap. Macro estimates of the underground economy are cheap talk. An undergraduate student wishing to finish his term paper on tax evasion can, using macro techniques, trot out estimates of the underground economy with a few keystrokes on his computer. We hope to have shown that macro estimates of the underground economy rely on assumptions that are questionable for mature economies and unrealistic for transition economies.

Our critique is not original. Practitioners of macro-methods for estimating the underground economy understand that their estimates rely on the realism of their model and on the constancy of their assumptions about key parameters in their model. We have shown that assumptions about key parameters in macro models, such as the velocity of money and the structure of electricity demand, are improbable for mature economies, they are positively impalpable for transition economies. Measuring the size of the underground economy in transition economies may be an impossible task, but measuring how it changes may be feasible by using panel studies that yearly ask people about what they believe is the size of the underground economy and whether or not they in engage in underground economic activities.

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