

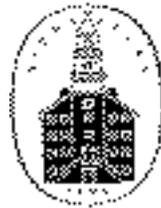
“A Note on Measuring the Unofficial Economy
in the Former Soviet Republics”

by

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A Note on Measuring the Unofficial Economy in the Former Soviet Republics

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Abstract

This note argues that the most commonly used estimates of the size of the unofficial economies in the former Soviet republics are flawed. Most important, they are based on calculations that disregard the variation in unofficial economic activity across space in the pre-transition Soviet Union. In addition, these estimates appear to understate the size of the unofficial economies in these countries. We propose alternative estimates and find that they are more strongly related to the institutional factors commonly used to explain the size of the unofficial sector. Our estimates also show that the size of a country's pre-transition unofficial economy is an important predictor of its size during the transition. This suggests that the size of the unofficial economy is to a large extent a historical phenomenon only partly determined by contemporary institutional factors.

JEL classification: O17, P2, P3

Keywords: hidden economy, transition economies

A Note on Measuring the Unofficial Economy in the Former Soviet Republics

1. Introduction

Conventional wisdom holds that the unofficial economies in post-socialist countries are quite large. With state institutions still developing the capacity to regulate and measure market-based activities, it is widely believed that a significant share of the goods and services produced in these economies does not enter into official estimates of GDP. But how much? The answer is not trivial in its consequences; a better sense of the size and nature of the unofficial economy may lead to a re-assessment of output dynamics during the transition and influence policies from public finance to social protection. However, arriving at a precise answer to this question is impossible, and even a reasonable approximation is not easy to come by.

Kaufmann and Kaliberda (1996) were the first to apply a consistent methodology to measuring the unofficial economies in former socialist countries. Drawing on the same approach, Johnson *et al.* (1997) updated Kaufmann and Kaliberda's work, producing estimates for the size of the unofficial economy in eleven former Soviet republics and six Central and East European countries in 1995. Subsequent studies by Johnson *et al.* (1998), Friedman *et al.* (2000), Schneider and Enste (2000), Rosser *et al.* (2000) and Johnson and Kaufmann (2001) used these estimates to evaluate the causes and consequences of cross-country variation in unofficial economic activity. Although this work has done much to advance understanding of unofficial economies during the transition, we feel that the size estimates of Kaufmann and Kaliberda (1996) and Johnson *et al.* (1997) were significantly flawed by an assumption that the unofficial economies of the pre-transition former Soviet republics accounted for the same 12% share of their total GDP.

Below we address this important element of the discussion of the post-socialist unofficial economy. Using data from the Berkeley-Duke survey project, we show both that the average size of the unofficial economies in the Soviet republics was significantly larger than assumed by Kaufmann and Kaliberda (1996) and that there was a good deal of variation in their size across space.¹ On the basis of the Berkeley-Duke data, we re-estimate the size of the unofficial economies at the end of the socialist period. Using these new estimates, we apply the same methodology used

by both Kaufmann and Kaliberda (1996) and Johnson *et al.* (1997) to trace the dynamics of the unofficial economy during the transition. This leads us to a revised set of estimates for the size of unofficial economies in 1995.

We conclude with a series of side-by-side comparisons. These demonstrate that our revisions are more closely related than the previous estimates to a set of governance variables that have been shown to be associated with unofficial economic activity. Perhaps even more important, we show with our estimates that the size of a country's unofficial economy in 1989 had a statistically significant impact on the size of its unofficial economy in 1995. This finding differs from Johnson *et al.* (1997) and suggests that the size of the unofficial economy is to a large extent a historical phenomenon only partly determined by contemporary governance indicators, which themselves may be historically determined and not easily modified by policy initiatives.

This finding can be viewed in a more general context. The transition of the former Soviet republics represents a fascinating natural experiment with respect to the impact of policies on economic growth and the development of new institutions. These countries began their transitions with a similar legacy of Soviet institutions but then diverged substantially during the 1990s. However, in order to interpret their transition experiences appropriately, one needs to remember that not all of the initial conditions of the former Soviet republics were the same. We argue that one important difference had to do with the extent of informal economic activities, and this distinguishing factor needs to be taken into account when analyzing the institutional developments in these economies.²

2. The Electricity Consumption Methodology

The initial study by Kaufmann and Kaliberda started from the observation that in the short run electricity consumption and total economic activity move in more or less parallel fashion, with near unit-elasticity.³ Thus the difference between the growth rates of measured GDP and electricity consumption can yield an estimate of the change in the size of the unofficial economy, which Kaufmann and Kaliberda define as “the unrecorded value added by any deliberate misreporting or evasion by a firm or individual (p. 83).”

Kaufmann and Kaliberda sub-divided the post-socialist countries into three groups on the basis of differences in the timing and scope of policy reform.⁴ Since energy prices were liberalized earlier and more extensively in Central and Eastern Europe, that region's countries were assumed to

be more efficient consumers of energy than others in the post-socialist world. Electricity consumption, that is, was presumed to rise more slowly or fall more quickly relative to rises or falls, respectively, in total output. Energy prices were liberalized later in the Baltic economies and still later and not as comprehensively in the rest of the former Soviet Union.⁵ Following this tri-partite division, Kaufmann and Kaliberda applied the output elasticity of electricity-consumption measures that are noted in Table 1.

INSERT TABLE 1 HERE

By themselves, these elasticities are useful only for estimating the change in the size of the unofficial economy for given dynamics in measured output and electricity consumption. In order to use them for computing the relative size of a country's unofficial economy at a given point in time, one needs to work from a baseline estimate, i.e., an estimate of the size of the unofficial economy at some initial date. For example, we would conclude that a country's unofficial economy accounts for 11.7% of its total GDP if over a prior interval of time official (*i.e.*, measured) GDP and electricity consumption grew by 3.0% and 5.0%, respectively, *and* if the estimated size of the unofficial economy at the beginning of that interval was 10.0%.⁶ A different estimate for the baseline would necessarily yield a different estimate for the unofficial economy at the later date.

Thus, to estimate the size of the unofficial economy in the former Soviet republics during the transition, Kaufmann and Kaliberda needed to work from estimates of their sizes in the pre-transition period. Since there were no widely recognized estimates of the sizes of the unofficial economies in the Soviet republics, Kaufmann and Kaliberda assumed that the size of the unofficial economy was uniform across the USSR. Without being specific, they wrote:

On the basis of the Berkeley-Duke research project on the USSR Second Economy ... as well as the work of J. Braithwaite, estimates ranging roughly between 10 and 15 percent of total economic activity were arrived at. Thus ... we use the 1989 midpoint estimate share of unofficial activities of 12 percent (pp. 93-94).

They relied upon other country-level studies to establish the size of unofficial economies in 1989 in Central and Eastern Europe.⁷ All the estimates appear in the first column of Table 2.

By comparing the dynamics of measured output and electricity consumption and applying the noted estimates of elasticities, Kaufmann and Kaliberda arrived at size estimates for 1994. Using a year's worth of additional data, Johnson *et al.* (1997) followed the same approach and

produced estimates for 1995.⁸ As shown in Table 2, they found that the unofficial economy represented a significant share of total output both prior to and during the transition. But whereas in Central and Eastern Europe there was generally little change in its size relative to measured output, there was a significant increase in its relative magnitude in the former Soviet republics. This trend appears to have been most pronounced in the Caucasian states of Azerbaijan and Georgia where unofficial activity is reported to have jumped from twelve percent to well over half of total GDP.

The estimates of Kaufmann and Kaliberda (1996) and Johnson *et al.* (1997) have been recognized as the most comprehensive, internally consistent set of estimates of the unofficial economy in post-socialist countries. But their approach has been criticized. Generally, unofficial economy activities can vary greatly with respect to the amount of electricity that they require; likewise, the differences in elasticities across space and time can be considerable and quite difficult to calibrate (Shneider and Enste, 2000). Lacko (2000), although an advocate of using electricity consumption, also voices skepticism at some of the estimates produced by Kaufmann and Kaliberda's methodology. In particular, she suggests that their finding of significant cross-country variation in unofficial economy dynamics does not pass the believability test. She proposes an alternative methodology that involves econometrically estimating per capita household electricity consumption. Her methodology is considerably more complicated than Kaufmann and Kaliberda's and it has its own shortcomings, some of which are noted by Schneider and Enste (2000). Most importantly, Lacko's assumption that all informal economic activities take place in the household sector may be problematic, particularly for the economies in transition. Also, her approach requires the type of data that are not readily available for some of these economies. When the appropriate data are lacking, her estimates do not pass the believability test either. For example, she estimates that the shares of the hidden economy in Latvia and Lithuania far exceed those in Russia, Uzbekistan, and Kazakhstan. This is hard to reconcile with anecdotal evidence and common perception. Given these considerations and the fact that Kaufmann and Kaliberda's estimates have been more commonly cited, we concentrate on their approach. We will, however, compare our estimates with those by Lacko as well.

INSERT TABLE 2 HERE

We agree with Kaufman and Kaliberda that changes in electricity consumption can serve as a consistent, albeit very rough, metric for assessing unofficial economy dynamics across countries. We further note that they have tried to account for the likely variation in output elasticities of

electricity consumption across the transition countries. But we feel that their estimates of the pre-transition baseline were flawed. We find there to be compelling evidence that the size of the unofficial economy in 1989 was not uniform across all Soviet republics. We also feel that there is good reason to believe that it amounted to more than 12% of total Soviet GDP at that time. In the next section, we develop these two points by using the publications of the same Berkeley-Duke project that was referenced by Kaufmann and Kaliberda. This leads us to dramatically different estimates of the Soviet republics' unofficial economies circa 1989 and, hence, for 1995 as well.

3. The Alternative Estimates of the Unofficial Economy Size in the FSU

Soviet and Western researchers proffered a number of estimates of the size of the unofficial economy in the Soviet Union.⁹ Usually, these estimates were not presented as a share of GDP because it is often unclear to what extent unofficial economic activities add to the official GDP. For example, if a home owner rents out part of his home in a transaction that is not declared to the tax authorities, this is presumably part of the unofficial economy. But the official GDP includes not only the value of paid rent, but also the imputed rent on owner-occupied housing. Therefore, the unofficial rental income would be included in the GDP although it might be misclassified as imputed rent instead of paid rent. Also, GDP calculations are often based on sources such as consumer surveys that may take into account many unofficial transactions.¹⁰ We will disregard these methodological issues and follow Kaufmann and Kaliberda in assuming that the share of the unofficial economy in GDP is roughly equal to some measure of the share of unofficial economic activity in all economic activity. For example, one such measure may be the share of labor inputs used in the unofficial economy.

As we mentioned in the previous section, Kaufmann and Kaliberda did not fully develop the justification for their 1989 estimates. They simply made a rather general reference to various issues of the *Berkeley-Duke Occasional Papers on the Second Economy in the USSR* (BDOP) and a report by Braithwaite (1995).¹¹ We have been able to find only two more or less general estimates of the size of the Soviet unofficial economy based on the Berkeley-Duke survey data in the BDOP.¹²

According to Trembl's (1992) estimates, 11.8% of all working time in the Soviet urban economy in 1979 was spent on private economic activities. Assuming that the productivity in the unofficial economy was the same as in the official economy, this number suggests that 12% of GDP would be a reasonable estimate for the size of the unofficial economy in 1979. Is the

assumption of equal labor productivity in the two economies reasonable? There are arguments both for and against. For example, the unofficial economy's productivity may be higher, because it offered much more powerful incentives. On the other hand, the capital-labor ratio in the unofficial economy was probably lower than in the official one, suggesting that productivity in the former was also lower, other things being equal.¹³ Ideally, we would like to have estimates for the value of output rather than inputs in both economies.

Based on the same Berkeley-Duke survey data, Grossman (1991) estimates that Soviet urban households derived on average over 30% of their total income from unofficial or second economy sources. In evaluating these estimates, one should keep in mind that household income from unofficial sources probably included at least part of the capital income from the second economy, while official capital income, to the extent it was not distributed in transfers and wage subsidies, accrued to the state. Nonetheless, a comparison of Treml's and Grossman's figures suggests that productivity was probably higher in the unofficial economy than in its official counterpart.

Whether or not one accepts either the 12% or the 30% figure as a suitable estimate of the share of the unofficial economy in total GDP, it is almost certain that this share increased between 1979, the modal reference year for the Berkeley-Duke survey, and 1989. The reasons for this growth, particularly in the second half of the 1980's, included increased imbalances between household incomes and opportunities to spend it in the official economy, new opportunities for unofficial economic activities engendered by greater autonomy of state enterprises, and Gorbachev's anti-alcohol campaign that resulted in an explosion of bootlegging and exacerbated inflationary pressures.¹⁴ Later, we will extrapolate the estimates based on Berkeley-Duke data from 1979 to 1989 and show that Kaufmann and Kaliberda significantly underestimated the size of the Soviet unofficial economy prior to the transition. More important, the Berkeley-Duke study makes clear that there were substantial differences in the volume of unofficial economic activity across the former Soviet republics. Grossman (1991), in breaking down urban household income data from official and unofficial sources for several groups of former Soviet republics, presents the most comprehensive data that can be used to make quantitative estimates in this regard. Table 3 summarizes the relevant numbers.

INSERT TABLE 3 HERE

Grossman does not present incomes for some of the republics. Therefore, for those republics we had to make estimates using aggregated regional data. For example, to calculate

incomes for the Baltic republics, we took out the data on Russia from the Russia-Baltic subzone, using the following formula:

$$I_B = (I_{RB} \cdot N_{RB} - I_R \cdot N_R) / (N_{RB} - N_R)$$

where I stands for per capita income, N denotes the number of observations, and subscripts B, RB, and R refer to the Baltic republics, the Russia-Baltic subzone, and Russia, respectively. We then assumed that the size of the unofficial economy was the same across republics within each region for which we could not obtain separate estimates. For example, Belorussia and Moldavia were presumed to have the same shares. And we assumed the same for the republics in the South zone as well as for those in the Baltic region. The results of these calculations are shown in Table 4 below. Notice that the shares of unofficial incomes vary in the range from 0.27 in Russia to 0.50 in the South zone.

INSERT TABLE 4 HERE

As we suggested earlier, the fractions in the last column of Table 4 probably overstate the share of the unofficial economy in Soviet GDP because they do not account for capital income accrued to the Soviet state. Thus, on the basis of Trembl's (1992) estimates of labor inputs, we adopt the 12% figure as a conservative estimate of the share of unofficial economic activity in total GDP. However, unlike Kaufmann and Kaliberda, we take this share to refer to 1979 since that was the year for which Trembl made his estimate.

In order to determine the share of the unofficial economy in the Soviet Union in 1989, we use the same technique that Kaufmann and Kaliberda used to project their estimates from 1989 to 1995. According to the CIA estimates, between 1980 and 1989, Soviet official GDP grew by approximately 21%. Over the same period, electric power output increased by about 36%.¹⁵ Assuming that in 1979 the unofficial economy contributed 12% of total GDP and using unitary elasticity of total GDP with respect to electricity output, we can infer that by 1989 the unofficial economy share grew to about 22%.¹⁶ This is the base estimate that we will use in our further calculations.

Next, we determine the unofficial economy shares in eleven Soviet republics. (Following Kaufmann and Kaliberda, we exclude four republics from our calculations because we do not have adequate electricity consumption data to estimate unofficial economy shares in 1995.) While Grossman's estimates of second economy household incomes in different republics may not

measure the share of the unofficial economy in the GDP, we assume that his estimates adequately reflect the size of unofficial economies in these republics in relative terms. We assume, for example, that because South zone households obtained 50% of their incomes from the second economy versus only 27% in Russia, the share of the unofficial economy in GDP was almost twice as high in the republics of the South zone as it was in Russia. Given the relative shares shown in Table 4 and using republican GNP data we can calculate the size of the unofficial economy in each republic, making sure that the share of the unofficial economy for these republics as a group equals 22%. Table 5 presents the results. In order to obtain the 22% share, we had to scale the shares implied by Grossman by approximately two-thirds. For example, for Azerbaijan, $0.5 \cdot 0.66 = 0.33$.

INSERT TABLE 5 HERE

Finally, we project our 1989 unofficial economy estimates to 1995, again using Kaufmann and Kaliberda's technique. Using our estimates for the unofficial economy in 1989 and the GDP and electricity output indices from Johnson *et al.* (1997), we calculate the 1995 shares according to the following formula:¹⁷

$$UE_{95} = 1 - (1 - UE_{89}) \cdot GDP_{OF} / GDP_{EL}$$

where UE denotes the share of the unofficial economy in total GDP and GDP_{OF} and GDP_{EL} denote, respectively, the indices of official GDP and total output as proxied for by electricity consumption. The results of these calculations are presented in the next to last column of Table 6. For comparison, we also show the estimates that Johnson *et al.* (1997) obtained using Kaufmann and Kaliberda's methodology. In the next section, we will compare both their and our estimates for 1995 in a series of side-by-side regressions.

INSERT TABLE 6 HERE

4. Side-by-Side Comparisons

One might expect that the more intrusive and the less helpful government is *vis-a-vis* business, the more likely firms are to exit into the unofficial economy. More burdensome taxation and regulation, more corruption and poorer provision of public goods all are likely to encourage evasion from government's reach. But evaluating this proposition econometrically presents problems. First, variables that measure state policies and capabilities tend to be highly correlated

and so multicollinearity becomes a problem when more than one are used as regressors. Second, governance may be endogenous to the size of the unofficial economy. For example, when firms enter the unofficial economy, they pay less tax and thereby diminish government's ability to provide public goods. This simultaneity bias can only be alleviated if appropriate instrumental variables can be found.

Several recent studies have uncovered a strong empirical relationship between the size of unofficial economies and governance. Johnson *et al.* (1997) found unofficial economy size in transitioning countries to be inversely related to fairer taxation, fewer regulations and more effective provision of public goods. Johnson *et al.* (1998) and Friedman *et al.* (2000) further confirmed strong associations between unofficial activity and measures of governance using expanded databases that included OECD and developing countries.

In addition to governance, we argue that it is also reasonable to expect that a country's traditions and norms would play an important role in determining the extent of unofficial economic activity. Of course, the nature of the unofficial economy during transition is different from that under the *ancien regime*. While under the Soviet system resale for profit and most other private economic activities were conducted informally, the main reason for informality during transition has been evasion of taxes and regulation. However, even though many economic activities that used to belong to the informal sector became perfectly legal at the start of the transition, there are reasons to believe that there is a link between the pre- and post-reform magnitudes of the informal economy. Our argument for continuity in this respect is based on two considerations.

First, despite the changing character of informal activities, deeper and more stable economic, political, sociological, and psychological factors have continued to play a role in determining the size of the informal economy. These factors include the popularly perceived ability of government to commit to certain economic policies, public attitudes towards informality and trust in the official institutions, the endurance of an informal economic infrastructure such as connections and trust among economic agents and the degree of property rights protection and contract enforcement in the informal sector. We view the pre-reform size of the informal economy as a proxy for such factors and, therefore, as a potential determinant of the extent of informal activities in a country relative to other economies in transition.

Second, the quantitative link between the size of the informal sector before and after reforms is an empirical issue. The electricity consumption methodology would not be directly

affected by the reasons for informal economic activities unless consumption of electricity per unit of output has changed either in the formal or in the informal sector. As we discussed, the possibility of such changes is, of course, the major criticism of the methodology. We note, however, that there are arguments both for and against improved energy efficiency due to transition processes. The electricity consumption approach remains the only consistent methodology that can be used with the available data. In any case, our use of pre-reform estimates as a starting point for projecting the size of the informal economy into the transition period is identical to the technique employed by Kaufmann and Kaliberda.

We now turn to a side-by-side comparison of the performance of our estimates of second economy size with those of Johnson *et al.* (1997). While our point estimates of the relevant coefficients are broadly similar to theirs, we find two important differences that support our estimates. First, our regressions exhibit better fit as measured by both the R^2 values and the statistical significance of the coefficients, which, of course, are equivalent for the bivariate regressions. Second, the coefficient on the pre-transition size of the unofficial economy is highly significant in several of our regressions, while it is statistically insignificant in all of the corresponding Johnson *et al.* (1997) regressions. We discuss both differences in some detail in turn.

The value of R^2 can serve as a test of the accuracy of the dependent variable only under rather limited circumstances. For example, let the true relationship between a dependent variable Y and independent variable X be $Y = \alpha + \beta X + \varepsilon$, where α and β are constant coefficients and ε is a random error that satisfies the OLS assumptions. Suppose now that we have two measures of Y that have errors denoted, respectively, by J and K . In other words, under the first measure we observe values $Y+J$, while under the second we observe $Y+K$. Suppose also that when we regress $Y+J$ and $Y+K$ on X , we obtain the respective R^2 values of r_j and r_k . It is straightforward to show that if the values of J and K are uncorrelated with either Y or ε , then $r_k > r_j$ implies that the variance of K is lower than the variance of J . This would indeed suggest that $Y+K$ is a better estimate of Y than $Y+J$ if both K and J have the same mean. However, if K and J have different means, the value of R^2 says nothing about which error has a smaller mean. This is because the difference in the means of the measurement errors of the dependent variables would be reflected only in the point estimates of the constant term. Therefore, if the above assumptions on the measurement errors are satisfied, the better fit of our regressions favors our estimates of the unofficial economies across the

former Soviet republics. As for the higher average size of the unofficial economy according to our estimates, we can rely only on the arguments presented in the previous section.

With the above discussion in mind, consider Table 7. It reports the outcomes from three pairs of bivariate regressions, each of which uses the same governance variables as regressors as Johnson *et al.* (1997).¹⁸ The third column in Table 7 reproduces results presented in Johnson *et al.* (1997) for fifteen transitioning countries -- the six East European countries and nine of the former Soviet republics listed in the bottom half of Table 2. The results recorded in column four are similarly derived with the exception that they are based on our estimates for the relative size of the unofficial economy.¹⁹ In addition, we ran the same regressions for an expanded set of seventeen countries, including Belarus and Uzbekistan, both of which were omitted by Johnson *et al.* (1997).²⁰ The expanded regression results for Johnson *et al.*'s (1997) and our estimates are presented side-by-side in the first two columns of Table 7. Columns five and six show the results of the same regressions run on just the eleven former Soviet republics for which we developed new estimates.

All the variables in these regressions have the expected negative signs. Better governance, that is, is associated with smaller unofficial economies. But the series using our re-estimates offer stronger support for this proposition. Comparing the R^2 values across each pair of regressions using the same governance variable and the same sample of countries, the ones using our re-estimates are almost uniformly higher. With the exception of “regulation” (for which we do not have a complete set of data for all seventeen countries), governance variables explain more of the variation in the size of the second economy as we have estimated it. Furthermore, plugging our re-estimates into the larger seventeen country data set, we find that all five of the variables are significant at the 1% level; only one, however, is significant at this level using the Johnson *et al.* (1997) estimates.

Because of the potential simultaneity between governance and the unofficial economy, Table 7 also presents the results using two variables to instrument for the governance regressor: the distance of the country's capital city from Brussels and a dummy variable that indicates whether the country used to be part of the Soviet Union. The comparative results are similar to those in the OLS regressions.

Given that Johnson *et al.* (1997) use identical 1989 unofficial economy shares for all FSU republics, it is not surprising that their regressions do not show a significant relationship between the pre- and post-transition shares of the unofficial economy when controlling for governance factors (see Table 8). In substantive terms, however, as we argued earlier, one would expect the

historical size of unofficial economy in the country to affect its size at a later date. Notice also, that in the absence of any cross-country variation in the rate of structural change during the 1989–1995 period, the correlation between the two sets of shares would have been perfect. Did the transition produce such a radical change of regime with respect to the unofficial economy share of GDP that the post-transition governance indicators became the only significant explanatory factor? In contrast to Johnson *et al.* (1997), our estimates show that this was not the case. The pre-transition shares of the unofficial economy are positive and highly significant in all our OLS regressions for 15 economies and are significant at least at the 10% level in our 17-economy regressions (see Table 8).²¹ While this correlation is natural because we work with levels (shares) rather than growth rates, we argued earlier that the correlation is enhanced because the pre-transition shares of unofficial economy could be viewed as proxies for the cultural environment and historical factors in each country.²² To the extent that this is the case, the positive relationship between the 1989 and 1995 shares suggests that the shares of the unofficial economy are path-dependent and only partly determined by the post-transition governance environment. We present additional results in the Appendix tables. All offer further confirmation of the conclusions drawn from Table 7. Table 1A re-produces regressions that control for being a former Soviet republic. Table 2A presents the same set of bivariate regressions run in Table 7 but makes the comparison between our and Lacko's estimates. Table 3A runs the same regression as in Table 7 but for a newer set of governance variables recently released by the World Bank. The R^2 values for our estimates and the significance of the coefficients are consistently higher in the pairwise comparisons.

5. Conclusion

In this paper, we argue that the most commonly used estimates of the shares of the unofficial economy in the former Soviet republics are flawed in two important respects. First, the estimates of Kaufmann and Kaliberda and Johnson *et al.* (1997) disregard the variation in the development of unofficial economies across space in the former Soviet Union. Second, their estimates for 1989 and, as a consequence, for 1995 significantly understate the average size of unofficial economies in this entire group of countries. We propose our own estimates and compare the two sets by evaluating how strongly they are related to the institutional factors commonly used to explain the size of the unofficial sector. We find that our estimates, combined with Kaufmann and Kaliberda's estimates for a few other transition economies, are more strongly associated with

the explanatory variables as measured by the R^2 values and the statistical significance of the coefficients in almost all regressions. We also demonstrate the better fit of our estimates relative to those generated by Lacko (2000).

In addition, we find that our 1989 estimates remain a significant explanatory factor in our regressions even in the presence of governance variables, suggesting perhaps that the pre-transition starting point is important above and beyond the institutional environment that was achieved in the process of transition.

References

- Alexeev, M. (1997), 'The Russian Underground Economy in Transition,' in Lippert, O. and M. Walker (eds.), *The Underground Economy: Global Evidence of Its Size and Impact*, Vancouver, Canada: The Fraser Institute, pp. 255-273.
- Alexeev, M. and V. Treml (1994), 'The Growth of the Second Economy in the Soviet Union and Its Impact on the System,' in Campbell, R. (ed.), *The Postcommunist Economic Transformation*, Boulder: Westview Press, pp. 221- 247.
- Braithwaite, J. (1995), 'From Second Economy to Informal Sector: The Russian Labor Market in Transition,' *ESP Discussion Paper Series*, No. 58, World Bank.
- Dobozi, I. and G. Pohl (1995), 'Real Output Decline in Transition Economies -- Forget GDP, Try Power Consumption Data!' *Transition Newsletter*, 6:1-2, pp. 17-18.
- Friedman, E., S. Johnson, D. Kaufmann and P. Zoido-Lobaton (2000) 'Dodging the Grabbing Hand: The Determinants of Unofficial Activity in 69 Countries,' *Journal of Public Economics*, 76, pp. 459-493.
- Grossman, G. (1991), 'Wealth Estimates Based on the Berkeley-Duke Émigré Questionnaire: A Statistical Compilation,' *Berkeley-Duke Occasional Papers on the Second Economy in the USSR*, No. 27, May.
- Johnson, S. and D. Kaufmann (2001), 'Institutions and the Underground Economy,' in Havrylyshyn, O. and S. Nsouli (eds.), *A Decade of Transition: Achievements and Challenges*, Washington, D.C.: International Monetary Fund.

- Johnson, S. D. Kaufmann and A. Shleifer (1997), 'The Unofficial Economy in Transition,' *Brookings Papers on Economic Activity*, 2, pp. 159-221.
- Johnson, S. D. Kaufmann and P. Zoido-Lobaton (1998), 'Regulatory Discretion and the Unofficial Economy,' *American Economic Review*, 88:2, pp. 387-392.
- Kaufmann, D. and A. Kaliberda. (1996), 'Integrating the Unofficial Economy into the Dynamics of Post-Socialist Economies: A Framework for Analysis and Evidence' in Kaminski, B. (ed.) *Economic Transition in Russia and the New States of Eurasia*, London: M.E. Sharpe, pp. 81-120.
- Lacko, M. (2000), 'Hidden Economy -- An Unknown Quantity: Comparative Analysis of Hidden Economies in Transition Countries, 1989-95,' *Economics of Transition*, 8:1, pp. 117-149.
- Levine, H. (1983), 'Possible Causes of the Deterioration of Soviet Productivity Growth in the Period 1976-80,' in *Soviet Economy in the 1980's: Problems and Prospects*, Joint Economic Committee, Congress of the United States, US Government Printing Office: Washington, DC, pp. 153-168.
- May, J., W. Pyle and P. Sommers, 'Does Governance Explain Unofficial Activity,' *Applied Economics Letters*, forthcoming.
- Millar, J., ed. (1987), *Politics, Work, and Daily Life in the USSR : A Survey of Former Soviet Citizens*, Cambridge University Press: Cambridge, Mass.
- Narodnoe khozjaistvo SSSR v 1980 godu*, Moscow: Finansy i statistika.
- Noren, J. and L. Kurtzweg (1993), 'The Soviet Economy Unravels: 1985-91,' in *The Former Soviet Union in Transition*, v. 1, Joint Economic Committee, Congress of the United States, US Government Printing Office: Washington, DC, pp. 8-33.

- Ofer, G. and A. Vinokur (1992), *The Soviet Household Under the Old Regime: Economic Conditions and Behavior in the 1970s*, Cambridge University Press: Cambridge, Mass.
- Reed, J. (1995), 'The Great Growth Race,' *Central European Economic Review*, December -January, pp. 8-10.
- Rosser, J., M. Rosser and E. Ahmed (2000), 'Income Inequality and the Informal Economy in Transition Economies,' *Journal of Comparative Economics*, 28, pp. 156-171.
- Rutgaizer, V. (1992) 'The Shadow Economy in the USSR,' *Berkeley-Duke Occasional Papers on the Second Economy in the USSR*, No. 34, February.
- Schneider, F. and D. Enste (2000), 'Shadow Economies: Size, Causes, and Consequences,' *Journal of Economic Literature*, 38, pp. 77-114.
- Smith, P. 'Assessing the Size of the Underground Economy: The Statistics Canada Perspective,' in Lippert, O. and M. Walker (eds.), *The Underground Economy: Global Evidence of Its Size and Impact*, The Fraser Institute: Vancouver, Canada, 1997, pp. 11-36.
- Treml, V. (1992), "A Study of Labor Inputs Into the Second Economy of the USSR," *Berkeley-Duke Occasional Papers on the Second Economy in the USSR*, No. 33, January.

Table 1. Output Elasticity of Electricity-consumption

Elasticity	Central and East Europe	Baltic Countries	Former Soviet Union
Output Rises	0.9	1.0	1.15
Output Falls	1.11	1.0	0.87

Note: Output elasticity of electricity-consumption measures the percentage change in measured electricity consumption divided by the percentage change in total GDP.

Table 2. Unofficial Economy's Share of Total Output:**Kaufmann and Kaliberda's Methodology**

Central and Eastern Europe	1989	1994	1995
Bulgaria	22.8	29.1	36.2
Czech Republic	6.0	17.6	11.3
Hungary	27.0	27.7	29.0
Poland	15.7	15.2	12.6
Romania	22.3	17.4	19.1
Slovakia	6.0	14.6	5.8
Former Soviet Union			
Azerbaijan	12.0	58.0	60.6
Belarus	12.0	18.9	19.3
Estonia	12.0	25.1	11.8
Georgia	12.0	63.5	62.6
Kazakhstan	12.0	34.1	34.3
Latvia	12.0	34.2	35.3
Lithuania	12.0	28.7	21.6
Moldova	12.0	39.7	35.7
Russia	12.0	40.3	41.6
Ukraine	12.0	45.7	48.9
Uzbekistan	12.0	9.5	6.5

Note: Neither Kaufmann and Kaliberda (1996) nor Johnson *et al.* (1997) presented estimates for Armenia, Kyrgyzstan, Tadjikistan or Turkmenistan. See p. 176 in Johnson *et al.* (1997).

Source: Johnson *et al.* (1997).

Table 3. Per Capita Incomes from Official and Unofficial Sources: Berkeley-Duke Survey

Region		Number of observations	Socialist income	Total personal income	Unofficial income
North zone		1944	1280	1890	610
	Russia-Baltic subzone	1384	1270	1780	510
	Russia	1057	1330	1830	500
	Belorussia-Moldavia-Ukraine	560	1300	2170	870
	Ukraine	361	1350	2190	840
South zone excluding Armenia		488	896	1780	884

Notes: 1. North zone includes Russia, Ukraine, Belorussia, the Baltic republics, and Moldavia. South zone includes all other republics. We exclude Armenia because, like Kaufmann and Kaliberda we do not have the electricity consumption data that would be necessary for our subsequent estimates. 2. We refer to the former Soviet republics by their Soviet names.

Source: Grossman (1991), pp. 13-16.

**Table 4. Per Capita Incomes from Official and Unofficial Sources
for 11 Soviet Republics: Berkeley-Duke Survey**

Region	Number of observations	Socialist income	Total personal income	Unofficial income	Share of unofficial income
Russia	1057	1330	1830	500	0.27
Baltic republics	327	1076.1	1618.4	542.3	0.34
Belorussia-Moldavia	199	1209.3	2133.7	924.4	0.43
Ukraine	361	1350	2190	840	0.38
South zone excluding Armenia	488	896	1780	884	0.50

Source: Authors' calculations based on Grossman (1991), pp. 13-16.

Table 5. Estimated Shares of Unofficial Economy in 11 Republics of the FSU, 1989

	Official GNP (mln. rub.)	Unofficial economy share, 1979	Extrapolated shares of unofficial economy, 1989	Unofficial GNP (mln. rub.)	Total GNP (mln. rub.)
Azerbaijan	14,697	0.50	0.33	7,166	21,863
Belarus	40,100	0.43	0.29	16,058	56,158
Estonia	7,977	0.34	0.22	2,265	10,242
Georgia	14,900	0.50	0.33	7,265	22,165
Kazakhstan	46,363	0.50	0.33	22,606	68,969
Latvia	12,488	0.34	0.22	3,546	16,034
Lithuania	12,897	0.34	0.22	3,662	16,559
Moldova	12,681	0.43	0.29	5,078	17,759
Russia	626,300	0.27	0.18	137,786	764,086
Ukraine	164,761	0.38	0.25	55,847	220,608
Uzbekistan	32,430	0.50	0.33	15,813	48,243
Total	985,594	0.34	0.22	277,094	1,262,688

Sources: Official GNP is from World Bank (1993), Table 2b, pp. 10-11. We used the GNP data for 1990, because this was the earliest year for which such data were available to us. Given that we used these data only as relative weights, the difference between 1990 and 1989 must have been negligible. Unofficial economy shares for 1979 are calculated based on Grossman (1991).

Table 6. Estimates of Unofficial Economies in 1995

	Unofficial economy share, 1989 (%)	Index of official GDP, 1995 (1989=100)	Index of electricity output, 1995 (1989=100)	Unofficial economy share, 1995 (%)	Unofficial economy share, 1995 Johnson <i>et al.</i> (1997) (%)
Azerbaijan	32.8	31.4	70.1	69.9	60.6
Belarus	28.6	56.1	61.2	34.5	19.3
Estonia	22.1	69.1	68.9	21.9	11.8
Georgia	32.8	16.0	37.6	71.4	62.6
Kazakhstan	32.8	46.5	62.3	49.8	34.3
Latvia	22.1	47.3	62.3	40.9	35.3
Lithuania	22.1	45.1	50.6	30.6	21.6
Moldova	28.6	43.0	58.8	47.8	35.7
Russia	18.0	49.1	74.0	45.6	41.6
Ukraine	25.3	39.0	67.0	56.5	48.9
Uzbekistan	32.8	84.0	79.0	28.5	6.5

Sources: Columns 1 and 4 are based on authors' calculations. Columns 2, 3 and 5 are from Table 1 in Johnson *et al.* (1997).

Table 7. Regressions of Unofficial Economy (as % of GDP) on Governance Indicators

Governance Indicator	17 Transition Countries				15 Transition Countries (excludes Belarus and Uzbekistan)				11 FSU Countries				
	Johnson <i>et al.</i>		Authors		Johnson <i>et al.</i>		Authors		Johnson <i>et al.</i>		Authors		
	Gov	R ²	Gov	R ²	Gov	R ²	Gov	R ²	Gov	R ²	Gov	R ²	
Legal	OLS	-0.41	.306	-0.60	.560	-0.60	.642	-0.74	.729	-0.44	.190	-0.55	.391
Safeguards	IV	(-2.57)*		(-4.37)**		(-4.83)**		(-5.91)**		(-1.45)		(-2.40)*	
		-0.36	.300	-0.65	.557	-0.59	.642	-0.83	.719				
		(-1.84)		(-3.86)**		(-3.96)**		(-5.35)**					
Crime and Corruption	OLS	-0.39	.321	-0.56	.552	-0.55	.643	-0.67	.703	-0.41	.216	-0.48	.382
	IV	(-2.66)*		(-4.30)**		(-4.84)**		(-5.54)**		(-1.57)		(-2.36)*	
		-0.35	.318	-0.64	.540	-0.59	.641	-0.82	.669				
		(-1.90)		(-3.84)**		(-3.97)**		(-4.98)**					
Tax Burden	OLS	-0.55	.223	-0.86	.458	-1.16	.764	-1.38	.801	-0.27	.039	-0.43	.127
	IV	(-2.07)		(-3.56)**		(-6.49)**		(-7.23)**		(-0.61)		(-1.15)	
		-0.66	.214	-1.17	.394	-1.16	.764	-1.63	.777				
		(-1.82)		(-3.41)**		(-4.92)**		(-6.09)**					
Regulation†	OLS	-1.32	.482	-1.39	.419	-1.30	.484	-1.39	.419	-1.81	.765	-1.77	.815
	IV	(-3.48)**		(-3.06)**		(-3.35)**		(-2.94)*		(-4.77)**		(-5.55)**	
		-1.92	.378	-2.04	.327	-1.87	.393	-2.02	.333				
		(-3.59)**		(-3.23)**		(-3.43)**		(-3.09)**					
Legal Effectiveness	OLS	-0.86	.263	-1.25	.464	-1.30	.578	-1.56	.616	-0.75	.139	-0.88	.251
	IV	(-2.31)*		(-3.60)**		(-4.21)**		(-4.57)**		(-1.21)		(-1.74)	
		-0.88	.263	-1.60	.427	-1.44	.570	-2.01	.567				
		(-1.80)		(-3.41)**		(-3.59)**		(-4.27)**					

Numbers in parentheses are *t*-statistics; numbers under "Gov" are coefficients on governance variables.

*Significant at 5% level; **Significant at 1% level.

Boldened results are those reported in Johnson *et al.* (1997).

†For "regulation," no observations for Kazakhstan and Uzbekistan.

Sources: The legal safeguards, crime and corruption and tax burden variables were taken from the December 1995-January 1996 issue of the. A panel of eight experts was asked to rank 26 transition countries on the basis of a number of factors affecting business. Grades were given on a scale of 0 to 10, with 10 representing the best environment for business. The panel members included: Dirk Damrau, Salomon Brothers Internation; Susanne Gahler, JP Morgan; Donald Green, PlanEcon; Andreas Gummich, Deutsche Bank Research; Peter Havlik, Vienna Institute for Comparative Economic Studies; Jonathan Hoffman, CS First Boston; James Lister-Cheese, Independent Strategy; and Werner Varga, Creditanstalt Bankverein. In their article, Johnson *et al.* (1997) refer to the "tax fairness" and "corruption" variables from the survey in the *Central European Economic Review*; the survey actually asked about "tax burden" and "crime and corruption."

The regulation variable was created by experts at the Heritage Foundation (see www.heritage.org/index). The original scale was from 0 to 4, with 0 meaning that there is little or no corruption, existing regulations are straightforward, not burdensome and applied uniformly to all businesses. We follow Johnson *et al.* (1997) by reversing the scale so that 4 means the least burdensome regulation, allowing us to consistently have the pro-business governance scored with the higher numbers.

As reported in Johnson *et al.* (1997), we use the European Bank for Reconstruction and Development's "legal effectiveness" index for 1995.

Table 8. Regressions of Unofficial Economy (as % of GDP) on Governance Indicators and Estimated Share of Unofficial Economy in 1989

		17 Transition Countries						15 Transition Countries (excluding Belarus and Uzbekistan)					
		Johnson <i>et al.</i>			Authors			Johnson <i>et al.</i>			Authors		
		Gov	Init	R ²	Gov	Init	R ²	Gov	Init	R ²	Gov	Init	R ²
Legal	OLS	-0.045	.728	.355	-0.037	.920	.640	-0.063	.665	.690	-0.048	1.090	.842
Safeguards		(-2.73)*(1.04)			(-2.02)#(1.77) #			(-5.15)**(1.36)			(-3.58)**(2.93)*		
	IV	-0.041	.697	.353	-0.031	1.051	.637	-0.064	.672	.690	-0.046	1.126	.841
		(-2.06)#(0.98)			(-1.04) (1.52)			(-2.06)*(0.98)			(-2.26)*(2.41)*		
Crime and	OLS	-0.043	.744	.373	-0.035	.976	.656	-0.058	.676	.692	-0.043	1.188	.856
Corruption		(-2.84)*(1.07)			(-2.22)*(2.06) #			(-5.17)**(1.38)			(-3.90)**(3.56)**		
	IV	-0.041	.731	.372	-0.031	1.054	.655	-0.064	.721	.685	-0.045	1.151	.855
		(-2.14)*(1.04)			(-1.17) (1.66)			(-4.31)**(1.44)			(-2.50)* (2.71)*		
Tax Burden	OLS	-0.057	.545	.251	-0.042	1.151	.592	-0.118	.442	.786	-0.097	.989	.897
		(-2.12) #(0.73)			(-1.39)(2.15)*			(-6.61)**(1.01)			(-5.11)**(3.34)**		
	IV	-0.076	.614	.226	-0.085	.609	.529	-0.124	.454	.784	-0.109	.864	.893
		(-2.05) #(0.80)			(-1.24) (0.64)			(-5.29)**(1.12)			(-3.05)** (2.01) #		
Regulation†	OLS	-0.144	-.553	.511	-0.051	1.586	.667	-0.143	-.585	.517	-0.039	1.772	.692
		(-3.51)**(-0.84)			(-1.11)(2.99)*			(-3.41)**(-0.87)			(-0.80)(3.13)**		
	IV	-0.215	-.959	.388	-0.088	1.318	.650	-0.210	-.967	.404	-0.066	1.562	.684
		(-3.68)**(-1.26)			(-1.22)(1.96) #			(-3.54)**(-1.24)			(-0.83) (2.08)#		
Legal	OLS	-0.088	.481	.285	-0.062	1.14	.595	-0.131	.323	.589	-0.087	1.297	.785
Effectiveness		(-2.32)*(0.66)			(-1.43)(2.13) #			(-4.13)**(0.58)			(-2.50)* (3.06)**		
	IV	-0.100	.501	.280	-0.086	.925	.585	-0.152	.341	.574	-0.114	1.086	.774
		(-2.03) #(0.68)			(-1.02) (1.12)			(-3.69)**(0.60)			(-1.83) #(1.84) #		

Numbers in parentheses are *t*-statistics; numbers under "Gov" are coefficients on governance variables; "Init" is the share of the unofficial economy in 1989 as estimated by Johnson *et al.* and the authors, respectively.

Significant at 10% level; * Significant at 5% level; ** Significant at 1% level.

Boldened results are those reported in Johnson *et al.* (1997).

†For "regulation," no observations for Kazakhstan and Uzbekistan.

Sources: See note in Table 7. All governance data are for 1995.

Appendix

Table 1A. Regressions of Unofficial Economy (as % of GDP) on Governance Indicators and Soviet Dummy

		17 Transition Countries						15 Transition Countries (excluding Belarus and Uzbekistan)					
		Johnson <i>et al.</i>			Authors			Johnson <i>et al.</i>			Authors		
		Gov	Sov	R ²	Gov	Sov	R ²	Gov	Sov	R ²	Gov	Sov	R ²
Legal Safeguards	OLS	-0.036	.033	.310	-0.044	.115	.605	-0.055	.033	.648	-0.055	.115	.775
		(-1.61)	(0.31)		(-2.38)*	(1.27)		(-3.26)**	(0.42)		(-3.67)**	(1.57)	
Crime and Corruption	OLS	-0.035	.031	.325	-0.040	.120	.604	-0.051	.038	.650	-0.051	.126	.760
		(-1.72)	(0.29)		(-2.36)*	(1.35)		(-3.28)**	(0.49)		(-3.45)**	(1.69)	
Tax Burden	OLS	-0.039	.074	.247	-0.053	.154	.544	-0.114	.010	.765	-0.114	.101	.837
		(-1.09)	(0.67)		(-1.74)	(1.63)		(-4.67)**	(0.16)		(-4.83)**	(1.63)	
Regulation†	OLS	-0.118	.146	.648	-0.116	.236	.760	-0.113	.165	.691	-0.113	.248	.774
		(-3.56)**	(2.38)*		(-3.76)**	(4.14)**		(-3.53)**	(2.72)*		(-3.61)**	(4.15)**	
Legal Effectiveness	OLS	-0.068	.061	.280	-0.079	.154	.556	-0.110	.067	.601	-0.109	.159	.715
		(-1.37)	(0.58)		(-1.86)	(1.70)		(-2.83)*	(0.85)		(-2.85)*	(2.04)	

Numbers in parentheses are *t*-statistics; numbers under "Gov" are coefficients on governance variables; "Sov" is a dummy variable for former Soviet republics.

* Significant at 5% level; ** Significant at 1% level.

Boldened results are those reported in Johnson *et al.* (1997).

†For "regulation," no observations for Kazakhstan and Uzbekistan.

Sources: see note in Table 7. All governance data are for 1995.

Table 2A. Regressions of Unofficial Economy (as % of GDP) on Governance Indicators

	Lacko		Authors	
	Gov	R ²	Gov	R ²
Legal Safeguards	-.015 (-3.24)**	.428	-.060 (-4.16)**	.552
Crime and Corruption	-.013 (-3.10)**	.407	-.055 (-4.08)**	.543
Tax Burden	-.023 (-3.15)**	.415	-.086 (-3.52)**	.470
Regulation†	-.032 (-2.17)*	.282	-.141 (-3.11)**	.446
Legal Effectiveness	-.031 (-2.85)*	.354	-.124 (-3.52)**	.470

Note: Lacko produced estimates for the ratio of the hidden economy to the official GDP. Since we and Johnson *et al.* (1997) used the ratio of the hidden economy to total GDP as our dependent variable, we adjust Lacko's estimates according to the following formula: $L/(1+L)$, where L refers to Lacko's estimate of the ratio of the hidden economy to official GDP. We thus convert her estimates into the ratio of the hidden economy to total GDP. She produces estimates for twenty countries. The above regressions are, however, just run for the sixteen countries for which we both have estimates. These are the seventeen countries listed in Table 2 minus Moldova.

Table 3A. Regressions of Unofficial Economy (as % of GDP) on World Bank Governance Indicators

<i>Governance Indicator</i>	17 Transition Economies				15 Transition Economies			
	Johnson <i>et al.</i>		Authors		Johnson <i>et al.</i>		Authors	
	Gov	R ²	Gov	R ²	Gov	R ²	Gov	R ²
Voice and Accountability	-.084 (-1.54)	.136	-.151 (-2.97)**	.370	-.200 (-4.31)**	.588	-.251 (-5.26)**	.680
Political Instability	-.167 (-2.59)*	.309	-.226 (-3.70)**	.477	-.225 (-4.22)**	.578	-.265 (-4.31)**	.588
Government Effectiveness	-.115 (-1.64)	.153	-.180 (-2.64)*	.318	-.209 (-3.33)**	.460	-.249 (-3.47)**	.481
Regulatory Burden	-.077 (-1.32)	.105	-.143 (-2.58)*	.307	-.228 (-4.45)**	.604	-.278 (-5.07)**	.664
Rule of Law		-.139 (-1.79)	.176 (-2.92)*	-.217	.362 (-4.07)**	-.270	.561 (-4.23)**	-.319 .579
Graft	-.175 (-2.59)*	.309	-.239 (3.78)**	.488	-.244 (-4.51)**	.611	-.286 (-4.59)**	.618

Numbers in parentheses are *t*-statistics; numbers under "Gov" are coefficients on governance variables.

*Significant at 5% level; **Significant at 1% level.

Note: May *et al.* (forthcoming) first noted the relatively poor fit between these governance variables and the unofficial economy estimates of Johnson *et al.* (1997).

Source: World Bank.

ENDNOTES

¹ Our use of Berkeley-Duke data is justified in part because it was the only family budget survey specifically aimed at studying the unofficial or second economy in the USSR and because Kaufmann and Kaliberda claim to have derived their estimates, in part, from Berkeley-Duke data.

² We are grateful to an anonymous referee for bringing this point to our attention.

³ Dobozi and Pohl (1995) first addressed the degree of correlation between measured output and electricity consumption during the transition.

⁴ Kaufmann and Kaliberda note several biases in using electricity consumption as a proxy for overall GDP. Applying a near-unit-elasticity assumption could lead to incorrectly high estimates of total output if the economy slumps and electricity is primarily a fixed cost, or if electricity costs rise because of a lack of basic maintenance, or if energy users substitute from other sources to electricity. Downward biases could result from improved efficiency in electricity use, price-induced substitution away from electricity, or a shift in output away from electricity-intensive industries. On balance, they feel that the upward and downward biases offset each other.

⁵ Published electricity pricing data confirm that nominal prices per kilowatt hour were several times lower in the CIS region than in Central and Eastern Europe and the Baltic countries from 1992-95; nominal prices were increasing, however, at roughly equal rates across the region during this time. The similar dynamics during this period were most likely not mirrored in the period from 1989-1992; price liberalization came earlier to Central and Eastern Europe. The nominal trends of electricity prices for six groups of transitional economies (Central Asia, Russia, CIS, excluding Russia, Southern Europe, Central and Eastern Europe, and Baltic countries) were obtained from a World Bank web site (URL: <http://lnweb18.worldbank.org/eca/eca.nsf/Attachments?OpenView&Start=59>). Prices converted to US dollars for most CIS countries are available for selected years from EBRD web site (URL: <http://www.ebrd.com/pubs/tr/01/russian/lefttab.pdf>).

⁶ This figure is calculated with the assumption of unitary output elasticity of electricity consumption and according to the formula $(105-92.7)/105=11.7\%$, where $92.7=90 \cdot 1.03$.

⁷ See footnote 25 in Kaufmann and Kaliberda (1996).

⁸ Kaufmann and Kaliberda produce estimates for 1994 and present them in a bar graph that indicates the relative sizes of unofficial economies across republics. Exact percentages are not provided. Johnson *et al.* (1997) use the same methodology and baseline estimates to update the estimates for 1995. They provide the exact percentages for both 1994 and 1995.

⁹ Rutgaizer (1992) presents a survey of estimates made by Soviet researchers who, as he stresses, provided virtually no substantiation for their numbers. The estimates from other surveys of emigrants out of the USSR are reported in Ofer and Vinokur (1992) and Millar (1987). Note, however, that unlike the Berkeley-Duke project, neither of these surveys focused on the study of the underground economy.

¹⁰ See Smith (1997) for arguments along these lines.

¹¹ See footnote 23 in Kaufmann and Kaliberda. Braithwaite's estimate of approximately 13% of the labor force being engaged in the unofficial economy relates to the post-1992 period. More important, her estimate is derived under the apparent assumption that none of the full-time officially employed individuals participated in the unofficial economy. We think that this assumption is at great odds with casual observation and undermines the validity of Braithwaite's estimates.

¹² A note on terminology is in order. Both Grossman and Treml defined the second economy in the Soviet Union as all economic activity that either is directly for private gain or knowingly contravenes the law, or

both. Kaufman and Kaliberda define the unofficial economy as constituting activity that is not recorded in the official GDP. Clearly, Grossman's definition is broader because it includes private legal economic activities that were included in the country's official statistics. But for urban USSR circa 1979, the year to which both Grossman's and Trembl's second economy estimates refer, this distinction is likely to be unimportant since the official private sector was negligible.

¹³ Note, however, that a significant share of unofficial income was obtained by using state-owned capital at state-owned enterprises.

¹⁴ The estimates of the dynamics of unofficial economy made by the Soviet researchers are summarized in Rutgaizer (1992). Alexeev and Trembl (1994) provide some econometric evidence of its growth. See also Alexeev (1997) for a discussion of the reasons for the growth of the underground economy in the USSR in the late 1980's.

¹⁵ The CIA estimates of Soviet GNP growth for 1980 are reported in Levine (1983). Noren and Kurtzweg (1993) present CIA GNP growth estimates for 1981-1989 and electricity output growth rates for the same period. The growth rate of electricity output for 1980 was calculated based on *Narodnoe* (1981). The CIA might have overestimated Soviet economic growth in the 1980's. If so, then our estimates of the size of informal economy at the end of the Soviet period would be too conservative. However, even if the CIA growth numbers were significantly inflated (for example by 50%) this would have only a small effect on our regressions in Section 4.

¹⁶ This number is obtained as $(1.36 - 0.88 \cdot 1.21) / 1.36 \approx 0.22$. We use unitary elasticity of output with respect to electricity consumption for the 1979-89 period essentially by default, as we do not have strong priors for the value of this elasticity in the former USSR.

¹⁷ To derive this formula, normalize the total 1989 GDP to 1. Then the official 1995 GDP can be obtained as $X_{OF} \cdot (1 - UE_{89})$, implying that the unofficial economy in 1995 is $X_{EL} - X_{OF} \cdot (1 - UE_{89})$. The formula for the share of this unofficial economy is then obtained by dividing the latter expression by X_{EL} .

¹⁸ Tables 2 and 3 in Johnson *et al.* (1997) also present regressions with several other governance variables which we have chosen not to present here. The data for "internal liberalization" were not available publicly. "External liberalization" and "large-scale privatization" do not relate as directly to governance and firm-level decisions to enter the underground economy as variables measuring the legal, regulatory and tax environments. "Rule of law" was constructed in 1997, two years subsequent to the unofficial economy data; the origins of the "legal extensiveness" data were not clear.

¹⁹ In later studies using cross-section data that included OECD and developing countries, Johnson *et al.* (1998) and Friedman *et al.* (2000) continued to use the same set of unofficial economy size estimates for transition countries. These had been constructed with output and electricity consumption data through 1995. These later studies, however, regressed these estimates on a number of governance indicators that had been created after 1995.

²⁰ They argue that the governments in these two countries were so repressive that "entrepreneurs [could not] switch into the unofficial sector." We disagree with this reasoning. Generally, all governments try to prevent entry into the unofficial sector. And, no doubt, there is a good deal of variation in their capabilities. But these are the very sort of differences in governance that our regressors are designed to capture. In Johnson *et al.* (1998) and Friedman *et al.* (2000), the argument about the uniqueness of these countries is not made and Belarus and Uzbekistan are included in the regressions.

²¹ We should note that there might well be additional factors that we do not consider that explain the variation in the size of the unofficial economy. For instance, Georgia, Azerbaijan and Moldova all experienced periods of civil war. We expect, however, that such an experience would be at least partly captured by the governance variables.

²² Using growth rate of the shares during 1989-95 period would have presented its own problems, because higher initial shares would tend to grow slowly simply because they would have less room for growth. In the limit, if a country's share of unofficial economy is 100%, it could only decline.