HOW DOES THE UNOFFICIAL ECONOMY INTERACT WITH THE OFFICIAL ONE?

CASE OF UKRAINE.

by

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Abstract

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The purpose of this research is to determine the effect of the shadow economy on the official one and possible reverse relation. The question is highly important in the contemporary Ukrainian conditions as the shadow sector is believed to be substantially large, but its impact still not adequately studied. The unobservable nature of the shadow economy is the strongest challenge.

We proceed in two stages. Firstly, the size of the underground sector in Ukraine during 1993-2001 is estimated with the augmented money demand approach. Secondly, VAR and simultaneous equations models are built in order to address our key questions.

It was assessed that local hidden economy is indeed substantially large when compared to other countries. Moreover, the ratio of shadow to official GDP did not show any particular trend over last nine years. We did not find a strong effect of the unofficial sector on the official one, while the reverse relation is positive and significant.

We believe that major tax relief envisaged by the draft Tax Code would break stable preferences of economic agents towards underground activities and *ceteris paribus* cause even faster recorded growth

TABLE OF CONTENTS

List of Figures. ii

List of Tables. iii

Acknowledgements. iv

Glossary v

Chapter 1: Introduction. 1

Chapter 2: Literature Review. 3

Chapter 3: Actors, Markets, and Institutions (Ukrainian Context). 11

Chapter 4: Theory. 16

Chapter 5: Data Description and Empirics. 27

Chapter 6: Discussion of Results and Policy Implications. 51

Chapter 7: Conclusions. 53

Works Cited 54

Appendix A1 57

Appendix A2 58

LIST OF FIGURES

Number	*Page*
Figure 1. *Normal Export versus Under Invoiced Export*	12
Figure 2. *Unofficial Economy and Collapse of Public Finance*	16
Figure 3. *Real Official and Shadow GDP*	37
Figure 4. *Shadow GDP as % of Official GDP (real terms)*	38
Figure 5. *Impulse Response of the VAR (3) model*	40

LIST OF TABLES

Number	*Page*
Table 1. *Estimation of Money Demand Function*	34
Table 2. *Real Shadow GDP in Ukraine, 1993-2001*	36
Table 3. *Hausman simultaneity test*	42
Table 4. *Estimation of SEM by Ordinary Least Squares*	43
Table 5. *Estimation of SEM by Two-Stage Least Squares*	44
Table 6. *Estimation of SEM by Three-Stage Least Squares*	45

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Finally, I express great thanks to my family who supported and encouraged me in the process.

GLOSSARY

Benevolent State. A state that seeks to maximize the total revenue of producers.

Deshadowization. A series of intentional activities undertaken by the legal authorities to suppress the extent of the *shadow economy*.

Inegalitarian Distribution. A distribution of endowments (income, privileges, etc.) within a society such that some members obtain more units than others [syn.: *unequal distribution*].

Perceived Tax Burden. A subjective evaluation by an individual economic agent of the burdensomeness of the duty to pay taxes and contributions to the state.

Proprietary State. A state that seeks to maximize its own revenue.

Public Good. A good that either will not be supplied by the market, or, if supplied, will be supplied in insufficient quantity (e.g., *national defence*).

Tax Evasion. Activities (most frequently, underreporting) that lead to payment less taxes than is due *according to the law* when calculated with respect to actual operations.

Unofficial Economy. Any kind of economic activity that generates value-added but is not reported to the statistics office, therefore not included into the National Accounts [syn.: *black, hidden, informal, shadow, underground, unrecorded economy*].

Chapter 1

INTRODUCTION AND MOTIVATION

During a chat at the campus cafeteria, an undergraduate fellow asked me: "*How do you explain the sharp GDP growth in 2000? Could it be attributed to the transformation of some shadow activities into the official ones?*" I was at a loss to answer the question because I never took the shadow economy into account. That time I replied: "*Yes. Why not?*" Obviously, my younger friend was not completely satisfied with the answer. Thus, at the end of this study I wish to be able to say either "*yes*" or "*no*" with a greater degree of confidence.

The personal motivation notwithstanding, I would like to deal with the question because it has not yet been adequately answered by anyone.

Economic research on the link between official and unofficial economies has a short history. As indicated in *Schneider and Enste* (1999), "the effects of an increase of the shadow economy on economic growth remain considerably ambiguous" [p. 24, op. cit]. Even if one has obtained reliable estimates of the share of Ukrainian shadow economy, it is still difficult to say how do both sides of the economy interact. The latter is a central question of our research. Namely, we set out to discover the impact of the shadow economy on the official sector (if any) and to identify a possible feedback.

The proposed topic is important from policy perspective. On the one hand, it is generally agreed that an abnormal shadow sector size undermines the institutional framework and makes economy degenerate. It is quite difficult to define the *normal* shadow economy size. On the other hand, the unofficial economy

provides a shelter for businesses unable to depart and survive in an overly aggressive official environment.

We would try to find out whether Ukrainian underground sector growth harms or promotes the development of the official one. In case of harming, the shadow sector should be treated as a "*public disaster*" and adequately suppressed. Otherwise, the underground economy is a "*public ally*" that should be welcomed. Respective policy implications would then be suggested.

Drawing on the knowledge about the interaction between the two sides of Ukrainian economy, we would try to answer whether the shadow economy was a donor for the official GDP growth during 2000-01.

C h a p t e r 2

LITERATURE REVIEW

Economists employ a variety of approaches to the estimation of the shadow economy. Enumeration of all methods is beyond the scope of this work. Two common approaches most frequently applied to the transition countries are the *(augmented) money demand* and the *electricity consumption* approach. Other methods might or might not be relevant; for the sake of comparability of results, we will maintain either of the mentioned approaches in our research, and therefore restrict the discussion to solely these two. Sticking to the standpoint that "assumptions derive conclusions" we choose the method by examining the assumptions.

Kaufmann and *Kaliberda* (1996) originally developed *electricity consumption* (also known as *physical input*) approach. According to *Schneider* and *Enste* (1999):

> Kaufmann and Kaliberda [1996] assume that electric power consumption is regarded as the single best physical indicator of overall economic activity. Overall (official and unofficial) economic activity and electricity consumption have been empirically observed to move in lockstep with an electricity/GDP elasticity usually close to one … Kaufmann and Kaliberda suggest that the growth of total electricity consumption is an indicator for representing a growth of official and unofficial GDP … the difference between the gross rate of registered (official) GDP and the gross rate of total electricity consumption can be attributed to the growth of the shadow economy [op. cit, p. 34]

Schneider and *Enste* (1999) also suggest a number of challenges to the model's assumptions:

(i) "not all shadow economy activities require a considerable amount of electricity … and other energy sources can be used…

(ii) … both the production and use of electricity are more efficient than in the past…

(iii) there may be considerable differences or changes in the elasticity of electricity /GDP across countries and over time" [op. cit, p. 35]

These limitations are strong enough to discourage a researcher from maintaining electricity consumption method. In addition to that, the approach does not control for *tax evasion*, which we regard as the most significant factor of Ukrainian underground economy.

In contrast to the Kaufmann and Kaliberda model, *money demand* approach explicitly accounts for tax evasion. This method's assumptions could be challenged and rejected as well. However, we believe they are more credible in the Ukrainian context than the set of assumptions in *electricity consumption* approach. Therefore, we comply with *money demand* approach to estimate the Real Shadow GDP for the purposes of this research. In this chapter first the literature on the selected approach is discussed. Then we review the controversy on the impact of shadow economy on the official one.

The underlying assumption of the method is that *cash serves all the operations in the underground economy*. Any other sources of settlement are ignored.

The paper by *Philip Cagan* (1958) is recognized as seminal to the money demand approach. The researcher determined correlation between tax burden and currency demand. The former factor was claimed to be a significant cause of the latter one.

Later on, *Peter Gutmann* (1977) used the same way of reasoning to arrive at the shadow economy estimates. He assumed a constant relation between the ratio of currency to demand deposits and official output. Any deviation from the anticipated fixed proportion was accounted for by the underground activities.

The underground GDP was estimated under the assumption that currency velocity is the *same* in both official and shadow economy. It implies that a currency unit (e.g., $1) will support the same amount of transactions in either sector. However, Gutmann's work lacks solid quantitative foundations. The author avoided any statistical procedures and made inferences simply from observation currency to deposit ratio.

Edgar Feige (1979) maintained quite similar assumptions. He relied on Fisher *quantity* identity ($M \cdot V = P \cdot T$), where all the variables except for *total transactions* (T) are as in the conventional identity. Feige's approach resembles Gutmann's in assuming a fixed long-term ratio. This time it is relation between volumes of transactions to nominal GDP. Moreover, the method requires quite a strong assumption of a base year without underground transactions. Indeed, Feige's approach is treated as a separate one today [*Schneider and Enste* (1999)]. Therefore, we would not pursue its discussion further.

Vito Tanzi (1983) augmented the money demand approach. The major innovations included the following: Firstly, currency to deposits ratio was substituted by currency to M2 ratio. The reason was to isolate the genuine demand for cash trend from shrinking bank deposits that seemed to be the case in the USA at that time. Secondly, an explicit tax burden was introduced into the currency demand equation. It was approximated by the ratio of total income tax payments to total income. Estimates of US shadow economy obtained by Tanzi are somewhat smaller than those of Gutmann and Feige, but they seem more reliable.

Tanzi's approach was most heavily used in the subsequent research. As mentioned, it also would be a central one for the purposes of this study. Below we briefly outline the model to make the critique of Tanzi's approach clear. We

will stress the key points and major controversies in more detail in the empirical part (*Chapter 5*).

The idea of this method is to separate the effects on money demand from official and shadow sectors. Therefore, explanatory variables to control for both are simultaneously introduced. Demand from the official side is solely explained by conventional factors: (1) opportunity cost of holding cash, (2) level of economic development (wealth), and (3) proportion of wages/salaries to GDP. Maintenance of two scale factors [(2) and (3)] that might often lead to the *multicollinearity* issue was justified in the following fashion: Higher level of wealth (higher per capita GDP) should lead to a *decrease* in currency/M2 ratio because the richer the country (*i*) the better developed the banking industry is (banking services cheaper), and (*ii*) the smaller the share in total income of items usually purchased with cash (e.g., food). Both (*i*) and (*ii*) induce agents to switch out of cash into more advanced monetary tools (*C/M2* reduces) when per capita GDP goes up.

On the other hand, since wages & salaries are usually paid in cash the increase of their cumulative share in GDP have to *increase C/M2* ratio. Therefore, factors (2) and (3) have *opposite* effects on the dependent variable. *Tanzi* (1983) also suggests excluding factor (3) from the model when the shadow economy in a country is presumably large. Statistical insignificance of *WS/NI* coefficient often indicates that actual wages and salaries are highly under reported because of large informal sector.

Tanzi regarded tax evasion as the core element of the shadow economy. The heavier tax burden creates more incentive to evade, thus enlarging the unofficial sector. If there were no taxes (i.e., tax burden equal to zero) no one is expected to cheat. Such reasoning lies behind Tanzi's measurement of *monetary volume* of the hidden economy.

To get the estimates of shadow GDP one should know the *money velocity* within the sector. Obviously, this parameter is unobservable. Like Gutmann, Tanzi assumes *equal* velocity in both official and unofficial economy. Since official money demand has already been deduced, formal sector velocity is easily calculated.

Tanzi model was aggressively criticized. Amongst the most sharp and relevant critics were the following:

Thomas (1999) pointed out that the model catches only the effect of tax burden on the shadow money demand. He claims that a number of other significant factors were ignored and points to the *Frey and Weck-Hannemann* (1984) study. The latter concludes that the lack of tax discipline is more statistically significant cause of the shadow economy than tax rates themselves. Thomas also suspects that Tanzi's parameter estimates are not robust.

Klovland (1984), *Hill* and *Kabir* (1996) find out that even official sector money velocity is difficult to measure. In turn, the velocity in the shadow sector is expected to be even more volatile. So, it is even impossible to predict which velocity in a certain time span is higher [*Shabsigh* (1995)].

An interesting empirical finding by *Isachsen* and *Strom* (1985) was that a fraction of 80% of all transactions was paid in cash in Norway at the time they gathered data. Thus, it undermines not only the Tanzi model but also the core assumption of the money demand approach. It was also stressed that the fraction may eventually fall down due to money laundering techniques.

More recent papers offer trustworthy results. *Bhattacharyya* (1990) used quite sophisticated econometric techniques to estimate separate money demand functions for formal and informal economies. When combined, they yielded a

hybrid non-constant-elasticity specification that was quite different from the conventional (Tanzi) one. In particular, Bhattacharyya used a modified version of Ramsey RESET procedure and a battery of diagnostic tests (LM, ARCH, etc.) to arrive at robust hidden economy estimates for the UK.

Despite cumbersome econometric specification, this approach gains by dealing only with observable and easily accessible variables. Bhattacharyya's results are close to those obtained by conventional techniques. The United Kingdom shadow economy (in % to official GDP) was estimated to rise steadily from 3-5% in 1960s to 6-10% in 1970s and then to shrink slightly in the first half of 1980s (8-9% on average). However, the predictive power of the model is not that clear.

An impressive application of money demand approach to a developing country was *Shabsigh* (1995) research on Pakistan. He introduced the level of banking services (represented by a ratio of per capita deposits to the number of bank accounts) into the set of explanatory variables. It is expected to adversely influence relative demand for cash. Tax burden was split into domestic, export, and import components that allowed the author to make certain policy implications.

The estimated yearly shares of shadow GDP to the official one during 1974-1990 in Pakistan were found to be within 20-26% range (no particular trend observed). It is perceived to be a high level. A significant long-run relation between fiscal deficit and the size of shadow sector was brought to the surface. Quite striking results were uncovered while exploring relation between private investment (PI) and both formal and underground output. It was done via cointegration equations testing. Shabsigh found a positive long run effect of the official GDP on PI, however the reverse was not true: PI did not contribute to recorded GDP over the long horizon. In contrast (and quite surprisingly), investment positively influenced the underground output in the long run.

Unfortunately, the literature lacks comprehensive measurement of Ukrainian hidden economy with money demand approach. As for today, we could refer only to the pioneering study by a group of experts from the *Institute of Economic Research and Policy Consulting/German Advisory Group* (IER) [*Melota, Thiessen and Vakhnenko* (2001)]. It has contributed to the field by introducing additional explanatory variables to catch the size of the shadow sector and augmenting the tax burden proxy, the letter discussed in length in *Chapter 5*. The former are a proxy for regulatory burden [measured as the share of state servants in the population] and a proxy for tax system simplicity [measured by the sum of squared proportions of tax revenue items in the whole tax revenue pool].

Experts also intended to control for foreign currency assets (*dollarization*). They conducted experimental tests using the following *enlarged* definitions of the dependent variable (DV):

- DV≡[C (domestic)+Foreign Currency Deposits (FCD)]/[M2+FCD]
- DV≡[C (domestic)+Net Purchases of USD ($NP)]/[M2+$NP]
- DV≡[C (domestic)+FCD+$NP]/[M2+FCD+$NP]

In all three cases:

> Estimations … yielded insignificant results and even perversely changed the signs of traditional explanatory variables (interest rate) … Hence, a definition (*of dependent variable* – R.D.) based on domestic currency only is superior to any enlargement" [op. cit, p.5, footnote 5].

Authors explain this phenomenon with a large fraction of dollar assets (approximately $10 billion) used as household savings rather then serving underground operations.

The aforementioned paper suggests comprehensive conclusions for further macroeconomic policy implications. However, it does not explicitly measure the size of the hidden economy in Ukraine.

At this point, we turn to the discussion of the literature on the central question of this research.

Adam and *Ginsburg* (1985) advocate a ***positive*** relation between the informal and formal economies under the assumption of low entry cost into the shadow sector. *Bhattacharyya* (1999) and *Schneider* (1998) make similar conclusions operating through the private consumption prism: They argue that a large portion of shadow income is directed into consumption thereby stimulating an increase in official supply.

On the opposite side, *Loayza* (1996) and *Johnson, Kaufmann, and Zoido-Lobaton* (1998b) study the effect of the shadow economy size on the rate of economic growth within the *public good* framework and find significant ***negative*** relation. These authors make cross-country analysis for a sample of Latin American and OECD – CEE/FSU – Latin American economies respectively. In passing, *Johnson* et al. (1998b) points to some issues connected with endogeneity /simultaneity that should be further researched. We explain and elaborate these suggestions more deeply in the empirical part (see *Chapter 5*).

Therefore, the following citation from *Schneider and Enste* (1999) still seems to be valid:

> The analysis of the effects of an increasing shadow economy is quite difficult and comprehensive empirical evidence is not available…the effects of an increase of the shadow economy on the economic growth remain considerably ambiguous [op. cit, p.39].

As stated in *Chapter 1*, we will try to clarify the mentioned ambiguity for the case of Ukraine. The core literature has been reviewed so far. Additional aspects would be emphasized as the research proceeds.

Chapter 3

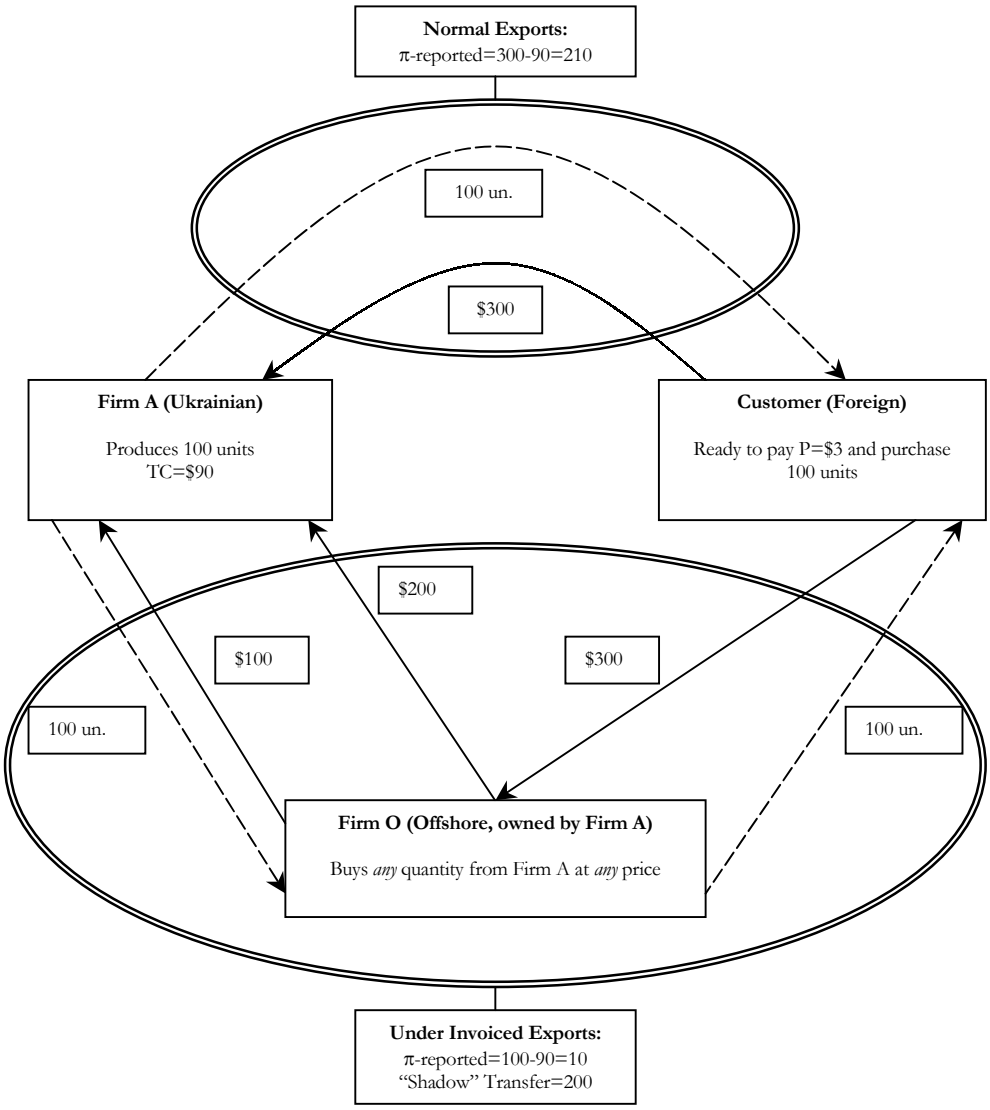
ACTORS, MARKETS AND INSTITUTIONS (*UKRAINIAN CONTEXT*)

Due to the shadow economy peculiarities the following analysis is rather non-standard one. However, it should contribute to better understanding of what are the *markets* and *agents* of the shadow economy and what *institutions* try to impact the latter in Ukraine. First, we will describe the mechanics of shadow operations. Second, the government plan on shadow economy reduction would be outlined.

According to various sources, post-Soviet entrepreneurs succeeded in the art of underreporting of operations, profits hiding, and other activities that lead to shadow economy increase. The most widespread schemes do involve an offshore company. The latter is a legal entity registered in a zone with little or no taxation, e.g. *Bahamas, Cyprus, Cayman, Virgin Isles* to name only a few. Registering an offshore company is not that burdensome for a Ukrainian entrepreneur today. The former is often a so-called "*virtual office*" with only a receptionist answering phone calls and re-directing mail. The founder in this or that way manages banking accounts of an offshore company.

The simplest scheme is an under invoiced exports (see *Figure 1*). Imagine that Ukrainian Firm A is a producer of Good 1 with average cost of production $0.9; it also possesses an offshore Firm O. Further, Firm A produces 100 units of Good 1 (Bundle) and would like to supply it to some foreign customer. The latter is willing to pay $3 per unit.

Figure 1: *Normal Export versus Under Invoiced Export*



Under the normal exports scheme, Firm A has to declare profit equal to $210 [= (3 – 0.9)×100]. According to Ukrainian legislation, corporate profit is subjected to 30% tax rate. Therefore, Firm A should pay $63 to the budget.

However, the manager of Firm A considers such a tax burden too heavy and decides to evade. He then sells the Bundle to offshore Firm O at $1 per unit. Simultaneously, the same manager (or his assistant) signs a contract with the foreign client on behalf of Firm O. Here Ukrainian tax authorities see only $10 profit [= (1 – 0.9)×100] from which $3 is due to the budget. Eventually, Firm O does not pay any charges from $300 revenues obtained; it could simply transfer surplus [$200=$300-$100] to Firm A or retain it offshore. These $200 are not reported to Ukrainian tax administration and therefore non-taxable.

As a consequence of offshore transaction, Firm A substantially evaded taxes by camouflaging more than 95% of actual profits [= (210 – 10)/210]. It resulted in dramatic decrease of budget revenues: $3 instead of $ 63.

Unfortunately for profit-hiders, tax inspectors today have a good expertise in uncovering simple evasion schemes like the above one. Therefore, more advanced and sophisticated mechanisms were practiced. Some of them include an intermediary company (Firm M) that specializes in profits hiding. Most commonly, Firm M obliges to provide some services to Firm A. The latter pays according to the contract and adds that amount to the production costs thus minimizing operational profits. Payment received by Firm M is thereafter transferred into cash and returned back to Firm A. On the aggregate, Firm A pays much less in commission fees to Firm M than it would have to pay to the budget.

Up to this point it should be quite clear that shadow sector is established mostly on long-term tradition and strong personal contacts. It also could survive well to negative external shocks. Admitting an abnormally high level of shadow activities in Ukraine, Cabinet of Ministers headed by *Victor Yuschenko* adopted "*The State Program of Deshadowization of Ukrainian Economy*" (Program) in 2000.

After government reshuffle in May 2001, a new government continued to implement the Program. We will briefly outline the latter since it is the central official document on the issue so far.

The goal of the Program is to increase the share of official sector by means of cutting down the unofficial one. Shadow economy in this context is pinpointed as an economic activity that generates value added which is neither resembled in National Accounts nor considered for taxation purposes. Noteworthy, any sort of criminal activity that is done in shadow (e.g., drug dealing) is not considered when estimating the scale of shadow economy since it is not an economic one.

The main kinds of hidden operations include tax evasion (described in length above), illegal/unlicensed economic activity or a financial violation. The last one is the least clearly defined and most probably pertains money laundering.

Ukrainian shadow sector is believed to yield enormous gain; be strongly linked with authorities at different levels; use highly proficient staff (managers, economists, analysts, lawyers), and penetrate into all areas of economy. **Therefore, we may infer that each Market has its shadow component and every firm might be suspected as an unofficial economy Agent.**

Imperfect and unstable tax legislation, poor tax discipline, regulatory burden, corruption, and low income in the state sector is named among the core causes of economy "*shadowization*". The most disastrous consequences are budget revenues loss, capital investment deterioration, irrational resource allocation, inadequate government regulations and European integration postponement.

It was decided to reduce the shadow sector through tax burden decrease; elimination of tax preferences; simplification of taxation, licensing, registration, accounting and reporting procedures; deregulation; banking and financial markets development; improvement in settlement mechanisms and other.

The key institutions called to implement the program were State Tax Administration, National Bank of Ukraine, Securities and Stock Market Commission, State Property Fund, a number of ministries and specialized committees.

In summary, the Program declares intention "to create *favorable economic conditions* for shadow economy agents to leave the sector". However, after reviewing the *Scope of Work* appendix to the Program we think that some measures in banking & finance industry and on the electricity market if implemented could even further increase the regulatory burden. Thus, shadow economy reduction acts may actually boost the former.

C h a p t e r 4

THEORY

According to *Tanzi* (1999), there is no solid theory underlying his method notwithstanding it maintains some elements of static money demand theory. Shadow economy estimation model is purely empirical one. Moreover, Tanzi argues that a comprehensive shadow economy theory is infeasible.

Johnson, Kaufmann, and *Shleifer* (1997) [JKS] propose a model that emphasizes the public finance determinants to the unofficial economy. The key idea of the model is simple but intrinsically powerful; however, the formal part of the analysis is somewhat inconclusive. *Figure 2* visualises the JKS argument.

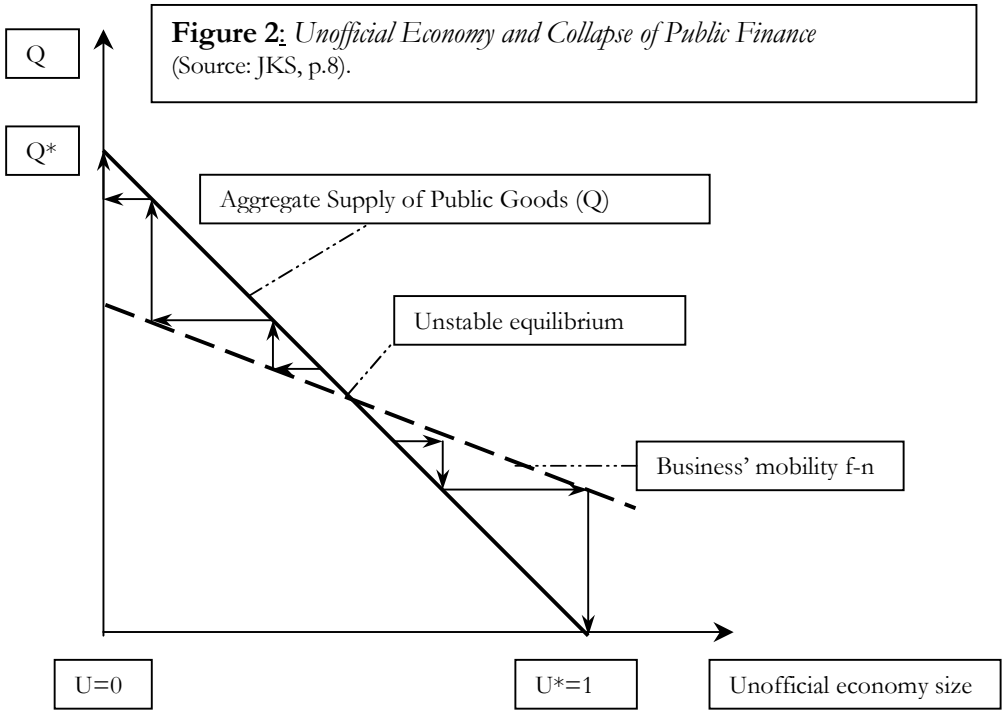


Figure 2: *Unofficial Economy and Collapse of Public Finance*
(Source: JKS, p.8).

The figure graphs quantity of public goods on the vertical axe against the share of the unofficial economy in the overall economy on the horizontal one. The crucial properties of the public good are that (1) informal firms could be and actually are *excluded* from using it, and (2) the good per se is *production enhancing* hence badly needed by all firms [Justice system is the best example of such a public good].

The solid line resembles the **aggregate supply** of public good. It shows that the higher is the share of the unofficial economy, the lower are the official tax collections, and hence the supply of public goods to the official sector.

The dotted line (*Business' mobility function, MF*) might be treated as **aggregate demand** for public good from firms. It shows that the higher is the supply of public goods in the official economy, the fewer firms choose to operate unofficially. MF generally cuts the solid line from below.

In general, there are three equilibriums in this model. The first one corresponds to point Q*. In this equilibrium, all resources are concentrated in the official sector. Thus U=0; tax collection and provision of public goods (financed with tax revenues) is the maximum here.

The second equilibrium could be achieved at point U*=1, meaning that all firms operate in the underground sector, so that Q = 0. The third and the last possible equilibrium is at the crossing of the two functions (*knife-edge equilibrium*) in which the two sectors coexist.

The first two equilibriums are stable. If, for example, all resources are concentrated in the official sector, public good provision in that sector is high enough for all firms choose to stay there. The equilibrium is stable because, when only a few firms are operating unofficially, it is to their advantage to switch to the official economy and access to official public goods (in *Figure 2* MF is below the

solid line for U close to zero). Otherwise, when most firms are in the unofficial sector, government revenues do not suffice to provide the level of public goods needed to draw firms back into the official sector. Hence, further resources move to the unofficial sector until all firms end up there.

By contrast, the *knife-edge* intermediate equilibrium is unstable. Let us follow the *cobweb* dynamics suggested by arrows in *Figure 2*. Suppose that an economy due to a positive budgetary shock gets on the positive side (to the north-west along the AS line) of the intermediate equilibrium, meaning that there is *excess supply* of public good. At this point the unofficial economy is relatively small and tax revenues are relatively large. Some unofficial firms wish to capture this excess supply and thus switch to the formal sector. As they move, tax revenues as well as the excess supply of public goods in the official sector rise. Therefore, we pass to the higher point along the curve. Here, a number of other shadow firms decide to switch to the official economy and everything repeats as described above. A sort of *virtuous cycle* leads to a fully official economy when the equilibrium is attained.

Conversely, suppose that some adverse shock pushes economy to the southeast along the AS curve from the unstable equilibrium. In this instance, unofficial economy is relatively large, tax revenues and public goods supply – relatively small (firms face undersupply/excess demand of/for public good). It now becomes more attractive to operate in the shadow sector. As additional firms go underground, excess demand increases further. This *vicious cycle* leads to the extreme equilibrium where the whole economy is unofficial. Unfortunately, we never observe these two stable equilibria in the real world.

Azuma and *Grossman* (2002) elaborated this line of analysis and obtained quite sound results. The latter authors formally show which public finance factors

contribute to the shadow economy. Similar to JKS, *Azuma* and *Grossman* (2002) depart from the importance of public good at the shadow economy analysis:

> Producers in the informal sector … must produce with less assistance from public services that is available to producers in the formal sector. These public services include the protection of property rights by the police and the courts as well as public utilities, such as roads, electric service, potable water, and sewage disposal [op. cit., p.1]

The model suggested by *Azuma* and *Grossman* (2002) is outlined below. For simplicity, all producers are divided into two broad categories: *well endowed* and *poorly endowed*. Authors assume that productive endowments include important *unobservable* components (e.g., knowledge and ability, reputation, connections, financial backing, and market power). If the state could observe these components, it would simply charge each firm precisely the maximum amount consistent with each firm to remain in the official sector. Since it is not the case, government could not extract from each producer (in the formal sector) according to the latter's endowments and therefore the state charges a *uniform* amount (X) from both well- and poorly-endowed firms.

We will focus on the case of a *proprietary* state, i.e. the state which maximizes own net revenue that is the difference between taxes and bribes collected and the cost of public good provided. An alternative case suggested by *Azuma* and *Grossman* is the case of *hypothetical benevolent state* (maximises total net income of producers). The latter model yields quite similar results to the model of the proprietary state; however, Ukrainian government (as most of non-hypothetical governments) is much likely to behave in proprietary than benevolent fashion.

Assume there are N well-endowed and n poorly endowed producers ($N+n=1$) in the economy with K and k units of productive resource respectively. It is crucial to note here that *unobservability* implies that the government could not determine precisely whether the firm is well or poorly endowed, but it knows

(or has adequate expectations on) what are the respective shares (N and n) as well as the magnitude of K or k. State supplies G units of public good only to those in the formal sector; G is utilised as an intermediate good in production process.

Let Ω denote the average endowment of productive resources across all firms in the economy: $\Omega = NK+nk$. Then Ω_f is the amount of productive resource employed in the formal sector: $\Omega_f = MK+mk$, where M and m represent respectively share of well and poorly endowed producers in the formal sector ($0 \le M \le N$, $0 \le m \le n$).

Net gross output in the formal sector (gross official output less output used to provide public services) is denoted by Z_f. Assuming that production function is of a CRS Cobb-Douglas form, we have:

[4.1] $$Z_f = \Omega_f^{\alpha} G^{1-\alpha} - G, \quad 0<\alpha<1$$

Net income of well and poorly endowed producers in the formal sector is denoted by Y_f and y_f respectively. Average production per unit of productive resource in the formal sector is equal to the gross formal-sector output [$\Omega_f^{\alpha} G^{1-\alpha}$] divided by the total amount of productive resource in the sector [Ω_f]. When this ratio is multiplied by the resource endowments of a producer in the formal sector [either K or k], we obtain respectively the gross incomes of formal-sector well and poorly endowed individual producers. Since each official firm is charged a uniform amount of X by the state, the resulting net incomes of the formal producers become:

[4.2] $$Y_f = \left(G / \Omega_f \right)^{1-\alpha} K - X \quad \text{and} \quad y_f = \left(G / \Omega_f \right)^{1-\alpha} k - X$$

The drawback of being in the informal sector is that public good (input) is unavailable. For that reason, well and poorly endowed producers in the shadow economy should respectively allocate S and s to obtain a *substitute* for the public services.[1] However, it is important to assume that providers of these substitutes are less efficient than the government as a provider of public goods to the formal economy. For instance, assume that the state could offer S and s units of *public services* at the price of S and s units of *output* respectively. Alternative providers, charging the same price, would offer μS and μs units of *public services* respectively with $0 < \mu < 1$.

Assume further that informal-sector producers utilise productive resources and public good *substitutes* in the CRS Cobb-Douglas manner. Then, the respective net incomes for well-endowed [Y_i] and poorly endowed [y_i] informal producers are as follows:

[4.3] $$Y_i = K^{\alpha}(\mu S)^{1-\alpha} - S \quad \text{and} \quad y_i = k^{\alpha}(\mu s)^{1-\alpha} - s$$

Any well-endowed producer in the informal sector maximizes Y_i with respect to S. The first order condition [FOC] becomes: $\frac{dY_i}{dS} = (1-\alpha)K^{\alpha}[\mu S]^{-\alpha} - 1 = 0$.

Simplifying, it follows that:

[4.4] $$S = (1-\alpha)^{1/\alpha}\mu^{(1-\alpha)/\alpha}K \text{ ; by analogy, } s = (1-\alpha)^{1/\alpha}\mu^{(1-\alpha)/\alpha}k$$

Let us substitute the first part of equation [4.4] into [4.3]:

$$Y_i = S\left[K^{\alpha}\mu^{1-\alpha}(1-\alpha)^{-1}\mu^{\alpha-1}K^{-\alpha} - 1\right] = S\left[\frac{1}{1-\alpha} - 1\right] = \alpha S(1-\alpha)^{-1} = \alpha\left[(1-\alpha)\mu\right]^{(1-\alpha)/\alpha}K$$

[1] As indicated in footnote 7 op. cit, mafia might provide these substitutes; also, bribes to state servants may grant informal firms an unofficial access to the public good.

The similar expression could be derived y_i. Consequently:

[4.5] $$Y_i = \alpha\left[(1-\alpha)\mu\right]^{(1-\alpha)/\alpha} K \quad \text{and} \quad y_i = \alpha\left[(1-\alpha)\mu\right]^{(1-\alpha)/\alpha} k$$

The final assumption says that a producer chooses to work in the formal economy *if and only if* his net income there exceeds income in the informal sector [either $Y_f \geq Y_i$ or $y_f \geq y_i$]. These conditions could be stated in the following way:

[4.6] $$\left(G/\Omega_f\right)^{1-\alpha} K - X \geq \alpha\left[(1-\alpha)\mu\right]^{(1-\alpha)/\alpha} K$$

$$\left(G/\Omega_f\right)^{1-\alpha} k - X \geq \alpha\left[(1-\alpha)\mu\right]^{(1-\alpha)/\alpha} k$$

The net revenue of the state is given by:

[4.7] $$R = (m+M)X - G$$

As already mentioned, the proprietary state maximizes R with respect to G and X. G is chosen so that $dR/dG = 0$. There are two possible options for X. State could extract to satisfy either:

[4.8] $$Y_f > Y_i \quad \text{and} \quad y_f = y_i$$

or

[4.9] $$Y_f = Y_i \quad \text{and} \quad y_f < y_i$$

Under the former option ([4.8]), all firms choose to perform in the formal sector. Hence, M=N, m=n, and $\Omega_f = \Omega$. Government revenue function thus simplifies to $R = (n+N)X - G = X - G$ [*].

From [4.6], equality $y_f = y_i$ implies:

[4.10] $$X = \left(G/\Omega\right)^{1-\alpha} k - \alpha\left[(1-\alpha)\mu\right]^{(1-\alpha)/\alpha} k$$

From [*] and [4.10] we have that $\frac{dR}{dG} = \frac{dX}{dG} - 1 = (1-\alpha)G^{-\alpha}\Omega^{\alpha-1}k - 1 = 0$.

Thereby, $G\big|_{m=n} = (1-\alpha)^{1/\alpha} k^{1/\alpha}\Omega^{(\alpha-1)/\alpha} = \left[\frac{(1-\alpha)k}{\Omega}\right]^{1/\alpha}\Omega$. Substituting the latter into [4.10], we obtain $X\big|_{m=n} = \left[\left\{\frac{(1-\alpha)k}{\Omega}\right\}^{(1-\alpha)/\alpha} - \alpha\left\{(1-\alpha)\mu\right\}^{(1-\alpha)/\alpha}\right]k$. After minor simplification, we end up with the following:

[4.11] $$X\big|_{m=n} = (1-\alpha)^{(1-\alpha)/\alpha}\left[\left(\frac{k}{\Omega}\right)^{(1-\alpha)/\alpha} - \alpha\mu^{(1-\alpha)/\alpha}\right]k > 0$$

$$G\big|_{m=n} = \left[\frac{(1-\alpha)k}{\Omega}\right]^{1/\alpha}\Omega$$

Resulting government revenue (with absolutely all producers in the formal sector) is of the following form:

[4.12] $$R\big|_{m=n} = X\big|_{m=n} - G\big|_{m=n} =$$

$$= (1-\alpha)^{(1-\alpha)/\alpha}\left[\left(\frac{k}{\Omega}\right)^{(1-\alpha)/\alpha} - \alpha\mu^{(1-\alpha)/\alpha} - (1-\alpha)\left\{\frac{k}{\Omega}\right\}^{(1-\alpha)/\alpha}\right]k =$$

$$= (1-\alpha)^{(1-\alpha)/\alpha}\left[\left(\frac{k}{\Omega}\right)^{(1-\alpha)/\alpha}\left\{1-(1-\alpha)\right\} - \alpha\mu^{(1-\alpha)/\alpha}\right]k =$$

$$= \alpha(1-\alpha)^{(1-\alpha)/\alpha}\left[\left(\frac{k}{\Omega}\right)^{(1-\alpha)/\alpha} - \mu^{(1-\alpha)/\alpha}\right]k \geq 0$$ that holds for $\frac{k}{\Omega} \geq \mu$.

When $\frac{k}{\Omega} < \mu$, government would set *X* in order to satisfy condition [4.9] instead of [4.8]. In this case, only well-endowed producers stay in the formal sector with all poorly endowed ones moving to the informal one. Respectively, *M*=*N* and *m*=0. Government revenue is now $R = (m+M)X - G = NX - G$ [**].

From [4.2] and [4.5] we get:

[4.13] $$X = \left(G/NK\right)^{1-\alpha} K - \alpha[(1-\alpha)\mu]^{(1-\alpha)/\alpha} K$$

Combining [**] and [4.13] we see that $\frac{dR}{dG} = (1-\alpha)\left[\frac{G}{NK}\right]^{-\alpha} - 1 = 0$. From this condition we obtain the following:

[4.14] $$G\big|_{m=0} = (1-\alpha)^{1/\alpha} NK$$

$$X\big|_{m=0} = \left[(1-\alpha)^{(1-\alpha)/\alpha}\left(1-\alpha\mu^{(1-\alpha)/\alpha}\right)\right]K$$

Finally, bearing in mind that $NK = \Omega - nk$, we are able to calculate the government revenue with poorly endowed firms being in the informal sector:

[4.15] $$R\big|_{m=0} = NX\big|_{m=0} - G\big|_{m=0} =$$

$$= \left[(1-\alpha)^{(1-\alpha)/\alpha}\left(1-\alpha\mu^{(1-\alpha)/\alpha}\right)\right]NK - (1-\alpha)^{1/\alpha} NK =$$

$$= (1-\alpha)^{(1-\alpha)/\alpha}\left[1-\alpha\mu^{(1-\alpha)/\alpha} - (1-\alpha)\right]NK =$$

$$= \alpha(1-\alpha)^{(1-\alpha)/\alpha}\left[1-\mu^{(1-\alpha)/\alpha}\right](\Omega - nk)$$

Since the proprietary government maximizes net revenue, it would set X high enough to induce the informal sector *if and only if* the revenue thus generated would exceed the revenue obtained with no informal sector, the latter being the case with a smaller X. Using our results from [4.12] and [4.15], for $R\big|_{m=0} > R\big|_{m=n}$ to hold we need that:

[4.16] $$\left[1-\mu^{(1-\alpha)/\alpha}\right](\Omega - nk) > \left[\left(\frac{k}{\Omega}\right)^{(1-\alpha)/\alpha} - \mu^{(1-\alpha)/\alpha}\right]k \Rightarrow$$

$$\Rightarrow \frac{\left(\frac{k}{\Omega}\right)^{(1-\alpha)/\alpha} - \mu^{(1-\alpha)/\alpha}}{1-\mu^{(1-\alpha)/\alpha}} < \frac{\Omega - nk}{k} \Rightarrow \frac{\left(\frac{k}{\Omega}\right)^{(1-\alpha)/\alpha} - \mu^{(1-\alpha)/\alpha}}{1-\mu^{(1-\alpha)/\alpha}} < \frac{1-\frac{nk}{\Omega}}{k/\Omega}$$

This result is the essence of the unofficial sector theory developed by *Azuma* and *Grossman* (2002). They argue that the government would choose X to satisfy [4.9] rather than [4.8] when either k/Ω is sufficiently small or μ is sufficiently large (close to unity). Literally, it means the following:

> **If the proprietary state could not observe the endowment of each producer, and if either the distribution of endowments is sufficiently *inegalitarian* or the production of private substitutes for public services is sufficiently easy, then to maximize its net revenue the proprietary state extracts from producers in the formal sector a large enough amount that poorly endowed producers choose to work in the informal sector [op. cit, p.12].**

This result seems especially relevant when explaining the existence of the informal sector in transitional context. In Ukraine, for example, large strategic enterprises in metallurgy, oil and gas, chemicals and other industries survived the Soviet Union disintegration in large part due to their considerable endowments

(substantial production capacities, proximity to raw materials, excess labour force, powerful government lobby). In contrast, start up firms face rigorous credit constraint and also are not eligible for foreign investment, thus could not accumulate substantial productive resources. Obviously, resource distribution is drastically unequal in Ukraine (k/Ω is sufficiently small).

It is important to stress that such sharp endowments gap between incumbent firms and entrants somewhat undermines the plausibility of the *unobservability* assumption. The central implication of this assumption is the uniform absolute amount (X) extracted from official firms. The implication nevertheless might remain valid because many or most of Ukrainian large/strategic enterprises are situated in *Donbass* region (*Dnipropetrovsk* and *Donetsk* oblasts) where the Free Economic Zone experiment is ongoing. This program implies tax vacations or taxation at the negligible level. Therefore, the absolute amount charged might really turn comparable across these and other firms.

As to the alternative providers of public goods, both mafia and corrupt state servants are suitable candidates. Moreover, it is often difficult to draw a line between these two: They seem to cooperate quite well and yield mutual gains from so doing. Hence, an unofficial firm faces plenty of cost-efficient ways to access public good or get an equivalent (μ is quite close to unity).

Chapter 5

DATA DESCRIPTION AND EMPIRICS

We first estimate the size of the unofficial economy in Ukraine and then explore its interaction with the official sector. In this study, a *macro* data set would be used. We would not engage into micro level analysis; however, refer to a decent micro research when needed.

In his original approach, *Tanzi* (1983) relied upon the following basic specification:

$$\ln \frac{C}{M2} = \beta + \beta_1 \ln(1+T) + \beta_2 \ln \frac{WS}{NI} + \beta_3 \ln R + \beta_4 \ln y + e \qquad [5.1]$$

Expected signs are: $\beta_1 > 0, \beta_2 > 0, \beta_3 < 0, \beta_4 < 0$. Variables have the following meaning:

$\frac{C}{M2}$	Proportion of currency [*C*] in *M2*
T	Total income tax payments to total income ratio
$\frac{WS}{NI}$	Ratio of wages and salaries (*WS*) in national income (*NI*)
R	Rate of interest paid on time deposits
y	Real GDP per capita

An outline of the model and major critique is presented in *Chapter 2*. We re-emphasize the key points here.

Currency in circulation to M2 monetary aggregate ratio [*C/M2*] is used as a depended variable. The ratio is designated to control for changes in the composition of an agents' cash versus non-cash assets portfolio. If, for instance, the *ratio declines*, it signals that agents prefer to hold *smaller fraction* of cash than before.

Independent variables *WS/NI, y*, and *R* determine money demand from the official sector, while *T* explains the unofficial money demand. *WS/NI* is expected to have *positive* effect on the dependent variable since wages and salaries are usually paid in cash. In contrast, Tanzi anticipates that *y* would impact the LHS *negatively* for the following reasons: (*i*) richer countries have better developed banking industries (thus cheaper banking services), and (*ii*) in richer countries, the share of total income spent on items usually purchased with cash (e.g., food) tends to be lower than in poorer ones. Hence, an increase in *y* (country becomes richer) will provide stimulus to economic agents to hold relatively more non-cash assets, so *C/M2* will reduce.

The opportunity cost of holding cash represented by *R* is expected to have traditionally *negative* effect on the proportion of cash assets. Let us now look how the model assumptions assist one to form expectations about the sign of coefficient at *T*.

Tanzi starts by assuming that *tax evasion* is the only considerable source of the shadow economy. Tax evasion is born by the *tax burden*. Underground GDP *per se* is *unobservable*. However, having assumed that *all* shadow operations are settled with cash, one can make inference about the change in the unofficial economy size from the (observable) change in *C/M2* ratio. Therefore, we get the following "chain reaction":

[**Tax Burden**] $\uparrow \Rightarrow$ [**Tax Evasion**] $\uparrow \Rightarrow$ [**Shadow GDP**] $\uparrow \Rightarrow$ [***C/M2***] $\uparrow$

It indicates that tax burden proxy *T* should *positively* influence the dependent variable.

Let us now consider some facts and empirical findings about the peculiarities of the informal sector in transition economies and use these to augment the model accordingly.

First, econometric test with *WS/NI* variable included showed the latter to be *insignificant*. According to *Tanzi* (1983), this might happen when the shadow sector is substantially large, thereby actual wages and salaries being highly under reported. Leading experts in *labor economics* avoid exploiting official Ukrainian statistics on employment and wages[2]. Instead, they use survey data. The latter is not available in quarterly series format (at best, surveys are conducted annually). So we have no substitute for the irrelevant variable and therefore must proceed *without* controlling for labor cost.

Noteworthy, *Shabsigh* (1995) warned that inclusion of two scale variables (namely, *WS/NI* and *y*) is likely to bear *multicollinearity* issue. We insure against the latter by omitting *WS/NI*.

Second, tax burden approximated by *T* is effectively an average income tax rate, an indicator of direct taxation. *Melota, Thiessen and Vakhnenko* (2001) tested specifications with a variety of proxies for direct, indirect, and social security tax burden and combinations of these. They conclude that direct tax burden is *always* significant, while the indirect one is *never* so. Social security burden proxies yield insignificant results when taken separately.

[2] During a class in Labour Economics at EERC, Dr. *Hartmut Lehmann* stressed that official data on employment and labour costs in Ukraine is highly misleading.

And only the following proxy for combined direct taxation and social security burden stays highly significant in all test modifications:

$$TB \equiv \frac{PIT + EPT + SC}{GDP}, \text{ where}$$

PIT Personal Income Tax revenues (known also as *Household Income Tax*)

EPT Enterprise Profit Tax revenues

SC Social Contributions (approximately equal to the Pension Fund levies)

It is obvious that $TB \in [0,1)$[3]. We will now justify the inclusion of *TB* (as defined above) into our model to represent the *tax burden*.

Though *TB* is calculated from aggregate (macro) data, it might also be interpreted at the micro level. Under the assumption of *symmetric* taxpayers, each and every taxpayer pays a fraction of his/her income exactly equal to *TB* in the form of direct taxes and social security contributions. If we relax the assumption, *TB* would stand for an average share of income extracted from an agent by these two kinds of taxation. Below we describe the *role* of direct taxes and social security contributions in the agent's decision-making process.

Schneider (2000) developed a procedure to assess the relative (percentage) contribution of the change in (a) direct taxation; (b) indirect taxation; (c) social security payments; (d) tax system complexity; and (e) regulatory burden to the change of the shadow economy size and applied it to annual Austrian data covering 1965-98. From these calculations, we see that factors (a)+(c) were approximately twice as much "influential" as (b)+(d)+(e) in most periods.

[3] We restrict *TB* to be strictly less than unity because taxation itself never absorbs the entire income in the real world. Moreover, *TB* is less (at maximum, equal) than the ratio of Total Tax Revenues to GDP.

Similar results hold true for a transitional context, as shown by *Johnson, Kaufmann, McMillan, and Woodruff* (1999). The paper presents results of *micro* level study[4] of unofficial activity in Russia, Ukraine, Poland, Romania, and Slovak Republic; among the key results it was stated that direct taxation is by far more crucial for entrepreneurs in each country as compared to the indirect one.

These empirical evidences allow us to compare and contrast performance of different proxies for tax burden. An alternative proxy most widely used during the early years of money demand approach application [e.g., *Feige* (1986), *Zilberfarb* (1986)] is defined as follows:

$$TR \equiv \frac{TTR}{GDP}$$

with *TTR* denoting Total Tax Revenues. *Example 1* clearly shows what are the consequences of incorporation either *TB* or *TR* into the model:

Example 1: *Comparative Analysis of Alternative Proxies for Tax Burden*

For simplicity, assume that GDP stays constant across periods 0 and 1: GDP(0)=GDP(1)=200. Denote: DTS(t) ≡ EPT(t)+PIT(t)+SC(t); INDT(t) ≡ VAT(t) + +Excise(t)+Duties(t); TTR(t) ≡ DTS(t)+INDT(t).

Suppose, in t(0): DTS(0) = 50, INDT(0) = 50; TTR(0)=100. In t(1): DTS(1)=60, INDT(1)=40, TTR(1)=100. Noticeably, TTR(0)=TTR(1).

According to our notation, TB(t) ≡ DTS(t)/GDP(t) and TR(t) ≡ TTR(t)/GDP(t). Consequently: TB(0)=0.25, TB(1)=0.3, i.e. TB(1)> TB(0) while TR(0)=TR(1)=0.5.

We see that indirect taxation (INDT) decreased and direct taxation, social contributions (DTS) increased to exactly the same extent, so that *absolute percentage tax burden* (TTR) remains constant. However, agents put more weigh onto DTS, which then is the best indicator of the *perceived percentage tax burden*. Since DTS(1)>DTS(0), we expect the shadow economy volume to increase between periods. In terms of dependent variable, we anticipate [C/M2](1)>[C/M2](0).

[4] Samples of 200-300 enterprises were surveyed in each country.

Implications from Ex.1: Inclusion of TB will result in the correct (*positive*) impact of tax burden on the dependent variable (DV). If one included TR, s/he will not be able to explain the change in DV (caused by the *perceived percentage tax burden*) with an explanatory variable [tax burden proxy stays fixed: TR(0)=TR(1)]. The change would falsely be attributed to the error term. The explanatory power of the model would thus deteriorate.

Drawing on the implications from *Example 1*, we suggest that *TB* is a sound tax burden proxy for the model.

To derive the US shadow economy estimates, *Tanzi* (1983) approximated the lowest tax burden level by T=0. Surely, the approximation is somewhat arbitrary: Why not define the minimum level, say, as T=0.1 or T=0.05? On the one hand, the founder of the method did *not* explain the reasons for such a choice; on the other hand, hid strongest opponents did *not* challenge this assumption.

All in all, to be consistent with Tanzi approach we also set $TB = 0$ as the minimum *perceived* tax burden (see below). On the micro level, it implies that agents are charged with taxes that are not important for their official-unofficial sector choice. On the macro level, this means that government revenues consist completely of INDT, but it is not necessarily the case of the government going bankrupt!

Third, the problem with Ukrainian real commercial banks' deposit rate (equivalent to *R*) data is that in 16 out of 33 observations, the rate has a *negative value*. Since natural logarithm of a negative integer is not defined, we make a linear transformation [1+*rate*]. Hence, the specification (after exclusion *WS/NI*) is:

$$\left[\ln CM2\right]_t = \alpha + \alpha_1\left[\ln(1+TB)\right]_t + \alpha_2\left[\ln(1+RR)\right]_t + \alpha_3\left[\ln RGDPPERCAP\right]_t + e_t$$
Expected signs: $\alpha_1 > 0, \alpha_2 < 0, \alpha_3 < 0$ [5.2]

with variables description following:

CM2 = (C/M2)

C – Currency in Circulation [1993Q1 – 2001Q4]

M2 – M2 in domestic currency (w/o deposits in foreign currency) [1993Q1 – 2001Q4]

TB – proxy for Tax Burden [aggregate share of PIT, EPT, and SC in GDP (see above for details); in *decimals*; 1993Q1 – 2001Q4]

RR – real commercial banks' deposit interest rates, weighted average (by banks' assets)[% per month; 1993Q1 – 2001Q4]

RGDPPERCAP – real per capita GDP, in UAH [1993Q1 – 2001Q4]

Data was borrowed from the UEPLAC: *Ukrainian Economic Trends*, December 2001. All data is measured in UAH millions and is quarterly, if otherwise not explicitly indicated. Corresponding coverage span is presented in brackets.

All series are *stationary* when checked with ADF test (see *Appendix A2* for details). In order to handle seasonality, we introduce dummy variable for the last quarter in each year [**DUM4Q**: 1 for the *fourth* quarter, 0 otherwise]. Estimation of [5.2] pointed to the *autocorrelation* issue. We therefore included lagged terms. The best specification follows:

$$\left[\ln\frac{C}{M2}\right]_t = \gamma + \gamma_1\left[\ln\frac{C}{M2}\right]_{t-1} + \gamma_2\left[\ln(1+TB)\right]_t + \gamma_3\left[\ln(1+RR)\right]_t + \\ + \gamma_4\left[\ln(1+RR)\right]_{t-1} + \gamma_5\left[\ln RGDPPERCAP\right]_{t-1} + \gamma_6 DUM4Q + e_t \qquad [5.3]$$

Estimation output of both [5.2] and [5.3] is presented in *Table 1*.

Table 1. *Estimation of Money Demand Function*

	Specification [5.3] (Autocorrelation-corrected)		Specification [5.2] (Original)	
Explanatory variable:	Coefficient (standard error)	p-value	Coefficient (standard error)	p-value
Constant	-0.9360* (0.304)	0.0046	-1.931154* (0.4750)	0.0003
LOG(CM2(-1))	0.8322* (0.056)	0.0000	---	---
LOG(1+TB)	1.1488** (0.55)	0.0460	0.087571 (1.1787)	0.9412
LOG(1+RR)	-0.5803* (0.194)	0.0059	0.357941 (0.3832)	0.3574
LOG(1+RR(-1))	-0.6851* (0.122)	0.0000	---	---
LOG (RGDPPERCAP)	---	---	-1.173543* (0.1837)	0.0000
LOG (RGDPPERCAP(-1))	-0.3266* (0.116)	0.0089	---	---
DUM4Q	0.0783** (0.029)	0.0125	---	---
R-squared	0.962		0.733	
Adj. R-squared	0.954		0.708	
F-statistic (prob.)	118.7 (0.0000)		29.33 (0.0000)	
Durbin-Watson stat.	2.13		0.803	
White Heterosced. (p-val)	0.005§		0.03	
BG Ser. Corr. LM (p-val)	0.52		0.002	
Jarque-Bera (p-value)	0.79		0.93	
No. of observ.	35		36	

Note: * denotes coefficient's significance at 1% level; ** - at 5%; *** - at 10%.
§ White heteroskedasticity-consistent standard errors and covariance were used
Source: Author's own calculations (EViews output)

The model [5.3] fits actual data well. All explanatory variables have expected signs and are statistically significant at 1% level, with only tax burden proxy and seasonal dummy being significant at 5%. The latter indicates that *C/M2* persistently tends to be higher than usual during the IV quarter.

Noticeably, lagged real interest rate has stronger negative impact than the current one. It is so because agents usually plan their monetary portfolio composition in advance and therefore use current (i.e., lagged with respect to the planned period) interest rate as the orient. In case the rate during the period starts deviating from the expected value, agents perform partial adjustment, which is reflected in the effect of current interest rate.

At this stage, we have all necessary information to estimate the size of the informal sector in Ukraine. The procedure is as follows:

1. Regard fitted values of dependent variable from equation [5.3] as *total* $(C/M2)_t$ ratio.
2. Put $TB_t=0$ for any t into the estimated equation, so that LOG(1+*TB*)=LOG(1)=0; since the only cause of the shadow economy has been thereby *eliminated*, this is the case of *zero* shadow economy.
3. Solve [5.3] to obtain $(C/M2)_t$ ratio for the case of *zero* shadow economy. This time dependent variable represents series of official sector $(C/M2)_t$ ratio, which is less than the actual one [see (1)]. An important qualification to the resulting ratio is that we have assumed *TB* to be *the only* significant cause of the unofficial economy.
4. Multiply both *total* and *official sector* ratios [from (1) and (3) respectively] on $M2_t$ to get $[C_t]_{Total}$ and $[C_t]_{Official}$ – a quantitative measure of respective money demands.
5. Difference between total and official cash demand yields an estimate of underground currency demand ($[C_t]_{Shadow} = [C_t]_{Total} - [C_t]_{Official}$).
6. Official sector money velocity ($[V_t]_{Official}$) is calculated as a ratio of nominal official GDP in period t to $[C_t]_{Official}$
7. Utilise the crucial assumption of equal money velocity in both official and shadow economies[5] ($[V_t]_{Official} = [V_t]_{Shadow}$) and assess **Nominal *Shadow* GDP** ($=[C_t]_{Shadow} \times [V_t]_{Shadow}$).
8. When deflated, the latter gives us **Real *Shadow* GDP** (we also assume a *common* deflator for the official and shadow economies)**.**

The estimates of *Real Shadow GDP* are provided in *Table 2*.

[5] The same assumption was recently utilised by *Schneider* (2000).

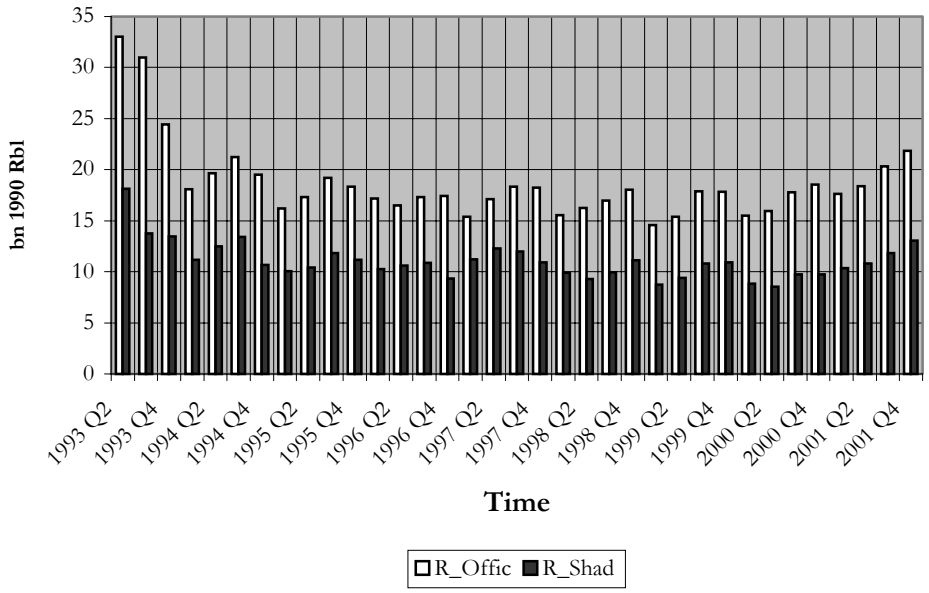
Table 2: *Real Shadow GDP in Ukraine, 1993-2001*

Quarter	Real *Official* GDP (bn 1990 Rubles)	Real *Shadow* GDP (bn 1990 Rubles)	Real Shad. GDP as % of R. Off. GDP
1993 Q2	33.02	**18.16**	*0.55*
1993 Q3	30.97	**13.78**	*0.44*
1993 Q4	24.44	**13.46**	*0.55*
1994 Q1	18.08	**11.17**	*0.62*
1994 Q2	19.64	**12.52**	*0.64*
1994 Q3	21.22	**13.42**	*0.63*
1994 Q4	19.53	**10.69**	*0.55*
1995 Q1	16.21	**10.06**	*0.62*
1995 Q2	17.33	**10.42**	*0.60*
1995 Q3	19.21	**11.81**	*0.61*
1995 Q4	18.32	**11.16**	*0.61*
1996 Q1	17.17	**10.28**	*0.60*
1996 Q2	16.53	**10.63**	*0.64*
1996 Q3	17.31	**10.85**	*0.63*
1996 Q4	17.4	**9.33**	*0.54*
1997 Q1	15.39	**11.21**	*0.73*
1997 Q2	17.12	**12.31**	*0.72*
1997 Q3	18.33	**12.01**	*0.66*
1997 Q4	18.26	**10.91**	*0.60*
1998 Q1	15.56	**9.91**	*0.64*
1998 Q2	16.24	**9.27**	*0.57*
1998 Q3	16.98	**9.96**	*0.59*
1998 Q4	18.05	**11.11**	*0.62*
1999 Q1	14.56	**8.76**	*0.60*
1999 Q2	15.38	**9.39**	*0.61*
1999 Q3	17.89	**10.81**	*0.60*
1999 Q4	17.84	**10.92**	*0.61*
2000 Q1	15.5	**8.82**	*0.57*
2000 Q2	15.94	**8.55**	*0.54*
2000 Q3	17.77	**9.78**	*0.55*
2000 Q4	18.56	**9.74**	*0.52*
2001 Q1	17.64	**10.36**	*0.59*
2001 Q2	18.4	**10.83**	*0.59*
2001 Q3	20.33	**11.85**	*0.58*
2001 Q4	21.84	**13.04**	*0.60*

Source: UEPLAC; author's own calculations

To visualize the series from *Table 2*, we present *Figure 3*.

Figure 3: Real Official and Shadow GDP



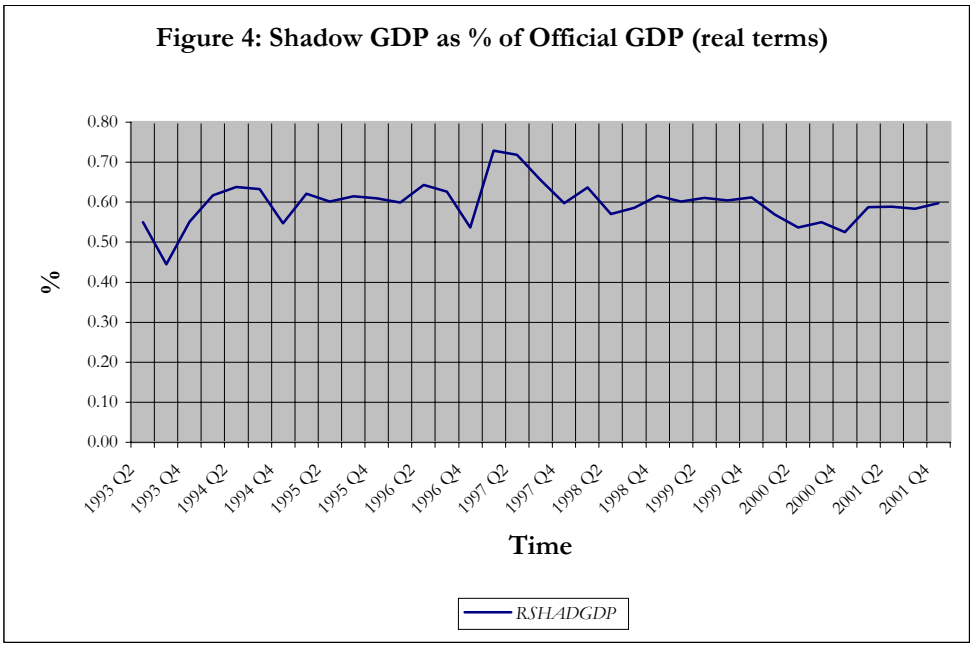
Source: UEPLAC (R_Offic); author's own calculations (R_Shad)

One may see that trends of official and shadow economy size are comparatively similar. It is even better evident when one refers to the *share* of the shadow economy in the official one (see *Figure 4* below).

Estimated share of the unofficial economy varied between the low of 44% (1993 Q3) and the high of 73% (1997 Q1). However, most of the time it kept within 55% – 65% corridor. Both *mean* and *median* share are approximately 60%. With a few exceptions outlined below, we may treat the estimated relative share of the shadow economy as *comparatively stable* during last 9 years.

The share under consideration showed distinguishable trends in the following periods. It increased sharply between 1993 Q3 (44%) and 1994 Q3 (63%). We explain this strong upward trend by *hyperinflation* period in Ukraine (1993 - 1994). Distortions in data caused by abnormal price hikes might have strongly contributed to the trend.

Figure 4: Shadow GDP as % of Official GDP (real terms)



Source: Table 2, p.36

Another possible reason for very large relative shadow economy in 1993-1994 is that agents protected themselves from hyperinflation by going underground. Tax evasion or at least tax arrears become extremely beneficial during such periods. For instance, one month delay of UAH 100 tax payment at the average inflation rate of *50%* per month (*hyperinflation threshold*) yield net return of 33.3% [= (150-100)/150] to the debtor. "Return" on tax evasion is much higher.

When the hyperinflation slowed down and actually turned into high inflation, we observe the share reduced somewhat but shortly returned to the near-60% level. This tells us that relative stabilization in 1995 was not strong enough anti-shadow incentive to break acquired preferences towards unofficial activities.

Then we observe share's fluctuation during the second half of 1996 and the first half of 1997. Two important events took place in that period. New national currency (*hrywnia*, or UAH) was introduced into circulation in September 1996. Right after that, the relative size of the unofficial economy declined (1996 Q4)

signalling about the agents' trust into the National Bank's commitment on the new currency. At the same time, mass (voucher) privatisation started. Incumbent management of state owned enterprises, in order to protect itself from possible dismissal by new owners, actively channelled assets to affiliate firms. Shadow economy turned out to be the safest harbour for these assets, as evidenced by dramatic increase of the respective indicator between 1996 Q4 and 1997 Q2. Here we observe the highest relative share of the underground economy ever (72% - 73%).

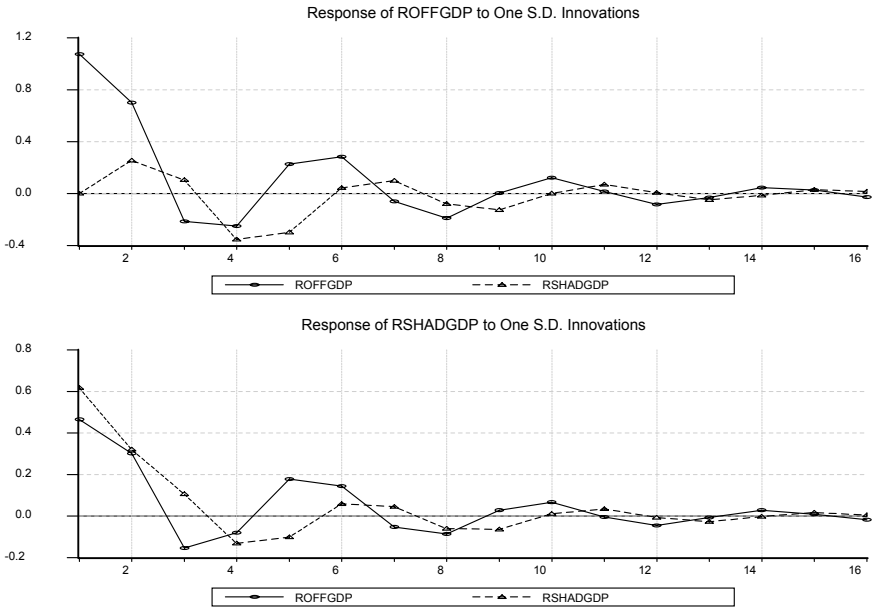
The indicator dropped in the second half of 1997. The obvious reason is that the boom of foreign direct (FDI) and portfolio investments occurred during 1997 Q2 – 1998 Q1 in Ukraine. These funds fuelled primarily the official sector, thus the *relative* share of the shadow one has to decline even if the *absolute* size of the latter remained constant.

Millennium brought a further decline in the indicator after "*fixed*" 60% in 1999. According to our estimates, **decline in the relative size of the shadow economy during 2000 *coincided* with the real economic growth**. Nevertheless, the pattern of year 2001, when we again see the share to be around 60%, suggests that we might have observed a *spurious* relation during 2000. Therefore, we need some solid ground for a sound inference.

Our first strategy is to exploit *Vector Autoregressive* (VAR) model. The key advantage of the VAR modelling is that one does not need any underlying theory: Data is allowed to explain itself. The main drawback is that any relation found might be economically unjustifiable.

Endogenous variables are Real Official GDP (*ROFFGDP*) and Real Shadow GDP (*RSHADGDP*). We find the optimal order of VAR by estimating models of order 1, 2, …, 7 and comparing respective *Akaike Information Criteria* (AIC) and *Schwarz Criteria* (SC). The lowest values of both criteria are found in the VAR (3) model, so we would further use this specification (see *Appendix A1* for details). Coefficients per se do not contain any significant information; we are primarily concerned with the *impulse response function* of the model.

Figure 5: *Impulse Response of the VAR (3) model*



Source: own calculations

The dotted line in the upper panel of *Figure 5* shows the response of the real official GDP to a one-standard-deviation shock in real shadow GDP. In the initial three periods the response is positive, however then it becomes negative for another three periods. The magnitude of reaction is almost equal in both directions (i.e., average positive response = average negative response). After that the picture repeats with average responses being smaller in magnitude. Overall,

we could not determine any unambiguous impact of the unofficial economy on the official one.

The solid line in the lower panel of *Figure 5* represents the impact of the official economy on the size of shadow activities. Strong positive but declining effect is noticeable during the first three periods. Subsequently, the impact becomes negative and so on. In general, the model does not allow us to confirm any stable impact in the latter direction.

So we should proceed with the model based on certain theoretical predictions. As mentioned in *Chapter 2*, *Loayza* (1996) and *Johnson, Kaufmann, and Zoido-Lobaton* (1998b) have found significant *negative* effect of the shadow economy size on the rate of economic growth using *cross-country* data. Such type of analysis allows controlling for country-specific level of development, infrastructure, institutional systems, etc.; however, the results are with absolute certainty valid only for the particular time period. In a research involving *time-series* data for a single country (the one we do) it is often impossible to include this or that factor because of missing data. For example, *Johnson* et al. (1998b) controlled for a level of corruption across countries; unfortunately, we do not have *quarterly corruption index* for Ukraine. Therefore, we focus on developing the following suggestion by *Johnson* et al. (1998b):

> Further, we need to address issue of *endogeneity*, since lower growth performance may be a contributor to a higher unofficial economy, and not just the reverse causality [p.22, op.cit].

To address possible endogeneity (simultaneity), we need to build a *Simultaneous Equations Model* (SEM). According to *Johnson* et al. (1998b), the real official economy is affected by the unofficial one and a vector of demand factors (real domestic consumption, net exports) treated as exogenous. The shadow GDP, in turn, is influenced by the official GDP and tax burden.

To perform *Hausman simultaneity test*, we regress *RSHADGDP* (see description of variable below) on a set of exogenous variables: *RCONS* (real household consumption), *BALANCE* (trade balance in commodities and services), and *TB* (tax burden). Denote residuals and fitted values of the dependent variable from this regression as *ERROR_FIT* and *RSHADGDP_FIT* respectively. Then we regress *ROFFGDP* on *RSHADGDP_FIT, RCONS, BALANCE*, and *ERROR_FIT* and look whether estimated coefficient at *ERROR_FIT* is statistically different from zero. If it is, we reject the null hypothesis of no simultaneity and proceed with the SEM. Respective estimations are provided in *Table 3*.

Table 3: *Hausman simultaneity test*

Sample: 1995:1-2001:2 Method: LS	Dep. Var. is RSHADGDP		Dep. Var. is ROFFGDP	
Explanatory variable:	Coefficient (standard error)	p-value	Coefficient (standard error)	p-value
Constant	-6.038* (1.44)	0.0004	7.093* (0.226)	0.0000
RSHADGDP	---	---	---	---
RSHADGDP_FIT	---	---	-0.0311 (0.025)	0.2345
RCONS	0.815* (0.101)	0.0000	1.366* (0.029)	0.0000
BALANCE	-0.0001 (0.0001)	0.4477	-0.0002* (4.08E-0.5)	0.0000
TB	20.16* (2.156)	0.0000	---	---
ERROR_FIT	---	---	**1.6259*** **(0.05)**	**0.0000**
R-squared	0.865		0.995	
Adj. R-squared	0.846		0.994	
F-statistic (prob.)	46.98 (0.0000)		1059.8 (0.0000)	
Durbin-Watson stat.	2.46		1.658	
No. of observ.	26		26	

Note: * denotes coefficient's significance at 1% level; ** - at 5%; *** - at 10%.
Source: Author's own calculations (EViews output)

As follows from *Table 3*, we reject the hypothesis of no simultaneity between real shadow and official GDP. The system is specified as follows:

[5.4] $ROFFGDP = f(RSHADGDP, RCONS, BALANCE)$

[5.5] $RSHADGDP = h(ROFFGDP, TB)$

We have already described the ***TB*** variable. ***ROFFGDP*** and ***RSHADGDP*** are taken from *Table 2* (measured in billions 1990 Rubles). ***RCONS***: Real Household Consumption (UAH millions); ***BALANCE***: Balance of Trade in Commodities and Services (USD millions). Data was borrowed from the UEPLAC: *Ukrainian Economic Trends*, December 2001; all data is quarterly. Since *BALANCE* data is available starting 1995 Q1, the subsequent analysis covers a shorter time span than before, namely 1995 Q1-2001 Q4.

The best fit of equation [5.4] is obtained with lagged (one period) *RCONS* instead of the current one (official supply adjusts to the market demand). All variables are stationary by ADF test (*Appendix A2*); each equation estimated separately is robust; coefficients have expected signs and are significant at conventional level. When the two equations are combined into a system, [5.4] is *just identified* and [5.5] – *over identified*[6]. OLS estimates of the system are presented in *Table 4*.

Table 4: *Estimation of SEM by Ordinary Least Squares*

Sample: 1995:1 2001:4

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	2.931511	2.330580	1.257846	0.2138
C(2)	0.860450*	0.172089	5.000043	0.0000
C(3)	0.714478*	0.221275	3.228912	0.0021
C(4)	0.000899**	0.000367	2.449808	0.0175
C(5)	-10.50807*	0.715280	-14.69086	0.0000
C(6)	0.535289*	0.012466	42.93820	0.0000
C(7)	22.99512*	1.133995	20.27797	0.0000
Determinant residual covariance		0.030123		

[6] Order condition for identification has been used. In [5.4], number of excluded exogenous variables (=1) is equal to the number of included endogenous variables (=2) less 1. In [5.5], number of excluded exogenous variables (=2) is greater then the number of included endogenous variables (=2) less 1.

Equation: ROFFGDP = C(1) + C(2)*RSHADGDP + C(3)*RCONS(-1) + C(4)*BALANCE				
Observations: 27				
R-squared	0.629148	Mean dependent var		17.23037
Adjusted R-squared	0.580776	S.D. dependent var		1.331337
S.E. of regression	0.862008	Sum squared resid		17.09031
Durbin-Watson stat	1.981043			
Equation: RSHADGDP = C(5) + C(6)*ROFFGDP + C(7)*TB				
Observations: 27				
R-squared	0.982946	Mean dependent var		11.06456
Adjusted R-squared	0.981880	S.D. dependent var		1.826156
S.E. of regression	0.245820	Sum squared resid		1.933675
Durbin-Watson stat	2.157413			

Note: * denotes coefficient's significance at 1% level; ** - at 5%; *** - at 10%.
Source: Author's own calculations (EViews output)

We have to check whether OLS estimates are consistent using *Hausman* test. The system estimated by Two-Stage Least Squares (TSLS) method is represented in *Table 5*. *RCONS*[-1], *BALANCE*, and *TB* were specified as instruments.

Table 5: *Estimation of SEM by Two-Stage Least Squares*				
Sample: 1995:1 2001:4				
Instruments: RCONS(-1) BALANCE TB C				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	11.09799**	4.178712	2.655839	0.0108
C(2)	-0.000411	0.360341	-0.001141	0.9991
C(3)	0.817890**	0.321273	2.545783	0.0142
C(4)	0.000552	0.000541	1.021646	0.3122
C(5)	-10.06375*	0.434128	-23.18149	0.0000
C(6)	0.585435*	0.019760	29.62662	0.0000
C(7)	20.39043*	0.326503	62.45091	0.0000
Determinant residual covariance		0.003333		
Equation: ROFFGDP = C(1) + C(2)*RSHADGDP + C(3)*RCONS(-1) + C(4)*BALANCE				
Observations: 27				
R-squared	0.225655	Mean dependent var		17.23037
Adjusted R-squared	0.124654	S.D. dependent var		1.331337
S.E. of regression	1.245598	Sum squared resid		35.68482
Durbin-Watson stat	1.582411			
Equation: RSHADGDP = C(5) + C(6)*ROFFGDP + C(7)*TB				
Observations: 27				
R-squared	0.996907	Mean dependent var		10.40863
Adjusted R-squared	0.996649	S.D. dependent var		1.011982
S.E. of regression	0.058583	Sum squared resid		0.082367
Durbin-Watson stat	1.796642			

Note: * denotes coefficient's significance at 1% level; ** - at 5%; *** - at 10%.
Source: Author's own calculations (EViews output)

We are concerned with the following statistics: χ_sq=(**b**_tsls - **b**_ols)'×(**V**_tsls - **V**_ols)$^{-1}$×(**b**_tsls - **b**_ols), where **b**_ols and **b**_tsls stand for the matrices of estimated coefficients by OLS and TSLS respectively; **V**_ols and **V**_tsls are coefficients of covariance matrices in OLS and TSLS estimations. Calculated statistics has value of ***993.91*** and is distributed by chi-square distribution with 7 degrees of freedom. It exceeds the critical value at any significance level (p_value=0.0000), so we reject the hypothesis of consistency of OLS estimates and use 2SLS.

It is advisable to use Three-Stage Least Squares (3SLS) procedure to obtain more efficient estimates than by 2SLS. Efficiency, however, is achieved at the expense of greater vulnerability to the error of specification. We provide 3SLS estimates in *Table 6*.

Table 6: *Estimation of SEM by Three-Stage Least Squares*

Sample: 1995:1 2001:4				
Instruments: RCONS(-1) BALANCE TB C				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	11.19054*	3.843876	2.911264	0.0055
C(2)	-0.013900	0.329392	-0.042198	0.9665
C(3)	0.823921*	0.295809	2.785313	0.0077
C(4)	0.000496	0.000461	1.076447	0.2872
C(5)	-10.06375*	0.409300	-24.58769	0.0000
C(6)	0.585435*	0.018630	31.42378	0.0000
C(7)	20.39043*	0.307830	66.23919	0.0000
Determinant residual covariance		0.003383		
Equation: ROFFGDP = C(1) + C(2)*RSHADGDP + C(3)*RCONS(-1) + C(4)*BALANCE				
Observations: 27				
R-squared	0.212530	Mean dependent var		17.23037
Adjusted R-squared	0.109817	S.D. dependent var		1.331337
S.E. of regression	1.256110	Sum squared resid		36.28967
Durbin-Watson stat	1.588755			
Equation: RSHADGDP = C(5) + C(6)*ROFFGDP + C(7)*TB				
Observations: 27				
R-squared	0.996907	Mean dependent var		10.40863
Adjusted R-squared	0.996649	S.D. dependent var		1.011982
S.E. of regression	0.058583	Sum squared resid		0.082367
Durbin-Watson stat	1.796642			

Note: * denotes coefficient's significance at 1% level; ** - at 5%; *** - at 10%.
Source: Author's own calculations (EViews output)

With 3SLS, standard errors of individual coefficients become smaller, but the determinant of residuals covariance matrix gets larger. Both 2SLS and 3SLS yield essentially the same results in terms of coefficient signs/significance and model appropriateness.

From the simultaneous model one can see that, on the one hand, size of the shadow economy has **negative**, but **small** and statistically **insignificant** impact on the official sector. On the other hand, the official GDP affects the underground activities volume **positively** and **significantly**.

At a glance, the result is rather *striking*. It is not that obvious why should the official economy impact the shadow one, but not vice versa. Model proposed by *Azuma and Grossman* (2002) [see *Chapter 4* for details] allows us to explain the finding. To add some realism, we also utilise a stylised fact about the nature of Ukrainian shadow economy revealed by *Kaufmann* and *Kaliberda* (1996), the latter arguing that in FSU countries official and unofficial operations very often (almost always) *co-exist* within a single firm in contrast to, say, Latin America.

In line with *Azuma* and *Grossman* (2002), we divide all local businesses into two broad categories:

- **Type-A**/"*Well endowed*": Large (strategic) enterprises that account for a substantial share of overall GDP. These companies heavily interact with government agencies on different grounds (e.g., steel producers with respect to export contracts).
- **Type-B**/"*Poorly endowed*": Small and medium size enterprises.

Existence of the shadow economy means that Ukrainian government set tax charges high enough to push *poorly endowed* firms into the informal sector. Taking into account *Kaufmann* and *Kaliberda* (1996) argument, we suggest that Type-B firms do *not* report *most* of their profits rather than go completely unofficial.

In a similar manner, Type-A companies (that are the core of the formal sector) are likely to report a large fraction of net revenue instead of reporting absolutely everything. Managers of these firms could not arbitrarily decide on what share of overall proceeds to report because government officials are aware of most of its activity. The two interest groups might have a sort of implicit contract according to which a certain portion of Type-A company revenues goes underground in order to be shared between managers and regulators for their "private needs". It is quite difficult to assess the extent of shadow operations within Type-A firms. According to different anecdotal evidences, we believe it to be on a small to moderate scale/magnitude.

Taking into account our empirical estimations (see *Table 2* and *Figure 4*), we claim that **both Type-A and Type-B firms have a kind of long-run preference toward the share of the shadow operations.** The relative extent of informal activities is higher for Type-B firms. The preference is characterised as a *long run* one due to the fact we observe the ratio of informal to formal GDP around a single value (60%) for most quarters during 1993-2001.

So we regard Type-A and Type-B companies as the *primary source* to *ROFFGDP* and *RSHADGDP* change respectively. Notice further that most local Type-B firms operate in trade and services and target at the domestic consumers. In contrast, a common representative of Type-A league is an industrial giant oriented (to large extent) towards external markets. Let us analyse what will occur in the following cases:

- **Scenario 1**: Only Type-A firms' business activity increases
- **Scenario 2**: Only Type-B firms' business activity increases
- **Scenario 3**: Overall business activity growth occurs

Scenario 1 is likely when foreign demand increases (e.g., favourable conditions on the metals market in 2000). *Scenario 2* is in place when domestic consumers could

purchase more (e.g., domestic consumption growth in 2001). Accordingly, *Scenario 3* happens when the overall market conjuncture improves.

Consequently, under *Scenario 1* official sector should considerably grow, driven by Type-A firms. For the reasons discussed above, managers of large enterprises would channel a fraction of profits into the informal sector. Therefore, *RSHADGDP* should also increase. This is exactly what the coefficient resembling the impact of *ROFFGDP* on *RSHADGDP* in the system [5.4]-[5.5] predicts (see *Table 5* or *Table 6*, coefficient C(6)). To interpret the model, a *recorded* UAH 1 billion increase in the real official GDP causes approximately UAH 0.58 billion increment to the real informal output.

Under *Scenario 2*, Type-B firms would drive the shadow sector growth (say, *RSHADGDP* increases by UAH 1 billion). According to the model[7], this might have an adverse effect on *ROFFGDP*; however, the affect is so weak and rarely occurring, that we may simply ignore it. It is very likely that in this case the official sector remains unaffected.

Finally, *Scenario 3* implies that both formal and informal sector would expand. Which one increases faster will depend on the comparative magnitude of forces underlying growth of certain type of firms (i.e., domestic versus external factors) as well as weights of the letter (firms) in the overall economy. This is a complex case and further research (supposedly, lying far beyond the scope of current study) is needed to deal with it.

Now we can address the questions that motivated this study (see *Chapter 1*). Experts from the *International Centre for Policy Studies* (ICPS) reported that the official sector was climbing in 2000 due to abnormally favourable conditions on

[7] The respective coefficient in *Table 6* showing the impact of *RSHADGDP* on *ROFFGDP* is C(2)= -0.014 [st. error=0.32; p-value=0.96].

major export markets[8] and thus considerable export growth - *Scenario 1* was presumably a dominant one. As our model predicts, in such case the unofficial economy will also grow but to a smaller extent. If one looks at *Table 2* or *Figure 3*, it is evident that real growth in the official GDP during year 2000 went hand-in-hand with the growth of the unofficial real GDP. The formal economy should have grown much faster[9] because shadow to official GDP ratio reduced from 60-61% in 1999 to 52-57% in 2000 (best seen in *Figure 4*).

According to the IER economists[10], the main contributors to the growth of value added in the economy during 2001 were *manufacturing* (accountable for approximately half of the GDP growth despite sector's deceleration in 2001 comparing to 2000), *construction* and *wholesale & retail trade*. These conclusions suggest that *Scenario 3* was most likely to take place in that year. As stated above, our simple model does not enable one to assess precisely how the relative share of the shadow economy behaves in the cases when both sectors experience boom. We, however, see from *Figure 4* that the latter indicator increased from average of 55% in 2000 to 60% in 2001, meaning that this time the shadow sector was growing (in absolute volume) comparably with or even faster than the official one.

So, we conclude that recent (recorded) economic growth in Ukraine was determined by factors other than a switch of certain business activities from the underground into the official economy. Moreover, we see that the shadow sector was also growing during the respective period. It did not harm the official growth

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[8] See *Quarterly Predictions*, #16, July 2001[p.7].

[9] Notice that absolute increase in the official and shadow GDP by 1.8 and 1.2 billion respectively between 2001 Q2 – 2001 Q3 resulted in an *increase* in the ratio under consideration (see *Table 2*). A simple calculation shows that for the ratio to decline by 0.01 between these two periods the official GDP should have grown by 2.5 billion (with twice the pace of the shadow GDP growth): 2.51=[9.78/(0.54-0.01)]-15.94

[10] See *Monthly Economic Monitor Ukraine*, #12 (14), December 2001: "Real economy: statistic demonstrate domestic roots of economic growth in Ukraine" [pp. 1-2].

since there is no a significant adverse effect of the informal economy on the formal one. These two are rather complements than substitutes. Economic agents have formed preferences on what share of activities to report or hide. The preferences look remarkably stable; only major policy shocks are likely to break these preferences in favour of the official economy.

In the chapter that follows we suggest some *policy implications* with respect to these findings.

Chapter 6

DISCUSSION OF RESULTS AND POLICY IMPLICATIONS

The estimated relative size of Ukrainian underground sector (normally, around 60%) is rather close to the estimate obtained by *Kaufmann and Kaliberda* (1996) for year 1994 [49%]. The discrepancy is not substantial taking into account that different methodologies were applied.

The only known to us research that subscribes to the money demand approach when studying Ukrainian shadow economy, is *Melota, Thiessen, and Vakhnenko* (2001). As we noted in *Chapter 2*, they did not calculate the size of the shadow sector. Hence, we are not able to make any comparison.

In general, Ukraine is among the world "leaders" by the relative size of the underground economy. *Schneider and Enste* (1999) provide excellent data for comparison[11] - size of the shadow economy in % of official GDP, average over 1990-93 for selected countries in Africa, Central and South America, Asia, Central Europe, FSU, and OECD. Only *Thailand* (70%), *Nigeria* and *Egypt* (both 68%-76%) outpaced Ukraine by the mentioned indicator in the respective time period. *Guatemala, Mexico, Peru*, and *Panama* had a similar level (55%-60%); *Philippines, Sri-Lanka, Malaysia, South Korea, Tunisia*, and *Morocco* – a somewhat smaller one (from 38% to 50%).

Compared to the Central European "leaders" – *Hungry, Bulgaria*, and *Poland* (all with 20%-28% of the underground economy), Ukraine's respective figure is at least twice as large. The same holds true when we compare Ukraine with *Baltic*

[11] See op. cit, Table 2, pp. 9-10.

States or *Russia* (all: 21%-27%). However, it is quite doubtful that Russian shadow sector was that (relatively) small in 1990-93.

Interestingly, OECD members with the largest unofficial economy [*Greece, Italy, Spain*, and *Portugal* (all: 24%-30%)] do not differ at all from their less developed transitional counterparts. However, developed countries with the least underground activity [*USA, Austria,* and *Switzerland* (all: 8%-10%)] could freely criticize Ukraine for the abnormally great shadow economy.

So what policy measures should be done today to avoid such criticism tomorrow? Obviously, tax burden should be *decreased*. As the simultaneous model predicts[12], if the share of direct taxes, social security contributions in agents' income reduced by 10%, the real shadow GDP would decline by approximately 2 billion 1990 Rubles (equivalent to UAH 20 billion in 2001!).

This policy shock might happen shortly after the Tax Code[13] would be adopted by the newly elected parliament. Our model, nevertheless, *does not* indicate that the shadow sector contraction would certainly result in the expansion of the official one, so that tax revenues are replenished due to a larger number of taxpayers.

However, there were no precedents of major tax relief holding overall business activity constant. This genuinely new kind of shock might *break down* the established preferences towards the shadow activity. Therefore, the *significance* of the found negative effect of the informal economy on the official one might enhance when after-shock data is incorporated. We leave this as an area for future research.

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[12] Consider coefficient C(7) in *Table 6*.

[13] Draft code envisages reduction of most tax rates accompanied with the elimination of majority of tax privileges.

Chapter 7

CONCLUSIONS

Drastically unequal resource distribution coupled with the ease of provision substitutes for public goods in Ukraine makes local government to tax economic agents heavily enough for relatively worse endowed businesses (small & medium enterprises) to non-report most of their activities. They hence constitute the core of the underground economy. Furthermore, large enterprises that are a building block of the official economy do also hide a fraction of their net revenue from taxation.

We estimate the relative size of the shadow economy sticking to the augmented money demand approach. With a few exceptions, the informal sector was around 60% of the official GDP during 1993-2001. By this indicator, Ukraine is among the world "leaders".

We conclude that recorded economic growth in Ukraine during 2000-2001 was determined by factors other than a switch of certain business activities from the underground into the official economy. The shadow sector expansion during this period did not harm the official growth since there is no evidence for a significant effect of the former on the latter.

The two sectors are rather complements than substitutes. Economic agents have formed stable preferences on what share of activities to report or hide. Major taxation relief envisaged by the draft Tax Code might be a policy shock breaking these preferences in favour of the official economy.

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Appendix A1: *VAR (3) estimation output.*

Sample(adjusted): 1994:1 2001:4 Included observations: 3 after adj. endpoints Standard errors & t-statistics in parentheses		
	ROFFGDP	RSHADGDP
ROFFGDP(-1)	0.477721	0.062834
	(0.22617)	(0.17727)
	(2.11219)	(0.35446)
ROFFGDP(-2)	-0.519687	-0.297075
	(0.19665)	(0.15413)
	(-2.64273)	(-1.92746)
ROFFGDP(-3)	0.490850	0.304383
	(0.12928)	(0.10133)
	(3.79667)	(3.00389)
RSHADGDP(-1)	0.374608	0.515230
	(0.31050)	(0.24336)
	(1.20646)	(2.11713)
RSHADGDP(-2)	-0.226269	-0.121826
	(0.28164)	(0.22075)
	(-0.80338)	(-0.55188)
RSHADGDP(-3)	-0.348835	-0.131179
	(0.25580)	(0.20049)
	(-1.36371)	(-0.65430)
C	11.74769	6.536920
	(2.30913)	(1.80983)
	(5.08750)	(3.61189)
R-squared	0.584388	0.499564
Adj. R-squared	0.484642	0.379460
Sum sq. resids	36.90715	22.67214
S.E. equation	1.215025	0.952306
S.D. dependent	1.692508	1.208902
Determinant Res. Covariance		0.528714
Akaike Information Criteria		**-79.74013**
Schwarz Criteria		**-79.09887**

Appendix A2: *Testing variables for stationarity with ADF test*

CM2

ADF Test Statistic	-5.289173	1% Critical Value*	-3.6422
		5% Critical Value	-2.9527

*MacKinnon critical values for rejection of hypothesis of a unit root.

(1+RR)

ADF Test Statistic	-4.455696	1% Critical Value*	-3.6353
		5% Critical Value	-2.9499

*MacKinnon critical values for rejection of hypothesis of a unit root.

(1+TB)

ADF Test Statistic	-3.495396	1% Critical Value*	-3.6422
		5% Critical Value	-2.9527

*MacKinnon critical values for rejection of hypothesis of a unit root.

RGDPPERCAP

ADF Test Statistic	-4.081476	1% Critical Value*	-3.6353
		5% Critical Value	-2.9499

*MacKinnon critical values for rejection of hypothesis of a unit root.

RSHADGDP

ADF Test Statistic	-3.500851	1% Critical Value*	-3.6496
		5% Critical Value	-2.9558

*MacKinnon critical values for rejection of hypothesis of a unit root.

ROFFGDP

ADF Test Statistic	-5.271604	1% Critical Value*	-3.6496
		5% Critical Value	-2.9558

RCONS

ADF Test Statistic	-4.134412	1% Critical Value*	-3.6496
		5% Critical Value	-2.9558

BALANCE

ADF Test Statistic	-4.901134	1% Critical Value*	-3.7343
		5% Critical Value	-2.9907