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The theoretical remarks about the shadow economy

Measuring the shadow economy.

Some latest developments

Outline

- 1. A new method of measuring the shadow economy: the use of surveys of company managers

- 2. Methods of modeling the shadow economy. Characteristics and classification

Goal of this lecture:

Discussing a new method of measuring the shadow economy. Defining its advantages and disadvantages.

Analysing the Models of the shadow economy

Considering first and second class models of the shadow economy. Discussing their features.

Introduction - Measuring the shadow economy

Three methods of measurement:

1. *Direct procedures* using the micro level and aiming at determining the size of the shadow economy. An example of this method are surveys.

2. *Indirect procedures* that make use of macroeconomic indicators following the development of the shadow economy over time.

3. *Statistical models* that use statistical tools to estimate the shadow economy as an "unobserved" variable.

A new method of measuring the shadow economy: the use of surveys of company managers

- Talis J. Putnins and Arnis Sauka use surveys of company managers to measure the size of the shadow economy. They combine miss reported business income and miss reported wages as percentage of GDP. Their method produces detailed information on the structure of the shadow economy, especially in the firm sector. It is based on the premise that company managers are the most likely to know how much business income and wages go unreported due to their unique position in dealing both of these types of income. They use a range of survey design features to "maximize" the truthfulness of responses.

A new method of measuring the shadow economy: the use of surveys of company managers

- The method combines estimates of miss reported business incomes, unregistered or hidden employees, and unreported wages in order to calculate a total estimate of the size of the shadow economy as a percentage of GDP. To their opinion, their approach differs from most other studies of shadow economies which largely focus either on macroeconomic indicators or on surveys about households. They developed first results for Estonia, Latvia and Lithuania. The results are shown in Table 1. The results are compared with the ones of Schneider (2016) and the results of Putnins and Sauka (2015) are in the case of Latvia quite the same to the ones of Schneider. Table 4 shows the results for the years 2009 to 2015 and the average size of the shadow economy over 2009 to 2015 for Latvia is 27.8% according to the method of Putnins and Sauka, and 25.8% according to Schneider (2016). For the other two countries, Estonia and Lithuania, the results are quite different. In Estonia, Putnins and Sauka receive 17.4% and Schneider 28.1% and for Lithuania, Putnins and Sauka estimate the average shadow economy over 2009 to 2015 at 16.4%, compared to 28.2% by Schneider. This new method seems to be promising, but more empirical investigations have to be undertaken to see how reliable this method is.

Table 1: A comparison of the size of the shadow economy (in % of GDP) in the Baltic countries 2009–2015 by Putnins and Sauka with Schneider

Year	Estonia		Latvia		Lithuania	
	Putnins and Sauka	Schneider	Putnins and Sauka	Schneider	Putnins and Sauka	Schneider
2009	20.2%	29.6%	36.6%	27.1%	17.7%	29.6%
2010	19.4%	29.3%	38.1%	27.3%	18.8%	29.7%
2011	18.9%	28.6%	30.2%	26.5%	17.1%	29.0%
2012	19.2%	28.2%	21.1%	26.1%	18.2%	28.5%
2013	15.7%	27.6%	23.8%	25.5%	15.3%	28.0%
2014	13.2%	27.1%	23.5%	24.7%	12.5%	27.1%
2015	14.9%	26.2%	21.3%	23.6%	15.0%	25.8%
Average 2009–2015	**17.4%**	**28.1%**	**27,8%**	**25,8%**	**16.4%**	**28.2%**

Source: Putnins and Sauka (2016), Table 1, p. 12 and Schneider, own calculations, Linz, September 2016.

Methods of modeling the shadow economy.
Characteristics and classification
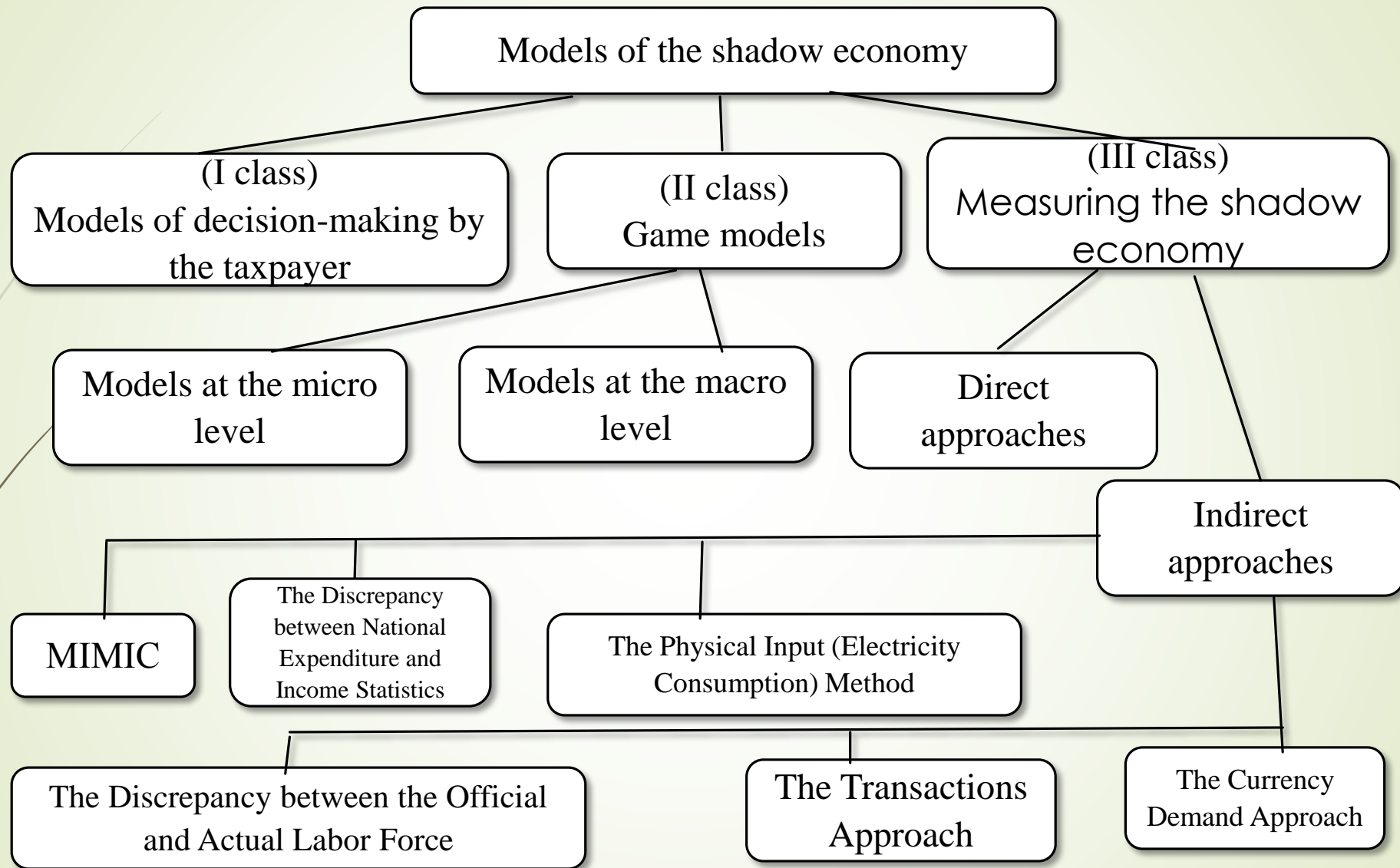
(I class) Models of decision-making by the taxpayer

- The model defines the extremum (minimum or maximum) of the taxpayer's target function for a given system of restrictions.

- Usually during creating the optimization models of the shadow economy, the choice of the amount of income hidden from tax services by the agent (individual, company) is considered.

- Consider the three main models of this class.

Theorizing about the shadow economy

- A useful starting point for a theoretical discussion of the shadow economy is the famous study by Allingham and Sandmo (1972) on income tax evasion. While the shadow economy and tax evasion are not congruent, in most cases activities in the shadow economy imply the evasion of direct or indirect taxes, such that factors determining tax evasion will most certainly also affect the shadow economy. According to Allingham and Sandmo tax compliance depends on its expected costs and benefits. The benefits of tax non-compliance result from the individual marginal tax rate and true individual income. In the case of the shadow economy the individual marginal tax rate is often roughly calculated using the overall tax burden from indirect and direct taxes including social security contributions. The expected costs of non-compliance derive from deterrence enacted by the state, that is, the state's auditing activities raising the probability of detection and the fines individuals face when they are caught. Individual morality also plays a role in compliance and additional costs may apply beyond the tax administration's pure punishment in the form of psychic costs like shame or regret, but also additional pecuniary costs if, for example, loss of reputation results.

Individuals are rational calculators who weigh up costs and benefits when considering breaking the law. Their decision to partially or completely participate in the shadow economy is a choice under uncertainty, facing a trade-off between gains if their activities are not discovered and losses if discovered and penalized. Shadow economic activities *SE* thus negatively depend on the probability of detection *p* and potential fines *f*, and positively on the opportunity costs of remaining formal denoted as *B*. The opportunity costs are positively determined by the burden of taxation *T* and high labor costs *W* –individual income generated in the shadow economy is usually categorized as labor income rather than capital income – due to labor market regulations. Hence, the higher the tax burden and labor costs, the more incentives individuals have to avoid these costs by working in the shadow economy. The probability of detection *p* itself depends on enforcement actions *A* taken by the tax authority and on facilitating activities *F* accomplished by individuals to reduce detection of shadow economic activities. This discussion suggests the following structural equation:

$$SE = SE\left[\overset{-}{p}\left(\overset{+}{A}, \overset{-}{F} \right); \overset{-}{f}; \overset{+}{B}\left(\overset{+}{T}, \overset{+}{W} \right) \right].$$

Shadow economic activities may be defined as those economic activities and income earned that circumvent government regulation, taxation or observation. More narrowly, the shadow economy includes monetary and non-monetary transactions of a legal nature; hence all productive economic activities that would generally be taxable were they reported to the state (tax) authorities. Such activities are deliberately concealed from public authorities to avoid payment of income, value added or other taxes and social security contributions, or to avoid compliance with certain legal labor market standards such as minimum wages, maximum working hours, or safety standards and administrative procedures. The shadow economy thus focuses on productive economic activities that would normally be included in the national accounts but which remain underground due to tax or regulatory burdens.6 Although such legal activities would contribute to a country's value added, they are not captured in national accounts because they are produced in illicit ways. Informal household economic activities such as do-it-yourself activities and neighborly help are typically excluded in the analysis of the shadow economy.

- The model describes the following situation: the taxpayer has a total income W, which is set exogenously, and its size is known only to the taxpayer. The state, as an agent, only knows the information that the taxpayer provides and which can be checked. The model introduces τ - the tax rate on the income set by the state. A taxpayer faces a choice: declare all of his real income W and pay taxes completely, or declare only a portion of his income X and pay taxes only from them. The state, for its part, can check the taxpayer with probability p, and if it turns out that the taxpayer has hidden some of his income (W-X), he will have to pay a fine from this amount in the amount of π% (π> τ). The taxpayer is a risk taker, therefore, has a concave utility function U.

- To solve this problem, the taxpayer maximizes the mathematical expectation of his utility function with respect to X:

$$E[U] = (1-p)U(W - \tau X) + pU(W - \tau X - \pi(W - X)).$$

Allingham and Sandmo showed that the taxpayer will hide part of his income if the system of restrictions will be:

$$\begin{cases} p\pi > \tau \left[p + (1-p)\dfrac{U'(W)}{U'(W(1-\pi))} \right] \\ p\pi < \tau. \end{cases}$$

If the first restriction is violated, the taxpayer hides all his income, if the latter is violated, the taxpayer pays taxes in full.

Within these limits, i.e. when only part of the taxpayer's income is hidden, an increase in the tax rate increases the amount of hidden income, and an increase in the probability of checking p or penalties π reduces them.

Conclusion.

Within this model, the profit tax generates more tax evasion than other taxes (for example, VAT). The shadow economy is not always linearly dependent on taxes: on the one hand, the increase in taxes increases the desire to go into shadow, on the other hand, the increase in taxes reduces the real income of the taxpayer, which increases his risk aversion, i.e. the taxpayer starts to be afraid to hide his income

The Levenson and Maloney approach [Levenson et al., 1996] is based on the assumption that entrepreneurs remain in the formal economy not because of fear of fines for being in the shadows, but because doing business in the real sector creates benefits from the state goods and services. As in the previous model, it is taken into account that activities in the formal economy are associated with constant costs for entrepreneurs, since they must comply with the rules established by the state. Levenson and Maloney proceeded from the assumption that entrepreneurs, as a rule, start their business in the informal sector in order to avoid high expenses for compliance with the rules. When a firm reaches a sufficient size, it switches over to the formal economy to capitalize on government-provided benefits that improve the operating environment. The merit of these authors is that they modeled the dynamic process of transition between the formal and informal sectors.

Friedman, Johnson, Kaufmann and Zoido-Lobaton [Friedman, 2000] in their model suggest that entrepreneurs go to the shadow economy not only because of the existence of taxation, but also because of the activities of corrupt officials. It is assumed that the entrepreneur has an income Y, which he can direct to expand production in the formal economy and make a profit in R (T) Y (R - return on investment projects, R> 1, T - total tax revenue), or hide and not pay with this income taxes. With funds left in the formal economy, the entrepreneur pays tax t, as well as corruption tax r, which is paid in the form of bribes to corrupt officials. D - the amount of income hidden from taxation. The entrepreneur bears the cost of being in the shade in the amount of $kD2 / 2$, where k is the parameter describing the effectiveness of the legal system.

The entrepreneur maximizes his utility function:

$$U = (1 - t - r)(Y - D)R(T) + D - \left(\frac{kD^2}{2}\right) \rightarrow max_D.$$

The result of maximization is:

$$D^* = \left(\frac{1}{k}\right)(1 - (1 - t - r)R(T)).$$

Total tax revenues are described by the following formula:

$$T = tR\ (T)\ (Y\text{-}D^*)$$

The growth of corruption tax increases the amount of hidden income and reduces the total tax revenue

The growth of total tax revenues affects the effectiveness of the legal system k (T). Considering the situation when k (T) has a dependence in the form: if T≤T *, then k (T) = kL, if T> T *, then k (T) = kH (kH> kL), the authors showed that there is a situation where an increase in the tax rate can reduce the size of the shadow economy. This is due to the fact that the growth of general tax revenues leads to the improvement of legal institutions, as well as to the improvement of the quality of public goods that affect the profitability of investment projects.

(II class) Game models

- A game is a process, which involves several agents. Agents in gaming models can be the state and the population, a taxpayer and an official, several countries, etc. Each agent competes with other agents for the realization of their interests, has its own goal and strategy that can lead to a win or loss, depending on the behavior of other agents . As a result of agents' interaction, a shadow economy is formed.

- Game models appeared relatively recently - in the 70's. Their goal is to study the process of formation of the shadow economy, to identify its properties and factors that affect it.

4 types of Game model

- 1. An important contribution to the development of game models was made by Johnson, Kaufmann and Shleifer [Johnson et al., 1997]. They created a full employment model, suggesting that the workforce is used either in the official or in the shadow sector. The authors showed that the increase in the shadow sector always implies a reduction in the formal sector, and vice versa, which shows of the interconnection and competition of the official and shadow economy.

4 types of Game model

- 2. The game model of the interaction of countries of two types was developed by B. Brodsky [Brodsky, 2000]. He divided countries into 2 types:

- R - rich countries in natural resources, with predominantly extractive export-oriented industries;

- L - countries that are relatively poor in natural resources, with predominantly manufacturing and postindustrial production.

Conclusion

Investigating the interaction of countries of these types, the author has revealed why the development of the shadow economy in these countries goes in different directions. B. Brodsky showed that in the economy of a country like R, liberalization of foreign trade causes an immediate increase in the export of raw materials. Privatization of the public sector is stimulated by the fierce struggle of oligarchic groups for access to raw materials. The goal of the commodity sector is a sharp increase in domestic commodity prices to the level of world prices, and for the manufacturing sector, on the contrary, low prices for resources for successful competition with imported products are important. In these conditions, the manufacturing sector has to go into the shadows to continue its existence.

4 types of Game model

- 3. The game model of interaction between corrupt officials and production companies was developed by Douglas A., Hibbs Jr. and V. Piculescu [Douglas et al., 2005]. This model considers criminal and hidden economic activity. But if the activity of manufacturing companies belongs to the hidden economy, then the activity of corrupt officials is criminal. It introduces the limitations of a corrupt official and the choice to take a bribe or not to take and how much; as well as the manufacturer's limitations and the option of giving a bribe of this size or not. The improvement of state institutions and the quality of public goods will reduce the size of the shadow economy and facilitate the legalization of production.

4 types of Game model

- 4. Jay Pil Choi and Marcel Thum [Jay Pil Choi et al., 2005] considered the flow of manufacturing companies into a shadow only as a departure from paying a bribe to a bureaucrat for entering the formal economy. This model was complicated by the introduction of indicators of the size of the company's capital. In general, the model of Jay Pil Choi and Marcel Thum is as follows.

- There are a number of entrepreneurs, each of which can generate its own income v. The function $F(v)$ describes the proportion of entrepreneurs who can generate an income greater than v. There are also corrupt bureaucrats who demand a bribe of m for obtaining a license for economic activity. To open your business, you need an initial capital of k, while it is assumed that k is a constant value.

Within the framework of this model, the authors consider two states of the economy: when enter to the shadow economy is possible and when it is impossible.

If the entrepreneur's departure into the shadow is impossible, then within the framework of the model his profit is calculated as $\pi OE = v - k - m$.

From this it follows that only $v \geq k\ m$ entrepreneurs stay on the market. Knowing this, bureaucrats maximize their income function:

$$\max m R(m) = m * F(k + m)$$

The result of this maximization is m *. In this case, only those entrepreneurs who generate profits more than v * = k + m * will remain in the market.

If entering of the entrepreneurs in the shadow is possible, then entrepreneurs have an additional strategy. It is assumed that entrepreneurs do not pay bribes to bureaucrats, but have the risk of being caught by controlling bodies with a probability of μ. At the same time, the entrepreneur loses all his money. The profit of the entrepreneur in case of going into the shadow is as follows: $\pi SE = (1-\mu)v - k$. It is assumed that m is sufficiently large, and μ is so small that $k\,(1-\mu) < m + k$. Maximizing its profits, the entrepreneur will not engage in economic activities if $v < k/(1-\mu)$, the entrepreneur will engage in shadow economic activities if $m\mu > v \geq k/(1-\mu)$, will work in the formal economy if $v \geq m/\mu$.

Knowing this, corrupt bureaucrats maximize their utility function:

$$\max m R(m) = m * F(m/\mu).$$

As a result of maximization, the optimal bribe size m 'and the corresponding size v' (v 'v *) are determined.

Conclusion

Thus, the authors showed that the shadow economy in this case not only increases the public welfare, but also increases the size of the official economy, because corrupt bureaucrats, maximizing their incomes, establish lower amounts of bribes. Going into the shadows, entrepreneurs limit the ability of corrupt officials to distort the economy for personal gain. From this it follows that, within the assumptions of the model, the shadow economy mitigates distortions created by the government and, as a result, leads to an increase in economic activity in the official sector. This suggests that the model describes the situation when the shadow economy does not compete with the official economy, but complements it. This result is in contradiction with the conclusions of the authors of other models, where the shadow economy competes for resources with the official one and reduces economic growth. Another conclusion from the model is that any efforts to reduce the shadow economy are ineffective without addressing the problem of corruption.

References

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