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MODELING ORIGINS OF TAX ARREARS IN UKRAINE: THE CORRUPTED GOVERNMENT MODEL

In 2001-2005 arrears have been equivalent to 9-26% of Consolidated Budget or 3-8% of GDP of Ukraine. A list of the major debtors includes distressed agricultural companies as well as leading monopolists and exporters. Thus, it is necessary to clarify factors determining the magnitude of tax arrears and to analyze whether they are amassed due to liquidity problem of the indebted firms or their bargaining potential.

Our model of tax arrears accrual outlines firms-to-government interplay. The government compares cost of the debtors' liquidation with cost of TA cancellation. Firms choose whether to be diligent taxpayers or rent-seekers.

This paper is aimed to investigate reasons for tax arrears accrual in Ukraine. Tax arrears (TA) of domestic companies to the consolidated budget of Ukraine have inflated enormously during the latest decade. In 1998-2005 overdue TA were equivalent to 5-10% of GDP of the state [12]. This level exceeds TA typical for developed and transition countries. For instance, stock of TA in Czech Republic, Estonia, Lithuania, Romania, and Slovakia fluctuated around 1.5-5% of GDP [9].

Ukrainian government attempted to reduce TA. For instance, TA decline in 2001 resulted from Law of Ukraine «About Clearing off Arrears to the Budget and the State Special Рифові Funds» [13]. According to this document, the government may compensate TA via sale of an indebted firm. However, notwithstanding the penalty, TA *enlarged* in 2002, highlighting inadequate enforcement of the law. Moreover, according to information of The State Tax Administration of Ukraine [14], in 2002 the Consolidated Budget loss due to tax nonpayments and privileges exceeded the Consolidated Budget revenue by 38.8%.

Currently, a list of indebted companies includes distressed agricultural firms as well as the major Ukrainian exporters. For instance, among ten major debtors to the consolidated budget there are regional energy monopolists, nuclear-generating companies, and several major metallurgical exporters.

Thus, the aim of this paper is to clarify criteria allowing firms not to cover their TA, and to analyze reasons allaying enforcement of tax law.

Literature Review

Tax arrears are widely discussed in economic literature. Most of the authors agree that accumu-

lation of TA is primarily caused by liquidity problems of firms and by regional political resistance. TA are highly dependent on power of governors in federal states. Politically strong governors protect firms of their regions from the federal tax collection [7, 10]. Furthermore, these are mainly distressed firms that amass TA [5, 9]. According to Kornail et al [6] government might tolerate accumulation of TA by unprofitable firms in order to support «too big to fail» companies whose breakdown might initiate chain reaction of bankruptcies. These failures could cause mass redundancies and a fall in aggregate demand, possibly leading recession. However, according to Bergstrom [1] and Swann [11], TA accrual may be caused by rent-seeking. Profitable producers might «invest» their rent generated in previous periods in lobbying the government. Politicians willing to be elected or reelected implement required legislation changes. This scenario presumes bargaining between the government that redistributes particular privileges and firms willing to get access to them.

Bargaining between politicians and firms is exhibited in several models. For instance, Schaffer [8] developed a model of dynamic commitment where managers demand the government to compensate their production efforts. Boyko et al [2] outlined criteria that allow firms to pretend on government support. According to their model, government bribes manager to retain employment if the share of firm's profit owned by the government is relatively high. Dewatripont - Maskin [4] model outlines government - firms bargaining under asymmetric information. At this model managers are self-oriented, while the government maximizes social welfare.

In the majority of models government is supposed to maximize social welfare. Though, according to capture theory [3], it may forego public utility if it contradicts to private interests of officials. Hence, our model of corrupted government presumes officials that maximize their personal income. They may sacrifice budget revenues for possibility to be elected or reelected. Firms analyze the cost of bribing and choose between rent-seeking and fair tax payments.

Theory: Simplified Model of Corrupted Government

Players in the economy include profitable and distressed domestic firms and the government.

Loss-making firms are unable to cover their charged taxes entirely. The government assesses cost of their liquidation and amount of their tax arrears TA (TA may be compensated if funds generated on firm's liquidation are directed to the budget). If liquidation cost exceeds amount of TA of a particular company, the government bails its TA out. Since the government is known to be bailing some loss-makers out, viable firms evaluate cost of lobbying government officials (or «the government», or «politicians») in order not to pay taxes and the amount of their charged taxes, and choose the minimum cost strategy. Figure 1 presents the extensive form of the game.

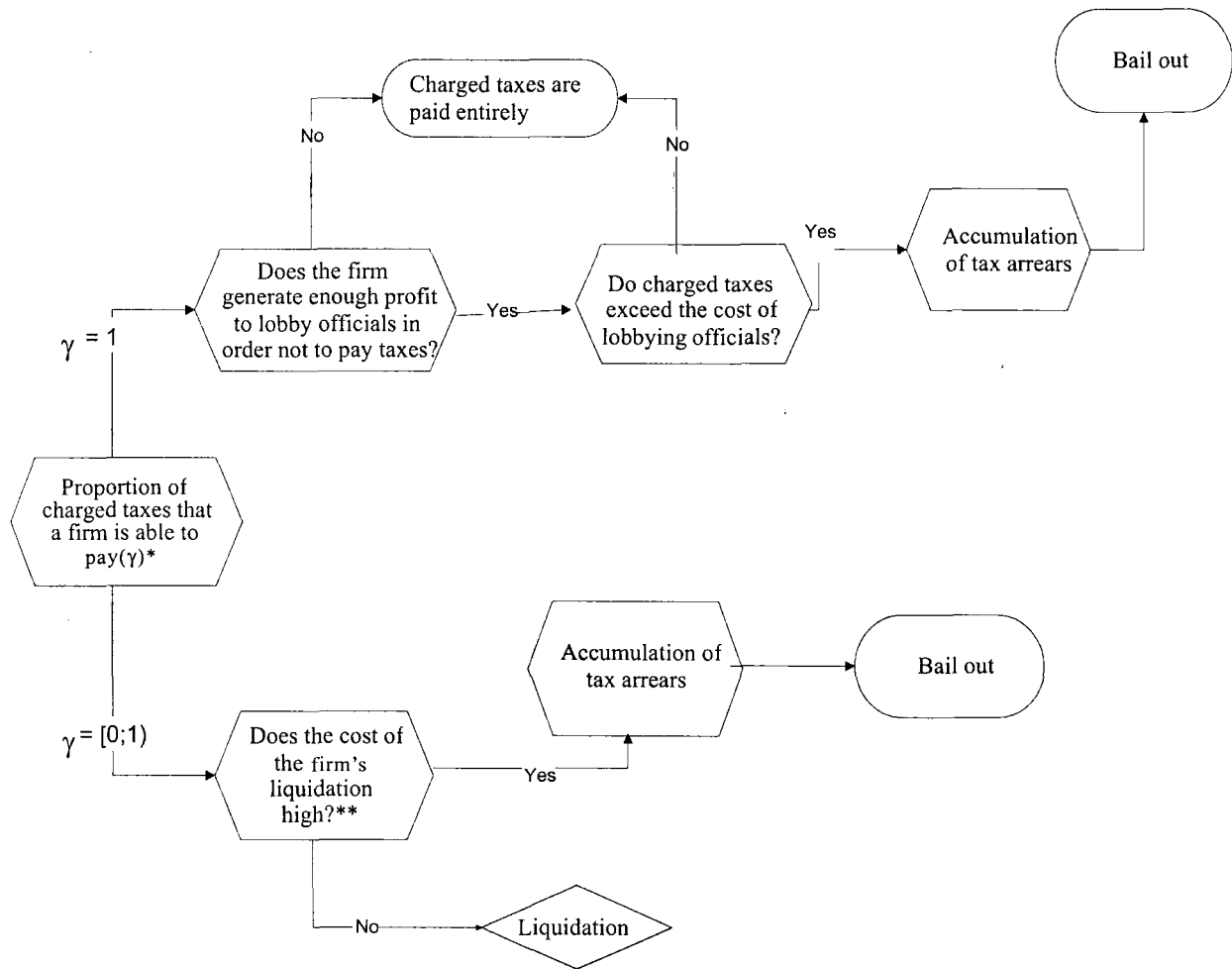


Fig. 1 Tax arrears formation strategy

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* Hence, $(1-\gamma)$ is the proportion of tax arrears.

** Cost of liquidation is high if a firm's breakdown causes

• a chain of other firms' bankruptcy

• huge unemployment (loss of electorate)

The Government

The model is developed for two time periods. Politicians are assumed to maximize their income rather than overall social welfare. Income consists of their wages W , which can be earned only if officials are elected or re-elected. Moreover, the more votes they have got on elections, the higher post they fill after elections, and, thus, the higher wages they are paid. Hence, their income depends on the share of total votes e that politicians are able to gain during election campaign. Therefore, the utility function of the government is

$$U^g = e * W \rightarrow \max, \quad (1)$$

where $e = [0, 1]$. The share of total votes (or probability to get more votes) e depends on probability to raise funds to finance election campaign e^1 and probability to lose some electorate e^2 (where $e^1 = [0, 1]$ and $e^2 = [0, 1]$):

$$e = e^1 - e^2.$$

Probability to lose electorate $e^2 = f(UL)$ depends on amount of labor UL that might be fired if politicians proclaim after-election liquidation of firms indebted to the budget. UL consists of (i) unemployed labor of a liquidated company UL^l and (ii) some proportion of labor of its trade partners (or partner-companies) UL^p that is fired if the firm l is liquidated. Hence,

$$UL = UL^l + \sum \beta_i * UL_i^p,$$

where β_i is the coefficient of dependence of a partner-company i on the liquidated firm. Definitely, $\beta_i \rightarrow 0$ if the liquidated firm is small, and $\beta_i \rightarrow 1$ if it is big.

This labor UL is getting unemployed only if the government decides to liquidate the indebted firm rather than to bail its TA out. Probability of liquidation is q_2 .¹ Hence, probability to lose electorate is

$$e^2 = q_2 * f(UL),$$

where $q_2 = [0, 1]$.

$$\text{Alternatively, } e^2 = q_2 * f(UL^l + \sum \beta_i * UL_i^p). \quad (2)$$

Probability to raise more funds e^1 depends on politicians' willingness to grant privileges to economic agents «investing» in their election campaign. Politicians offer these agents an option not to pay their taxes². Anticipating tax cancellation, the agents refrain from paying their taxes in the pre-

election and election periods, and demand officials to bail these taxes out when politicians are in power. The higher is probability that certain politicians will bail TA out, the higher is their probability to raise election campaign funds:

$$e^1 = q_1 * g(TA), \quad (3)$$

where q_1 is probability of bail out, and TA is the amount of tax arrears generated by firms.

Hence, utility function of the government takes the following form:

$$U^g = e * W \rightarrow \max, \\ U^g = W[q_1 * g(TA) - q_2 * f(UL^l + \sum \beta_i * UL_i^p)] \rightarrow \max.$$

Firms

A set of firms consists of profitable (or viable) and distressed firms. Loss-makers are able to cover only a certain proportion of their charged taxes $\gamma^l = [0, 1]$. Thus, amount of their charged taxes $t\pi^l$ paid to the budget is $\gamma^l t\pi^l$, and amount of their tax arrears (TA) is $(1 - \gamma^l)t\pi^l$. In the extreme case, they cannot pay the entire amount of their charged taxes ($\gamma^l = 0$), thus their TA are equal to the total amount of charged taxes $(1 - \gamma^l)t\pi^l = t\pi^l$. Consequently, the total amount of TA generated by distressed firms is

$$TA^l = \sum (1 - \gamma^l) t\pi^l. \quad (5)$$

Loss-makers can not invest in politicians' election campaign and, thus, can not demand for TA bailout. Hence, their TA may be covered ($TA = 0$) only if tax authorities initiate their bankruptcy, and direct funds generated during liquidation to the budget. So,

$$TA^l = 0 = q_2 * \sum (1 - \gamma^l) t\pi^l, \quad (6)$$

where q_2 is probability that the government decides to liquidate indebted firms rather than bailing them out.

Profitable firms have enough liquidity to cover their charged taxes entirely. However, if the rate of enforcement of tax obligations q_2 is low in the society, viable firms choose whether to be taxpayers or rent-seekers. This decision is based on the cost of each activity C_i and C_r correspondently. Thus, a firm becomes a taxpayer if $C_i < C_r$ and visa versa. A profitable firm willing to minimize its tax exemptions contributes to politicians' election. However, it would not spend on elections more than on taxes. So, its charged taxes $t\pi^l$ might be

¹ Probability of bailout q_1 and probability of liquidation q_2 ($q_2 = 1 - q_1$) are exogenous in the model. They depend on proximity of presidential or parliament elections.

² This offer is extremely convenient for politicians, since it does not presume any pecuniary post-election gratitude to agents investing in the election campaign.

distributed between donating politicians $b^r\pi^r$ and paying taxes $\gamma^r t^r\pi^r$:

$$t^r\pi^r = \gamma^r t^r\pi^r + b^r\pi^r, \quad (7)$$

where π^r is a firm's profit, and b^r is the share of its profit invested in politicians. Tax arrears of viable firms TA^r are cancelled only if they are bailed out ($C_r \rightarrow 1$). Otherwise, if they may be liquidated, they chose to cover their TA:

$$0 = q_1 * \Sigma[(1 - \gamma^r)t^r\pi^r - b^r\pi^r], \quad (8)$$

Proof: $t^r\pi^r = \gamma^r t^r\pi^r + b^r\pi^r$

$$t^r\pi^r - \gamma^r t^r\pi^r = b^r\pi^r,$$

where $t^r\pi^r - \gamma^r t^r\pi^r = TA^r$

$$(1 - \gamma^r)t^r\pi^r = b^r\pi^r$$

$$0 = (1 - \gamma^r)t^r\pi^r - b^r\pi^r$$

$$0 = q_1 * [(1 - \gamma^r)t^r\pi^r - b^r\pi^r],$$

where $q_1 \neq 0$ and $(1 - \gamma^r)t^r\pi^r - b^r\pi^r = 0$.

For the entire set of firms:

$$0 = q_1 * \Sigma[(1 - \gamma^r)t^r\pi^r - b^r\pi^r],$$

where q_1 is probability of bailout.

Equation (8) exhibits the expected profit of firms that donate officials for possibility not to pay their TA. Thus, profitable firms would be willing to pay at most $b^r\pi^r$ of donations for the privilege not to cover their tax arrears $(1 - \gamma^r)t^r\pi^r$.

Aggregate Response to Tax Arrears Minimization

The government utility function is

$$U^g = W[q_1 * g(TA) - q_2 * f(UL^l + \Sigma\beta_i * UL_i^p)] \rightarrow \max.$$

Firms strategies towards minimizing their tax arrears (TA) are

$$q_2 * \Sigma(1 - \gamma^l)t^l\pi^l = 0 \quad (\text{for loss-makers}),$$

$$q_1 * \Sigma[(1 - \gamma^r)t^r\pi^r - b^r\pi^r] = 0 \quad (\text{for profitable companies}).$$

Consequently, the Lagrangian is

$$\begin{aligned} L = & W[q_1 * g(TA) - q_2 * f(UL^l + \Sigma\beta_i * UL_i^p)] - \\ & - \mu_l \{q_2 * \Sigma(1 - \gamma^l)t^l\pi^l\} - \\ & - \mu_p \{q_1 * \Sigma[(1 - \gamma^r)t^r\pi^r - b^r\pi^r]\}. \end{aligned} \quad (9)$$

The aggregate response function for bailing TA out is

$$\begin{aligned} \partial L / \partial q_1 = & W * g(TA) - \\ & - \mu_p \Sigma[(1 - \gamma^r)t^r\pi^r - b^r\pi^r] = 0. \end{aligned} \quad (10)$$

$$\text{Hence, } W * g(TA) + \mu_p \Sigma b^r\pi^r = \mu_p \Sigma(1 - \gamma^r)t^r\pi^r. \quad (11)$$

Intuitively, politicians presume that their excess to high wages, guaranteed by TA bailout $W * g(TA)$, and an excess to political campaign donations $\mu_p \Sigma b^r\pi^r$ compensate taxes that are not paid by profitable firms $\mu_p \Sigma(1 - \gamma^r)t^r\pi^r$.

Proposition 1

Corrupted government tends to tolerate tax arrears generated by profitable firms.

Proof of Proposition 1:

According to (11), politicians' election campaign is donated only by profitable firms. Assume that the government commits to liquidate the indebted firms. Since probability of bailout is low ($q_2 \rightarrow 1$ and $q_1 > 0$), profitable firms choose to pay their charged taxes $\gamma^r = 1$, and $\Sigma(1 - \gamma^r)t^r\pi^r = TA = 0$. Moreover, as far as they cover their TA, they do not invest in elections $\Sigma b^r\pi^r = 0$. According to (11), $W * g(TA) + 0 = 0$. Hence, politicians are unable to get votes guaranteed by elections' donations in order to have higher wages.

The aggregate response function for liquidation of the indebted firms is

$$\begin{aligned} \partial L / \partial q_2 = & -W * f(UL^l + \Sigma\beta_i * UL_i^p) - \\ & - \mu \Sigma(1 - \gamma^l)t^l\pi^l = 0. \end{aligned} \quad (12)$$

Thus,

$$-W * f(UL^l + \Sigma\beta_i * UL_i^p) = \mu \Sigma(1 - \gamma^l)t^l\pi^l. \quad (13)$$

Intuitively, if politicians liquidate distressed firms in order to cover their TA $\mu \Sigma(1 - \gamma^l)t^l\pi^l$, they loose employees' votes, and their post-election wages are getting lower by $-W * f(UL^l + \Sigma\beta_i * UL_i^p)$.

Proposition 2

Big firms are more probable to accrue tax arrears.

Proof of Proposition 2:

According to (13), if officials liquidate small companies in order to cover their TA, their wages decrease by $W^* = W * f(UL^l)$. On the contrary, liquidation of big firms lowers their wages by $W^{**} = W * f(UL^l + \Sigma\beta_i * UL_i^p)$. Since $W^* < W^{**}$, officials are less likely to liquidate big companies. Since probability of being liquidated is lower for big firms, they are more reluctant to generate TA.

Summing up, according to our model, TA are accrued not by distressed firms only. Profitable companies may also amass TA if the rate of enforcement of tax obligations is low in society, and if cost of lobbying does not exceed their charged taxes. Additionally, amount of TA depends on debtors' size. Big firms guarantee more electoral support, which highly influences politicians' probability to be elected. Thus, we expect that these are mostly big companies that accrue TA.

This conclusion is based on pure theoretical concept. So, the purpose of our further research is to conduct econometric analysis of the problem and to verify whether TA are amassed by profitable firms, and whether big companies are more likely to accrue their tax arrears.

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Вишня М. М.

МАТЕМАТИЧНІ МЕТОДИ ОЦІНКИ ПОДАТКОВОЇ ЗАБОРГОВАНOSTІ В УКРАЇНІ: МОДЕЛЬ КОРУМПОВАНОГО УРЯДУ

Упродовж 2001-2005 рр. обсяги простроченої податкової заборгованості в Україні сягнули 9-26% консолідованого бюджету. До переліку найбільших боржників перед бюджетом належать збиткові агропромислові підприємства, а також: провідні вітчизняні монополісти та експортери. Отже, доцільно дослідити, чи накопичення податкової заборгованості визначається неліквідністю компаній чи їхнім лобіюючим потенціалом.

Згідно з нашою моделлю корумпованого уряду, фірми обирають між: сплатою податків та стратегією пошуку ренти. У той же час уряд порівнює витрати, пов'язані з ліквідацією компанії-боржника, з обсягами її податкової заборгованості.