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BARRIERS TO ENTRY AND ECONOMIC GROWTH IN TRANSITION ECONOMIES

Abstract*. Some believe that temporary governmental policies are likely to have no permanent consequences. In this paper, we develop a mathematical model of crime and corruption. We show that even temporary imposition of the barriers to entry to a competitive industry may lead to permanent extortion development and substantial slow-down in the economic growth. Entry restrictions, if binding, lead to the excess profits, which create an incentive to extort. Emergence of the extorters reduces the expected profit from production, making the producers expect to get extorted in the future. If, after this adaptation of expectations, the government removes the barriers to entry, only few new firms enter the market. Hence, the total number of firms on the market is lower that it would have been under no barriers to entry. The low number of firms on the market allows each producer to earn relatively high pre-extortion profits which reinforces the desire of racketeers to take part on their wealth. Consequently, the part of the population is permanently diverted from the production to rent-seeking activities, which is likely slow down economic growth even in the long run.*

Keywords*: transition, crime, corruption, barriers to entry, monopolistic competition, economic systems, game theory, mathematic modeling.*

JEL Classification: C70, K20, L12, P20

1. Introduction

One of the possible reasons for the developed corruption in the former USSR countries might have been the hesitant policy of the government in allowing the private enterprises for the first time. In 1987,Mikhail Gorbachov partly lifted the ban on the private and cooperative businesses. As a result, students and pensioners were allowed to enter the private sector (see Alexeev, 2014).There might have been many

reasons behind this decision. Some argue that Gorbachov was fearful that if the private sector was open to everybody, the state sector would collapse (Goldman, 1996; or Brauers and Zavadskas, 2010). Later, the ban was removed completely and the rest of the population was allowed to enter the private sector which happened in January 1992 in Russia (see Åslund, 1999; or Fungáčová and Weill, 2013).

At the times of the Soviet Union, the consume goods sector suffered from the neglect of the state planners, the demand for consumer goods was enormous. Those few people who were allowed to enter the market often became millionaires overnight. For example, there wasa group of people who started to make pantyhose. After approximately six months they became so rich that they closed down the production because they feared that nobody would believe that they had made their money honestly (see Goldman, 1996; or Gorodnichenko et al., 2014). Having been deprived of wealth of this magnitude for several decades, it was understandable that first-tier businessmen began to spend money. At the same time, criminal groups were being formed in the society, which realized that with little effort they can take a share on that wealth. In a matter of months, racketeers began to control 70-80% of the private sector. Before Gorbachov, Yeltsin, and Kravchuk removed the ban completely, the transition faced many obstacles (see Goldman, 1996;Andersen, 1995; or Jiroudková et al., 2015).Some authors (Goldman, 1996;Klepper et al., 2006; Sonin, 2013; or Zhuk, 2015) argue that had the government not imposed the temporary barriers to entry, extortion would not have become so pervasive and the private sector would have developed much faster.

In this paper, we expose this idea to mathematical scrutiny, analyzing the effect of the entry restrictions (both permanent and temporary) on the extortion development and the economic growth.

2. Economic modelling: timing and assumptions

Let us set the economic model in the following fashion:

1. $N_1 < N$ people are allowed to enter the market. People decide on whether to work on the state sector or open their own business.
2. The rest of the population decides on whether to work in the state sector or to engage in racketeering activity
3. The government abolishes the restriction on entry and new firms enter the market.

The assumptions of the model would be the following:

- Population is large enough. The size of the population equals to N
- Risk neutral individuals and firms
- Firms play Cournot competition

- Extortion of the state sector workers does not occur, whereas private sector is open to extortion.

The preliminarieswould be as described in the section that follows. Let inverse demand be the following:

$$p = S - Q \text{ if } Q \in [0; S]; \; p = 0 \text{ if } Q \geq S \tag{1}$$

where S is the amount of goods bought when the price is close to zero.

$$Q = N_f q \tag{2}$$

is the total amount of goods bought, q is quantity produced by one firm, and N_f is the number firms on the market.

Firm's cost:

$$C = cq \tag{3}$$

The optimal amount produced by one firm equals to

$$q = \frac{S - c}{N_f + 1} \tag{4}$$

and one firm maximal profit is

$$\pi_f = \frac{(S - c)^2}{(N_f + 1)^2} \tag{5}$$

A firm takes the output of the other firms as given and maximizes its profit in the form:

$$\max_q (S - Q_0 - q)q - cq \tag{6}$$

where $Q_0 = (N_f - 1)q$ (7)

First order conditions:

$$S - Q_0 - 2q - c = 0 \tag{8}$$

Substituting the expression (7) gives

$$q = \frac{S - c}{N_f + 1} \tag{9}$$

and

$$\pi_f = \frac{(S - c)^2}{(N_f + 1)^2} \tag{10}$$

Second order conditions:

$$\frac{d^2\pi_f}{dq^2} = -(N+1) \tag{11}$$

Thus, the optimal q represents the value that *maximizes* profit function. The maximal number of firms that are able to make profits larger than their opportunity wage equals to

$$N_f^{\max} = \left[\frac{S-c}{\sqrt{w}}\right] - 1 \tag{12}$$

where w is the wage in the state sector. The formula follows from equalization of equation (5) to the wage in the state sector.

3. Restricted model

The barriers to entry are imposed by the government in stage 1 and abolished in stage three. The government allows N_1^r firms to enter the market, $N_1^r << N_f^{\max}$ Being very few on the market the entrants enjoy incomes much greater than their opportunity wage in the state sector, arousing envy in the rest of the population. The profits of one firm may be expressed by the formula similar to (5), the quantity produced by one firm – by the expression (4), and the overall private sector output is:

$$N_1^r q = \frac{S-c}{N_1^r + 1} N_1^r \tag{13}$$

The rest of the population finds out about the enormous profits the firms earn, and not being allowed to participate in the production process themselves, decides on whether to extort existing firms, or to work in the state sector. However, the extortive activity is costly. The cost of extortion perceived by one person positively depends on the number of firms extorted. The question remains on whether the cost is convex or concave. One can think of arguments supporting both the convexity and the concavity of the cost function. The more one person extorts the bigger is his experience and the more firms fear him. Thus, to extort each additional firm is likely to be less costly than the previous ones and the cost function is likely to be concave. On the other hand, the firms may cooperate and try to defend themselves. The can do this either by informing the police or by physical means or both. For this reason, each additional extorted firm may cost the racketeer more than the previous, and the cost of extortion is likely to be convex. Both arguments seem plausible. It is difficult to predict which effect will dominate. Thus it seems reasonable to assume linear cost of extortion.

$$C_e = c_e N_e \tag{14}$$

where c_e is unit cost of extortion, and N_e is number of firms that are extorted by one racketeer in one period.

However, the linear cost of extortion has one disadvantage: it implicitly assumes that, if the conditions for the extortion are favorable enough, one racketeer can extort all the private firms on the market in a limited time frame. This implicit assumption does not seem plausible. Let $N_e^{\max}$ be the maximal number of firms that can be extorted by one person during one stage of the model. Unit cost of extortion reflects both the cost of visiting the firms and demanding money, and risks coming from being caught by the police and penalized. This way it also reflects regulatory and law enforcement environment in the country. The more severe is the punishment for extortion and the bigger is the probability of detecting extortion; the higher is the unit cost of extortion. If the condition that limits the number of firms that can be extorted by on person is not binding, the number of racketeers (H_e) is:

$$H_{e1} = \left[\frac{N_f \left(\pi_f \alpha - c_e \right)}{w} \right] \tag{15}$$

where $0 < \alpha \leq 1$ reflects both successfulness and greed of racketeers. If the condition on maximal number of firms extorted is binding, which is the case if:

$$\frac{N_f}{H_{e1}} \geq N_e^{\max} \tag{16}$$

then

$$H_{e2} = \left[\frac{N_f}{N_e^{\max}} \right] \tag{17}$$

The profit from extortion is:

$$\pi_e = \left(\pi_f \alpha - c_e \right) N_e \tag{18}$$

Assuming that profits of firms are high enough, all the firms are likely to be extorted and number of firms extorted by one person equals to

$$N_e = \left[\frac{N_f}{H_e} \right] \tag{19}$$

Obviously, the larger is the number of extortionists, the lower is the profit per one person. Thus new individuals will be entering the extortive business till the profit is equal to the opportunity wage in the state sector. The maximum number of racketeers is defined from the following condition:

$$\pi_e = \left(\pi_f \alpha - c_e\right)\frac{N_f}{H_e} = w \tag{20}$$

By expressing H_e from this equation one can easily get formula (17).From the expression (20) one can conclude that if the profits of the firms and the successfulness of extortion are low enough compared to the cost of extortion, the number of racketeers might be zero. However, if the restrictions to entry are imposed the profits from production are likely to be high enough and extortion may arise.

Substituting the expression of one-firm profit, one can easily get the number of extortioners on the stage two to be equal to

$$H_{e2}^r = \left[\frac{N_1^r\left(\left(S-c\right)^2\alpha - c_e\left(N_1^r+1\right)^2\right)}{w\left(N_1^r+1\right)^2}\right] \tag{21}$$

or, if the condition of maximal number of extorted firms per one racketeer is binding

$$H_{e2}^r = \left[\frac{N_1^r}{N_e^{\max}}\right] \tag{22}$$

Generally, if entry restrictions are not severe (and, thus, profits of the firms are low), extortion on the stage two may push some firms out of the market. In this case, steady state the expressions for the number of racketeers and firms may be different from these above.

The government abolishes entry restrictions and new firms are about to enter the market. Expectations of the firms as for their future profits are already different from those at stage one. Both old and new producers include the payments to racketeers to their expected costs.

Assume that firms expect that they will have to give up the same proportion of their profits as on the stage one (adaptive expectations). This assumption, however, implies that the racketeers have some estimates of the firms' profits so that they know how much to demand. The latter seems plausible for the case of Ukraine and Russia, where some banks are known to reveal confidential information about clients' accounts to the third parties. Especially relevant is the assumption about the reveal of firms actual profits to the racketeers, for the first-tire post-soviet businesses in the end of eighties beginning of ninetieth, when the businessmen by extensive spending money indicated how large their incomes were. The expected profit of a firm would be:

$$E\left(\pi_{f3}^r\right) = \left(p-c\right)q\left(1-\alpha\right) \tag{23}$$

where α stands for the proportion of profits extorted in the previous period.

Profit maximization leads to the following optimal quantities produced:

$$q_3^r = \frac{S-c}{N_{f3}^r + 1} \tag{24}$$

And on firm optimal expected profit is

$$E\left(\pi_{f3}^r\right) = \frac{(S-c)^2}{\left(N_{f3}^r + 1\right)^2}(1-\alpha) \tag{25}$$

Obviously, the profit of one firm negatively depends on the number of the firms on the market. The firms will be entering the market till the profit from production will be equal to opportunity wage in the state sector. Making firm's expected profit (25) to be equal to the wage, and expressing the number of firms on the market from the resulting equation one can easily get

$$N_{f3}^r = \left[\frac{(S-c)\sqrt{1-\alpha}}{\sqrt{w}}\right] - 1 \tag{26}$$

Substituting the number of firms on the market to the previous expression, the pre-extortion profit of one firm would be equal to:

$$\pi_{f3}^r = \frac{w}{1-\alpha} \tag{27}$$

If condition that specifies the maximal number of firms that can be extorted by one person is not binding, than:

$$H_{e3}^r = \left[\frac{(S-c)\sqrt{1-\alpha} - \sqrt{w}}{w\sqrt{w}}\left(\frac{w}{1-\alpha}\alpha - c_e\right)\right] \tag{28}$$

Otherwise

$$H_{e3}^r = \left[\frac{(S-c)\sqrt{1-\alpha} - \sqrt{w}}{\sqrt{w}N_e^{\max}}\right] \tag{29}$$

Since the adaptive expectations of the producers as for how much they have to pay the extortioners are also rational, the conditions (26) – (29) represent steady state employment decisions.

4. The benchmark model

At the benchmark model, there are no barriers to entry at stage one. If everybody is allowed to open his/her own firm, the agents will do it as long as the profits are higher than the opportunity wage in the state sector. From the optimal amount of output produced by one firm equals to:

$$q = \frac{S - c}{N_{f1}^{b} + 1} \tag{30}$$

and one firm optimal profit is:

$$\pi_{f1}^{b} = \frac{(S - c)^2}{(N_{f1}^{b} + 1)^2} \tag{31}$$

If the population is large enough, in the end of stage one there will be $N_f^{\max}$ firms on the market making profits equal to the opportunity wage in the state sector.

$$N_{f1}^{b} = N_f^{\max} = \left[\frac{S - c}{\sqrt{w}} - 1 \right] \tag{32}$$

$$\pi_{f1}^{b} = w \tag{33}$$

People who were working in the state sector in the stage one observe the profits the firms make and decide on whether it proves profitable to extort them.

Profit from extortion equals to

$$\pi_{e2}^{b} = (w\alpha - c_e) N_{e2}^{b} \tag{34}$$

Under the following conditions there will be no extortion

$$c_e > w\alpha - \frac{w}{N_e^{\max}} \tag{35}$$

The first racketeer will be able to extort maximally $N_e^{\max}$ firms. If he can get from these firms less than his wage in the state sector plus the cost of extortion, he will not be willing to enter. Thus, substituting $N_e^{\max}$ to the formula (32), equalizing it to the opportunity wage in the state sector, and expressing the cost of extortion, one can get the condition (35). If the condition (35) does not hold, the number of racketeers on the market is equal to (lemma 3)

$$H_{e2}^{b} = \left[\frac{N_{f1}^{b}(w\alpha - c_e)}{w} \right] = \left[\frac{(S - c - \sqrt{w})(w\alpha - c_e)}{w\sqrt{w}} \right] \tag{36}$$

if the constraint for maximal number of the firms extorted by one extortioner is not binding, otherwise

$$H_{e2}^{b} = \left[\frac{N_{f1}^{b}}{N_e^{\max}} \right] \tag{37}$$

Similarly to the restricted model, the steady state employment decision will be somewhat different from these presented above. If extortion occurs, it reduces firms' profits to the levels below the opportunity wage and, thus, some of the firms

will find it more profitable to return to the state sector. Reduction in the number of firms on the market will lead to decrease in the racketeers' profits, and persuade some of racketeers to return to the state sector. The firms adjust their expected profits by inclusion the cost of extortion. Similarly to the stage three of the model with the barriers to entry, the number of firms on the market is equal to:

$$N_{f3}^{b} = \left[\frac{(S-c)\sqrt{1-\alpha}}{\sqrt{w}} \right] - 1 \tag{38}$$

the profit of one firm is:

$$\pi_{f3}^{b} = \frac{w}{1-\alpha} \tag{39}$$

If condition that specifies the maximal number of firms that can be extorted by one person is not binding, than

$$H_{e3}^{b} = \left[\frac{(S-c)\sqrt{1-\alpha} - \sqrt{w}}{w\sqrt{w}} \left(\frac{w}{1-\alpha}\alpha - c_e \right) \right] \tag{40}$$

Otherwise

$$H_{e3}^{b} = \left[\frac{(S-c)\sqrt{1-\alpha} - \sqrt{w}}{\sqrt{w} N_e^{\max}} \right] \tag{41}$$

Similarly to the model with barriers to entry, the adaptive expectations of the firms as for the amounts they are to pay extortiones are also rational. Thus, the conditions (39) – (41) represent the steady state.

5. Comparison of the outcomes

The total output of the private sector increases with the number of firms on the market. The output of one firm equals to:

$$q = \frac{S-c}{N_f + 1} \tag{42}$$

Thus, the output of the whole industry is

$$N_f q = \frac{S-c}{N_f + 1} N_f \tag{43}$$

The first derivative of the total output of the industry with respect to the number of firms is

$$\frac{\partial(N_f q)}{\partial N_f} = \frac{(S-c)(N_f + 1 - N_f)}{(N_f + 1)^2} = \frac{S-c}{(N_f + 1)^2} > 0 \tag{44}$$

If the condition limiting the number of firms that can be extorted by one person is not binding, the number of racketeers is decreasing function of the number of firms on the market. The number of extortioners as the function of number of firms on the market (21) is equal to

$$H_e\left(N_f\right)=\left[\frac{N_f\left(\left(S-c\right)^2\alpha-c_e\left(N_f+1\right)^2\right)}{w\left(N_f+1\right)^2}\right] \tag{45}$$

The first derivative of the function (43) is

$$\frac{dH_e}{dN_f}=\frac{1}{w}\left(\frac{\left(S-c\right)^2}{\left(N_f+1\right)^2}-c_e-2\frac{\left(S-c\right)^2}{\left(N_f+1\right)^3}N_f\right)=\frac{1}{w}\left(\frac{\left(S-c\right)^2\left(1-N_f\right)}{\left(N_f+1\right)^3}-c_e\right)<0 \tag{46}$$

$\forall\ N_f \geq 1$

If the unit cost of extortion (c_e) is low enough, barriers to entry are likely to reinforce extortion development in the short run, and, given that the wage in the state sector is low, substantially diminish economic growth.

Generally, the number of firms on the market without barriers to entry is likely to be greater than that if barriers to entry are imposed ($N^r_1<N^b_{f1}$). Thus, since the number of extortioners is a diminishing function of number of firms on the market the barriers to entry may increase the number of extortioners. This conclusion does not hold if the condition limiting the number of firms extorted by one extortioner is binding.

The effect on economic growth is twofold. Firstly, limiting the number of firms on the market reduces the output of the private sector (lemma 4). Secondly, the created extra-large profits in the private sector divert a part of the population from working in the state sector to extortive activity, thus diminishing output of the state sector. However, as it will be shown below, the total number of producers and racketeers may be lower in the restricted model as compared to the benchmark. Thus, entry restriction may actually bring gain to the state sector and the effect on economic growth may heavily depend on the relative productivity of labor in the state and private sectors.

Mathematically, the analysis will look like the following: Private sector loss of output as compared to the benchmark model:

$$L_p=q_2^bN_{f2}^b-q_2^rN_{f2}^r=\frac{S-c}{N_f^{\max}+1}N_f^{\max}-\frac{S-c}{N_1^r+1}N_1^r=S-c-\sqrt{w}-\frac{S-c}{N_1^r+1}N_1^r \tag{47}$$

Obviously, the more severe are the barriers to entry the greater is the loss in private sector.

Assume that the productivity of one person in the state sector is constant and equals to a units of output per period. Then state sector loss of output equals to:

$$L_s = a\left(\left(N - N_f^{\max} - H_{e2}^b\right) - \left(N - N_1^r - H_{e2}^r\right)\right) = a\left(N_1^r \frac{w + \frac{(S-c)^2}{\left(N_1^r+1\right)^2}\alpha - c_e}{w} \right) - a\left(\frac{S-c}{\sqrt{w}} - 1\right)\left(\frac{w + w\alpha - c_e}{w}\right) \quad (48)$$

In order to find the qualitative influence of barriers to entry on the output of the state sector, it is necessary to find the derivative of the expression (48). The derivative of the second bracket with respect to N_1^r equals to zero, whereas, that of the first bracket is

$$\frac{\partial L_s}{\partial N_1^r} = \frac{a}{w}\left(w - c_e - \frac{\alpha(S-c)^2\left(N_1^r - 1\right)}{\left(N_1^r + 1\right)^3} \right) \quad (49)$$

The expression (47) may be negative for N_1^r. Thus, in general, barriers to entry may promote employment and, thus, production in the state sector. The intuition behind this finding is that the total number of racketeers and private sector producers may be lower in the case of barriers to entry as compared to the benchmark case. Thus, if the productivity of the worker in the state and private sector are not very different, the barriers to entry may actually lead to enhancement of economic growth in the short run. However, if the wage in the state sector is low (as it is the case in the most economies of transition), the barriers to entry are likely to substantially diminish economic growth.

If the cost of extortion is low enough[1], temporary barriers to entry are likely to have negligible effect on extortion development and economic growth in the long run. If permanent, they are likely to support extortion and diminish economic growth in the long run if α is low and extortion burden does not lead to the decrease in the number of firms on the market.

If α is high, and the limit imposed by the government on the number of firms on the market is not reached in the long run, permanent barriers to entry do not have any influence on the extortion development and economic growth.

Comparing the employment distributions among sectors on the stages three is the benchmark and "restricted" model, one can easily conclude that temporary barriers to entry do not have permanent influence on the number of people working in the state sector, producers and racketeers. Thus, neither economic growth is affected.

The conclusion is quite different if the barriers to entry are not removed and the "restricted" story ends at the stage two. Two cases are possible depending on whether the presence of racketeers is able to alter the number of firms on the market.

Case A: The burden the racketeers impose on the production sector is not immense (α is low) and, thus, the number of producers in the steady state is the same as on the stage two.

$$\pi_{f2} = \frac{(S-c)^2}{(N_1^r+1)^2}(1-\alpha) \geq w \tag{50}$$

Thus the results proved in proposition 2 for the short run is also valid in the long run if barriers to entry are permanent.

Case B: The racketeers are both greedy and successful (α is high):

$$\pi_{f2} = \frac{(S-c)^2}{(N_1^r+1)^2}(1-\alpha) < w \tag{51}$$

In this case the number of firms on the market in the steady state is determined by the equation similar to (51) but with equality sign instead the sign "less".

$$\pi_{f2}^s = \frac{(S-c)^2}{(N_1^s+1)^2}(1-\alpha) = w \tag{52}$$

Since the profit of one firm is decreasing function of the number of firms on the market, and $\pi_{f2} < \pi_{f2}^s$

$$N_1^s < N_1^r \tag{53}$$

Therefore, the upper limit barriers to entry impose on the number of firms is not achieved in the long run, and the barriers do not have any effect on extortion development and economic growth in the long run.

If the cost of extortion is high enough, successfulness of extortive activity is low and the barriers to entry are not severe, neither temporary, nor permanent barriers to entry are likely to cause any extortion development. In this case there is no effect of barriers to entry on economic growth.

If the environment for extortion is that severe, condition limiting the number of firms that can be extorted by one racketeer is likely to be binding. Thus the profit from extortion is

$$\pi_e = (\pi_f \alpha - c_e) N_e^{\max} \tag{54}$$

If the cost of extortion is high enough, successfulness and greediness of extortion (α) is low, the conditions limiting the number of firms on the market are not severe (N_f is large) and the ability of racketeer to extort is limited ($N_e^{\max}$ is low), the profit from extortion may be well below the opportunity wage in the state sector.

$$\pi_e = \left(\frac{(S-c)^2}{(N_f+1)^2} \alpha - c_e \right) N_e^{\max} < w \tag{55}$$

In this case there will be no extortion even with the barriers to entry.Temporary barriers to entry may cause extortion development both in the short and in the long run in the case when there would be no extortion had not had the barriers been imposed. In this case they may have tremendous negative long run effect on economic growth.

The proof will go as follows: firstly we prove that there exist such c_e that will cause extortion in the benchmark model to be relatively unprofitable business as compared to the wage in the state sector, but, if the entry restriction is imposed, the extortion would appear. Secondly, we analyze the effects of barriers to entry on the employment distribution among sectors and on economic growth. All in all, the crucial thing is the existence of such c_e that would disable extortion in the case without barriers to entry and enable it in the case with barriers to entry. The condition for no extortion had not had the barriers to entry been applied is (proposition one)

$$c_e^b > w\alpha - \frac{w}{N_e^{\max}} \tag{56}$$

Now it is necessary to prove that for c_e satisfying condition (56) extortion may occur if the barriers to entry are applied. Or, in other words, that it may be profitable for at least one racketeer to extort.

The profit of one extortioner in the restricted model is

$$\pi_e^1 = (\pi_f \alpha - c_e^r) N_e^{\max} > w \tag{57}$$

or

$$c_e^r < \pi_f^r \alpha - \frac{w}{N_e^{\max}} \tag{58}$$

Now it is enough to prove that the interval $[c_e^b; c_e^r]$ is not empty, or that

$$w\alpha - \frac{w}{N_e^{\max}} < \pi_f^r \alpha - \frac{w}{N_e^{\max}} \tag{59}$$

Since π_f^r is generally greater than w, the inequality above holds.

6. The effects on economic growth

Loss in the private sector production (similarly to 45):

$$L_p = q_2^b N_{f2}^b - q_2^r N_{f2}^r = \frac{S-c}{N_f^{\max}+1} N_f^{\max} - \frac{S-c}{N_1^r+1} N_1^r = S - c - \sqrt{w} - \frac{S-c}{N_1^r+1} N_1^r \quad (60)$$

$L_p > 0$ since the output of the industry positively depends on the number of firms in it (lemma 4). Loss of production in the state sector (similarly to 46)

$$L_s = a\left(\left(N - N_f^{\max}\right) - \left(N - N_1^r - H_{e2}^r\right)\right) = a\left(N_1^r \frac{w + \frac{(S-c)^2}{(N_1^r+1)^2}\alpha - c_e}{w} \right) - a\left(\frac{S-c}{\sqrt{w}} - 1\right) \quad (61)$$

The analysis of the functional form of $L_s(N_1^r)$ needs further elaboration. From the first sight it looks like the state sector loss may be either positive or negative depending on the value of N_1^r. Generally it may happen that the total number of racketeers and private sector producers is lower than the number of firms on the market in the benchmark model. In this case, the barriers to entry bring gain to the public sector.

Overall effect on economic growth naturally depends on the relative productivity of the population in the state and private sector. One can mention many reasons why one sector might be more productive than the other. State sector in the countries of the former Soviet Union is more endowed with the capital and, therefore, is more likely to benefit from economies of scale. Generally productivity of a worker positively depend on the amount of capital per worker, thus, the productivity of one worker in the state sector is likely to be higher than that of private sector. The state sector in the post-communist countries usually possesses greater scientific potential than the newly developing private one and, thus has better prerequisites to the development of new technologies. On the other hand, the private sector is more flexible in adopting new technologies and removing all the kinds of administrative barriers to increase in efficiency.

It looks like that heaving so many prerequisites to raise efficiency, the state sector in the Post-Communist countries does not use them adequately, and thus, is likely to be less productive the private one. Many state factories do not work at all or work at a proportion of their capacities. New technologies are rarely being adopted, and the administrative burden is enormous. Thus barriers to entry are likely to diminish economic growth even in the case when they actually promote employment (and, thus, production) in the state sector.

Temporary barriers to entry can change the expectations about the future profits so that the payments to extortioners are included. Thus, the actual profits of the

firms will be greater that the competitive wage reinforcing the desire of racketeers to extort. The loss in the private sector:

$$L_p = q_3^b N_{f3}^b - q_3^r N_{f3}^r = \frac{S-c}{N_f^{\max}+1} N_f^{\max} - \frac{S-c}{N_{f3}^r+1} N_{f3}^r = S - c - \sqrt{w} - \frac{S-c}{N_{f3}^r+1} N_{f3}^r \quad (62)$$

where (24)

$$N_{f3}^r = \frac{(S-c)\sqrt{1-\alpha}}{\sqrt{w}} - 1 \quad (63)$$

Thus

$$L_p = \sqrt{w}\left(\frac{1}{\sqrt{1-\alpha}} - 1\right) \quad (64)$$

Obviously the production sector loses if extortion develops.

State sector loss:

$$L_s = a\left(\left(N - N_f^{\max}\right) - \left(N - N_{f3}^r - H_{e3}^r\right)\right) = a(N_{f3}^r + H_{e3}^r - N_f^{\max}) \quad (65)$$

From formulas (24), (26) and lemma 2

$$L_s = a\left(\frac{(S-c)\sqrt{1-\alpha}}{\sqrt{w}} - 1 + \left(\frac{(S-c)\sqrt{1-\alpha}}{\sqrt{w}} - 1\right)\frac{1}{w}\left(\frac{w\alpha}{1-\alpha} - c_e\right) - \left(\frac{(S-c)}{\sqrt{w}} - 1\right)\right) \quad (66)$$

From this expression it is not clear whether the loss to the state sector is positive or negative. Obviously this depends, among other factors, on the cost of extortion.

The loss is positive (the state sector actually loses), if

$$c_e < w\left(\frac{(S-c)\left(\sqrt{1-\alpha}-1\right)}{(S-c)\sqrt{1-\alpha} - \sqrt{w}} + \frac{\alpha}{1-\alpha}\right) \quad (67)$$

and negative (the industry gains) if opposite.

If the cost of extortion is too large, the profitability of extortive activity diminishes and more people are likely to work in the state sector (please note that the number of firms in the private sector does not depend on the number of racketeers, it only depends on existence of extortion as a whole). Thus the employment in the state sector increases. If the cost of extortion is too low, more people are likely to extort, and less is left for the state sector.

It would be interesting to learn the condition (67) meets the constraints on the existence of extortion in the restricted model and non-existence in the benchmark one. These, however, depend on exogenously given maximal number of firms that can be extorted by one racketeer. If extortion in the restricted model is to exist, then:

$$N_e^{\max} \geq \frac{N_{f3}^r}{H_{e3}^r} \tag{68}$$

From the expressions for N_{f3}^r and H_{f3}^r one can easily get

$$N_e^{\max} \geq \frac{1}{\left(\frac{\alpha}{1-\alpha} - \frac{c_e}{w}\right)} \tag{69}$$

Substituting expression (67) to the formula (64) one can get

$$L_s \geq a\left(\left(\frac{(S-c)\sqrt{1-\alpha}}{\sqrt{w}} - 1\right)\left(1 + \frac{1}{N_e^{\max}}\right) - \left(\frac{(S-c)}{\sqrt{w}} - 1\right)\right) \tag{70}$$

In order to assure that $L_s \geq 0$ (the state sector loses) the expression above should be greater than zero. From this condition one can easily get

$$N_e^{\max} \geq \frac{(S-c)\left(1-\sqrt{1-\alpha}\right)}{(S-c)\sqrt{1-\alpha} - \sqrt{w}} \tag{71}$$

Under this condition there exists such c_e that the state sector loses in the long run if the state imposes temporary barriers to entry. Generally, it looks like that it may happen both: the state sector loses or the state sector gains in the long run. The total loss is:

$$L = a\left(\frac{(S-c)\sqrt{1-\alpha}}{\sqrt{w}} - 1 + \left(\frac{(S-c)\sqrt{1-\alpha}}{\sqrt{w}} - 1\right)\frac{1}{w}\left(\frac{w\alpha}{1-\alpha} - c_e\right) - \left(\frac{(S-c)}{\sqrt{w}} - 1\right)\right) + \left(\frac{\sqrt{w}}{\sqrt{1-\alpha}} - \sqrt{w}\right) \tag{72}$$

Less is produced in private sector (since there are fewer firms on the market), but possibly more people work in the state sector. Generally, if the case in the state sector gains from the extortion development, the conclusion upon the effect of barriers to entry on economic growth depends on the relative productivity of the state and private sector workers. As it was discussed above, in the countries of transition the private sector workers tend to be more productive than the state sector ones. Thus, even in the case if the state sector gains from the extortion development, temporary entry restrictions are likely to have negative long rune effect on economic growth.

In the case if the state sector loses, the conclusion is even more apparent. The whole economy loses from the entry restrictions.

7. Conclusions and implications

The effect of entry restrictions on extortion development substantially depends on the unit cost of extortion (c_e), successfulness and greed of racketeers (α) and on the wage in the state sector (w). If the values of the parameters are unfavorable

for the racketeers-to-be (the cost and the wage are high and the successfulness is low), it is possible that there will be no extortion even if entry is restricted.

If the parameters are favorable for the racketeers (the cost and the wage are low and the success is high), extortion may occur independently on the barriers to entry. In this case both temporary and the permanent barriers to entry are likely to reinforce extortion development in the short run.

In the long run, permanent barriers to entry are likely to support extortion development only if they are binding. Otherwise, neither temporary nor permanent entry restrictions lead to the increase in the number of racketeers.

Temporary barriers to entry may lead to permanent extortion development in the case when there would be no extortion had not had the barriers been imposed. Then, the expectations of the firms to be extorted in the future play the crucial role supporting extortion development. The firms, expecting to be extorted, produce extra actual profits, thus, reinforcing desire of racketeers to extort.

Entry restrictions if binding lead to diminishing number of firms on the market in the short run and support extortion development.

In the long run, in all the cases when the restrictions support extortion (see "effect on extortion development"), they also diminish number of firms on the market. If the barriers to entry do not lead to extensive extortion, they have negligible effect on the number of firms on the market.

The effect on the state sector employment is unclear and needs further investigation. Apparently, it may happen that extensive extortion will make the work in the state sector more attractive than in the case of no extortion, and thus increase state sector employment.

In the long run, this effect may be very much dependent on two factors. Firstly, the barriers to entry may have negligible effect on extortion development and, thus on economic growth. This may happen if the cost of extortion is too low and extortion appears independently on the entry restrictions or if the cost of extortive business is too high, and there are no racketeers even if the entry is restricted. If the cost of extortion is such that it warrants extortion in the case of barriers to entry and does to if the latter are not imposed, the entry restrictions reinforce extortion and may have tremendous negative effect on economic growth.

The second factor influencing the effect on entry restrictions on economic growth is the relative productivity of a person in the state and private sectors. Barriers to entry may lead to increase in the state sector employment, and, thus, enhance its output but reducing the output in the private one. Hence, if the state sector is much more productive, generally it is possible that the barriers to entry enhance growth. This may happen in the countries, where the state sector possesses more capital, better technologies and is able to use its resources efficiently. In the democratic countries, the efficiency of the state sector often reduced by the corruptness of government

officials. In Ukraine, Russia, and possibly some other economiesin transition, the state sector productivity is also worsened by outdated technology and virtually no investment. Thus, the private sector seems to be more productive in this region and the barriers to entry may cause substantial reduction in economic performance.

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