Contents

1 Introduction

As a result of privatization in Russia, many enterprises were passed from the public ownership to the private one. However, the government still keeps up relations with them and retains its influence over the production activity. This is not surprising. On the one hand, the authorities enjoy the support of the private sector which pays taxes, participates in public projects, helps them to carry out election campaigns. On the other hand, they make the enterprises accessible to specific resources necessary for successful business: licenses, guard, judicial protection, privileges, support in competition. So, the authorities and the private sector are in need of each other and can make arrangements about mutually beneficial co-operation. Such a co-operation is sometimes called "patronage". Usually, patronage is exercised by regional rather than central authorities.

Informal or even illegal deals between authorities and entrepreneurs are very much widespread. According to the sociological investigation among businessmen conducted by V. Radaev [11], a considerable part of the respondents (50%) has found it impossible to get rid of such deals; a smaller percentage of them have been really involved.

The purpose of this paper is, firstly, to reveal incentives of both parties to set up and accept patronage and, secondly, to evaluate economic consequences of such relations.

As we said, patronage often takes a form of giving privileges in exchange

for some benefits (monetary, political or any other). We are going to focus on this form of patronage in the present paper. Our analysis can be applied to a number of forms of special treatment such as subsidies, tax privileges, public projects, licensing and so on. Note, however, that there are other forms and motivations of patronage. For instance, regional government may support enterprises with a large number of workers in order to avoid unemployment and maintain social stability in the region. Such socially-oriented patronage is out of the scope of our current study.

We are going to consider the government as a specific economic agent with its own interests rather than as a mechanical welfare optimizer. This leads to the agency problem. A classical model of this kind was suggested by A. Shleifer and R. Vishny in [12]. Our model may be considered as a further development of this idea.

Offering patronage, the authority behaves as a monopolist who exercises control over other participants of the market. This is similar to the concept of vertical control (see [8], [13]). The government can be treated as a provider supplying private producers with some specific intermediate goods. Here we treat privileges as one of such goods.

The extent to which patronage is efficient depends on who enjoys the state support. If privileges are given to new, dynamic firms with efficient production technologies and high investment possibilities then patronage will contribute to economic growth (of course, only if the social cost of privileges and induced rent-seeking are not too high). In this case, the government,

on the one hand, enhances the incentives to produce and invest and, on the other hand, implements fruitful discrimination promoting efficient producers. However, privileges may be given to large firms with high production costs and enormous capital stock left from the Soviet times. Although it may help maintain social stability in the region, such enterprises are not going to invest; at the same time, the tax burden and social costs of patronage rest mainly on small firms which are potential investors. This may lead to stagnation.

Such unproductive use of privileges is possible because interests of politicians not necessarily coincide with those of the society. Similarly to what is shown by Shleifer and Vishny [12], this may lead to inefficient outcomes. A key point here is that patronage and lobbying activities are usually too costly in the sense that the equivalent public provision of favorable conditions (legislation, efficient judicial system and so on) would be less expensive to the society. This opportunity cost of patronage may occur not only by technological reasons, they can also be a consequence of "bad" incentives of bureaucrats and other office holders. This is because patronage activities are often informal (though not necessarily criminal) and hardly regulated. Resources going through the "exclusive" sector are controlled by the legislation and the federal government to a far less extent than, say, regular tax revenues; they are easy to be diverted from the budget for political and private aims. Under such circumstances, patronage becomes an instrument of fiscal protection (as in [15]) rather than discrimination, although, unlike [15], the government "protects" from itself first creating unfavorable conditions (for instance, setting high taxes) and then offering privileges. The patronized

sector (or the "parastate" as it is called in [16]) consists of those who can pay more, regardless of their efficiency. Finally, patronage allows to divert budget resources for aims which have nothing to do with economic development. This negatively affects the infrastructure and other public goods. If the diversion is uncontrolled, the only incentive to provide public goods can be, as in [10], a hope to raise more revenues in the future.

The paper is organized as follows. In section 2, model of patronage is introduced and the basic results are formulated. Section 3 presents the analysis concerning the impact that patronage has on investment. In the last section, some concluding remarks are given.

2 Basic Model

To study the above issues, we set up a model of patronage. Let us describe it in its basic and simplest version.

The economy of the region consists of n producers (firms) involved in Cournot quantity competition. In the present section, firms are supposed to be identical; then we are going to consider some special case of the model with heterogeneous firms varying in scale and efficiency. We also assume for simplicity that the production technology is linear.

The economy is regulated by the authority (government) which can patronize some firms. This patronage takes the form of giving privileges. If a firm has some privilege, it gets an advantage over the other firms in the subsequent market competition. We assume that this advantage is realized in cost or tax reduction. Thus, privileges can raise the firm's profit, so the firm is willing to pay or do something in return or struggle for state patronage with other firms. The government, in turn, tries to take into account the incentives of producers and form its patronage policy according to its preferences.

Formally, our model is a dynamic game which consists of three stages. At the first stage, the authority names the "price" at which privileges can be got. At the second stage, firms make their decisions on whether to get privileges (and on what terms). At the third stage, firms choose their production strategies and play the Cournot oligopoly game.

In accordance with the standard pattern of solving dynamic games, we will

look for the subgame-perfect Nash equilibrium proceeding backward, from the last stage to the first one.

Let us start with the last stage of the game, quantity competition. There are n identical firms with linear cost $C(y) = cy$. This cost include not only production costs but also investment costs[1] and taxes[2]. They compete in quantity as in the standard Cournot framework. We assume for simplicity that the demand for output is linear too and choose the units of output and prices so that $p(Y) = 1 - Y$ where Y is the total output of the industry and $p(Y)$ is the inverse demand function. In such a setting, all profits are only the result of the market power that firms have.

In the presence of privileges, the marginal cost actually incurred by the i-th firm may differ from c. Let this actual cost be $\tilde{c}_i$. Then the firm‘s profit maximization problem takes the form

$$\Pi_i = (p - \tilde{c}_i)y \to \max_{y \geq 0}. \tag{1}$$

For positive outputs, the solution to this maximization problem is given by

$$y_i = p - \tilde{c}_i. \tag{2}$$

[1]In this section, we do not make difference between production and investment costs. In section 3, this difference will be crucial.

[2]Such setting is valid only if we assume that taxes are levied per unit of quantity produced rather than per unit of sales. The same will be assumed about privileges. These assumptions will somewhat simplify our analysis. Note that the two settings are almost equivalent and lead to the same results.

This linear equation determine the reaction function of firm i. To find the Nash equilibrium, one should combine equations (2) for all i and solve this linear system.

Suppose that each firm has two opportunities: enter the privileged sector and produce at actual cost $\tilde{c}$ or stay outside and produce at actual cost $c' \geq \tilde{c}$[3]. Suppose that l firms are privileged and $n - l$ are non-privileged. Denote the outputs of privileged and non-privileged firms as y and y', respectively. Then, provided that the output of each firm is positive in equilibrium, the equilibrium price can be given by

$$p = \frac{1 + nc' - ls}{n + 1} \tag{3}$$

where $s \stackrel{\text{def}}{=} c' - \tilde{c}$. According to (2), the equilibrium output of privileged and non-privileged firm in this case is given by

$$y = \frac{1 - c' + (n - l + 1)s}{n + 1}; \tag{4}$$

$$y' = \frac{1 - c' - ls}{n + 1} = y - s. \tag{5}$$

The equilibrium profit of firm i is given by

$$\Pi_i = y_i^2. \tag{6}$$

Let us remind that these formulas are valid only if $y' > 0$, i. e., if

$$ls \leq 1 - c'. \tag{7}$$

[3]As we shall see, c' will not necessary coincide with c in the presence of non-market externalities.

If (7) does not hold, non-privileged firms produce nothing. In this case, for $\tilde{c} < 1$, the output of privileged firms is given by

$$y = \frac{1 - \tilde{c}}{l + 1}. \tag{8}$$

If $\tilde{c} \geq 1$, no firm produce anything. This case is not interesting.

Now let us turn to the second stage of the game. At this stage, producers form their attitude to privileges and decide whether to enter the privileged sector.

We assume that every firm entering the privileged sector has the marginal cost of production lowered by s comparing to its non-privileged rivals. Another assumption is that each entrant incurs fixed entry cost h. Some of this may be a sunk cost (since privileges increase the profits of firms, they are likely to struggle for privileges and any struggle is costly); the rest is payments to the government budget. Let us assume for simplicity that there are no sunk costs and all of h is paid to the government[4].

Regardless of sunk costs, a firm is willing to have privileges if its patronage expenditures do not exceed the gains of privileges, i. e., the extra profit earned due to the privileges:

$$\Delta(l) \stackrel{\text{def}}{=} \Pi - \Pi' \geq h \tag{9}$$

where Π' is the hypothetical profit earned by the potential entrant in the case

[4]If there were sunk costs, the level of patronage activity would be lower; up to this minor change, all other results would be the same as in the no sunk cost case.

of not entering (it will be defined more formally later on). Condition (9) is enough to determine the demand for privileges.

Before we proceed with completing the description of the game and looking for the second-stage Nash equilibrium, note that a very broad range of situations can be described by (9), i. e., are equivalent to getting a cost reduction in exchange for a fixed payment. Let us give some examples:

1. **Subsidies.** Firms are running for government subsidies. To get a per-unit subsidy of s, the firm has to spend a fixed amount h for struggle or bribes.

2. **Licensing.** The government is able to provide firms with some exclusive inputs like licenses. A license requires a fixed payment to the government and allows producers to avoid fines and other penalties for not having licensed. A firm faces risk to be fined every time that it produces a unit of output, so the license reduces its marginal cost.

3. **Tax privileges.** This form of privileges is equivalent to subsidies (provided that taxes are levied on the per-unit base, see footnote 2 on page 9).

4. **Lobbying.** A firm makes efforts equivalent to paying h units in order to lobby a law or resolution (e. g., concerning import tariffs) which is beneficial for it. This example differs from the above ones because the lobbying firm exerts an externality, i. e., affects profits of other ones. This externality may cause a feedback through the market price, so the

equilibrium behavior in this case is likely to be different from what can be derived for the three above examples.

5. **Government projects.** The government is going to carry out a project equivalent to producing s units of output. If a firm agrees to do this project, it is paid f. The net profit of the firm then will be

$$\Pi^{\text{net}} = p(y - s) + f - cy = (p - c + s)y - s(p + y) + f. \qquad (10)$$

Due to the linear demand, the second term in the right-hand side of (10) does not depend on y; the third one is constant too, so the firm behaves as if its cost were reduced by s, i. e., equivalently to examples 1–3.

We can see that almost all of these examples are equivalent (or, at least, nearly equivalent) from the producer's point of view. Note, however, that from the authority's point of view, some of them may be substantially different. For instance, it matters for the authority, whether h means bribe or losses of struggle.

Now let us introduce into our model an external effect which is quite important for the subsequent analysis. This effect is based on the fact that any private contract between a politician and a firm is costly for the society. This social cost occurs because each case of exclusive treatment signals economic agents that this economy is regulated by something other than the law, and less stable. Thus, patronage increases the expected investment risks. This factor raises the cost of investment. Another explanation of the social cost is that reducing costs privately is more costly (just from the technological

point of view) than doing so publicly. Or, put it another way, privileges bring about the opportunity cost of underprovision of some public goods. Finally, as it has been said, diversion of resources can bring about more costs.

Let us formalize these considerations in the following way: assume that each privilege s given to a firm increase the cost of investment in all of the economy by νs where $\nu \in (0,1)$ is an exogenous parameter. So each firm accepting state patronage exerts a non-market externality which affects other firms' costs and profits.

Now we are going to return to the analysis of the second-stage game. Under the externality we have introduced, the actual cost of a non-privileged firm positively depends on ls, the total of privileges given to other producers:

$$c' = c + \nu l s. \tag{11}$$

As follows from (4), the output of a privileged firm is then given by

$$y = \frac{1 - c + (n + 1 - (1 + \nu)l)s}{n + 1}. \tag{12}$$

To determine the demand for privileges (using (9)), let us find Π', the profit earned in the case of not entering. A rational manager should take into consideration that if his firm does not enter the privileged sector, the number of privileged firms will become less by one. Hence, Π' is given by

$$\Pi' = \left(y'|_{l-1}\right)^2 \tag{13}$$

where $y'|_{l-1}$ denotes the output of a non-privileged firm provided that the

number of privileged firms is $l-1$ rather than l. Due to (5) and (11), $y'|_{l-1}$ can be given by

$$y'|_{l-1} = y' + \frac{1+\nu}{n+1}s. \tag{14}$$

One can see that $y'|_{l-1}$ is higher than y'. It is so by two reasons. Firstly, when a firm enters the privileged sector, its marginal cost gets lower, so, according to (3), the equilibrium price in the market gets lower too and, as a consequence, the others are worse off. This external effect is known in the literature as "market stealing": when a new firm enters some market with favorable conditions, this market becomes less attractive for the others. Besides, the entrant exerts a non-market externality raising the social cost of patronage. This externality is added to the market stealing effect. So, there is a negative feedback which partly compensates the gains of entry.

Because of the same externalities, each firm's output negatively depends on l, is it privileged or not. Moreover, one can check that $\Delta(l)$ defined by (9) is also decreasing in l. This property is very important because it guarantees the existence of an endogenously determined equilibrium scope of the privileged sector.

Proposition 1 *Under fixed cost of entry, there is an equilibrium number of privileged firms with the following properties:*

1. *The equilibrium is stable and unique.*

2. *The equilibrium scope of the privileged sector positively depends on s and negatively, on h.*

Proof As we have noted, $\Delta(l)$ is decreasing in l. So, if l is low, privileges are attractive; according to (9), more firms are willing to enter the privileged sector and l rises. If l is high, the attractiveness of privileges is low, some firms prefer not to enter and l falls. Therefore, there must be an equilibrium number of firms in the privileged sector, l^*, which satisfies the following equilibrium conditions:

$$\begin{aligned} &\Delta(l^*) \geq h; \\ &\Delta(l^* + 1) < h \end{aligned} \tag{15}$$

where the second inequality means that no other firms are willing to enter if the number of privileged firms is l^*.

Due to the above considerations, the equilibrium given by (15) is stable and unique. To prove the last statement, suppose that s increases or h decreases. Then $\Delta(l) - h$ will rise for any l. Since $\Delta(l)$ is decreasing in l, (15) will hold for higher l^*. □

This result is valid not only for our setting but also for any oligopoly with market stealing.

Now let us study the first stage of the game. At this stage, the authority forms its policy of distributing privileges. In the homogeneous setting, this policy can be given by two parameters, s and h. So, we allow for only two

levels of privileges, s and zero. In the model with homogeneous firms, such an approach seems to be appropriate. It the subsequent section where the asymmetry is imposed, more general approach with a menu of contracts will be suggested.

The authority tries to choose $s \geq 0$ and $h \geq 0$ in the "best" way (in some sense), i. e., based on some preferences. We are going to consider two types of authorities which will be called "mercenary" and "benevolent". A mercenary authority concerns about government revenues only while a benevolent authority concerns about the social welfare. Besides these two polar cases, governments with some interim preferences will be considered.

Formally, the authority maximizes its objective function (cf [7])

$$V = G + \mu(\sum_i \Pi_i^{\text{net}} + CS) \tag{16}$$

where G is the total government revenues, Π_i^{net} is the profit of firm i net of expenditures for patronage, CS is the total consumer surplus and $\mu \in [0, 1]$ is the "rate of benevolence". The mercenary authority is represented by $\mu = 0$ and the benevolent one, by $\mu = 1$. The objective function is maximized provided that l is the equilibrium number of privileged firms ($l = l^*$), i. e., subject to (15).

Using what we know about our model, we can rewrite (16) as

$$V = l(h - sy) + \mu(l(y^2 - h) + (n - l)y'^2 + \frac{1}{2}(ly + (n - l)y')^2). \tag{17}$$

Here $G = l(h - sy)$, i. e., the government expenditures on patronage are

calculated as if privileges had the form of per-unit subsidies. This form of expenditures seems to be general (e. g., the expenditures for government projects (example 5) can be rewritten in the same way).

Suppose that at the optimal solution, there are l privileged firms. As follows from (15), if $\mu < 1$ then $h = \Delta(l)$[5]. Thus, to find the optimum, one should substitute h for $\Delta(l)$ in (17). For computational simplicity, we will look for an approximate equilibrium rather than for the true one. Namely, calculating $\Delta(l)$, we suppose that firm B values its contract in a somewhat myopic way not taking into account the impact its decision has on the rest of the economy. Technically, this means that we use $y' = y - s$ instead of $y'|_{l-1}$ in (13) thus neglecting the second term $\frac{1+\nu}{n+1}s$ in (14) (for large n, this term is actually small comparing to s). Under this assumption, the solution to the problem of maximizing V looks relatively simple which can be seen from the following proposition:

Proposition 2 *In (approximate) equilibrium, patronage contract (s, h) has the following properties:*

1. *The benevolent government implements no patronage as far as the rate of social cost ν exceeds some (low) threshold level ν_0 (actually, $\nu_0 = \frac{1}{n(n+2)}$);*
2. *The mercenary government always implements some patronage (to be*

[5]One can see that if $\mu = 1$, i. e., if the government is benevolent, it does not care about h, so h is only a way to commit just l firms to enter the privileged sector.

more specific, at the rate $s = \frac{1-c}{2l(1+\nu)}$*);*

3. *The scope of patronage negatively depends on* μ*, the rate of benevolence, as far as* $\nu > \underline{\nu}$ *where* $\underline{\nu}$ *is a threshold level,* $\underline{\nu} < \nu_0$*;*

4. *Actually, if some patronage is implemented, there are a number of equilibria with* $sl = const$ *and arbitrary* l*.*

Proof According to our approximation, $h = \Delta(l) = s(2y - s)$, so (17) can be approximately rewritten as

$$V = lsy' + \mu(ny'^2 + \frac{1}{2}(ny' + ls)^2) \tag{18}$$

where y' is given by

$$y' = \frac{1 - c - (1+\nu)ls}{n+1}. \tag{19}$$

One can see that the right-hand sides of both (18) and (19) are functions of $S = ls$ and are fixed if S is fixed. This proves the last statement. The results concerning $\mu = 0$ and $\mu = 1$ can be immediately obtained from (18) — (19) if one writes down the first-order conditions of maximization. Statement 3 follows from 1 and 2: taken together, they state that a finite difference of $s(\mu)$ is negative at least for $\nu \geq \nu_0$[6], so to prove the statement, just note that $s(\mu)$ is a fraction with linear numerator and denominator, i. e., a monotone function. □

[6]Actually, $\underline{\nu}$ is given by $\underline{\nu}(\underline{\nu} + 2)n(n+2) = 1$.

According to proposition 2, the equilibrium in a homogeneous setting is not always symmetric: there exist equilibria with asymmetric distribution of privileges. However, the robustness of the multiplicity of equilibria proved in proposition 2 is questionable. It can be shown that if the relative weights of benefits and costs of patronage in the expression for G are slightly altered, the equilibrium becomes unique. Specifically, if h gets slightly lower relative to sy, (by the way, this is the case if the firm takes into account the feedbacks that are neglected in the approximate setting), only the symmetric equilibrium remains. If, on the contrary, h gets higher relative to sy (this may be the case if a bureaucrat makes decisions personally while the subsequent expenditures are covered from a source not controlled by him), there are incentives to reduce the number of privileged firms in equilibrium and under low μ (i., e., under the mercenary authority), only one firm gets privileges, so limited liability for government expenditures along with self-interest is a source of monopolizing. From now on, we will look for symmetric outcomes every time that we face identical firms, so possible asymmetric equilibria will not be taken into account.

Proposition 2 suggests that patronage is not socially optimal if the social cost externality is not too subtle (if it is, the standard microeconomic result works: structures with market power should be subsidized). But what about production and investment? The following proposition outlines a possible tradeoff between growth and welfare:

Proposition 3 *Consider the symmetric equilibrium as a function of μ, the*

rate of benevolence. Then the equilibrium level of output negatively depends on μ if $\nu \in (1/n, \underline{\nu})$ and positively, otherwise. Thus, if $\nu \in (1/n, \underline{\nu})$, there is a tradeoff between growth and welfare: more benevolent government enhances social welfare but brakes growth.

Proof If $\nu > 1/n$, firms are facing a game with the negative sign: if the same privilege is given to every firm, the resulting cost is higher than in the absence of privileges. By proposition 2, more benevolent government gives less privileges at such high ν, so it will enhance growth. Otherwise, it will enhance growth only for $\nu < \underline{\nu}$ when the gains of subsidizing the oligopoly overweigh the social cost of patronage. $\square$

Why this tradeoff? One of possible explanations is that if the government runs for revenues rather than for welfare, it tries to draw as much rent from firms as possible. But firms will want to give their rent only if they have enough privileges in exchange. These privileges enhance production if the related social cost is not too high.

3 Patronage and Investment

In this section, we incorporate investment in our oligopolistic model of patronage and study how the latter affects the incentives of firms to invest.

It is recognized that lack of investment resources is one of the main causes of economic decline in some Russian regions. The investment activity is to a considerable extent determined by the investment conditions in the region: production possibilities, institutions, investment risks and so on. The character of relations between local governments and businesses often affects these determinants of growth. For example, predatory behavior of regional authorities may increase investment risks in the region and scare away potential investors.

Patronage may also affect in many ways the propensity to invest. Indeed, as we have seen, on the one hand, privileges given to firms encourage them to produce more while, on the other hand, the private sector incurs opportunity costs in this case because the resources spent on privileges could be more efficiently invested in infrastructure and other public goods which constitute the investment climate. However, and this is not captured by the model considered above, the demand for these public goods may vary from firm to firm: some producers have just started their business and need quite favorable conditions to survive and grow while others are endowed with large capacities and are relatively stable in any circumstances. Good investment climate may be even adverse for such companies because it promotes their rivals. So, they may use their influence on the authorities patronizing them to restrain the

infrastructural and institutional development.

To look closer at these effects, let us extend our model in the following way. Suppose that producers invest in their capacity prior to the usual Cournot interaction (cf [5]). So, the game between the firms is going in four stages. In the first stage, the authority forms the menu of contracts specifying the (non-linear) price of privileges. At the second stage, firms choose contracts. At the third stage, firms make investments in their capacities. And, finally, at the fourth stage, they play the Cournot oligopoly game choosing their production strategy subject to the capacity constraint: if firm i has capacity level k_i, it cannot produce more than k_i. We denote by b_i, the i-th firm's marginal cost of production, by r, the marginal cost of investment (see below) and by $c_i \stackrel{\text{def}}{=} b_i + r$, the total cost.

Our analysis gets non-trivial due to the following important assumption: we suppose that each firm i is initially endowed with capacity a_i, so it has to invest only if the desirable capacity level k_i exceeds a_i. Otherwise, the firm does not invest at all. The initial capacity level a_i is an individual parameter of firm i (as well as its marginal cost b_i) and can be interpreted as scale or fixed capital or irreversible investment made by the firm in the past[7].

To find the subgame perfect Nash equilibrium of this dynamic game, let

[7]One could consider the special case where all $a_i = 0$, i. e., firms differ only in their efficiency. Then one could get to a somewhat "trivial" result: if firms differ in their efficiency and this difference is substantial, it is worthwhile for any government to use some patronage for discrimination (mercenary government is likely to implement excess patronage in this case). One is not sure that this result needs any proof.

us start with analyzing the last stage, i. e. the quantity competition.

Given its capacity k_i, firm i solves in equilibrium (under no privileges) the profit maximization problem

$$(p - b_i)y_i \to \max_{y_i} \tag{20}$$

subject to the capacity constraint

$$0 \leq y_i \leq k_i. \tag{21}$$

Due to the linear form of the demand function, the solution to (20) — (21) is given by

$$y_i = \min(p - b_i, k_i). \tag{22}$$

Note that investment is made at non-zero costs, so it is not rational to make one's capacity level higher than the subsequent level of production. Hence, constraint (21) is binding unless the initial level of capacity is too high. According to (22), we have either $y_i = k_i$ or $y_i = p - b_i < k_i = a_i$. In the latter case, the firm uses not all of its capacity in production.

Let us turn to the third stage when the producers choose their level of investment. We suppose the linear cost of investment: if firm i chooses capacity level $k_i \geq a_i$, it incurs cost $r(k_i - a_i)$. Here r is the price of investment resource which is a function of "infrastructure" or "investment climate" and can vary depending on the government policy or the behavior of economic

agents. This component of producers' cost is supposed to be the same for all firms.

According to what we know about the capacity constraint, under no patronage, the firm's profit (net of the investment costs) is given by

$$\Pi_i = \begin{cases} (p - c_i)y_i + ra_i, & \text{if } y_i \geq a_i; \\ (p - b_i)y_i, & \text{otherwise} \end{cases} \tag{23}$$

where $c_i = b_i + r$. In equilibrium, firm i chooses its optimal investment strategy maximizing Π_i in y_i.

Let us denote $d_i \stackrel{\text{def}}{=} a_i + c_i$. It is easy to check that generally, the participants of the game form three groups with respect to their investment and production behavior in equilibrium. Namely, firms with low d_i (small and/or efficient) choose to invest, i. e. at the last stage, their level of production is above their initial capacity. They produce at their total marginal cost c_i, so the usual first-order condition holds for them:

$$y_i = p - c_i > a_i. \tag{24}$$

Firms with some medium d_i choose not to invest but use all of their capacity in production, i. e. produce just a_i. Firms with high d_i (large and/or inefficient) not only do not invest but also produce below their capacity level, so that

$$y_i = p - b_i < a_i. \tag{25}$$

The number of firms in each group is determined endogenously by equilibrium

conditions (24) — (25) where the equilibrium price is determined in the usual way (see formula (30) below).

Note that this two-stage setting (including investment and production) is equivalent to a one-stage setting with production only and with piecewise linear cost functions $C_i(y)$ like in fig. 1:

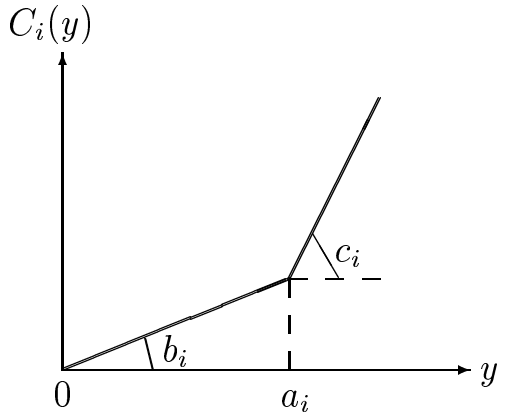

Fig. 1. Cost function of a firm with initial capacity a_i.

If we introduce privileges in this general model, the latter will become too complicated. However, if privileges are small, some result concerning the demand for privileges can be drawn:

Proposition 4 *Suppose, firms consider the possibility of reducing their marginal cost by some small amount. Then larger and more efficient firms will get higher rent from this privilege. As a consequence, if the cost of the privilege is fixed and the same for all firms, the privilege will be demanded by larger and more efficient ones.*

Proof If firm i does invest, its profit is given by

$$\Pi_i = y_i^2 + ra_i. \tag{26}$$

Hence,

$$\frac{\partial \Pi_i}{\partial s} = qy_i + \nu a_i \tag{27}$$

where q is some positive constant. The right-hand side of (27) is increasing in both a_i and b_i.

The same argument proves the proposition if firm i produces below its capacity. Only one variation occurs here: since the firm does not invest, the analog of (27) does not include the term proportional to a_i, so strictly positive dependence will be in efficiency only.

Finally, if firm i produces exactly at its initial capacity, its profit is just proportional to a_i, so, opposite to the previous case, there is a positive dependence in scale and no dependence in efficiency. $\square$

To simplify our further analysis and focus on the issues described in the beginning of this section, let us consider a special case of this model with only two types of firms, A and B. Firms of type A are called "old" and have a positive initial capacity (capital) $a_i = a$. Firms of type B are called "new" and have no initial capital, i. e. $a_i = 0$ for them. There are m old and n new firms. The marginal costs of production are b_A and b_B, respectively. Let us denote $c \stackrel{\text{def}}{=} c_B = b_B + r$. Firm B thus behaves as a firm with linear cost c.

Another assumption we make is that new firms always invest while old ones do not invest and produce at level a. This means that, firstly, new firms

produce a positive output and, secondly, old ones have "medium" d_i, so that

$$p - b_A - r \leq a \leq p - b_A. \tag{28}$$

From now on, suppose that (28) holds. Moreover, we assume that the corresponding analog of (28) holds under the equilibrium scheme of patronage that will be derived later on.

Now let us turn to the second stage of the game, namely, choosing contracts. Suppose that a firm is facing two contracts (s_A, h_A) and (s_B, h_B) and must decide which of them to choose (if any)[8]. As before, one should take into account the external effect exerted by each firm accepting a patronage contract: it increases the cost incurred by the others. In the current version of the model, we suppose that only the investment costs are affected in such a way: if a contract of s is accepted, r increases by νs. Formally,

$$r = r_0 + \nu \sum_i s_i. \tag{29}$$

Thus, only new firms can feel the externality. Old firms are not interested in investment, so they even gain from increasing investment costs. This is an additional incentive for firm A to accept state patronage. Indeed, if firm A chooses contract (s_A, h_A), its profit (before paying h_A) is given by

$$\Pi_A = (p - b_A + s_A)a$$

[8]The possibility of choosing between contracts implies that firms are anonymous for the authority, i. e. the firm cannot be identified as A or B. At the same time, the distribution of firms by types which determines reaction functions is supposed to be a common knowledge, so there is no need in introducing Bayesian strategies.

where, by our assumptions,

$$p = \frac{1 - ma + n(c - s_B + \nu(ms_A + ns_B))}{n+1}. \tag{30}$$

If it chose some other s, say, smaller than s_A, the price would go down by $\nu\frac{n}{n+1}(s_A - s)$. This term would be added to the direct effect on profit $(s_A - s)a$. Specifically, if firm A chose $s = 0$ ($s = s_B$), the change in profit would be

$$\Delta_A = \left(1 + \nu\frac{n}{n+1}\right) s_A a \tag{31}$$

or

$$\Delta_{AB} = \left(1 + \nu\frac{n}{n+1}\right) (s_A - s_B)a, \tag{32}$$

respectively.

The corresponding functions for firm B are

$$\Delta_B = y^2 - y'^2; \tag{33}$$

$$\Delta_{BA} = y^2 - y''^2 \tag{34}$$

where y is the output of firm B:

$$y = p - c + s_B - \nu(ms_A + ns_B) \tag{35}$$

and y' (y'') is the output of firm B if it chose no privileges (contract for firm A).

As before, let us look for an approximation to the equilibrium supposing that firm B values its contract in a myopic way not taking into account the impact its decision has on the rest of the economy. Then $y' = y - s_B$, $y'' = y - s_B + s_A$, so (33) and (34) can be approximately rewritten as

$$\Delta_B = s_B(2y - s_B); \tag{36}$$

$$\Delta_{BA} = (s_B - s_A)(2y - s_B + s_A). \tag{37}$$

The participation and incentive compatibility constraints guaranteeing that each firm will choose the proper contract take the form

$$\begin{array}{ll} (PC_A) & h_A \leq \Delta_A; \\ (PC_B) & h_B \leq \Delta_B; \\ (ICC_A) & h_A - h_B \leq \Delta_{AB}; \\ (ICC_B) & h_B - h_A \leq \Delta_{BA}. \end{array} \tag{38}$$

The following proposition claims that if old firms are sufficiently large, they act as "high-demand consumers" in the contract choosing game.

Proposition 5 *Suppose that tariffs h_A and h_B are set as high as possible (only so as not to violate (38)). Then there exists $\bar{a}$ such that for all $a \geq \bar{a}$, participation constraint (PC_B) for firm B and incentive compatibility constraint (ICC_A) for firm A are binding, i. e., hold as equalities.*

Proof As follows from (38), the necessary condition of the existence of a non-linear contract with s_A and s_B is given by

$$\Delta_{AB} + \Delta_{BA} \geq 0. \tag{39}$$

If (39) holds, one of the following three cases takes place (provided that tariffs h_A and h_B are set as high as possible):

$$h_A = \Delta_A, \quad h_B = \Delta_A + \Delta_{BA} \qquad \text{if } \Delta_B - \Delta_A \geq \Delta_{BA}; \tag{40}$$

$$h_A = \Delta_A, \quad h_B = \Delta_B \qquad \text{if } -\Delta_{AB} < \Delta_B - \Delta_A < \Delta_{BA}; \tag{41}$$

$$h_A = \Delta_B + \Delta_{AB}, \quad h_B = \Delta_B \qquad \text{if } \Delta_A - \Delta_B \geq \Delta_{AB}. \tag{42}$$

As follows from (39), (32) and (37), the set F of all feasible pairs (s_A, s_B) (satisfying (38) for some h_A, h_B) is given by

$$\begin{cases} (s_A - s_B)\left(\left(1 + \nu\frac{n}{n+1}\right)a - 2y + s_B - s_A\right) \geq 0; \\ s_A \geq 0, \qquad s_B \geq 0. \end{cases} \tag{43}$$

To prove the proposition, we should check that (42) holds for all $(s_A, s_B) \in F$. Due to (31), (33) and (36), this condition takes the form

$$s_B\left(\left(1 + \nu\frac{n}{n+1}\right)a - 2y + s_B\right) \geq 0. \tag{44}$$

If $s_A \geq s_B$, (44) immediately follows from (43). Otherwise, a simple analysis yields that (44) holds for all $(s_A, s_B) \in F$ if $(0, s_B) \notin F$ for $s_B > 0$. The latter condition is satisfied if $a \geq \bar{a}$ where

$$\bar{a} \stackrel{\text{def}}{=} \frac{2(1-c)}{2m + n(1+\nu) + 1}. \tag{45}$$

Hence, among constraints (38), (PC_B) and (ICC_A) are binding and the others are loose. $\square$

The following figure depicts F for $a \geq \bar{a}$.

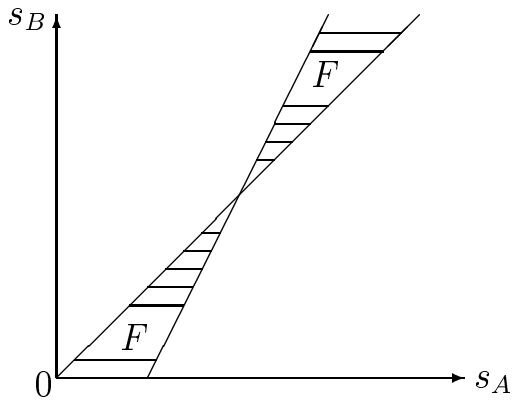

Fig. 2. The set of feasible contracts for $a \geq \bar{a}$.

For low a, it turns out that all of (40) — (42) are possible, so the problem of setting up an optimal contract is more complicated in this case. The following picture shows which condition holds for each of $(s_A, s_B) \in F$.

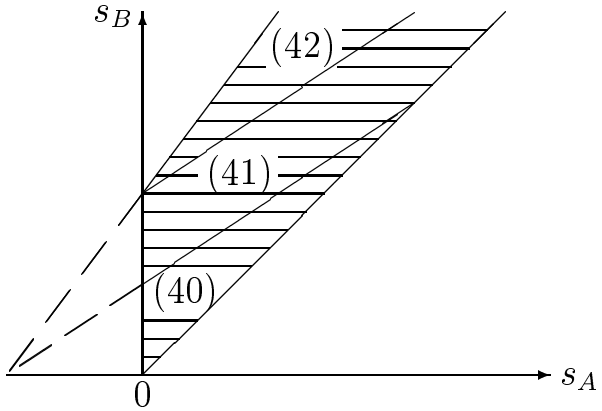

Fig. 3. The set of feasible contracts for $a < \bar{a}$.

Now we are going to turn to the first stage of the game. At this stage, the authority chooses contracts (s_A, h_A) and (s_B, h_B) so as to maximize its objective function

$$V = m(h_A - s_A a) + n(h_B - s_B y) + \mu(m(\Pi_A - h_A) + n(\Pi_B - h_B) + CS) \quad (46)$$

subject to (38).

Let us start our investigation of problem (46) with the case of the absolutely mercenary government for which $\mu = 0$. As can be seen from the following proposition, the level of the patronage activity is high in this extreme case.

Proposition 6 *Suppose that $a \geq \bar{a}$. Then the mercenary government sets s_B higher than it would do if old firms were not patronized. Firm A gets the maximal privilege s_A feasible at this optimal s_B.*

Proof Substituting (42) into (46) (this can be done due to proposition 5) and putting μ to be zero, we obtain after some manipulations:

$$V = (m+n)s_B(y - s_B) + m\left(s_B y + \nu \frac{n}{n+1} s_A a\right). \tag{47}$$

One can see that this expression is linear in s_A with a positive coefficient, so the authority will tend to set s_A as high as possible, given s_B fixed. This proves the second statement. The first one immediately follows from here because raising s_B, the authority gets new opportunities to raise s_A which implies that s_B will be set higher than if s_A were unchanged, specifically, if old firms were not patronized. $\square$

The proved result shows that s_A and s_B behave as "complements" for the mercenary authority in the sense that an increase in incentives to patronize firm A implies the corresponding increase in s_B and vice versa. This effect occurs because of the mutual incentive compatibility: one can see that, unlike

the usual second-degree price discrimination, both incentive compatibility constraints (ICC_A) and (ICC_B) are binding in equilibrium. Note also that s_A is set high because the externality exerted by old firms implies that the increase in profit of a privileged old firm exceeds the cost of privileges. In some extreme cases, new firms can be completely crowded out from the market. The authority acts as an ally of old firms in the entry deterrence game in this case.

Now let us release our assumption about absolutely mercenary government and compare equilibrium regimes for governments with different levels of care for social welfare.

Proposition 7 *Under the assumptions of proposition 6, the equilibrium depends on μ in the following way:*

1. *Both s_A and s_B fall as the rate of benevolence μ falls;*

2. *There exists some threshold level $\bar{\mu}$ such that for $\mu < \bar{\mu}$, old firms get minimal privileges (for high a, the privilege rate s_A will be equal to s_B) while for $\mu < \bar{\mu}$, they get maximal privileges.*

3. *If $\bar{\mu}$ actually exists (i. e., $0 < \bar{\mu} < 1$) and a is sufficiently high, the aggregate investment is maximized at some $\mu \in (0, 1)$.*

Proof The detailed proof is too technical to be reproduced here. The first statement is an analog of the results proved for the symmetric versions of the model. As for the second statement, it can be checked that V is convex in s_A

for $\mu > 0$, so the optimum in s_A can be reached only at the minimal or maximal feasible s_A. The second statement now follows from the first one. The third statement would also be an analog of the corresponding result proved above if there were no jump in s_A at $\mu = \bar{\mu}$. Because of this discontinuity, the level of investment jumps upward as μ proceeds through $\bar{\mu}$. If a is sufficiently high, the optimal μ (with respect to investment) is slightly lower than $\bar{\mu}$, so that there is no incentive to give firm A too much privileges. $\square$

The main conclusion that could be drawn from proposition 7 is that if the old sector is sufficiently strong, the absolutely mercenary government is suboptimal not only from the welfare point of view (which is obvious) but also with respect to investment and growth, even if it were optimal in the absence of the old sector.

The following picture illustrates proposition 7. As μ increases, the equilibrium patronage regime (s_A, s_B) proceeds along the arrow.

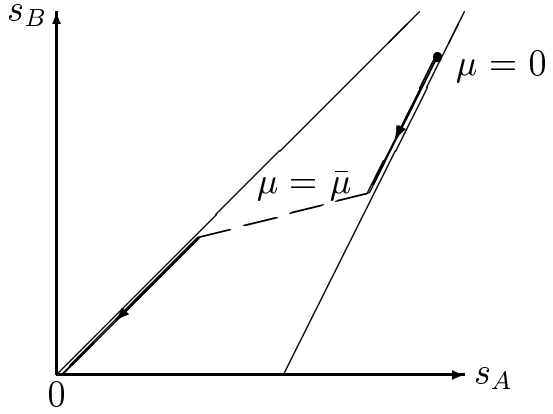

Fig. 4. Equilibrium patronage regimes under various μ.

If we release our assumption about high a, the analysis gets much more

complicated. A number of numerically analyzed examples suggest that our results are robust to this change: as before, the mechanism of discrimination works "in the opposite directions" depending on μ. Under mercenary government, firm A is privileged and firm B is discriminated while under benevolent government, the opposite (to some extent) scheme is realized.

4 Conclusion

In the present paper, we treat patronage as privileges given according to some optimal contract. Our analysis has yielded the following results:

- The benevolent government implements no patronage as far as the social cost of patronage is not too low while the mercenary government always implements some patronage. It is likely to give more privileges than is socially optimal.
- There can be a tradeoff between growth and welfare: more benevolent government enhances social welfare but brakes growth.
- Patronage is accepted by larger and more efficient firms and rejected by smaller and less efficient ones.
- The mercenary government is likely to give more privileges to large "old" firms. Such policy is suboptimal not only from the welfare point of view but also with respect to investment and growth.

A few words about the policy implications. Is it possible to avoid inefficient use of privileges or at least reduce the negative effects? Of course, the easiest way would be to cancel privileges at all and severely punish all who give (and receive) them. But will such a policy stimulate growth? Totally equal conditions for everyone may not be optimal too. Clearly, it is better to eradicate the origins of inefficiency. The following measures may be recommended to do it: lower taxes or impose tax ceiling (which, apart from the

rest, will impel firms to give up seeking privileges), provide favorable conditions for restructuring large unprofitable firms (but not new privileges under this mask), more strict control over financial flows going through the state institutions. It should be noted that the federal system can reduce negative effects of patronage. Indeed, if investment resources are sufficiently mobile and their supply is not perfectly elastic then interregional competition for these resources may discipline regional leaders. In particular, legal restrictions on export of capital will result in the stronger competition for inside investors which can bring regional governments to revise their privilege policy. Although, this effect is not likely to work if privilege consumers are huge factories (firms of type A) not interested in investment.

To conclude, privileges may be a way to attract more investment resources but may also result from a collusion between self-interested political and business elite. An important function of a regulator is to distinguish the former and the latter.

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