Private Incentives versus Class Interests: Implications for Growth

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Abstract

We consider an economy, in which the elite controls the means of production. The private incentives of each elite member contradict the interests of the elite as a whole. While each member of the elite would benefit from engaging into new productive activities, the byproduct of such activities is an increase in competition and hence decrease in elite's profits. We provide a model which allows us to parameterize the degree of consolidation of the elite q. We find that in a steady-state, the rate at which new technologies are implemented is constant and is decreasing in q. We next allow the elite to invest into a productivity enhancing public good. We show that the investments in public good increase in q. We conclude that there exists an optimal level of consolidation of the elite which maximizes economic growth. We illustrate our model using examples from the period of the Industrial Revolution in England and Russia.

KEYWORDS: elite, class interests, institutions, optimal institutions, sources of economic growth.

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1 Introduction

The rules and regulations governing the behavior and interaction of economic and political agents matter. As recently confirmed by the empirical studies of Hall and Jones (1999) and Acemoglu, Robinson and Johnson (2001 and 2002), better rules and regulations, i.e. better institutions, lead to better long run economic outcomes. Acemoglu, Robinson and Johnson (2001 and 2002) show that institutional quality in former colonies can be traced back to factors that affected colonization strategy of European powers, such as settler mortality and indigenous population density. They argue that the connection between current institutions and settler mortality (population density) exists because institutional arrangements can be very persistent. This argument is further supported by Sokoloff and Engermann (2000) who show that colonizers tended to introduce more efficient institutions in colonies which were technologically more developed and had better access to markets. These former colonies also tend to have better institutions and a higher rate of economic growth nowadays.

Further evidence shows that institutions have an impact not only on the rate, but also on the source of economic growth. The most stark examples are probably Russian Empire and Soviet Union, which had tremendous rates of factor accumulation, but low rates of productivity growth, as opposed to the free market economies whose growth has been mainly driven by constant improvements in productivity. Baumol (1990) provides a historical analysis of the influence of institutions on the level of entrepreneurship. Young (1995) demonstrates that the economic growth in Eastern Asia is mostly due to capital accumulation and investments in human capital, as opposed to total factor productivity. Persson and Tabellini (2003) study the implications of political institutions (presidential versus parliamentary regimes, majoritarian versus proportional voting systems, accountability of politicians) on structural policy, public spending and rent extraction. Their data analysis shows that proportional voting systems lead to larger size of the government and higher government spending. Similarly, parliamentarian regimes have larger government spending, but also better structural policies and higher economic performance.

In this paper, we take the stand that institutions might be inefficient and very persistent and analyze their impact on both political and economic outcomes. We consider a two-class society, in which political and economic power is concentrated in the hands of the elite. The elite decides whether to grant access to new entrepreneurs to political and economic power and simultaneously determines the amount of productivity enhancing investments. The institutional design determines the rules according to which decisions are made and, implicitly, the political and economic outcomes. For a specific class of institutional designs, we are able to provide a comparative statics analysis which orders them with respect to their effect on economic growth. Moreover, we find that the effect on growth is in general non-monotonic. While certain institutional designs promote growth through free entrepreneurship, others enhance growth through human capital accumulation. The efficient institutional design optimally trades-off the gains from these two activities to maximize the total rate of growth for the economy.

The point of departure for our model is the fact that the process of introduction of new technologies is driven not only by economic, but also by political and social considerations. In most societies, economic opportunities are a function of political power. Hence, the access of new entrepreneurs to production opportunities is usually controlled by elites. This might include the necessity of specific qualification, licenses and permissions in order to start a certain business, access to credit, and / or the social and political connections necessary to establish a new enterprise. In any of these cases, the elite (implicitly or explicitly, through legal rules or informal communication) can decide on whether to grant access of new members to its resources and allow them to actively participate in the political and economic process. The Industrial Revolution provides multiple examples. In England of the 18th century, the large industrials started as small producers who needed to establish connections with the merchants operating on the markets for final goods, in order to gain independence and start a trade on their own, see Bowden (1925). In Prussia, the emergence of the coalition of "Iron and Rye" between the land aristocracy and the industrial class was necessary as a "compromise between modern industry and the feudal aristocratic groups in the country", see Gerschenkron (1943, p. 49).

In making these decisions, the members of the elite face the following considerations: the admission of new members might be the only way to introduce better technologies[1] and hence, to induce economic growth; at the same time, the admission of new members might only be possible at the cost of giving up part of the political and economic power of the present elite members.

It is a well documented fact that often elites not only have not actively participated in the process of implementation of new technologies, but have also vehemently opposed it, see historic references in Acemoglu and Robinson (2000). The explanation for this fact might be that, while understanding the economic gains from new technologies, the elite fears the emergence of new social classes which, by gaining economic capital might undermine its political power. An example of this is the attempt to industrialize the Russian economy by Peter I in the 18th century. The new linen- and wool-factories required skilled labor, which was sparse in Russia of that time. Hence, the manufacturers had to train their workers, recruited mainly from the peasantry, before they could actively participate in the production. At the same time, highly-skilled and trained workers had incentives to depart the factory and start a business on their own, see Daniel (1995). High incidence of such departures and lobbying against it by current producers, led to an Imperial intervention. Catherine II introduced a legislature which gave the land aristocracy hereditary rights and full control over their peasants, effectively providing full protection of the producing class from entry.

It would be naive to think that each member of the elite had the interests of his social class in mind when deciding whether to invest in a new technology or not. Instead, we model the tension between the self-interested member of the elite who might find it profitable to invest in a new

[1] Sokoloff and Khan (1989) and Lamoreaux and Sokoloff (2005) present evidence from the US which shows that most of the inventions patented in the 19^{th} century came from independent inventors rather than from research and development activities inside the existing firms. They also demonstrate that most of the inventors not only sold patents to existing firms, but eventually established their own firms which used some of their own patents in the production.

method of production, as long as the economic gains are sufficiently high, and the interest of the elite as a whole which might dictate opposition to the process of modernization. We capture this trade-off by a variable which describes the degree of consolidation of the elite. Intuitively, the more consolidated the group of incumbents is, the easier it is going to be for it to deter potential entrants and preserve the political power of the elite.

To capture the degree of consolidation we suggest to use the following mechanism which was proposed by Baron and Ferejohn (1989) and recently used by Battaglini and Coate (2006). The members of the elite are represented by a finite number of legislators. In each period, one of the legislators is chosen at random to make a proposal on the number of granted production licenses, on the distribution of gains from innovation and on the provision and financing of a public project which increases the elite's return from production.[2] In order for a proposal to be implemented, a legislator must obtain a support from a share q of all legislators. It turns out that q can be used as a measure of the degree of consolidation of the elite. Intuitively, if $q = 1$, the proposing legislator will take into account the interests of the elite as a whole, whereas for small q's, the utility of the fraction of the elite represented by a single legislator is going to determine the outcome.

Our results are consistent with this intuition. We find that the number of newly implemented technologies depends negatively on q: whereas the elite as a whole perceives the process of innovation as threatening, a single member puts more weight on the short-run benefits than on the loss of political and economic power in the long-run. Hence, a highly consolidated elite will hinder economic growth by restricting the entrance of new entrepreneurs. In contrast, a high degree of consolidation benefits investments into public projects. Since the elite as a whole profits from higher productivity, a high value of q promotes the contribution to the public project.

The findings of our model indicate that the total effect of the degree of consolidation of the elite on economic growth is ambiguous. We conclude, therefore, that there exists an optimal value of q that maximizes economic growth, trading-off the benefits of more innovations against the benefits

[2] Examples of such investment include the railroad construction in Austria-Hungary and Russia in the 19th century.

of higher productivity.

We then compare our model to the historical evidence from the time of the Industrial Revolution. We conclude that the rapid industrialization in England might have been partly due to the fact that the degree of consolidation of the elite was relatively low. New entrepreneurs faced low entrance barriers and were integrated into the political process. In contrast, in Russia, the degree of consolidation of the elite was relatively high. This might have caused the relative lag between the industrial revolution in England and the industrialization in Russia.

The paper is structured as follows. Section 2 reviews the existing literature on institutions and growth. Section 3 presents the model. In section 4 we compute the steady state for the case in which the only decision-variable of the elite is the number of newly adopted technologies. In section 5, we introduce the possibility of investment into a public project and derive the steady state. We then illustrate the properties of the model by conducting comparative static with respect to the parameter q. Section 6 discusses the implications of our model for the rate and sources of economic growth. In section 7, we compare our findings to the historical evidence from the time of industrial revolution. Section 8 concludes. All proofs are stated in the appendix.

2 Related Literature

There is a large literature which examines the relationship between inequality and growth, such as Bertola (1993), Alesina and Rodrik (1994), Persson and Tabellini (1994). They show that more unequal societies generate more redistribution. If redistribution is costly or diminishes incentives to produce and accumulate capital, it has a negative impact on growth. In contrast, in cases in which redistribution is productive or helps to eliminate market imperfections, it might enhance growth, see Saint-Paul and Verdier (1993), Galor and Zeira (1993) and Perotti (1993). In our model, inequality is exogenously given, but can be reduced if the elite decides to admit new members. Diminishing inequality, is equivalent to increasing the access to production possibilities and hence, promotes growth. Since political decisions are reserved to the elite, we try to identify conditions under which the elite will endogenously decide to promote equality and growth.

Our model falls into category of models with endogenous political participation, such as Ades (1996) and Gradstein and Justmann (1995). Whereas Ades (1996) assumes that to enter the elite, it is necessary to incur some fix cost, Gradstein and Justman (1995) introduce an income franchise which is exogenously fixed. Acemoglu and Robinson (1996, 2000a, 2000b, 2001) assume that the suffrage is determined by the elite. They argue that the elite faces a trade-off between preserving its political power and obtaining superior economic outcomes. They derive conditions, under which inefficient political institutions which give rise to suboptimal market structures and, hence to low economic growth, can be very persistent. If, however, the economic benefits from a reform are sufficiently large or if the elite faces the threat of a revolution, the institutional change can be initiated by the elite itself. Bourgignon and Verdier (2000) assume that the right to vote depends positively on the level of education of an individual. Allowing for transfers between the rich (who can always afford education) and the poor (who face imperfections in credit markets and therefore cannot study, unless provided with sufficient funds), they find that the rich will face the trade-off between promoting growth by educating the society and creating political competition. They demonstrate that two steady states can obtain: one, in which the education level and the rate of growth are low and one with high level of education and high level of growth.

Similarly, our model also explores the trade-off between economic growth and increased political competition. However, differently from the models cited above, we do not think of the elite as being homogenous. The trade-off between the interests of an individual member of the elite and the elite as a whole is what drives our results. In this sense, our paper is closer in spirit to the work of Lizzeri and Persico (2004) and Jack and Lagunoff (2006). Lizzeri and Persico (2004) model a society with limited suffrage. Both papers use the idea that an increase of the suffrage effectively changes the preferences of the pivotal voters. In Lizzeri and Persico (2004), the policy is determined by a simple majority vote. Hence, if the change in preferences is such that the resulting allocation benefits a majority of the members of the elite, the elite will prefer to extend the suffrage. In Jack and Lagunoff (2006), the decision in each period is made by a dictator, who also denominates his successor. While staying in power forever is always a potential choice, a dictator might decide to delegate authority if he faces commitment problems. Jack and Lagunoff (2006) demonstrate that this mechanism can be equivalently represented by an endogenous enfranchisement rule and state conditions under which the resulting enfranchisement will be monotone in time, i.e. larger and larger parts of the population will be allowed to vote.

While these models make use of the heterogeneity in the population of (potential) voters, in our model all elite members have ex-ante equivalent preferences. Only ex-post, when they are exogenously divided into the group of pivotal and the group of non-pivotal voters, differences in preferences emerge. Hence, adding new voters does not change the preference structure of the elite in our model. Instead, the admission of new members to the elite creates short-run economic benefits for the pivotal voters, but increases the competition for resources (labor) and political power in the long-run for the elite as a whole. This trade-off, which is explicitly excluded by Assumption 1 and by the non-exclusiveness of the public good in Lizzeri and Persico (2004) is the key to our result.

Our model discusses the implications of different majority voting rules on economic and political outcomes. Persson, Roland and Tabellini (2000) examine the influence of different voting mechanisms (parliamentary versus presidential regimes) on public policy outcomes. They demonstrate that if more support is needed for a politician to implement a certain policy and if there is separation of powers, less public spending and a lower level of taxation will prevail. Our approach is similar to theirs in that we also examine the impact of the amount of support needed to implement a specific policy on economic outcomes. While their model only studies the impact on taxation and provision of a public good, we include voting on economic policy issues and show that economic growth is non-monotonic in the majority rule used.

In the model which we present here, the required majority to implement a proposal q is an exogenous variable. One possible motivation for this assumption would be that q is part of a constitution unanimously agreed upon by the elite. Barbera and Jackson (2000) provide a model of "self-stable" majority rules, defined by two parameters: majority required to make day-to-day decisions and majority required to change the constitutions. A self-stable rule is defined as a rule, which would be chosen under the voting procedure it itself prescribes. They show that under certain assumptions on the voters' preferences, the rule requiring simple majority in day-to-day decisions and unanimity to change the constitution is self-stable. This provides an example of how q might be determined endogenously and still differ from 1.

Aghion, Alesina and Trebbi (2004) discuss how q could be optimally determined under the veil of ignorance. Gersbach (2005) argues that the optimal value of q should depend on the particular decision. He computes optimal flexible majority rules. In the context of our model, this might mean that a first-best allocation would require separate voting for the amount of investment in the public project and the admission of new entrepreneurs. In the former, absolute majority would be required, in the latter a much lower value of q would be set. In this paper, we do not assume that the exogenously given q is optimal either from social perspective, nor from the point of view of the elite. One the one hand, we do not think that voting on a constitution under the veil of ignorance would be realistic in the type of societies which we model here. On the other hand, historical evidence which we discuss in the last section shows that q can differ across countries and elites.

3 A Model of Endogenous Elite Formation

We are looking at a society which consists of two classes — a worker class and an elite. The worker class consists of a continuum of individuals of measure L. In each period of time, the workers inellastically supply one unit of labor and consume. The elite consists of a continuum of individuals with measure E. We think of L as being large relative to E, i.e. E has measure 0 relative to L. The members of the elite are the only ones entitled to produce and to participate in the political process. We will often refer to the members of the elite as entrepreneurs.

The entrepreneurs produce the consumption good according to the technology:

$$y_i = x_i^{\frac{1}{\lambda}},$$

where x_i is the amount of labor employed by producer i.

$$y = \int_{i \in E} y_i$$

is the total supply of consumption good.

We can think of the different entrepreneurs as producing distinct varieties of the same product in distinct firms. Since the production of each variety has decreasing returns to scale, output will grow as more firms are operated. The introduction of a new variety requires the investment of a fixed amount of labor in the first period of production. We assume that this fixed cost is given by

$$\frac{\bar{\phi}}{E},$$

hence, it is inversely proportional to the number of already existing firms. This reflects the fact that in more technologically advanced societies, innovation is less costly.

We model the process of innovation in the following way. Each period is subdivided into $K \geq 1$ subperiods. In each subperiod $k \in \{1...K\}$, one of the members of the elite is chosen at random from a uniform distribution on E and receives the opportunity to establish new firms. At the same time, a randomly drawn sample of workers with measure ΔE receives ideas for the creation of new varieties of the product. To establish a new firm, the entrepreneur needs an idea for a new variety generated by one of the workers. Because of this complementarity, we assume that once a new firm is set, the worker who generates the idea receives $(1 - \alpha)$ $(\alpha \in (0; 1))$[3] of the profit π_t^{ent} earned in the first period of operation.

[3] Later on, we plan to endogenize α as an outcome of a bargaining procedure between the current and potential members of the elite, but for the purposes of the current model we assume that it is exogenous and constant over time.

To capture the fact that innovation leads to a change in the social structure, we assume that the worker who generated the idea for the new variety, obtains the right to produce, becomes the owner of the newly created firm and receives its entire profit from the second period of its existence on[4]. He also becomes part of the elite and obtains the right to partake in the political process.

The establishment of a new firm, is however, subject to approval by the legislature, which has the monopoly to issue licenses. Hence, it decides on both the quantity of licenses issued and their price in each period of time. The legislature consists of N legislators, each of whom represents the interests of a share $\frac{E_t}{N}$ of the elite in time t. We assume that the number of legislators remains fixed over time, while the number of voters they represent varies over time as workers become members of the elite. We model the licensing procedure in the following way. In each subperiod $k \in \{1...K\}$, the entrepreneur with an investment opportunity contacts his representative in the legislature[5] and asks him to set the item of new license issues on the agenda. The legislator then makes a proposal on the number of new licenses to be issued

$$E_{t+1} - E_t \in [0; \Delta E_t]$$

and on a transfer scheme, $(S_{tj})_{j\in\{1...N\}}$ which specifies the licensing fee to be paid by the entrepreneur and its distribution across the rest of the members of the elite. The presumption here is that members of the elite who are represented by the same legislator are treated symmetrically, and therefore, the transfers are specified with regard to the legislator, who then distributes them equally among the elite members he represents[6]. Since we assume that the worker generating the new idea

[4] We do not model the strategic decision of the worker whether to become an entrepreneur explicitly, although introducing this decision will leave the results unchanged. Since, in any period, every firm makes positive profits and since E has measure 0 relative to L, the profit earned by an entrepreneur will always exceed the wage earned by a worker. The timing of market entrance is also not an issue, since the probability that the same worker will generate an idea twice is 0.

[5] We do not model explicitly the decision to initiate the legislative process. Introducing such strategic considerations will leave the results of the model unchanged. The reasons for this are similar to those discussed in footnote 4.

[6] The exact distribution of transfers is important only for the determination of the licensing fee. Since our emphasis

receives a share of $(1-\alpha)\,\pi_t^{ent}$, $\alpha\pi_t^{ent}$ is the amount which can be used to pay the licensing fees and to remunerate the entrepreneur who has received the investment opportunity. The licensing fees are then distributed across the elite members to compensate them for the decline of profits due to increased competition.

A proposal of the form $\left(E_{t+1}; (S_{jt})_{j\in\{1\ldots N\}}\right)$ is implemented if at least qN legislators vote in its favor. Here, q specifies the amount of support needed by the legislator to implement a specific policy.

Since the majority required to make a decision is q, only those members of the elite who are represented by the winning coalition of qN legislators will receive positive transfers. Instead of specifying the problem in terms of licensing fees, we prefer to formulate it directly in terms of transfers to the members of the elite. It is obvious then that the transfer to the entrepreneur with an investment opportunity will be

$$\frac{\alpha\pi_t^{ent}-\sum_{j\neq i}S_{tj}}{E_t/N},$$

where i denotes the identity of the legislator who represents the entrepreneur. Hence, the licensing fee is given by:

$$\frac{\alpha\pi_t^{ent}\left(\frac{E_t}{N}-1\right)+\sum_{j\neq i}S_{tj}}{E_t/N}.$$

If the proposal receives approval, it is implemented. Production and consumption decisions are realized and the economy enters period $t+1$. If the proposal is rejected, then the economy enters subperiod $k+1$. A new entrepreneur is randomly drawn and receives an investment opportunity. If the economy has reached subperiod K and none of the proposals has been accepted, then the status quo is retained:

$$E_{t+1}=E_t$$

and no transfers are paid.

All individuals have the same discount factor $\beta\in(0;1)$.

is on the implications on growth and its sources, we do not pursue this issue further here.

3.1 The Market Equilibrium

We first determine the market equilibrium which would obtain, once the number of new entrants has been determined by the legislature. It is convenient to immediately write down the maximization problem of a firm as:

$$\pi_i = \max_{x_i \in \mathbb{R}_0^+} \left\{ x_i^{\frac{1}{\lambda}} - x_i w \right\},$$

where w denotes the wage. We assume that the entrepreneurs are price-takers in the labor market, hence the market wage in equilibrium is determined according to:

$$\frac{1}{\lambda} x_i^{\frac{1-\lambda}{\lambda}} = w.$$

If no new firms entered the market in a given period, the equilibrium wage and profits would be determined according to:

$$w = \frac{1}{\lambda} \left(\frac{L}{E} \right)^{\frac{1-\lambda}{\lambda}}$$

and

$$\pi_i = \frac{\lambda - 1}{\lambda} \left(\frac{L}{E} \right)^{\frac{1}{\lambda}}.$$

Let now E_t denote the number of incumbent firms at the beginning of period t and let

$$E_{t+1} - E_t$$

denote the number of entrants. In that case, the equilibrium wage must reflect the fact that a fixed cost of

$$\frac{\bar{\phi} \left[E_{t+1} - E_t \right]}{E_t}$$

units of labor must be invested in the creation of varieties. Hence, the market equilibrium condition becomes:

$$w = \frac{1}{\lambda} \left(\frac{L - \frac{\bar{\phi}[E_{t+1} - E_t]}{E_t}}{E_{t+1}} \right)^{\frac{1-\lambda}{\lambda}}$$

and the profit of an incumbent firm is given by:

$$\pi_{it}^{inc} = \frac{\lambda - 1}{\lambda}\left(\frac{L - \frac{\bar{\phi}[E_{t+1}-E_t]}{E_t}}{E_{t+1}}\right)^{\frac{1}{\lambda}},$$

whereas the profit of an entering firm is

$$\pi_{it}^{ent} = \frac{\lambda - 1}{\lambda}\left(\frac{L - \frac{\bar{\phi}[E_{t+1}-E_t]}{E_t}}{E_{t+1}}\right)^{\frac{1}{\lambda}} - \frac{1}{\lambda}\frac{\bar{\phi}}{E_t}\left(\frac{L - \frac{\bar{\phi}[E_{t+1}-E_t]}{E_t}}{E_{t+1}}\right)^{\frac{1}{\lambda}-1}.$$

Since all entrepreneurs are symmetrical and the dependence of profits on time results only from the dependence on E_{t+1}, assuming that E_t is given, we will ignore the indices i and t and will write $\pi^{inc}(E_{t+1})$ and $\pi^{ent}(E_{t+1})$ to denote the profit functions of incumbent and entering firms.

3.2 The Political Equilibrium

We now use the market equilibrium computed above to derive the optimal number of licenses issued by the legislature and the transfers to the existing elite members.

After the entrepreneur with an investment opportunity has been determined, the legislator who represents him, makes a proposal on the number of new production licenses which would be granted and on the distribution among the elite members. The transfer payments to the elite members are formulated conditional on their representative being part of the winning coalition[7]: in order for a proposal to be implemented, it must be supported by a fraction q of the legislators. Hence, after a proposal is made, $qN - 1$ legislators are drawn at random. The legislator who makes the proposal is a member of the winning coalition by default. If every member of the winning coalition agrees on the proposal, then it is implemented. If a proposal does not receive the necessary support, a new entrepreneur receives an investment opportunity, which is tantamount to a new legislator being randomly selected to make a new proposal. The bargaining lasts for K periods. If agreement is

[7] This is an important assumption, which makes the equilibrium proposal stable regardless of whether the value of q is above or below $\frac{1}{2}$. If the sequence of moves were different, i.e. the members of the winning coalition were known in advance, no proposal would be stable. Every member outside of the winning coalition could be bribed to vote in favor of the project for an arbitrarily small reward.

not reached at the end of period K, the elite does not admit any new members and transfers are 0 by default.

In the following discussion, we are going to neglect the difference between the members of the elite represented by a given legislator and the legislator. So, when we talk about the winning coalition, we mean interchangeably the legislators whose approval is necessary and the members of the elite represented by these legislators. The exact meaning will then be clear from the context.

Proposals and voting take place in ifinitesimally small time intervals. We can, therefore, abstract away from the costs of bargaining. It follows that the properties of the equilibrium of this bargaining game can be described by:

1. The proposal is accepted in the first round.
2. If new members are admitted to the elite, their payments are distributed among the members of the winning coalition.
3. The number of newly admitted members is chosen so as to maximize the present value of the expected utility of the members of the winning coalition.

This mechanism is described e.g. in Battaglini and Coate (2006). As a corollary of their result, we state:

Corollary 1 *Let*

$$v_1(E_t)$$

denote the value function of a member of the elite at the beginning of period t. Then, there exists a subgame-perfect equilibrium of the bargaining game in which for any round $k = 1...K$, the randomly chosen legislator $i \in \{1...N\}$ chooses the number of new members and a transfer scheme $\left(E_{t+1}; (S_{jt})_{j\in\{1...N\}}\right)$ such that

$$E_{t+1} = \arg\max_{E_{t+1}} \left[1 + \frac{\alpha}{q}\frac{E_{t+1} - E_t}{E_t}\right]\pi^{inc}(E_{t+1}) \tag{3.1}$$

$$-\frac{\alpha}{q}\frac{[E_{t+1} - E_t]}{E_t}\frac{\bar{\phi}}{E_t}w(E_{t+1}) + \beta v_1(E_{t+1}) \tag{3.2}$$

and the transfers to the current members of the elite satisfy:

$$\sum_{j\in\{1...N\}} S_{jt} = \alpha\left(E_{t+1}-E_t\right)\pi^{inc}\left(E_{t+1}\right) - \\ -\alpha\left[E_{t+1}-E_t\right]\frac{\bar{\phi}}{E_t}w\left(E_{t+1}\right)$$

such that if Ω *represents the winning coalition,*

$$S_{jt} = \max\left\{\begin{array}{c} -\left[\pi^{inc}\left(E_{t+1}\right)-\pi^{inc}\left(E_t\right)+\beta\left[v_1\left(E_{t+1}\right)-v_1\left(E_t\right)\right]\right]; \\ \frac{\alpha(E_{t+1}-E_t)\pi^{inc}(E_{t+1})-\alpha[E_{t+1}-E_t]\frac{\bar{\phi}}{E_t}w(E_{t+1})}{N}\end{array}\right\} \text{ for } j\in\Omega\backslash\{i\}$$

$$S_{jt} = 0 \text{ for } j\notin\Omega$$

After the proposal is made, the set Ω *is drawn at random from* $\{1...N\}$*. A member* $j\in\Omega$ *of the elite votes in favor of a proposal* $\left(\hat{E};\left(\hat{S}_j\right)_{j\in\{1...N\}}\right)$ *if and only if*

$$\left(1+\hat{S}_j\right)\pi^{inc}\left(\hat{E}\right)+\beta v_1\left(\hat{E}\right)\geq\max\left\{\left(1+S_{jt}\right)\pi^{inc}\left(E_{t+1}\right)+\beta v_1\left(E_{t+1}\right);\right\}.$$

A member $j\notin\Omega$ *never votes in favor of any proposal.*

4 The Steady-State Rate of Innovation

In order to derive the equilibrium dynamics, we combine the market equilibrium and the political equilibrium. Hence, we replace $\pi^{inc}\left(E_{t+1}\right)$ with its equilibrium level and we explicitly derive the value function $v_1\left(E_{t+1}\right)$ used in the computation of the political equilibrium.

First note that, similarly to Battaglini and Coate (2006) we can write $v_1\left(E_{t+1}\right)$ recursively as:

$$v_1\left(E_{t+1}\right)=\left[1+\alpha\frac{\left(E_{t+2}-E_{t+1}\right)}{E_{t+1}}\right]\pi^{inc}\left(E_{t+2}\right)-\alpha\frac{\left[E_{t+2}-E_{t+1}\right]}{E_{t+1}}\frac{\bar{\phi}}{E_{t+1}}w\left(E_{t+2}\right)+\beta v_1\left(E_{t+2}\right). \quad (4.1)$$

To understand the formula, note that in the next period, $t+1$, each member of the elite faces three possibilities:

- His representative might be randomly chosen to make a proposal. This happens with probability $\frac{1}{N}$. In this case, his transfer is:

$$\frac{\alpha\left(E_{t+2}-E_{t+1}\right)\left[\pi^{inc}\left(E_{t+2}\right)-\frac{\bar{\phi}}{E_t}w\left(E_{t+2}\right)\right]-S_t\left(qN-1\right)}{E_{t+1}/N}.$$

(Note that the transfer assigned to a legislator must be equally distributed across the members of the elites he represents, hence, each member of the elite receives a share of $\frac{1}{E_{t+1}/N}$ of the transfer)

- His representative might be randomly chosen be a member of the winning coalition, but not the proposer himself. This happens with probability $\frac{qN-1}{N}$. In this case, his transfer is $\frac{S_t}{E_{t+1}/N}$.
- His representative might be neither the proposer, nor part of the winning coalition, in which case he receives no transfers.

In everyone of these three cases, he receives the same profit $\pi^{inc}(E_{t+2})$, where E_{t+2} is the optimally chosen value of members of the elite by the proposer in period $t+1$. Hence, the expected payoff of a member of the elite in period $t+1$ is given by:

$$\begin{aligned} & \pi(E_{t+2}) + \frac{1}{N}\frac{\left[\alpha(E_{t+2}-E_{t+1})\left[\pi^{inc}(E_{t+2}) - \frac{\bar{\phi}}{E_t}w(E_{t+2})\right] - S_t(qN-1)\right]}{E_{t+1}/N} + \frac{qN-1}{N}\frac{S_t}{E_{t+1}/N} \\ = \; & \pi(E_{t+2}) + \alpha\frac{(E_{t+2}-E_{t+1})}{E_{t+1}}\left[\pi^{inc}(E_{t+2}) - \frac{\bar{\phi}}{E_t}w(E_{t+2})\right] = \\ = \; & \left[1+\alpha\frac{(E_{t+2}-E_{t+1})}{E_{t+1}}\right]\pi^{inc}(E_{t+2}) - \alpha\frac{[E_{t+2}-E_{t+1}]}{E_{t+1}}\frac{\bar{\phi}}{E_{t+1}}\frac{1}{\lambda}\left(\frac{L-\frac{\bar{\phi}[E_{t+2}-E_{t+1}]}{E_{t+1}}}{E_{t+2}}\right)^{\frac{1}{\lambda}-1}. \end{aligned}$$

Assume that $L_t = L = 1$ and set $\phi = \frac{\bar{\phi}}{L}$. The optimal proposal can now be computed as a solution to the following maximization problem:

$$\max_{E_{t+1}}\left\{\begin{array}{c} \pi^{inc}(E_{t+1}) + \frac{\alpha}{q}\frac{(E_{t+1}-E_t)}{E_t}\left[\pi^{inc}(E_{t+1}) - \frac{\phi}{E_t}w(E_{t+1})\right] + \beta v_1(E_{t+1}) \mid \\ v_1(E_{t+1}) = \pi^{inc}(E_{t+2}) + \alpha\frac{(E_{t+2}-E_{t+1})}{E_{t+1}}\left[\pi^{inc}(E_{t+2}) - \frac{\bar{\phi}}{E_t}w(E_{t+2})\right] + \beta v_1(E_{t+2}) \\ \pi^{inc}(E_{t+1}) = \frac{\lambda-1}{\lambda}\left(\frac{1-\frac{\phi[E_{t+1}-E_t]}{E_t}}{E_{t+1}}\right)^{\frac{1}{\lambda}} \\ w(E_{t+1}) = \frac{1}{\lambda}\left(\frac{1-\frac{\phi[E_{t+1}-E_t]}{E_t}}{E_{t+1}}\right)^{\frac{1-\lambda}{\lambda}} \end{array}\right\}. \quad (4.2)$$

Proposition 2 *Let*

$$(2\alpha-1)\lambda > 1,$$

then there exists a $\hat{\phi} \in (0;1]$ *such that for all* $\phi \in \left[0;\hat{\phi}\right]$, *the steady state of the economy is given by*

$$\frac{E_{t+1}}{E_t} = \max\left\{\min\left\{e^*;\Delta\right\};1\right\},$$

where e^* *satisfies:*

$$\begin{aligned} & \left(\frac{1+\phi}{e^*}-\phi\right)^{\frac{1}{\lambda}-1}\frac{\alpha}{q}\left[\left(\frac{1+\phi}{e^*}\right)-\frac{\lambda\phi}{\lambda-1}\right]- \\ & -\left(\frac{1+\phi}{e^{*2}}\right)\left(\frac{1+\phi}{e^*}-\phi\right)^{\frac{1}{\lambda}-2}\frac{1}{\lambda}\left[\left[1+\frac{\alpha}{q}\left(e^*-1\right)\right]\left(\frac{1+\phi}{e^*}-\phi\right)-\phi\frac{\alpha}{q}\left(e^*-1\right)\right]- \\ -\frac{1}{\lambda}\beta c_0 e^{*-\frac{1-\lambda}{\lambda}} &= 0. \end{aligned}$$

and c_0 *equals:*

$$c_0 = \left(\frac{1+\phi}{e^*}-\phi\right)^{\frac{1}{\lambda}-1}\frac{\left[(\lambda-1)\left[1+\alpha\left(e^*-1\right)\right]\left(\frac{1+\phi}{e^*}-\phi\right)-\alpha\phi\left(e^*-1\right)\right]}{1-\beta e^{*-\frac{1}{\lambda}}}$$

We now examine the dependence of the equilibrium rate of market entry on the parameter q. Note that issuing licences effectively reduces the average profit, by increasing the competition for labor. At the same time, the current payoff of the members of the winning coalition is increased by

$$\frac{\alpha\left(E_{t+1}-E_t\right)\pi\left(E_{t+1}\right)}{qE_t}-\frac{\alpha\left(E_{t+1}-E_t\right)}{qE_t}\frac{\phi}{E_t}w\left(E_{t+1}\right).$$

Note that if $q = 1$, hence unanimity is required to implement a proposal, the elite is going to optimally trade-off the current gains from new entrants against future losses from the point of view of the elite. However, if $q < 1$, the decision of the proposer might fail to be optimal from the elite's point of view. The elite would issue too many or too few licences. This is best seen by comparing the value functions of the proposer 3.1, who maximizes the discounted payoff of the winning coalition and an average member of the elite 4.1. One sees that the profits of the proposer of the winning coalition from including new members are increased by a factor $\frac{1}{q} > 1$ compared to those of an ordinary member. Hence, for $q < 1$ we would expect that the number of entering firms exceeds the optimum for the elite as a whole.

Economic growth is maximized at $e = \Delta$, since the introduction of new varieties, i.e. admission of new members of the elite, increases output, and the fixed cost of introducing new varieties tends to 0 as $E \to \infty$.

Proposition 3 *There exist a* $\hat{\beta} \in (0;1]$ *and a* $\hat{\phi} \in (0;1]$ *such that for all* $\beta \in \left[0;\hat{\beta}\right)$ *and* $\phi \in \left[0;\hat{\phi}\right)$*,*

$$\frac{de^*}{dq} < 0.$$

The proposition demonstrates that increasing the consensus necessary to make decisions lowers the equilibrium rate of innovation. Intuitively, this amounts to an internalization of an external effect that the winning coalition imposes on the elite as a whole. If unanimity is required in order to admit new members, the maximization problem of the proposer will optimize the value function of an ordinary member of the elite and the decision will be optimal from the point of view of the elite.

At the same time, the more consolidated the elite is, the further away is the equilibrium from the socially optimal allocation, $e^* = \Delta$. Hence, higher values of q impede growth by restricting the introduction of new varieties and reducing the level of competition.

It might appear that setting q to its lowest possible level (which amounts to giving the proposing legislator dictatorial power in the current period), would guarantee a maximal rate of growth. In the next section, we show that such a conclusion is justified only to a certain extent.

5 Productivity Enhancing Public Investment

In order to better understand the implications of the model, we now introduce a second dimension to the decision-problem of the legislature. We assume that the elite can invest in a public project, which generates improvement in labor productivity. In terms of the model, this means that only a fraction $1 - g$ of the labor force is employed directly in production. The remaining fraction is allocated to the public project. The investment creates no current benefits, but increases productivity of labor in the next period according to the following technology:

$$L_{t+1} = (1 + Ag - \delta) L_t,$$

where $\delta > 0$ and $A > 1$ are constants.

The static market equilibrium is described by the equilibrium wage:

$$\tilde{w}(E_{t+1}) = \frac{1}{\lambda}\left(\frac{L_t(1-g) - \frac{\bar{\phi}[E_{t+1}-E_t]}{E_t}}{E_{t+1}}\right)^{\frac{1-\lambda}{\lambda}}$$

The profit of an incumbent firm is given by

$$\tilde{\pi}^{inc}(E_{t+1}) = \frac{\lambda - 1}{\lambda}\left(\frac{L_t(1-g) - \frac{\bar{\phi}[E_{t+1}-E_t]}{E_t}}{E_{t+1}}\right)^{\frac{1}{\lambda}},$$

whereas the profit of an entrant is

$$\tilde{\pi}^{ent}(E_{t+1}) = \frac{\lambda - 1}{\lambda}\left(\frac{L_t(1-g) - \frac{\bar{\phi}[E_{t+1}-E_t]}{E_t}}{E_{t+1}}\right)^{\frac{1}{\lambda}} - \frac{1}{\lambda}\frac{\bar{\phi}}{E_t}\left(\frac{L_t(1-g) - \frac{\bar{\phi}[E_{t+1}-E_t]}{E_t}}{E_{t+1}}\right)^{\frac{1}{\lambda}-1}.$$

Throughout, we will use tildes to denote variables in the model with possibility to invest in a public project.

The model of political decision-making remains virtually unchanged. The legislator (who represents the entrepreneur with an investment opportunity) now makes a proposal consisting of $\left(\tilde{E}_{t+1}; \tilde{g}; \left(\tilde{S}_{tj}\right)_{j\in\{1...N\}}\right)$. In case of disagreement in round K, no new members are admitted, no investment is made and transfers are set to 0. In analogy with Corollary 1, the subgame-perfect equilibrium of the game satisfies:

Corollary 4 *Let*

$$\tilde{v}_1(E_t; g_{t-1})$$

denote the value function of a member of the elite at the beginning of period t. Then, there exists a subgame-perfect equilibrium of the bargaining game in which for any round $k = 1...K$, the randomly *chosen legislator $i \in \{1...N\}$ chooses the number of new members, the amount of investment in the public project and a transfer scheme $\left(\tilde{E}_{t+1}; \tilde{g}_t; \left(\tilde{S}_{tj}\right)_{j\in\{1...N\}}\right)$ such that*

$$\begin{aligned}\left(\tilde{E}_{t+1}; \tilde{g}_t\right) &= \arg\max_{E_{t+1}, g_t} \left[1 + \frac{\alpha}{q}\frac{E_{t+1} - E_t}{E_t}\right] \tilde{\pi}^{inc}\left(E_{t+1}; g_t\right) \\ &\quad -\frac{\alpha}{q}\frac{\left[E_{t+1} - E_t\right]}{E_t}\bar{\phi}\tilde{w}\left(E_{t+1}; g_t\right) + \beta\tilde{v}_1\left(E_{t+1}; g_t\right)\end{aligned}$$

and the transfers to the current members of the elite satisfy:

$$\begin{aligned}\sum_{j\in\{1...N\}} \tilde{S}_{jt} &= \alpha\left(\tilde{E}_{t+1} - E_t\right)\tilde{\pi}^{inc}\left(\tilde{E}_{t+1}; \tilde{g}_t\right) - \\ &\quad -\alpha\left[\tilde{E}_{t+1} - E_t\right]\frac{\bar{\phi}}{E_t}\tilde{w}\left(\tilde{E}_{t+1}; \tilde{g}_t\right)\end{aligned}$$

such that if Ω represents the winning coalition,

$$\begin{aligned}\tilde{S}_{jt} &= \min\left\{\begin{array}{c} -\left[\tilde{\pi}^{inc}\left(\tilde{E}_{t+1}; \tilde{g}_t\right) - \tilde{\pi}^{inc}\left(E_t; 0\right) + \beta\left[\tilde{v}_1\left(\tilde{E}_{t+1}; \tilde{g}_t\right) - v_1\left(E_t; 0\right)\right]\right]; \\ \frac{\alpha\left(\tilde{E}_{t+1} - E_t\right)\tilde{\pi}^{inc}\left(\tilde{E}_{t+1}; \tilde{g}_t\right) - \alpha\left[\tilde{E}_{t+1} - E_t\right]\frac{\bar{\phi}}{E_t}\tilde{w}_t\left(\tilde{E}_{t+1}; \tilde{g}_t\right)}{N}\end{array}\right\} \text{ for } j \in \Omega\backslash\{i\} \\ \tilde{S}_{jt} &= 0 \text{ for } j \notin \Omega\end{aligned}$$

After the proposal is made, the set Ω is drawn at random from $\{1...N\}$. A member $j \in \Omega$ of the elite votes in favor of a proposal $\left(\hat{E}; \left(\hat{S}_j\right)_{j\in\{1...N\}}; \hat{g}\right)$ if and only if

$$\left(1 + \hat{S}_j\right)\tilde{\pi}^{inc}\left(\hat{E}; \hat{g}\right) + \beta v_1\left(\hat{E}\right) \geq \max\left\{\left(1 + \tilde{S}_{tj}\right)\tilde{\pi}^{inc}\left(\tilde{E}_{t+1}; \tilde{g}_t\right) + \beta v_1\left(\tilde{E}_{t+1}; \tilde{g}_t\right);\right\}.$$

A member $j \notin \Omega$ never votes in favor of any proposal.

The proof of this result is identical to the proof of Corollary 1 and, hence, omitted.

We are interested in the steady-state of the economy, in which both $\tilde{g}$ and the admission rate $\tilde{e} = \frac{E_{t+1}}{E_t}$ are constant over time. To derive these, we note that the optimization problem of a proposing legislator reduces to:

$$\begin{aligned}&\max_{g,\tilde{e}}\left(\frac{L_t}{E_t}\right)^{\frac{1}{\lambda}}\left[1 + \frac{\alpha}{q}\left(\tilde{e} - 1\right)\right]\left[\frac{1 - \tilde{g} - \phi\left(\tilde{e} - 1\right)}{\tilde{e}}\right]^{\frac{1}{\lambda}} - \\ &-\frac{1}{\lambda - 1}\frac{\alpha}{q}\phi\left(\tilde{e} - 1\right)\left[\frac{1 - \tilde{g} - \phi\left(\tilde{e} - 1\right)}{\tilde{e}}\right]^{\frac{1}{\lambda} - 1} + \beta\tilde{v}_1\left(E_{t+1}; L_{t+1}\right).\end{aligned}$$

Proposition 5 *The steady-state values $\tilde{e}^*$ and $\tilde{g}^*$ are given by:*

$$\tilde{e}^* = \max\{1; \min\{\tilde{e}; \Delta\}\}$$

$$\tilde{g}^* = \max\{0; \min\{\tilde{g}; 1\}\},$$

where $\tilde{e}$ and $\tilde{g}$ satisfy the following conditions

- the first-order condition with respect to $\tilde{e}$:

$$\begin{aligned} &\left(\frac{1-\tilde{g}+\phi}{\tilde{e}} - \phi\right)^{\frac{1}{\lambda}-1} \frac{\alpha}{q}\left[\left(\frac{1-\tilde{g}+\phi}{\tilde{e}}\right) - \frac{\lambda\phi}{\lambda-1}\right] - \\ &-\left(\frac{1-\tilde{g}+\phi}{\tilde{e}^2}\right)\left(\frac{1-\tilde{g}+\phi}{\tilde{e}} - \phi\right)^{\frac{1}{\lambda}-2} \frac{1}{\lambda}\left[\left[1+\frac{\alpha}{q}(\tilde{e}-1)\right]\left(\frac{1-\tilde{g}+\phi}{\tilde{e}}\right) - \phi\frac{\alpha}{q}(\tilde{e}-1)\right] - \\ &-\frac{1}{\lambda}\beta\tilde{c}_0\tilde{e}^{-\frac{1-\lambda}{\lambda}}(A\tilde{g}+1-\delta)^{\frac{1}{\lambda}} = 0; \end{aligned} \tag{5.1}$$

- the first-order condition with respect to $\tilde{g}$:

$$\begin{aligned} &-\frac{1}{\lambda e}\left(\frac{1-\tilde{g}-\phi(e-1)}{e}\right)^{\frac{1}{\lambda}-2}\left[1+\frac{\alpha}{q}(e-1)\frac{(1-\tilde{g}-2\phi(e-1))}{e}\right] \\ &+\frac{1}{\lambda}\left(\frac{A}{\tilde{e}}\right)^{\frac{1}{\lambda}}\beta\tilde{c}_0(A\tilde{g}+1-\delta)^{\frac{1}{\lambda}-1} = 0; \end{aligned} \tag{5.2}$$

and

- the assumption for the continuation value:

$$\tilde{v}_1(E_{t+1}; L_{t+1}) = \left(\frac{L_{t+1}}{E_{t+1}}\right)^{\frac{1}{\lambda}}\tilde{c}_0,$$

which renders the constant $\tilde{c}_0$:

$$\tilde{c}_0 = \frac{[1+\alpha(\tilde{e}-1)]\left[\frac{1-\tilde{g}-\phi(\tilde{e}-1)}{\tilde{e}}\right]^{\frac{1}{\lambda}} - \frac{1}{\lambda-1}\alpha\phi(\tilde{e}-1)\left[\frac{1-\tilde{g}-\phi(\tilde{e}-1)}{\tilde{e}}\right]^{\frac{1}{\lambda}-1}}{\left(1-\beta\left(\frac{A\tilde{g}+1-\delta}{e}\right)^{\frac{1}{\lambda}}\right)}.$$

The proof of this result is obvious, and therefore, omitted.

Unfortunately, we do not have a closed form solution of this system and we cannot yet provide analytical results concerning the dependence of the equilibrium values of $\tilde{g}^*$ and $\tilde{e}^*$ on q. However, we have conducted a number of numerical examples in all of which we obtain that $\tilde{g}^*$ is increasing in q, while the value of $\tilde{e}^*$ decreases in q.

The interpretation of this finding is as follows. Whenever $\tilde{e}^* > 1$ and $q < 1$, the proposing agent does not fully internalize the benefits of increases in future productivity. Note, in particular that the transfers which the winning coalition receives depend negatively on $\tilde{g}$ and positively on $\tilde{e}$. The winning coalition will, therefore prefer a lower level of investments in the public project than would be optimal for the elite as a whole and a higher rate of admission of new members. Hence, the proposing agent will choose to sacrifice the future public benefit for the current gain of the few. Consequently, lower values of q imply higher $\tilde{e}^*$ and lower $\tilde{g}^*$.

6 Implications for Growth

In the last section, we have shown that increasing q has a positive influence on investment in public projects, but a negative influence on free entrepreneurship. Note that in our model, the rate of economic growth is given by:

$$G =: \frac{E_{t+1}\left(\frac{L_t(1-\tilde{g})-\frac{\phi L_t[E_{t+1}-E_t]}{E_t}}{E_{t+1}}\right)^{\frac{1}{\lambda}}}{E_t\left(\frac{L_{t-1}(1-\tilde{g})-\frac{\phi L_{t-1}[E_t-E_{t-1}]}{E_{t-1}}}{E_t}\right)^{\frac{1}{\lambda}}} = \tilde{e}^{1-\frac{1}{\lambda}}\left(1 + A\tilde{g} - \delta\right)^{\frac{1}{\lambda}},$$

hence growth depends positively both on $\tilde{e}$ and $\tilde{g}$, which are determined by equations 5.1 and 5.2 as implicit functions of q. Hence, there exists an optimal value of q, q^*, which optimally trades-off the benefits from investments in public projects versus the benefits from increased competition and maximizes economic growth. We write

$$\begin{aligned} \log G(q) &= \left(1-\frac{1}{\lambda}\right)\log \tilde{e}(q) + \frac{1}{\lambda}\log\left(1+A\tilde{g}(q)-\delta\right) =: \\ &= : G_{\tilde{e}}(q) + G_{\tilde{g}}(q), \end{aligned}$$

where $G_{\tilde{e}}(q)$ and $G_{\tilde{g}}(q)$ identify the share of total log-rate of growth which can be attributed to the increase of E and to investments in public projects, respectively.

Since we do not yet have closed form solutions for $\tilde{e}$ and $\tilde{g}$, we consider two possible cases illustrated in Figures 1 and 2. In each of these graphs, we depict $\log G(q)$ as a sum of the functions $G_{\tilde{e}}(q)$ and $G_{\tilde{g}}(q)$. The curvatures of $G_{\tilde{e}}(q)$ and $G_{\tilde{g}}(q)$ will determine the curvature of $\log G(q)$. We conjecture that we could find values of the parameters of the model, for which the following two cases emerge. In Figure 1, both $G_{\tilde{e}}(q)$ and $G_{\tilde{g}}(q)$ are concave, rendering a concave function $\log G(q)$ and leading to an optimal interior $q^* \in (0;1)$, maximizing growth. In Figure 2, $G_{\tilde{e}}(q)$ and $G_{\tilde{g}}(q)$ are both convex. Hence, the optimal value of q will be either $q^* = 1$ or $q^* = \frac{1}{N}$. We now discuss the interpretation of these two cases in turn.

Consider first the case in which the optimal value of q is in the interior, Figure 1. For this set of parameter constellations, optimal institutional arrangements would require moderate levels of support for public policy, as well as for market entry decisions. Societies which have optimally chosen such institutions will be characterized by an intermediate degree of entrepreneurial freedom and public investments.

The more interesting case is the one illustrated in Figure 2. For this set of parameter values, economic growth can either result from a very high degree of consolidation of the elite which prevents market entry, but stimulates growth by heavily investing in public projects, or from a very low degree of consolidation, which makes investments in public projects unfeasible, but enhances the introduction of new products to the market. The first case, $q = 1$, would capture totalitarian or authoritarian states, like Soviet Union, where the state bureaucracy monopolized markets, and economic growth was mostly due to "gigantomanic" public projects[8]. The second case, $q^* = \frac{1}{N}$,

[8] See Layenov, Majewski and Sokoloff (1992) for an analysis of the Soviet society and the role of the state bureau-

would describe societies with minimalistic states, but free market entry. Here growth would result solely from entrepreneurship, whereas public investment would be virtually non-existent.. North America at the beginning of its colonization could serve as an example. Countries with intermediate values of q, in which the elite is not sufficiently consolidated to promote public investments, but coherent enough to prevent market entry by outsiders, would have the lowest rate of growth under this scenario. This finding also indicates that the transition from a state-controlled to a market economy might be obstructed by low rates of economic growth on the path of transition from high to low values of q.

7 The Case of the Industrial Revolution

As an example to which our model would naturally apply, we consider the Industrial Revolution. As Acemoglu and Robinson (2004) note "There are many historical examples illustrating how the fear of losing political power has led various groups of political and economic elites to oppose institutional change and also introduction of new technologies. Perhaps the best documented examples come from the attitude of elites to industrialization during nineteenth century". As a first case, we discuss how our model could explain the speed of the industrialization in England.

Bowden (1925) provides us with the following facts regarding the economic and political situation in England in the end of the 18th century. The elite in England at that time consisted of landlords and rich merchants. The merchants controlled both production and trade by providing producers with materials and purchasing their output at fixed prices. They, themselves engaged in monopolistic competition on the markets for final goods, Bowden (1925, pp. 140-142).

The producers were small and relatively competitive, but completely dependent on the merchants to place their goods. As a result their profits were comparatively low. Most of the large industrials started as such small producers with a small amount of capital. The decisive factor for success was establishing connections with the merchants for end-products and eventually starting

cracy in the economic life.

to trade without the help of intermediaries, Bowden (1925, pp. 142-143.)

These facts seem to naturally fit into the setting of our model, which assumes monopolistic competition inside the elite and perfect competition on the market for labor. An interesting detail is the necessity to establish connections with the existing traders in order to obtain access to the market, which could naturally require sharing of the initial profits with a merchant.

In terms of our model, it seems that England in the end of the 18th century could be considered a country with very low consolidation of the elite. Entry barriers to trade were low and establishing connections with merchants was relatively easy. Differently from many European countries at that time, who enforced severely guild regulations, in England, the law that required a certain level of apprenticeship in order to engage in a certain trade was not implemented by the Parliament and the courts and was eventually abolished, see More (1989, p. 59). Moreover, the King did not discriminate between landlords and industrials in granting nobility titles, see Bowden (1925, p. 153). As Mokyr (1990, p. 243) notes "the landowning elite which controlled political power before 1850, contributed little to the Industrial Revolution in terms of technology or entrepreneurship. It did not, however, resist it".

All of these facts indicate that the value of q in England was very low — one can think about an industrial producer cooperating with a single merchant for a while until he establishes his own reputation. In terms of our model, this would mean that the rate at which new enterprises emerged and new technologies were introduced would be very high, as is indeed the case for England at this time.

At the same time, as More (1989, p. 60-62) illustrates, British public expenditure, and, in particular, public investment was not very pronounced at that time. The major part of it was diverted towards the military or used to serve the government debt. At the same time, granting monopoly rights, privileges or subsidies to particular firms and industries was considered "obnoxious", since it opposed the spirit of "laissez faire" and created opportunities for corruption. These facts seem to provide support for our theoretical results that a low value of q would lead to low level of public investment.

In contrast, Russia might be seen as a case in which the elite was highly consolidated. The elite, consisting mainly of land aristocracy, feared that introduction of new technologies and the creation of new classes would lead to a loss of political and economic power. It was represented by absolute monarchs, who could forbid the introduction of innovations per decree. As the history of the Russian industrialization demonstrates, a major part of the process was driven either by foreign capital or by state-sponsored projects, both during the 18th and the 19th century, see Daniel (1995), Gerschenkron (1970, p. 103). During the reign of Peter I, the potential manufacturers had to petition to the Tsar arguing that their factory will contribute to the well-being of the state. Most of the production was meant for the army, and so, the state took active interest in insuring the adequacy of the technology used, controlling the quality of output, guaranteeing monopoly rights and supplying the entrepreneurs with capital at low cost, see Daniel (1995). Daniel's (1995) analysis of the first manufacturers shows that they came from different backgrounds — some belonged to the merchants' guild, some were poor land aristocrats and one was even a serf. The fact that peasants who were the main labor force in the new factories could easily acquire high skills and then leave the factory to start a business on their own, was an unintended outcome of the fast industrialization initiated by the Tsar. The resulting social conflict forced his successor, Catherine II, to give more local power to the land aristocracy and place peasants entirely under its control. From that time on, the access of peasants to production has been if not eliminated, at least severely limited. As Dow (1947) notes, those few successful serfs who managed to establish their own factories and earn high profits, were not able to buy their liberty from their owners. Instead, they were forced to pay large duties for the allowance to run their business.

The situation in Russia did not change significantly in the 18th century. The Tsars were still empowered to grant privileges and monopoly rights to investors of their choice, who also received credits at low interest rates, tax subsidies and state orders, see Mosse (1996). As Polunov (1966, p. 136) writes, "[a] businessman's profit often depended less on skillful management than on close ties to the tsarist bureaucrats and the opportunity to receive state funds".

If we take these facts as evidence for a high value of q, our model would suggest that the high degree of consolidation of the elite in Russia would lead to slow adoption of technologies and relatively low economic growth compared to the level of economic growth in England. Interestingly, at the same time productivity enhancing public investment was more pronounced in Russia, just as our model would predict[9]. In particular, the enormous investments (often at a loss) of the Russian government into the railroad system and the mostly foreign investments into the metal and gas-industry, eventually allowed the Russian economy to align with Western Europe. Yet the entry to the Russian elite remained largely restrained, the Russian industry remained highly monopolized and concentrated mainly in the production of strategic goods for the military and goods for export, whereas the agriculture and the light industry were highly under-developed.

8 Conclusion

In this paper, we presented a model of a two-class society in which the elite monopolizes both the economic and the political power. In each period, the structure of the elite is endogenously determined by a voting procedure. We have identified the influence of the degree of consolidation of the elite on growth and on the degree of political and economic participation in the society. The results show that low degree of consolidation promotes innovation and political participation, but at the same time diminishes the level of investment into public projects, even if such investment is productivity enhancing. We also present examples from the time of the Industrial Revolution which seem to confirm the results of the model.

Of course, it is naive to think that the differences in the speed of industrialization can be described by means of one variable such as q in our model. However, the discussion above tries to illustrate that we perceive q not so much as a description of the voting legislature, but as a broader

[9] From the point of view of this paper, the economic history of Austria-Hungarian Empire was almost identical to that of Russian Empire. See, Acemoglu and Robinson (2000).

measure of the consolidation of the elite class in a given society. This measure has to reflect various features of the political and economic environment and to capture the openness of the elite both with respect to accepting new members and adopting new technologies.

Gurr (1990) suggests measures of access to political participation, independence of executive activity and of the scope of government functions regarding economic activity. Since we believe that a combination of such measures will provide an estimate of the value of q in our model, we discuss them here in short. The first set of variables refers to executive recruitment. They describe the extent of openness (XROPEN) and competitiveness (XRCOMP) of the political process, which would allow us to estimate the relative size of the political elite relative to the population as a whole. Two further variables reflect the extent to which decisions are made by individuals as opposed to collective decision-makers (MONO) and the constraints imposed on executives (XCONST). The last variable is especially interesting for our purposes, since it describes the support needed for an executive in order to implement a certain policy. Hence, this variable is directly related to the political dimension of q.

In terms of regulation of economic activity, Gurr's (1990) study identifies the variable scope (directiveness) of government functions (SCOPE). This variable orders states according to their involvement in and control of economic activity. It ranges from totalitarian states (Soviet Union, China), in which the state exercises total control on economic activity, over states like France and Sweden which control large-scale enterprises, but allow free small-scale economic activity, up to minimal states, who do not interfere in economic activity and merely maintain internal security and justice. This variable identifies the economic dimension of q in this model.

In future work, we intend to use the Polity II data collected by Gurr (1990) as an estimate of the parameter q in order to test the predictions generated by our model.

One of the drawbacks of our model is that it unifies political and economic institutions parameterizing both by a single variable q. While this formulation has advantages in terms of expositional and computational simplicity, we plan to extend the model allowing for difference in the institutions governing economic and public policy decisions. We conjecture that allowing the legislature to vote separately on economic and public policy decisions with potentially different values of q for the two decision-processes will not change the nature of results derived in this paper. In particular, the negative dependence between $\tilde{e}$ and $\tilde{g}$ will be preserved.

The results of the model rely heavily on the assumption that E has a measure 0 relative to L. This assumption allows us to neglect the strategic decision of the worker whether to enter the elite or not: becoming an entrepreneur always generates a profit which is higher than the wage received by an individual worker. Hence, in our economy, inequality is inherently persistent. Moreover, the initial state of the economy has no impact on the dynamics. In a next step, we plan to incorporate the fact that the initial endowment of the economy with skilled labor, as well as the settler mortality influence its long-run economic growth. To achieve this, we would have to consider a society consisting of three classes: elite, skilled labor and unskilled labor. Investments in education will reduce the share of unskilled labor in favor of skilled labor, whereas new elite members will be recruited from the class of skilled workers. We conjecture that the initial shares of these three groups combined with the parameter q will have a major impact on economic growth and its sources. Having identified the impact of q on economic growth for different initial conditions, we would be able to determine the optimal institutional arrangements (out of the class we consider) depending on the initial conditions of the economy. Furthermore, we would be able to compare the results of our model to the data and propose a theoretical explanation of the persistence of inefficient institutions.

Appendix

Proof of Corollary 1

Without loss of generality, suppose that the player chosen in the first period to make a proposal is legislator 1 and let the members of the winning coalition be

$$\{1; 2...qN\}.$$

In a symmetric subgame-perfect equilibrium, in which all actually made proposals, as well as all proposals that are better than the actually made and the status quo are accepted, the maximization problem of the proposer boils down to:

$$\begin{aligned}
& \max_{E_{t+1}\in[E_t;\Delta E_t];(S_{jt})_{j\in\{1...qN\}}} \left[1+\alpha\left(E_{t+1}-E_t\right)\right]\pi^{inc}\left(E_{t+1}\right)-\sum_{j\in\Omega_t\setminus i} S_{jt} \\
& -\alpha\left[E_{t+1}-E_t\right]\frac{\bar{\phi}}{E_t}w_t+\beta v_1\left(E_{t+1}\right) \\
s.t.\ S_{jt} \quad & \geq \quad 0 \text{ for all } j\in\{2...qN\} \\
S_{jt} \quad & = \quad 0 \text{ for all } j\in\{qN...N\} \\
\sum_{j\in\{2...qN\}} S_{jt} \quad & \leq \quad \alpha\left(E_{t+1}-E_t\right)-\alpha\left[E_{t+1}-E_t\right]\frac{\bar{\phi}}{E_t}w_t,
\end{aligned}$$

$$\pi^{inc}\left(E_{t+1}\right)+S_{jt}+\beta v_1\left(E_{t+1}\right)\geq v_{k+1}\left(E_t\right) \text{ for all } j\in\{2...qN\} \qquad ((IC))$$

where S_{jt} is a transfer to a member of the minimum winning coalition, v_{k+1} is the continuation value of a member of the elite, if the bargaining procedure reaches round $k+1$ for $k=1...K-1$ and $\Delta>1$ defines an upper bound on the number of new members.

The incentive compatibility constraint (IC) and the default decision not to admit any new members in the last period K, allow us to reduce this maximization problem to

$$\max_{E_{t+1}}\left[1+\frac{\alpha}{q}\frac{E_{t+1}-E_t}{E_t}\right]\pi^{inc}\left(E_{t+1}\right)-\frac{\alpha}{q}\frac{\left[E_{t+1}-E_t\right]}{E_t}\frac{\bar{\phi}}{E_t}w_t+\beta v_1\left(E_{t+1}\right), \qquad (8.1)$$

hence, the proposer is going to choose E_{t+1} so as to maximize the present value of the joint utility of the winning coalition. To see that this is indeed part of the equilibrium strategy, consider a subgame-perfect equilibrium in which a share of q legislators would agree to vote for a proposal with a different value of E_{t+1}, say

$$\hat{E}_{t+1}\neq\max_{E_{t+1}}\left[1+\frac{\alpha}{q}\frac{E_{t+1}-E_t}{E_t}\right]\pi^{inc}\left(E_{t+1}\right)-\frac{\alpha}{q}\frac{\left[E_{t+1}-E_t\right]}{E_t}\frac{\bar{\phi}}{E_t}w_t+\beta v_1\left(E_{t+1}\right).$$

In that case, the proposer could unilaterally increase the utility of those he represents as well as the utility of all his proponents by choosing an optimal E_{t+1} and adjusting the transfers accordingly.

The winning coalition will vote in favor of the optimal project and, therefore, $\hat{E}_{t+1}$ will not be proposed in equilibrium.

Now consider the strategies of the voters. The transfers to those voters who do not make the proposal must satisfy two conditions. First, the members of the winning coalition must be better off than under the status-quo (else they would prefer not to support any of the legislators). Second, their utility from accepting the proposal must be at least as high as their discounted continuation value from rejecting the proposal and going to the next round. Let S_L denote the transfer to the proposing legislator and let S stand for the transfers to the ordinary members of the winning coalition. Then, the continuation value of a legislator if a proposal is rejected in a given round k, but an identical proposal is accepted in the next round $(k+1)$ is given by:

$$v_{k+1}(E_t) = \frac{1}{N} S_L + \frac{(qN-1)}{N} S + \pi^{inc}(E_{t+1}) + \beta v_1(E_{t+1}).$$

Here, the expected value of transfers is determined taking into account that with probability $\frac{1}{N}$ the legislator will make a proposal himself and with probability $\frac{qN-1}{N}$, the legislator will not make the proposal, but will be part of the winning coalition.

In the case that the proposal is accepted in round k, the continuation value of a (non-proposing) legislator from the winning coalition is given by:

$$S + \pi^{inc}(E_{t+1}) + \beta v_1(E_{t+1})$$

Hence, the proposing legislator will set transfers in such a way that

$$v_{k+1}(E_t) = S + \pi^{inc}(E_{t+1}) + \beta v_1(E_{t+1}),$$

or

$$\frac{1}{N} S_L + \frac{(qN-1)}{N} S = S.$$

Together with the constraint

$$S(qN-1) + S_L = \frac{\alpha}{q} \frac{E_{t+1} - E_t}{E_t} \pi^{inc}(E_{t+1}) - \frac{\alpha}{q} \frac{[E_{t+1} - E_t]}{E_t} \frac{\bar{\phi}}{E_t} w_t,$$

this leads to

$$S = \frac{S_L}{N - qN + 1}$$

and

$$\begin{aligned} S_L &= \frac{\left[\frac{\alpha}{q}\frac{E_{t+1}-E_t}{E_t}\pi^{inc}\left(E_{t+1}\right) - \frac{\alpha}{q}\frac{\left[E_{t+1}-E_t\right]}{E_t}\frac{\bar{\phi}}{E_t}w_t\right]}{N}\left(N - qN + 1\right) \\ S &= \frac{\left[\frac{\alpha}{q}\frac{E_{t+1}-E_t}{E_t}\pi^{inc}\left(E_{t+1}\right) - \frac{\alpha}{q}\frac{\left[E_{t+1}-E_t\right]}{E_t}\frac{\bar{\phi}}{E_t}w_t\right]}{N}. \end{aligned}$$

Last, we have to guarantee that these transfers are sufficient to compensate the members of the winning coalition for the decline in profits caused by admitting new members. This is obtained by setting the transfers S_{jt} to:

$$\max\left\{S; -\left[\pi^{inc}\left(E_{t+1}\right) - \pi^{inc}\left(E_t\right) + \beta\left[v_1\left(E_{t+1}\right) - v_1\left(E_t\right)\right]\right]\right\}$$

for all $j \in \Omega \backslash \{i\}$.

Given S_{jt}, all members of the winning coalition are indifferent between voting in favor and voting against the proposal. In a subgame in which a strictly better proposal is made, every member of the winning coalition has incentives to vote in favor of this proposal, given that everyone else votes in favor of it. If the proposer suggests an admission rate and a transfer scheme which is worse than the equilibrium one, the optimal behavior of any voter is to vote against the proposal (given that everyone else follows this strategy). Finally, members outside of the winning coalition are indifferent between voting in favor and voting against a proposal for any proposal and in any round.

Finally note that since we consider subgame-perfect equilibria in contrast to coalitional proof equilibria, the existence of an equilibrium does not depend on the value of q exceeding $\frac{1}{2}$.■

Proof of Proposition 2

We postulate $\frac{E_{t+1}}{E_t} = e^*$ for all $t = 1, 2 ... \infty$ and conjecture

$$v_1(E) = c_0 E^{-\frac{1}{\lambda}}$$

for some constant c_0. First note that the expected utility of a proposing legislator:

$$\frac{\lambda-1}{\lambda}\left(1+\frac{\alpha}{q}\left(\frac{E_{t+1}-E_t}{E_t}\right)\right)\left(\frac{1-\phi\left[E_{t+1}-E_t\right]}{E_{t+1}}\right)^{\frac{1}{\lambda}}-\frac{1}{\lambda}\frac{\phi}{E_t}\frac{\alpha}{q}\frac{\left(E_{t+1}-E_t\right)}{E_t}\left(\frac{1-\phi\left[E_{t+1}-E_t\right]}{E_{t+1}}\right)^{\frac{1}{\lambda}-1}$$
$$+\beta v_1\left(E_{t+1}\right)$$

can be written in our notation as:

$$\frac{1}{\lambda}E_t^{-\frac{1}{\lambda}}\left(\left[(\lambda-1)\left(1+\frac{\alpha}{q}(e-1)\right)\left(\frac{1+\phi}{e}-\phi\right)-\phi\frac{\alpha}{q}(e-1)\right]\left(\frac{1+\phi}{e}-\phi\right)^{\frac{1}{\lambda}-1}+\beta\lambda c_0 e^{-\frac{1}{\lambda}}\right).$$

The first-order condition for the maximization problem 4.2 is given by:

$$(\lambda-1)\frac{\alpha}{q}\left(\frac{1+\phi}{e}-\phi\right)^{\frac{1}{\lambda}}-\frac{(\lambda-1)}{\lambda}\left(1+\frac{\alpha}{q}(e-1)\right)\left(\frac{1+\phi}{e}-\phi\right)^{\frac{1}{\lambda}-1}\left(\frac{1+\phi}{e^2}\right)-$$
$$-\phi\frac{\alpha}{q}\left(\frac{1+\phi}{e}-\phi\right)^{\frac{1}{\lambda}-1}+\frac{1-\lambda}{\lambda}\phi\frac{\alpha}{q}(e-1)\left(\frac{1+\phi}{e}-\phi\right)^{\frac{1}{\lambda}-2}\left(\frac{1+\phi}{e^2}\right)+\beta\lambda c_0 e^{-\frac{1}{\lambda}-1}$$
$$= 0. \tag{8.2}$$

$$\left(\frac{1+\phi}{e}-\phi\right)^{\frac{1}{\lambda}-1}\left[(\lambda-1)\frac{\alpha}{q}\left(\frac{1+\phi}{e}-\phi\right)-\frac{(\lambda-1)}{\lambda}\left(1+\frac{\alpha}{q}(e-1)\right)\left(\frac{1+\phi}{e^2}\right)\right]+$$
$$+\left(\frac{1+\phi}{e}-\phi\right)^{\frac{1}{\lambda}-2}\left[\phi^2\frac{\alpha}{q}-\phi\frac{\alpha}{q}\left(\frac{1+\phi}{e^2}\right)\right]+\beta\lambda c_0 e^{-\frac{1}{\lambda}-1}$$
$$= 0.$$

$$\left(\frac{1+\phi}{e}-\phi\right)^{\frac{1}{\lambda}-2}\left[(\lambda-1)\left(1-\frac{\alpha}{q}\right)\left(\frac{1+\phi}{e^2}\right)\left(\frac{1+\phi}{e}-\phi\right)+\phi^2\frac{\alpha}{q}-\phi\frac{\alpha}{q}\left(\frac{1+\phi}{e^2}\right)\right]+\beta\lambda c_0 e^{-\frac{1}{\lambda}-1}$$
$$= 0.$$

It is easy to show that this reduces to:

$$\left(\frac{1+\phi}{e^*}-\phi\right)^{\frac{1}{\lambda}-1}\frac{\alpha}{q}\left[\left(\frac{1+\phi}{e^*}\right)-\frac{\lambda\phi}{\lambda-1}\right]-$$
$$-\left(\frac{1+\phi}{e^{*2}}\right)\left(\frac{1+\phi}{e^*}-\phi\right)^{\frac{1}{\lambda}-2}\frac{1}{\lambda}\left[\left[1+\frac{\alpha}{q}(e^*-1)\right]\left(\frac{1+\phi}{e^*}-\phi\right)-\phi\frac{\alpha}{q}(e^*-1)\right]-$$
$$-\frac{1}{\lambda}\beta c_0 e^{*-\frac{1-\lambda}{\lambda}} = 0.$$

We can now substitute into the equation for $v_1(E)$ to find c_0:

$$c_0 E_{t+1}^{-\frac{1}{\lambda}} = \frac{1}{\lambda} E_{t+1}^{-\frac{1}{\lambda}} \left(\frac{1+\phi}{e} - \phi\right)^{\frac{1}{\lambda}-1} \left[(\lambda-1)(1+\alpha(e-1))\left(\frac{1+\phi}{e} - \phi\right) - \phi\alpha(e-1)\right] + \beta c_0 E_{t+2}^{-\frac{1}{\lambda}}.$$

Hence,

$$c_0 = \frac{\frac{1}{\lambda}\left(\frac{1+\phi}{e} - \phi\right)^{\frac{1}{\lambda}-1} \left[(\lambda-1)(1+\alpha(e-1))\left(\frac{1+\phi}{e} - \phi\right) - \phi\alpha(e-1)\right]}{1-\beta e^{*\frac{-1}{\lambda}}}.$$

Plugging this into the first-order condition 8.2 gives:

$$\frac{\alpha}{q} e^* = \frac{1}{\lambda}\left[1 + \frac{\alpha}{q}(e^*-1)\right] + \frac{1}{\lambda}\beta \frac{1+\alpha(e^*-1)}{1-\beta e^{*\frac{-1}{\lambda}}},$$

which reduces to

$$\frac{\alpha}{q}\left[(\lambda-1)e^* - \lambda\right] = \beta\frac{(1+\alpha(e^*-1))}{1-\beta e^{*-\frac{1}{\lambda}}} - 1. \tag{8.3}$$

Equation 8.3 implicitly defines the interior solution, if one exists. If the optimal e^* lies outside the interval $[1;\Delta]$, a corner solution with either $e^* = 1$ or $e^* = \Delta$ will obtain. In any case, however, the value function will have the form specified above.

Finally, in order to conclude the proof of our claim we should guarantee that it is unique. To see how this is done see theorem 4.6 in Stokey and Lucas (1989, p. 79). Of course, of an issue for us is whether the first-order condition of the proposing agent picks up the maximum or the minimum. The first-order condition defines a maximum only if the second derivative of the goal-function in 4.2 is negative. To derive sufficient conditions under which this would be true, consider the case of $\phi = 0$. Then, the first derivative of the utility function of a proposing legislator becomes:

$$\frac{d\left(-\frac{1}{\lambda}\left[1+\frac{\alpha}{q}\left(\frac{E_{t+1}}{E_t}-1\right)\right]E_{t+1}^{-1-\frac{1}{\lambda}} + \frac{\alpha}{q}E_{t+1}^{-1-\frac{1}{\lambda}}\right)}{dE_{t+1}} < 0.$$

Under our notation, this condition reduces to

$$-\frac{e^{-\frac{1}{\lambda}-2}}{\lambda}\left[\frac{\lambda-1}{\lambda}\frac{\alpha}{q}e - \frac{1+\lambda}{\lambda}\left(1-\frac{\alpha}{q}\right)\right] < 0,$$

or, equivalently

$$\left[\frac{\lambda-1}{\lambda}\frac{\alpha}{q}e - \frac{1+\lambda}{\lambda}\left(1-\frac{\alpha}{q}\right)\right] > 0.$$

This function is increasing in e and since $e \geq 1$ per definition, it is enough to impose

$$\left[\frac{\lambda-1}{\lambda}\frac{\alpha}{q} - \frac{1+\lambda}{\lambda}\left(1-\frac{\alpha}{q}\right)\right] > 0.$$

We conclude that a sufficient condition for an interior optimum for $\phi = 0$ is given by:

$$q < \frac{2\alpha\lambda}{1+\lambda}.$$

Since we will be interested in values of q close to 1, we want to preserve the whole range $q \in [0;1]$. Hence, we impose the condition

$$(2\alpha - 1)\,\lambda > 1,$$

which guarantees that

$$\frac{2\alpha\lambda}{1+\lambda} > 1,$$

and hence, the restriction for q does not bind. Since, the utility function of a proposing legislator in continuous in ϕ, it follows that there exists a surrounding of 0, $\left[0;\hat{\phi}\right)$ on which the function is concave.■

Proof of Proposition 3

Let first $\phi = 0$. From 4.2, we find that the sign of the derivative $\frac{de^*}{dq}$ is identical to the sign of the derivative

$$\frac{\partial\left[\frac{((\lambda-1)e^*-\lambda)\left(1-\beta e^{*-\frac{1}{\lambda}}\right)}{\beta(1+\alpha(e^*-1))-1+\beta e^{*-\frac{1}{\lambda}}}\right]}{\partial e^*},$$

or, equivalently to the sign of:

$$\alpha\beta\left(1-\beta e^{*-\frac{1}{\lambda}}\right) - (\lambda-1)\left(1-\beta e^{*-\frac{1}{\lambda}}\right)^2 + \beta^2 e^{*-\frac{1}{\lambda}}\left(\lambda - \frac{1}{\lambda} - \frac{1}{e^*}\right)$$
$$+\frac{\alpha(e-1)\,\beta^2 e^{*-\frac{1}{\lambda}-1}\left((\lambda-1)\,e^* - \lambda\right)}{\lambda}.$$

The last expression is a quadratic function of β and assumes the value

$$-(\lambda-1) < 0$$

for $\beta = 0$. Hence, there exists an interval $\left[0; \hat{\beta}\right)$ for some $\hat{\beta} \in (0; 1]$ for which the expression is negative. Now note that the expression for the equilibrium value of e^* is continuous in ϕ. Hence, there exists a surrounding $\left[0; \hat{\phi}\right)$, for which the derivative is negative, as well.■

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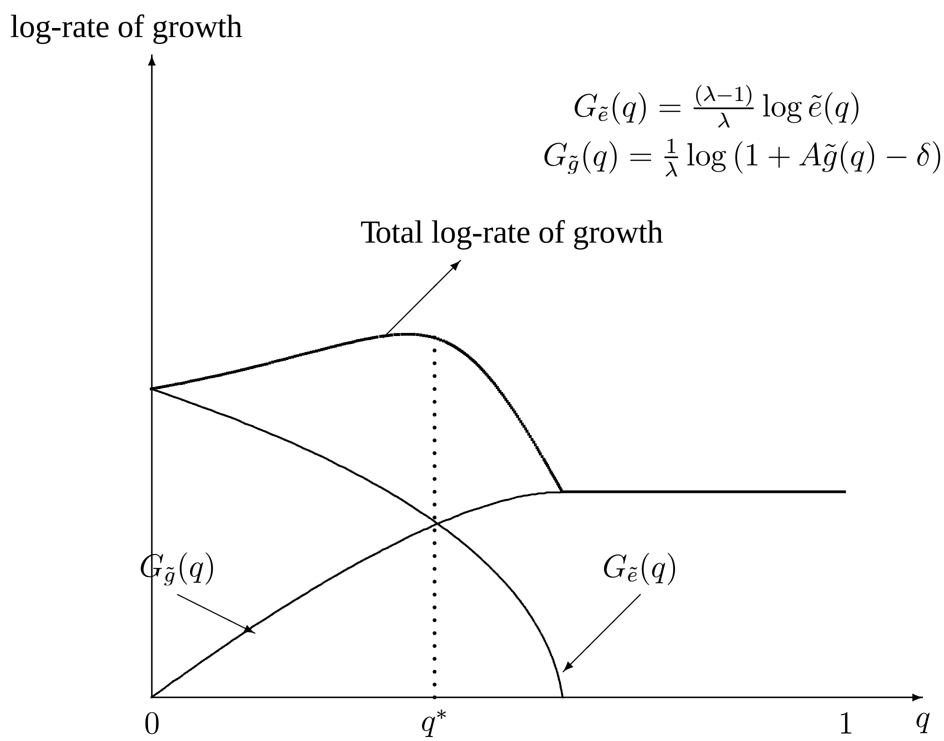

log-rate of growth
$G_{\tilde{e}}(q) = \frac{(\lambda-1)}{\lambda} \log \tilde{e}(q)$
$G_{\tilde{g}}(q) = \frac{1}{\lambda} \log (1 + A\tilde{g}(q) - \delta)$
Total log-rate of growth
$G_{\tilde{g}}(q)$
$G_{\tilde{e}}(q)$
0
q^*
1
q

Figure 1

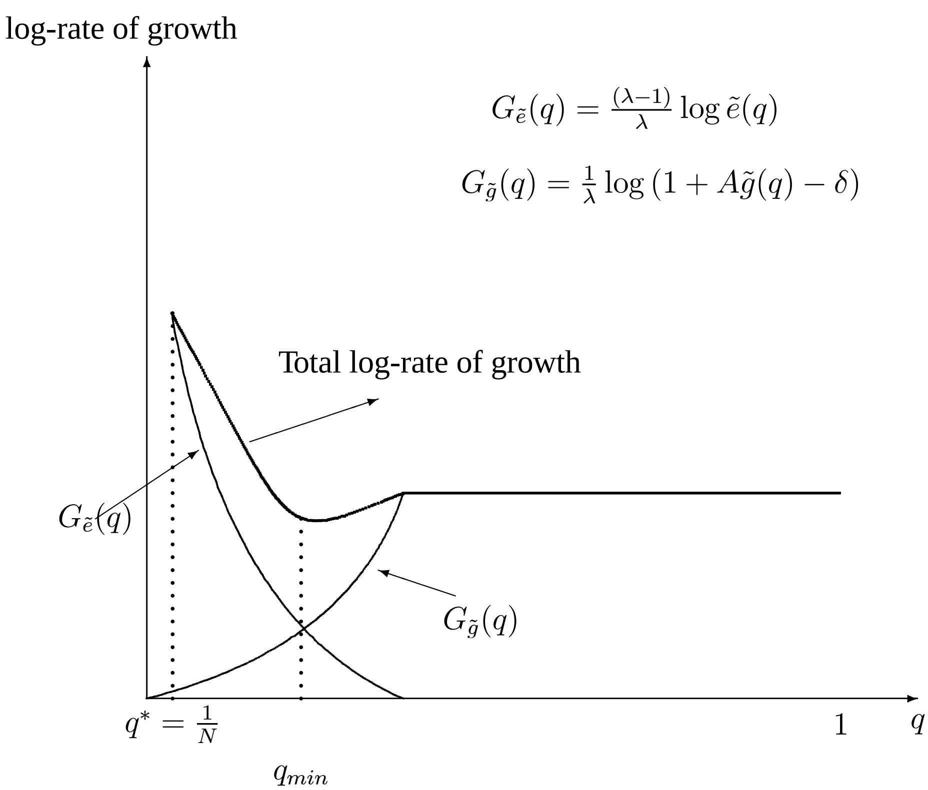
log-rate of growth
$G_{\tilde{e}}(q) = \frac{(\lambda-1)}{\lambda} \log \tilde{e}(q)$
$G_{\tilde{g}}(q) = \frac{1}{\lambda} \log(1 + A\tilde{g}(q) - \delta)$
Total log-rate of growth
$G_{\tilde{e}}(q)$
$G_{\tilde{g}}(q)$
$q^* = \frac{1}{N}$
1
q
q_{min}

Figure 2