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The Role of Institutional Environment in Economic Performance

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Introduction

In recent years economists have been greatly attracted by institutional environment and its influence on the economy. Today it is widely accepted that institutions are of great relevance in any society. Institutional environment is blamed for the failures and is lauded for the success of economic development. There is a growing opinion among economic researchers that the building-up of institutions can be considered as an essential instrument for successful economic performance.

The upsurge of the institutions role in economic literature is also due to the failure of former planned socialist economies and their transition to market ones. There are still many countries that do not succeed in the transition process. These countries suffer from the low quality of government and market failures that quite often are the consequences of the weak institutional environment. One of the new tools for the faster recovery and development, recently proposed by economic research, is the building-up of strong economic institutions, such as clear legislation, defined property rights, stable banking system, insurance and many others. Economists argue that the role of institutions, underestimated in the beginning of the transition period, should be reevaluated.

The study of the effects of the institutional environment on the economy is a relatively new field of research. There has been some empirical work on the role of institutions, but the theoretical research does not seem to be very wide. This work makes an attempt to formally describe the impact of institutions on the economic outcomes.

The dissertation takes as theoretical basis the papers of Shleifer and Vishny (1994), Acemoglu and Verdier (2000) and Esfahani (2000). This approach permits us to provide an analysis of the institutional environment's influence on the economic performance in the context of low quality of government and market failures correction in economies that suffer instability, such as transition economies. It is formally demonstrated that economic performance indeed depends on the strength or weakness of the institutional environment. As the analysis shows the impact of institutions on economic performance may be ambiguous. In fact, in a weak institutional environment such mechanisms like rent-seeking may contribute positively to the better allocation of resources.

The thesis is organized as follows. The first chapter offers the analytical literature review, where the most important issues on institutional environment, transition economies and quality of government are described, referring to the respective literature. Chapters 2, 3 and 4 review the articles of the above authors providing some critique on their methods and results. A personal contribution is given in chapters 5 and 6, where the models are integrated into two models with some extensions and elaborate analysis provided. The conclusion summarizes the results of the dissertation and offers suggestions for future research.

Chapter 1. Analytical Literature Review

1.1. Introduction

The present work focuses on the analysis of institutional environment's influence on the efficiency of resources allocation in the production sector, given market failures and low quality of government in transition economies. Therefore, the issues of particular interest for this research are the institutions, transition process, role of government, market failures and their interaction. In this chapter these issues are going to be analyzed referring to the recent literature related to this field.

1.2. Institutional environment

1.2.1. Concept of institutions

Recently there has been much work on a new field of economic research: institutional environment. Institutions and their influence on economic development is nowadays the subject of deep studies. Numerous economic concepts, notions and facts are seen now from different points of view thanks to the influence of institutions.

During the last century, the theory of institutions and their role in economics attracted the attention of many economists. David North is the author of the recent theoretical research on concept of institutions. His works gave the beginning to the wide range of papers dedicated to institutions and their role in economic development.

It is fair to say that "institutions" is a very vast concept that is understood and defined in numerous ways. There are many definitions of institutions: "institutions are the rules, enforcement characteristics of rules, and norms of behaviour that structure repeated human interaction" (North, 1989) or "institutions are stable and constantly reproducing social, legal, economic and other relations that structure the social life" (Kirdina, 2000). "Institutions are the rules that perform people relations" (Institute of Transition Economies, 2000). From these definitions it is easy to see that institutions make part of every component of social activity and therefore have a direct influence on economics.

Many economists underline the importance of institutions. The similar expressions are often seen in economic literature: "Institutions matter" North (1989), "Efficient markets are a consequence of institutions that provide the low-cost measurement and enforcement of contracts at a moment of time" North (1997), "Quality of market economy in any country is a reflection of the quality of its institutions" Ofer (2003), "Institutions are the fundamental cause of differences in economic development" Acemoglu and Robinson (1994), "Institutions define the environment where the market works" Stiglitz (1998) and many others. Empirical studies indeed find the evidence of close relationship between institutions and economic performance (Acemoglu et al., 2001, Easterly and Levine, 1997, Wu and Davis, 1999).

Institutions represent a very large concept that includes a wide range of components. North (1997) classifies the institutions into three categories:

1. Formal rules: political, judicial, economic rules and contracts;
2. Informal constraints: extensions, elaborations and qualifications of rules that solve exchange problems not covered by formal rules (e.g. traditions, customs, routines etc);

3. Self imposed codes of conduct.

The aggregate of different institutions comprises the "institutional set" that is considered as an "altogether of norms, rules, organizations and infrastructure appeared historically as unified complexes with common ideological base" (Institute of Transition Economies, 2000). Every society has its own set of institutions (Acemoglu, 1994) that makes it unique among all other societies. The variety of institutional sets in a society composes in its turn the "institutional environment". Institutional environment is unique for a society and has the same importance for its development as political or economical environment.

For the present work, institutions related to the economy represent a major interest. "Economic institutions represent exogenous, respect to economics, set of rules that have a limiting function in order to create a mutual benefit exchange in economic activity, i.e. best choice given the constraints" (Kirdina, 2000). Economic institutions are categorized in multiple ways; here is one of them (Tarushkin, 2004):

- institutions produced by private bodies with formal roles promoted by the state: regulation of stock markets, arbitration courts, accounting standards etc;
- institutions produced by political bodies: legislatures, electoral process, political power etc;
- institutions of state administrative bodies: product safety, health standards, patent registration etc;
- institutions of quasi-government bodies: central bank, public financial institutions, licensing etc;
- institutions of legal system: contract law of transactions, corporate governance etc.

Economic institutions make part of a complex institutional environment that includes a great number of other institutions from different fields of social activity, such as sociological, ideological, political, legal and other institutions.

1.2.2. Development of institutions

Institutions are dynamic: they are born, develop, change and disappear together with the transformations of a society. The change in institutions today alternates the long run path of institutional change (North, 1997). Some of the institutions, like formal institutions (law, economic rules, political and market infrastructure etc.) are relatively easy to impose or to alternate; but others, like informal institutions (moral code, rules, formal rules, behaviour, beliefs etc.) change very slowly and are hardly influenced by external forces. (North (1997), Acemoglu (1994), Djankov et al (2003)).

The change of institutions can be spontaneous or can be imposed by society. As Acemoglu (1994) argues, the institutional environment greatly depends on the history of the country. To colonies of England, France and others were imposed special sets of institutions that depended on the intentions of colonialists: countries where the colonialists intended to settle down received a set of strong institutions, while countries where they just intended to extract the resources were granted with weak institutions to allow easier extraction of rents. Djankov et al (2003) find an interesting historical confirmation of how the imported or forced institutions alternate the future development of the society.

Nowadays, institutions are imported from one country to another (Mao et al, 2003). Developing countries with the set of weak institutions try to transform them in such a way to speed up their development. These

countries make the attempt to "copy" the institutions of developed countries; for example, countries in transition try to build up the set of institutions of the countries with a market economy. But as Mao et al (2003) and Djankov et al (2003) argue, not all of the institutions can be successfully imported. Some of the institutions that work perfectly in a given environment may be not efficient in another society. This can happen in the first place because of informal institutions that may offer resistance since they are extremely difficult to alternate.

1.2.3. Theoretical and empirical research on the importance of institutions

There has been recently much empirical work on the role of institutions on economic performance. Sizable research is dedicated to the study of institutional impact on economic growth. Mauro (1995), Havrylyshyn and Van Rooden (2000), Raiser et al. (2001), Campos (2000), Rodrik et al. (2004) illustrate that strong institutions indeed represent a necessary component that contributes positively to growth. Great attention is concentrated also on the role of institutions in the efficiency of government intervention in transition economies. Ofer (2003), La Porta (1999) argue that countries with weak institutions demonstrate great, but inefficient government intervention into the economy. Corruption is another factor frequently analyzed for the importance of institutions. Mauro (1995), Acemoglu and Johnson (2004) find the evidence that corruption is strongly related to institutional efficiency.

Numerous papers test the influence of some types of institutions on economic performance. The importance of property rights (Acemoglu and Johnson, 1993), legal origins (Beck, Demirgüç-Kunt and Levine (2003)),

cultural aspects (Glaeser et al. (2000)), policy change and political instability (Damania (2004)), and many others are evaluated in this context.

It is important to underline that given the vast nature of institutions and their behaviour, the estimation of institutions is highly subjective and changes greatly from author to author. The variables that reflect institutional environment are often difficult to introduce into the model; no precise data but experts' evaluations and ratings are frequently used in the regressions. The empirical analysis usually suffers from correlation between independent variables that reflect institutions and often fails to be robust.

Even though the empirical studies find the evidence of the importance of institutions for the economic development, these studies are often concentrated on selected issues and do not explore in a broad manner the impact of institutional environment on the economy.

The theoretical research dedicated to institutions appears to be more concise compared to the empirical work. Similar to empirical, the theoretical approach frequently shows the influence of institutions on economic performance using a particular institution or a set of them. Difficulties of measurement and ambiguities in the definition of institutions are probably responsible for this outcome. Analyzing the theoretical literature on institutions one realizes that it is extremely difficult sometimes to draw a line that divides some institutional aspects from others. For example, not all of the theoretical models on rent-seeking or corruption reflect the institutional framework. Consider bribing at a firm level respect to bribing at the state level; the former could indicate personal opportunistic behaviour and could have nothing to do with institutions, while the latter would probably indicate the weakness of state institutions. The same discussion is

valid for other aspects that in certain circumstances can be or can be not related to institutional environment.

Among the theoretical models that reflect the influence of institutional environment on economic performance public institutions are more frequently used. Saha (2001), Guriev (2004), Lambsdorff (2002) offer a bribing game that shows the relationship between the low quality of public sector and the welfare. Vantelou (2002) studies the effects of top-level corruption on multiple equilibria in micro-macroeconomic framework. Hausken (2005) formalizes the influence of rent-seeking on the forms of economic organization. Links between corruption, political instability and institutional reform defined as policy are provided in sequential game presented by Damania (2004). Shleifer and Vishny (1994) model studies the influence of corruption on the efficiency of the transition process. Pezzeya and Anderies (2003) use a model of population to analyze the impact of state policies such as taxes and quotas.

Another type of institution, studied for the effects on the economic performances is given by the legal base often seen as protection of property rights. Gradstein (2004) represents a growth framework model that reflects the importance of property rights protection. Acemoglu and Johnson (1993) shows the importance of property rights protection using a micro-founded analysis.

Theoretical models decisively contribute to the understanding of institutional influence on the economic outcomes. However, they offer only a partial analysis and do not provide a systematic research on the role of broader institutional environment. An exception is the Esfahani (2000) model of organizational choice that introduces institutional environment as a simple parameter. The author builds up a model to show how the strength

and the weakness of institutions influence the efficiency of production in state and private enterprises. The analysis is provided by using the particular coefficients of economic institutions that are very easy to use but not commonly used in economic literature. Similar examples of these coefficients we find in the estimations of Cukierman, Edwards and Tabellini (1992) that show the influence of institutions on government behaviuor.

As a result, recent researches confirm that institutional environment plays an important role in society. Efficiency of reforms, economic outcomes, relationship between economic agents and the government quality depend on the degree of weakness or strength of institutions. Obviously, their role would have a great importance in transition economies due to their complex and unstable character.

1.3. Transition Economies

To analyze the role of the institutional environment in transition economies, we shall go through the principal characteristics of the transition.

Transition economies are characterized by drastic changes in social, political and economical aspects of society that make them differ from those economies that develop in an ordinary way. The period of transition is a particular form of economic evolution on the way to relevant changes that modify all the principal components of the State. In the majority of cases this process takes a long time and implies liquidating the old norms and rules and creating the new ones. First of all, the changes require time for the reformers that should evaluate the short and long strategies of transitions, create new rules and rights and percolate them in to practice. As a reply for

similar changes, a society needs time to turn to the new direction, modifying behaviours and attitudes, acquiring new knowledge.

Thus, transition period is a long and complex process with constitutional uncertainty where many old norms of common law become abolished or not respected, while the new norms are still not valid or not fully accepted by the society. The transition period for different countries is always unique, since it is influenced by the peculiarities of the society, different initial conditions such as history, social order and economic environment.
Different types of transition can be described in accordance with their scale and character of changes (Institute of Transition Economy, 1998):

- Natural process of historical evolution at the local (countries or regions) and global (world economy) levels;
- Transition that implies carrying out the reforms that influence constantly, but smoothly society's development, thus it is a process of natural evolution effected by gradual changes;
- Changes that have a revolutionary character, disintegrating the preceding system and forcing new rules on to the society. Transition of this type does not tolerate the influence of the forgone regime that makes paying high economic and social price for all the agents involved in the process.

For our purposes it is only the last two type of transition that are relevant. The types of transition, verified in East European countries after the collapse of the USSR, have represented a subject of great interest and thorniest discussions for economists during the last fifteen years. Two ways of thinking on how transition should be carried out sustained different strategies to switch to market economy. The first one was referred to the second type of transition noted above. This type implies the policy of slow

changes with low inflation, subsidies to the enterprises, and government ownership. While the other proposal was the policy of "shock therapy" with three steps of drastic changes: large scale privatization, price liberalization and stabilization. A large number of East European countries have chosen the second way but that did not bring the expected results.

The revolutionary type of transition is characterized, first of all, by the weakening of State power. The reason for this could be a transformation of social structure in such a way that the State becomes unable to form the groups for its support. Drastic changes influence the social structure that becomes more complex and classified in new classes, giving light to new social processes. For a certain period of time the State searches for satisfying diversified and contradict interests which often cannot be formed with other but a revolutionary form of transition.

A research of Transition Economy Institute (1998) verifies the main reasons for the State's weakness during transition period of revolutionary type:

- Financial crisis given by the loss of control over new economic sectors that does not contribute to the increase of State's budget;
- Alterability of the reform process, uncertainty in the finality of the reforms;
- The absence of political institutions and the influence of spontaneous groups and organizations that accomplish political functions;
- Emergence of groups of interest that obtain political and economical power;
- The absence of "rules of the game": government's decisions are not supported by formal norms and procedures.

The weakness of government aggravates the *disorganization* process, another characteristic of transition economies: the prices go out of control,

legislation becomes unclear, political instability and uncertainty are at their maximum level (Blanchard, 1997). During the transition the links between the economic agents are broken, destroying the economic relationships between enterprises, sectors and states. Disorder arises and it takes a long time to stabilize new relations between economic agents. This stage is the most difficult period in transition: production falls drastically, unemployment increases rapidly, crime increases its forces, social norms and rules transform, welfare state becomes weaker. At this stage of transition the State cannot support its enterprises, the value of subsidies diminishes and the epoch of soft budget constraints begins. Elianov (1996) writes: "The absence of the State's control over economic sectors brought to disequilibria between production, supply and procurement; the buyers and the sellers were not able to find optimal solution in conditions of uncertainty. The worse situation occurred with State enterprises that relied upon the help of the State and soft budgets".

The lack of financing, uncertainty of central planning, price liberalization and disorganization makes it that the production allocates at the initial stage of decreasing fraction of the U curve of production. The U curve individualized by economists (Blanchard, 1997) describes the tendency of production during transition: at the beginning of transition there is a drastic production fall that transforms slowly in to the growth only in the case that the crisis is overcome.

In the later stage of the production fall *restructuring* takes place: the structure of enterprises changes, the lines of production are transformed for new and competitive output, the number of employed agents is reduced. Restructuring is verified in all transition economies of revolution type, but its time and size differ from country to country. "For the process of restructuring the decisive importance have the reforms that precede

transition, entrepreneurs' spirit and belief in the positive outcome of changes. For this reasoning the restructuring gave different results in East European and Baltic countries" writes Aukzionek (1996). While Blanchard (1997) underlines that restructuring depends on the degree of unemployment: "higher is the level of unemployment, stronger is the opposition to restructure" notes the author.

Another factor, crucial for the restructuring process is *privatization*. In fact, the outside private ownership was considered as a tool for the restructuring promotion in post-communist countries, since it should be the more effective tool for making labour and production choices. However, many transition countries hold a mass insider privatization that did not give the expected effect on restructuring. Private property introduced in such a way expanded in spontaneous manner, without the legislative and political backgrounds, enriched those who had informational and political advantage and gave birth to crime structures, corruption and oligarchy.

However, privatization did not prove to be a successful tool for faster recovering, it contributed to the appearance of small business, a necessary part of market economies. The production switched to the private sector that brought it on the increasing fraction of the U curve, decreasing unemployment and facilitating the restructuring process. Thus, thanks to privatization *reallocation* became possible. This phenomena stands to indicate the switch of business and production sectors from old activities to new competitive ones. At this stage the broken links between the agents were being built up, enterprises reorganized their production process trying to find their niches of the market. The reallocation may be considered as the first step to economical recover.

Restructuring, reallocation and unemployment are the factors that proved to be linked to each other. Blanchard (1997) writes: "higher is the initial unemployment, more the growth of the private sector is obstructed, the reform proceeds slowly creating opposition to restructuring." This linkage explains the various outcomes of transition in different societies: initial conditions such as the impact of crises that defines the level of employment, production and the appearance of private sector that gives the beginning to the restructuring differ from country to country.

Almost fifteen years have passed since the beginning of the transition. Some countries have managed very well in building the market economy (e.g. Baltic countries, Hungary, Poland) but a lot of countries are still in a discouraging situation (Armenia, Georgia, Turkmenistan), the latter countries are characterized by illegal markets, unclear legislation and property rights, bureaucracy barriers, mafia-like groups, high class divergence and other unpleasant factors. Many economists see the reasons of the failure of the latter countries in the weakness of their institutional environment.

1.4. Transition process and institutions

1.4.1. Transition and institutional change

The interest to institutions and their development revived with the beginning of the transition to the market economy. Today it is widely accepted that institutional environment is of great relevance for economic development of any society, especially for those in transition. The build up of strong economic institutions, such as clear legislation, political stability, precisely defined property rights, stable banking systems, insurance and many others

is considered to be one of the effective tools to achieve economic development policy objectives.

Since institutions are "the rules of the game in a society… that shape human interaction" North (1997), they are flexible and reflect any transformation in society. Evidently, transition period implies the transformation of institutions: some of the institutions of a planned economy disappear, some convert, others arise. Transition process can be inherent to the institutions' transformations as well. Figure 1.1. shows the interaction between the transition and institutional change.

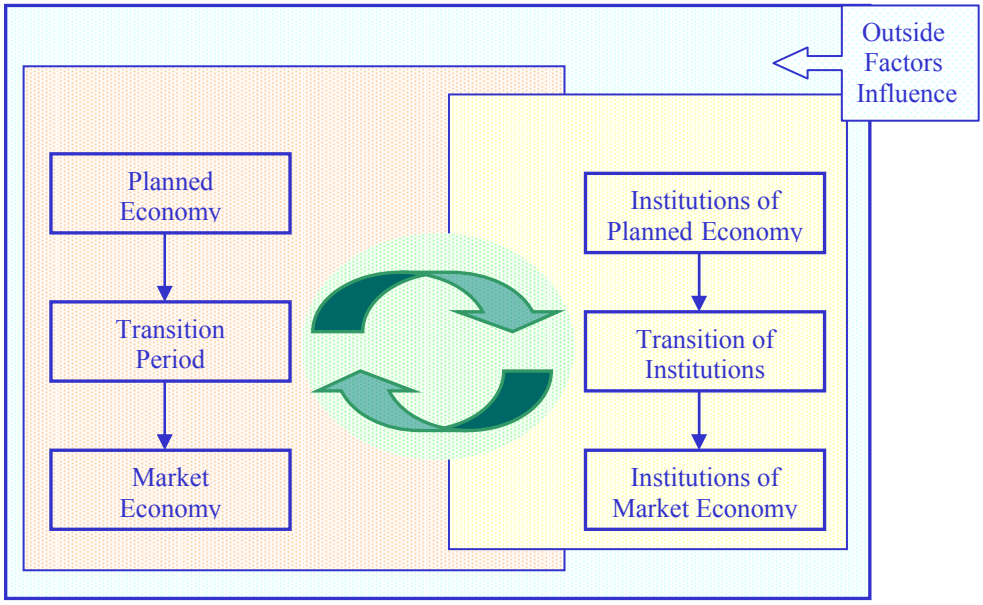


Figure 1.1. Transition process and Institutions interaction

Obviously, institutions of market economy differ from those of planned economy. Thus, the switch to the market implies their modification. Institutions change during the transition, influencing the transition process and, in its turn, it is influenced by these changes. They are also influenced

by external changes such as tendencies of world economy, globalization and other factors.

Kirdina (2000) develops North's idea on peculiarity of institutions in transition and argues that each country can be described by its own institutional matrix that contains economic, political, ideological and other institutions. She summarizes the process of transition in the "matrix" of institutions (Figure 1.2). As underlined, the creation of this complex institutional matrix took centuries of development. It is evident that the institutions of market economy can not appear immediately: they should be adopted, developed or imported (Mao et al, 2003).

Institutional matrix of planed economy		Institutional matrix of market economy
Economic Institutions		
Public ownership		Private ownership
Redistribution		Exchange
Coordination		Competition
Labour distribution (service labour)	⇨	Wage labour
Proportionality		Profit
Political Institutions		
Administrative division of state		Federation
Hierarchy of government		Self government
Nomination		Elections
Appeals to upper levels of hierarchy	⇨	Court appeals
Unanimity		Multi-party system and democracy
Administrative division of state		Federation
Ideological Institutions		
Collectivism		Individualism
Egolitarism	⇨	Stratification
Order		Liberty

Figure 1. 2. Institutional matrix in transition economies (Kirdina, 2002)

In the beginning of transition the transformation of public property to private, stabilization and liberalization of prices were considered the tools that would automatically lead to market economy (as argues North, 1997).

The reformist majority invoked unanimously to "go in the direction of disintegration of the instruments of regulation and control, privatizing the public property, stabilizing the finance, changing the government and then see how the market economy will come out" (as argues Tobin, 1996). Nowadays it is becoming clear that these measures were not enough.

Today economists argue that successful transition strategy should imply the establishment of institutional infrastructure of legal, political, economic rules and organizations "suitable to a market and private property-oriented society" (Elliot, 1997). Moreover, many researchers believe that the shock therapy could have worked, but only in the case where the country posses effective infrastructure and market institutions, including the mechanism of bankruptcy, civil code, juridical system, antitrust etc. "The goal of rapid transition to a market economy would probably not be realized in the absence of those economic, legal, political and social institutions that enable economy to function…liberalization of prices and privatization of enterprises would not succeed in the absence of such institutions." writes Intrilligator (1996).

As a consequence, the failure of the transition process can be explained by the fact that the demolished institutions of socialistic economy were not substituted by a set of new institutions (Tobin, 1996), creating in this manner an "institutional vacuum" (Tarushkin, 2004) or a weak and inefficient institutional environment. Weak institutions aggravated transition problems, bringing corruption, crime, despoliation of the state property, low quality of government and lacunae in the legal system. From the institutional point of view the country in transition is defined in this case as "a country with the set of institutions that doesn't guarantee the efficient functioning of market economy" (Mao et al, 2003). Figure 1.3. describes

this situation showing the interaction between institutions and transition process.

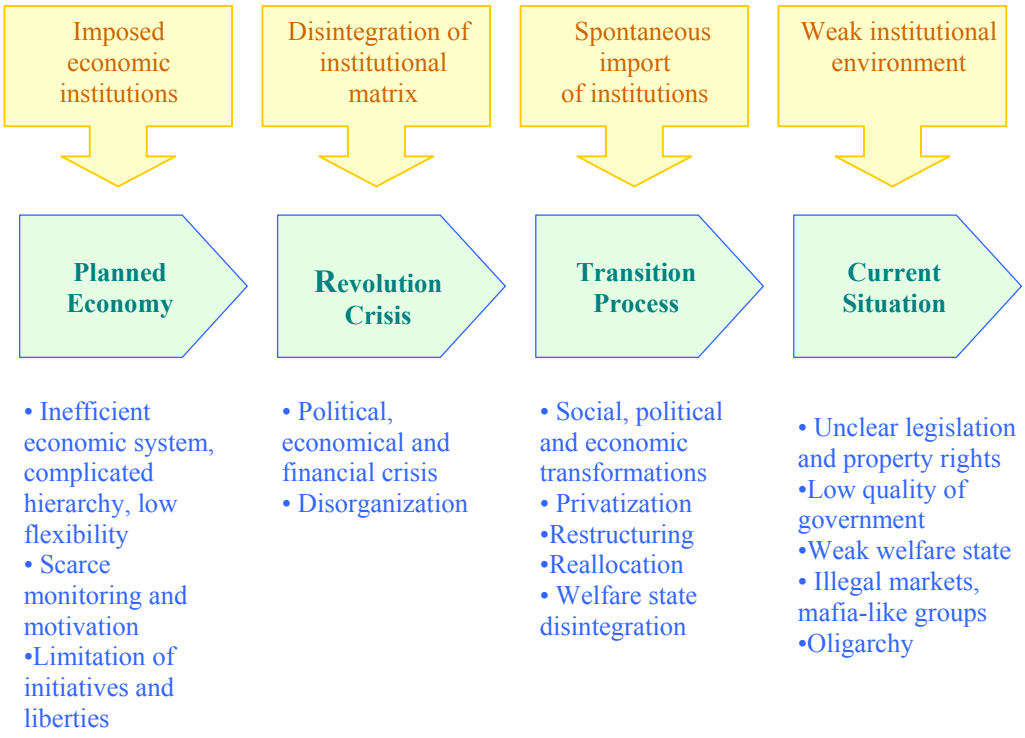


Figure 1.3. Components of transition and transformation of institutions

Hence, institutional development is demonstrated to be a complicated process that does not follow general rules and is different from country to country, implying high uncertainty. The question of how to build up the institutional set that contributes positively to economic performance is on the front-burner in many transition countries.

1.4.2. Privatization and quality of government

Economists agree that private property is one of the indispensable institutions on the way to the market economy (Intrilligator (1994) and Elliot (1997), Acemoglu and Robinson (1994)). Although the institution of private property was built up without the creation of supporting legal and

ideological institutions, it contributed significantly to the economic development of transition countries. Fifteen years of transition proved that private enterprises are more efficient than public (La Porta (1999), Boyko (1996), Yarrow (1999)); private property offers necessary incentives for firms' production and development. Moreover, building up the institution of private property in the conditions where the rest of the institutional environment is very weak (as happens in transition economies) contributed to a greater efficiency and stability (A. Shleifer, 1998).

In the same time, without a necessary normative base, privatization offered huge rents to the State apparat, local authorities, administrative units, giving the background to the growth of corruption. (Stiglitz (1996), Bardhan (1997)). As Tarushkin (2002) notes, "For many researches privatization has become the symbol of corruption". "…Violation of property rights [in transition economies] originates often predatory behaviour of government agents who abuse their power to regulate." writes Roland (2000). Privatization permitted the concentration of power and property in the hands of small groups of the population and contributed to limitation of government control and enlargement of government inefficiencies. State apparatus grew in the search for extra rents, increasing the number of bureaucrats in search for rents (Kirpichnikov, 2004).

In fact, Intrilligator (1997) and Elliot (1997) underline that privatization should follow only after the birth of market institutions (property rights reinforcement, juridical base, stock market, system of banking etc.), appearance of new competitive firms and reorganization of state enterprises. Obviously, the absence of the above conditions brought about the weakening of the State and its low quality.

1.4.3. State intervention to the economy during transition period

As commonly recognized, the State in the first place has a significant role in the creation of a favourable environment for institutional development. The State is expected to construct or to import the legal base, infrastructure, security, stability and other components necessary for an efficient set of institutions. "The government should create legal and regulatory agencies to prevent corruption and monopolization and a social safety net… the institutions have to be created by government" Intriligator (1996). The author lists three essential institutions: system of property rights, legal system and stable currency required for establishing a market economy, and underlines the State has to play a major role in their creation. However, today we see that the state often fails in fulfilling this role.

Instead of giving to the State particular functions of institutional development during the transition period, the main goal on the way to the market economy was to limit state intervention. With the limitation of the state's role, the important function of creation, maintenance and promotion of necessary set of institutions could never arise. In fact, highly limited state intervention led to the demolishing of the vital functions the state holds: welfare support, provision of public goods, correction of market failures and other functions.

Today economists agree that the State influence is vital in transition. Reasonable State intervention in market processes, starting with decisions on macroeconomics level and finishing with the growth policy planning are necessary during the transition period (Taylor (1996), Tobin (1996)). Tobin (1996) argues that "…many transition countries suffer from "wild" capitalism that is not better than the planned economy if it is not limited by competition and government regulation". Acemoglu and Verdier (1998)

discuss the necessity of the state intervention in the supply of public goods, redistribution and allocation of the resources, welfare support and correction of market failures. In their following work, Acemoglu and Verdier (2000) represent an interesting model that formalizes the state intervention in the correction of market failures. They argue that state intervention in the economy to correct market failures may be of great relevance even at the expense of holding rent-seeking state officers.

However, for the creation of necessary institutional environment, the state should restructure (Poumer, 1996). The restructuring of the state requires common ideas of the government, which is difficult to find under transition. Moreover, political and economical uncertainty give incentives to the government to behave in an opportunistic manner and extract even more rents. Therefore, state intervention in the economy may have an ambiguous result. As developed countries demonstrate, state and market should go in the same direction, complementing and supporting each other. But as often happens in developing and transition countries (Tresiman (2002), Ofer (2003) Elliot (1997), the interest of the state and the market can go in opposite directions, in search of private benefits and extra rents. Spontaneously and inaccurately created institutions of market economy during the transition period such as privatization, gave extra rents to the politicians and bureaucrats, decreasing the quality of government. Ofer (2003), Shleifer (1998) and La Porta (1999) demonstrate that transition countries with their weak institutions and market failures demonstrate great, but inefficient government intervention into economy.

1.5. Quality of government and institutions during transition period

1.5.1. Quality of government in transition economies

As Celentani and Ganuza (2002) note, it is often considered that the lack of competition generates the rents that lead to the increase in corruption of state officers. In accordance with this way of thinking, the transition to market economy would decrease corruption, given the diffusion of competitive markets. However, corruption, rent-seeking and self-interested bureaucracy are broadly presented in different societies. As Kirpichnikov (2004) underlines, "corruption is the chronic and incurable illness of any state…it is born with the appearance of the state and can die only with the state's destruction". Indeed, corruption and the use of the administrative power of government in private interests were widespread in planned economies and are now present in countries with market economies, in developing countries and underveloped countries.

Moreover, uncertainty, political instability, weak regulation and legislation facilitate the appearance and diffusion of these phenomena in transition economies. "In many transition economies the deregulation has transformed into abuse of power, corruption and crime" write Frye and Shleifer (1997). In fact, Mauro (1995) proves the positive link between corruption and instability.

0fer's (2003) empirical research suggests that transition economies rank very high in corruption in respect to developing countries, probably for the reason of the drastic changes institutions bear during transition. Aidis and Estrin's (2006) empirical research show that transition countries suffer from corrupt bureaucracy and corrupt entrepreneurs, moreover, corruption is increasing in some transition countries. The authors note that economies that

demonstrated a great level of corruption in centralized economy (such as high-level or "blat" corruption of the elite) have even major corruption once a market economy is built up. The high-level corruption and its effects on economic performance are captured by Hellman (1998), Helman, Jones and Kaufmann (2000), Slinko et al (2003) who discuss the influence of institutional subversion on the wide range of economic indicators, such as small business development, firm performance, finance etc.

The persistence of corruption is a current problem of many economies. While corruption leads to similar consequences, its sources may be very different. Some authors explain the persistence of corruption by history (Djankov et al, 2000), the social order (Shleifer and Vishny, 1997) or the collective reputation of previous generations (Tirole, 1996). The stream of literature argues that the corruption problem gets worse in the decentralized economies where the bribes are uncoordinated and sequential, since the centralized economy permits the grouping of the corruption, so reducing its value (Shleifer and Vishny, 1997, Bardhan, 1997). Centralization of power permits to have a lump-sum corruption and have smaller distortions on to the economic performance.

However, the fact that similar countries have different levels of corruption requires another approach. Bardhan (1997) notes that corruption may have "frequency dependent equilibria" and the value of corruption depends on the number of corrupt agents involved. To illustrate this dependence he refers to Schelling diagram (Figure 1.4.) that demonstrates the importance of the corruption "starting point" of the society. This diagram shows that the society that gets involved into a high level of corruption may move toward an even higher level.

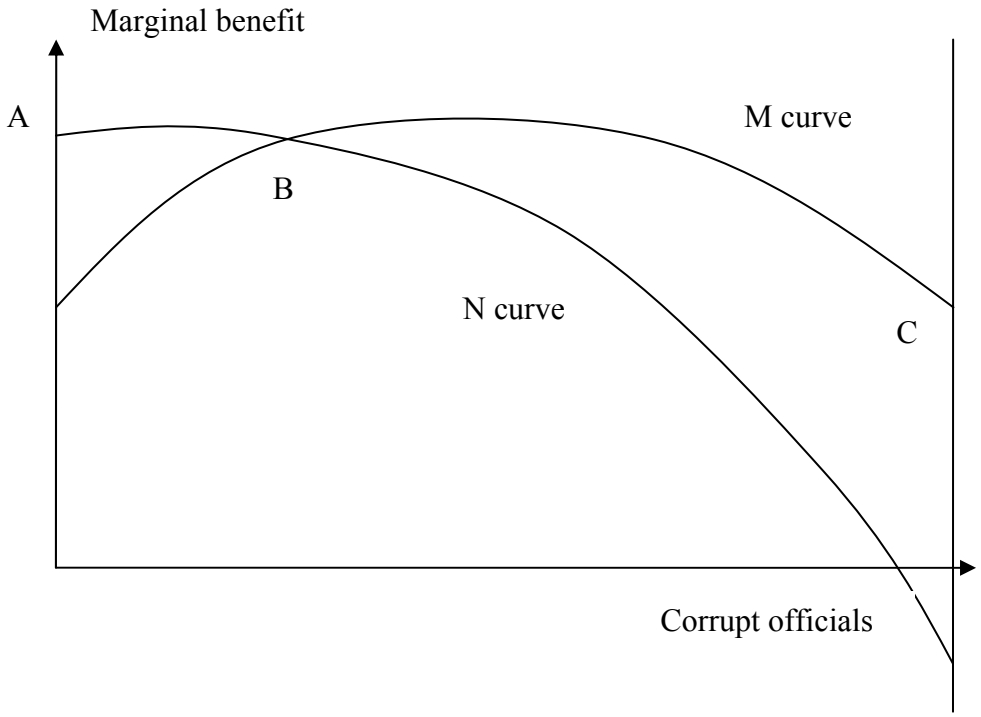


Figure 1.4. Schelling diagram (Bardhan, 1997)

Curve M represents the marginal benefit for a corrupt bureaucrat, while curve N is the marginal benefit for an honest bureaucrat. So that at the point A all bureaucrats are honest and at the point C all of them are dishonest. These points form up a stable equilibrium. At the point B the bureaucrats are indifferent between being honest or corrupt, but once one of them chooses to become honest, the marginal bureaucrat chooses to be honest as well; if he chooses to be corrupt, the marginal bureaucrat becomes corrupt too. Hence, as Bardhan (1997) writes, if the economy gets involved in a high level of corruption, it will move versus high-corruption equilibrium (C); if the initial level of corruption is low the economy will reach a low-corruption equilibrium (A). As the author notes, the diagram gives plausible explanation of how two similar economies may end up with different levels of corruption.

Many theoretical papers (Ofer (2003), La Porta (1999), Mauro (1995), Acemoglu and Johnson (2004)) demonstrate the impact of corruption on the economic performance during transition. Of Particular interest is the Shleifer and Vishny (1994) model, reviewed in the present work, that formalizes in a handy and efficient way the government low quality in transition economies. In this model of transition economy, government intervention in the production sector leads to the market malfunctions. Government failures are verified in the form of corruption and imposed distortions of the resources allocation of the market. As it is argued in this work, strong institutional environment could contribute to the correction of government failures in the frames of this model.

1.5.2. Institutional environment and government quality

Those who hold power have great impact on the institutional environment: politicians, bureaucracy, oligarchy and other power groups (Acemoglu (1994), Goldman (1998), Tobin (1996)). Very often these groups try to alternate the institutional matrix in a way to make it work for their personal interests and to extract rents. However, a strong institutional environment can pose the necessary resistance to low quality of government. Acemoglu and Johnson (2004), prove, using estimations, that high quality of institutions is positively linked to the decrease of corruption.

Do corruption and self-interested bureaucracy always lead to negative consequences? The answer to this question may also refer to the institutional environment. In transition countries with weak institutions where the government fails to fulfill its functions, bureaucracy in search of rent and corruption can contribute to greater efficiency (Acemoglu and Verdier (1998), Acemoglu and Robinson (2004), Acemoglu and Verdier (2000), Djankov et al (2003), Infante and Smirnova (2006) offer theoretical and

empirical testimony). When benevolent, but weak government is not able to control market failures, bribes could be the instrument of bargaining between the economic agents to limit these failures. There are often the situations where non-benevolent government brings inefficiencies to market (for example, the excess of labour, as argues Boyko (1996), Shleifer and Vishny (1994)); in this case the private sector uses corruption to limit the influence of harmful government intervention. "…In the context of pervasive and cumbersome regulations in developing countries, corruption may actually improve efficiency…in the second best world when there are pre-existing policy induced distortions, additional distortions in the form of black-marketeering, smuggling, etc., [corruption] may actually improve welfare even when some resources have to be spent in such activities" writes Bardhan (1997).

The range of literature argues that bribing often provide incentive for government officials to cut through the red tape and hence minimize the waiting costs and reduce inefficiencies (Shleifer and Vishny (1993), Guriev (2004), Saha (2001)). Even at the household level, there are many examples of the positive influence of corruption. Kirpichnikov (2004) makes an example related to mafia-like structures that obstacle the development of family business, endangering the members of the family. In situations with weak institutions where government is helpless, bribes are the unique effective way to avoid crime and permit business development.

However, Méon and Sekkat (2005) affirm that the most popular justification of the positive effect of corruption is based on the so-called "grease the wheels" hypothesis. According to Méon and Sekkat this hypothesis was first introduced by Leff (1964), Huntington (1968) and Leys (1965) that suggested that corruption may be beneficial in a second best world because of the distortions caused by malfunctioning institutions. Inefficient

bureaucrats that harm or impede business start-up, investment or multinational localizations can be "greased" by money to speed up their decisions. However, in their macroeconomic test of the "grease the wheels" hypothesis they found the opposite result "corruption becomes even more harmful when government is poor in the presence of existing distortions an additional distortion deteriorates welfare" (Méon and Sekkat, 2005).

Clearly, the strong institutional environment does not leave room for the government failures, even though market failures still persist. A growing economy generates the conditions that permit the cutting of the corruption opportunities, in fact, rich economies possess enough resources to offer high rents to government officials, while poor economies leave much room for the rent-seeking activities (Bardhan (1997), Acemoglu and Verdier (2000)). However, situations that require corruption as an instrument of improvement are automatically referred to the presence of weak institutions. On the other hand, the first best solution of a strong institutional environment is hardly achievable in reality, therefore corruption and bureaucracy's search for rents may indeed contribute to the better allocation of the resources and are frequently used in relationships between economic agents.

1.6. Conclusions on literature review

As follows from the numerous recent papers of economists, institutions play a very important role in any society, in particular in those under transition process. Empirical research has proved that institutional environment have significant influence on outcomes of transition countries: economic performance, quality of government, business relations, social welfare and many other aspects. Theoretical research, more concise than empirical ones,

offers the analysis of the influence of wide range of institutions (introducing them separately or the groups of them) on economic outcomes in different context.

The wide nature of institutions and their ambiguous definition together with complexity of transition process makes it difficult to provide a systematic research on the role of institutional environment. In fact, although there is a growing consensus on the importance of institutions, the mechanism through which institutions affect economic performance is not clearly defined. Thus, it seems interesting to formalize the impact of institutional environment on the performance of economic agents by a theoretical modeling. The study of the links between economic performance and the strength of institutional environment would contribute to the determination of the factors that promote economic development and stability. Thus, the present work concentrates its attention on the economic institutions, with the aim to analyze how the quality of these institutions influences the efficiency of economic outcomes in transition economies.

Chapter 2. Politicians, regulatory discretion and enterprises in transition economies

2.1. Introduction

As argued above, the State has an important role in a relationship between institutional environment and economic performance, especially in transition economies. There is a wide range of models dedicated to the influence of the State on the private sector in economies that suffer instability where asymmetric information plays an important role. In fact, the relationship between institutions, politicians, and enterprises depends on the level of regulatory discretions that the State enjoys. We shall briefly review some papers related to this field of research.

Damania, Fredriksson and Mani (2004) study the link between policy distortions persistence and the rent-seeking in regimes that suffer instability. The model studies the relationship between non-benevolent government, corrupt State officer and a firm that produces pollution in the production process. The control of the pollution is the subject of rent-seeking activity of the State officer who requires a bribe to report about the firm production process. In its turn, non-benevolent government decides about the policy to undertake in a way to extract higher rents. The political instability is introduced by the probability of government revolt. Hence, the general equilibrium is determined and takes into consideration political instability, judicial efficiency, corruption, and compliance. The authors argue that the reason for high rent-seeking activity is the weakness of institutions that is a common factor in the presence of political instability.

The conflicting interests of the State and the private sector are captured as well by Fedeli and Santoni (2001) in a model of organizational choice. They show how the nature of bureau-government interaction influences the choice of either centralized or decentralized government. Using a two stage game approach the model studies governments and managers matching or conflicting interests and their influence on social welfare. The social welfare in its turn is measured by the share of resources that are not used for the rent-seeking. The model confirms that the conflict of interests between society and government that obstacles achieving of the first best solution.

An interesting model of relationships between government and managers of the State firms in transition economy is developed by Li, Li and Zhang (2000), where the authors verify the influence of the product market competition on the rise of private property. The multistage game searches for first best allocation of the resources that leads to social welfare increase, maximizing the objective functions of the agents. The model proves that promotion of market competition in transition economy results in the diffusion of private property.

The issue of non-benevolent State intervention in the private sector is studied by Nombela (2001). The model analyzes the relationship between the excess of employment and enterprises ownership. The author evaluates the conditions under which the infrastructure project offered by the non-benevolent public agency may be given to a public or private enterprise. The model obtains the optimal number of workers and this is dependent on the ownership of the firms by defining the voting function which represents the interest for the State agency. It is demonstrated that public ownership results in greater than optimal size of employment.

A similar approach is used by Shleifer and Vishny (1994), constructing a model that describes the relationship between State intervention, and enterprises ownership that depends on the discretion power of State officers. The discretion power determines the bargaining power between politicians and firms on the excess of employment the State introduces into the production sector. Evaluating extra employment within different levels of control and property rights, the model analyzes its influence on the privatization, restructuring and commercialization processes. The paper confirms not only the generally accepted issues of transition process, (e.g. high production efficiency of private enterprises in comparison to public firms), but also offers non trivial results (e.g. corruption may improve the efficiency of resources allocation). Among various models, the Shleifer and Vishny (1994) model is chosen for our further analysis thanks to its simplicity and clarity in describing the transition process where a non-benevolent government imposes inefficiencies into the private sector.

2.2. Model

2.2.1. Settings of the model

There are three players in the model: the treasury, a politician and a manager that bargain on firm's decisions on resources allocation. The politician is self-interested and the manager is interested in the firm's profits. The treasury (that is represented as a State in this model) provides subsidies to the firm through the politician.

The firm can be owned by the Treasury or by the manager, i.e. they both can hold the cash-flow rights. Ownership depends on the fraction of the firm's profit π that can be held by the manager: fraction α; or by the Treasury:

fraction *1-α*. Therefore, if *α=0* the firm is public and if *α=1* the firm is private.

The politician is interested in unreasonably large employment provided by the firm and tries to convince the firm to employ as many workers as the politician desires. These workers represent for the firm and for society unneeded employment (*L)* that produces nothing, receiving the wage *w*. It is supposed that the firm earns profit π before it hires extra workers. The extra labour causes a cost μ to the society. In the case that the firm accepts the extra employment, the politician gets the benefit *B(L)*.

To persuade the manager to accept extra employment, the politician makes a transfer *t* in the form of subsidy from the Treasury to the firm. In this case the Treasury pays only a net transfer *T* because some amount of money it receives back as a shareholder of the firm. *T* is then given by:

$$T = t - (1 - \alpha) \cdot (t - w \cdot L) \qquad (2.2.1)$$

The politician has a cost *C(T),* where *C(T)<T,* to provide this net subsidy. There is also a social cost of transfer *T* denoted by σ.

Given these conditions the social welfare function is given by:

$$S = -\mu \cdot L - \sigma \cdot T \qquad (2.2.2)$$

and the first best occurs under condition *L=T=0,* where there is no excess of employment and there are no subsidies.

The politician and the manager bargain over *L* and *T*, bribing one another. The bribe from the manager to the politician which is denoted by *z* costs exactly *z*. The politician's utility function is then given by:

$$U_p = B(L) - C(T) + z \qquad (2.2.3)$$

It includes the benefits the politician extract from the excess of employment, mines the cost he pays for this extra employment, plus the bribe. The manager's utility function is:

$$U_m = \alpha \cdot \pi + T - w \cdot L - z \qquad (2.2.3)$$

It consists of the share of profits that belongs to the manager, plus the net transfer he receives from extra employment, mines the cost he bares for this extra employment, minus the bribe. Note, the bribe can take positive or negative value, since it can be paid by the politician (when he wants to impose the extra employment) or by the manager (when he wants to get rid of extra employment).

It is assumed that the politician controls T, and L can be controlled by the manager or by the politician. Hence, four different types of firm are possible; these types are shown in Figure 2.1., respecting the authors' definitions.

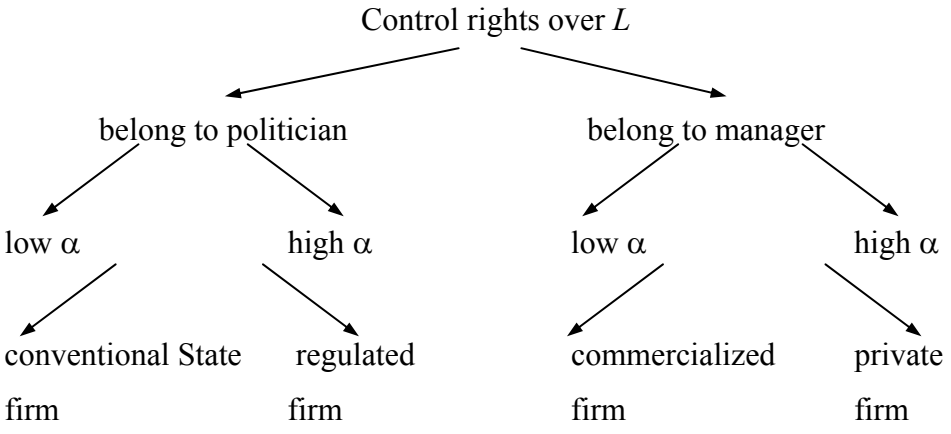


Figure 2.1. Possible types of firms' regulation

According to Figure 2.1, different levels of cash flow rights (α) and control rights over L conduct to the different types of firm. Since bribes are possible, the politician can interfere even in the decisions of a private firm as well as the manager in the decisions of a conventional state firm.

2.2.2. Before-bribes allocations

Let us analyze the optimal choice of the politician and the manager when one or the other has the control rights over L. The control rights over L determine the threat point in negotiations between the participants. The optimal choice in case of collaboration of the manager and the politician is then defined.

a. Politician control

The politician maximizes:

$$U_p = B(L) - C(T) \qquad (2.2.4)$$

subject to the manager's utility constraint without bribes:

$$\alpha \cdot \pi + T - w \cdot L \geq 0 \qquad (2.2.5)$$

that gives the first order conditions or the politician's threat point:

$$T = w \cdot L - \alpha \cdot \pi \qquad (2.2.6)$$

$$B'(L) = w \cdot C'(T) \qquad (2.2.7)$$

i.e. the politician brings the firm's profits to zero and benefits from extra employment until his marginal cost of getting the extra transfers from the Treasury offsets the benefit he receives.

b. Manager control

The threat point in this case is given by the Nash equilibrium. The manager and the politician non-cooperatively choose:

$$L = T = 0 \qquad (2.2.8)$$

so there is no excess of employment and there are no transfers.

c. Collaboration of the manager and the politician

The joint optimal choice is given by maximization of the joint utility of the manager and the politician:

$$B(L) - C(T) + \alpha \cdot \pi + T - w \cdot L \qquad (2.2.9)$$

The first order condition is given by differentiation of the joint utility with respect to T and L:

$$B'(L)=w$$
$$C'(T)=1. \qquad (2.2.10)$$

Hence, both the manager and the politician admit extra employment at the level where the marginal political benefit $B(L)$ is equal to the marginal cost w of extra employment. Then they receive the transfer from the Treasury up to the point where the cost of getting one unit (dollar) of such transfer is equal to one unit (dollar).

The threat points and joint efficient point are represented in Figure 2.2.

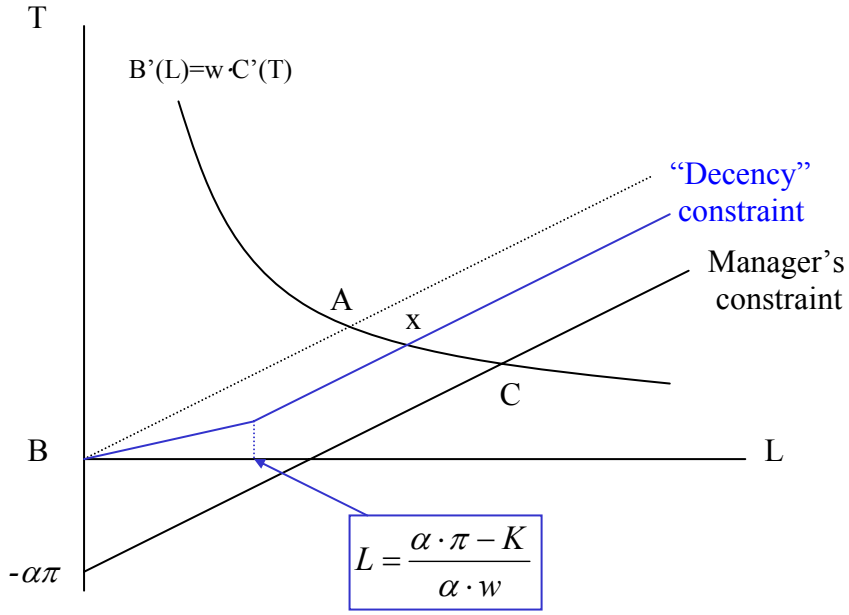


Figure 2.2. Allocation of the resources. Source: Shleifer and Vishny (1994)

Figure 2.2 represents the set of points where the politician's marginal benefits from extra employment ($B'(L)$) are offset by the marginal costs $(w \cdot C'(T))$, i.e. $B'(L) = w \cdot C'(T)$ which is given by politician maximization problem when he controls L. The politician's threat point lies on this curve at the point where $T = w \cdot L - \alpha \cdot \pi$ (point C), i.e. where the transfer the politician pays brings the firm's profit goes to zero.

Point B represents the situation with the manager's control over extra labour L. In this situation there are no transfers and no extra employment. The politician has no influence on the firm's decisions. Point A describes the joint efficient point with presumable collaboration of the politician and the manager. This allocation is better for the politician and the manager; they agree to find the equilibrium level of L and T that makes them both better off.

2.2.3. Equilibrium with bribes

Now bribes are allowed in the game.

a. Politician control

The politician's and the manager's bargain starts at the politician's threat point, since he imposes extra employment L. The incremental utility from the bargain (movement from the threat point to join efficient point) for politician is given by:

$$B(L) - C(T) + z - (B(L_d) - C(T_d)) \qquad (2.2.11)$$

where $B(L_d)$ and $C(T_d)$ are the cost and the benefit at the threat point. The manager's incremental utility is then given by:

$$\alpha \cdot \pi + T - w \cdot L - z \qquad (2.2.12)$$

The Nash equilibrium is obtained by the product of these utilities maximized with respect to *L, T, z* and gives the following solution:

$$z = 0{,}5 \cdot \{(\alpha \cdot \pi + T - w \cdot L) - [B(L) - C(T) - B(L_d) + C(T_d)]\}$$

$$C'(T) = 1$$

$$B'(L) = w \qquad (2.2.13)$$

b. Manager control

At the manager's threat point, the manager's utility is given by $\alpha \cdot \pi$ and the politician's by zero. Then the manager's incremental utility is:

$$T - w \cdot L - b \qquad (2.2.14)$$

and the politician's is

$$B(L) - C(T) + z \qquad (2.2.15)$$

Again, the maximization of their product with respect to *L, T, z* gives the following result:

$$z = 0{,}5 \cdot \{(T - w \cdot L) - [B(L) - C(T)]\}$$

$$C'(T) = 1$$

$$B'(L) = w \qquad (2.2.16)$$

As follows from maximization, the presence of bribes does not influence the distribution of *L* and *T*. Therefore, with bribes the allocation of resources is independent of either the allocation of cash flow rights α or the allocation of control rights over *L*. The politician and the manager allocate the resources efficiently and use bribes to divide the surplus. Hence, as the authors underline, *in the presence of corruption neither privatization nor commercialization matters.*

It is interesting to note from the equilibrium levels of bribes that under the politician's control the equilibrium bribe is increasing in α and under the manager's control is independent of α. It happens because under the politician's control a high α increases the profit $\alpha \cdot \pi$ and, as a result, increases the politician's utility at threat point, therefore the bribe should be higher to convince the politician to decrease *L*. As for the manager, he receives $\alpha \cdot \pi$ regardless of his agreement or disagreement with the politician, so the bribe in this case is independent of α.

2.2.4. Equilibrium without bribes

Unrestricted corruption, as the authors note, seems not to be realistic. Empirical research proves that limited corruption is of greater relevance. The extreme case of no corruption is taken into analysis. Below is the analysis of equilibrium without bribes; its main outcomes are represented in Table 1 that concludes this section.

2.2.4.1. Cash flow rights and their role in no bribes equilibrium

a. Politician control

When the politician controls *L* there cannot be any bargain between the politician and the manager without bribes. As a result, the threat point of the politician is still point C in Figure 2.2. However, given the politician's control case, the allocation of *L* and *T* depends on α. An increase in α shifts the manager's constraint downward which leads to an increase in *L* and a decrease in T, i.e. a change of the politician's threat point.

b. Manager control

Under the manager's control over *L* the no-bribes bargain solution is given by maximizing the product of the incremental utilities of the manager and the politician with respect to *L,T*:

$$(T - w \cdot L) \cdot (B(L) - C(T)) \qquad (2.2.17)$$

that gives again the solution: $w \cdot C'(T) = B'(L)$, where

$$C'(T) = \frac{B(L) - C(T)}{T - w \cdot L} \qquad (2.2.18)$$

$$B'(L) = \frac{w \cdot (B(L) - C(T))}{T - w \cdot L} \qquad (2.2.19)$$

From the above expression it is easy to see that given the manager's control, the no-bribes allocation is independent on management ownership α. It happens because the manager gets the $\alpha\pi$ regardless of his agreement or disagreement with the politician.

2.2.4.2. Allocation of T and L

a. Politician control

As it was noticed before, in the case that the politician controls *L* and there are no bribes, there is no bargain and the politician's threat point is still C. In this case with no bribes the politician extracts more surplus by requiring a high *L* and giving a low *T*. But once bribes are possible, the politician may find it convenient to increase the surplus by extracting bribes from the manager, not by fixing a higher *L*. Therefore in this situation, *L* is lower in the equilibrium with bribes than in the equilibrium without bribes.

However, in the case that *C(T)* is high and there are no bribes allowed, the politician can not fix very high extra employment and *L* is low. But if bribes become possible the politician can pay bribes to the manager in order to increase *L*. Hence, in this situation *L* is higher in equilibrium with bribes than without bribes.

As a result, the no bribes equilibrium can have higher or lower *L* than the equilibrium with bribes.

b. Manager control

With a similar analysis as before, *L* can be higher or lower in the equilibrium without bribes than in that with bribes when *L* is under the manager's control.

When there are no bribes, the manager sets a very low level of *L*. If bribes are allowed, the manager and the politician can agree on a higher *L* given the bribe from politician to manager. Given these circumstances the level of *L* is higher in the equilibrium with bribes than in that without bribes.

Again, the possible case is a high *L* in the no-bribes equilibrium. If the manager considers the transfer T relevant in the no bribes equilibrium, he gets it by accepting the extra employment *L*. But if bribes are allowed, the manager can use them to pay the politician in order to receive a higher *T* with a lower *L*. Here the level of *L* is lower in the presence of bribes than without bribes.

As a result, regardless of the politician's or the manager's control of *L*, when the no bribes equilibrium has a high *L*, the manager bribes the

politician in equilibrium with bribes; when the no bribes equilibrium has a low L, the politician bribes the manager in equilibrium with bribes.

2.2.4.3. Restructuring under control of the politician and the manager

Under the politician's control with no bribes allowed, the manager's utility is zero and his indifference curve in Figure 2.2 has an intercept of zero. While under the manager's control the utility is at least $\alpha \cdot \pi$ and the indifference curve has the intercept above zero. Therefore, under manager control L is lower and T is higher than under politician control. Such proposition implies that under the manager's control of L the firm is more disposed to restructure (i.e. get rid of extra L).

2.2.4.4.Go back to bribes: corruption and efficiency

The important moment is worth noting: in present model, reducing L and rising T is socially efficient, therefore the corruption (it permits the achievement of a lower L and higher T for a manager by paying bribes to the politician) increases efficiency. It happens because bribes help to fight government inefficiency– the excess of labour force.

Table 2.1. summarizes the above points of the no-bribes equilibrium and derives some relevant conclusions.

Conclusions made on no bribes equilibrium	**Consequences**
1.Cash flow rights and their influence on no-bribes equilibrium:	
a. Manager's control of *L*: The no-bribes allocation is independent of management ownership α.	*Giving to the manager the cash flow rights does not change the allocation of L and T, i.e. privatization has no effect on resources allocation.*
b. Politician's control of L: The no-bribes allocation depends on α; an increase in α increases *L* and decreases *T*.	*The regulated but private firm has higher employment excess than a public firm and therefore is less efficient*.
2. Allocation of T and L	
When the no-bribes equilibrium has a high *L*, the manager bribes politician in equilibrium with bribes; when no bribes equilibrium has a low *L*, the politician bribes the manager in equilibrium with bribes. It does not depend on the allocation of control rights on *L*.	*The party paying the bribe shifts the allocation to what it wants: higher L in the case of politician and higher T in case of manager*.
3. Restructuring under control of the politician and the manager	
Under the manager's control the firm has a lower *L* and receives higher transfers from the Treasury than under the politician's control.	*Firms with the manager's control restructure more (get rid of excessive L) than firms with state control. Therefore, the transfer of control rights from politicians to managers promotes restructuring.*
4. Go back to bribes: corruption and efficiency	
Bribes reduce *L* and raise *T*; therefore, make the allocation socially efficient.	*Corruption promotes efficiency because it enables the manager to pay for the reduction of inefficient political control on the firm, so bribes facilitate restructuring of the firm.*

Table 2.1. No bribes equilibrium and its consequences

2.2.5. Restricted subsidies

The drawback of the above analysis is the impossibility to figuring out what influence on resources allocation the cash flow rights have when the control rights belong to the manager. As it was shown, under the manager's control over L privatization doesn't matter which seems hardly probable. To overcome this difficulty, restrictions on subsidies are imposed. Such an assumption corresponds to reality; the unrestricted subsidies are not plausible. Therefore, the model makes an assumption of a "decency" constraint that allows giving transfers only to the firms with high profits where the utility of manager does not exceed a certain level K:

$t > 0$

only if

$$\alpha \cdot \pi + T - w \cdot L < K \qquad (2.2.20)$$

The decency constraint is represented in Figure 3.2 with a blue color. If the firm is profitable with $\alpha \cdot \pi > K$ and bribes are impossible, the politician can pay for the excess of labour only by decreasing the profits, otherwise the transfers are not allowed. For a high L the firm spends a lot for the excess of employment and has lower profits, so receives the transfer. Therefore there is a certain level of L:

$$L = \frac{\alpha \cdot \pi - K}{\alpha \cdot w} \qquad (2.2.21)$$

below which a maximum transfer is:

$$T = (1 - \alpha) \cdot w \cdot L \qquad (2.2.22)$$

and over which the transfer is:

$$T = w \cdot L + K - \alpha \cdot \pi. \qquad (2.2.23)$$

Under the manager's control over L, no bribes and $\alpha \cdot \pi > K$ the manager's threat point does not change. This happens because decency constraint lies below the manager's indifference curve that passes through the origin and the manager is still better off with $L=T=0$. When bribes are allowed the manager chooses a certain level of L and doesn't require subsidies. This level of L is lower, as authors prove, than the level of L with $\alpha=0$. Therefore, the decency constraint serves as a mechanism that forces profitable commercialized firms with private ownership to have a lower L and not search for subsidies. As the model proves, *privatization encourages restructuring (lower L) in the case that the firm is profitable*.

2.3. Results of the model

The model analyzes the relationship between private or public firms and politicians that try to influence firms' decisions following their private interests. The important components that influence the outcome of this relationship are the control rights, cash flow rights and corruption under government failures. Their combinations in this framework help to shed light on the topical issues of transition economies such as restructuring, privatization and commercialization. The model proves the following results:

a. When bribes are allowed, the allocation of resources is independent of control rights distribution;
b. Without bribes the transfer of control rights from politicians to managers facilitates the restructuring;
c. Corruption may improve the allocation of resources because it helps to limit the politicians' harmful intervention;

d. Regardless of corruption, the privatization of cash flow rights encourages restructuring in the case that firms are profitable and State subsidies are limited.

2.4. Critique of the model

2.4.1. Cost of corruption

In the Shleifer and Vishny (1994) model it is supposed that the bribe *z* that can be paid from manager to politician or vice versa costs exactly *z*. Actually, the bribe includes not only the amount of money (or other values) it contains, but as well the lost opportunity costs, the cost of organizing the bargaining and many other costs. Therefore, the corruption costs as well as the bureaucracy costs. Moreover, the politician's bribe cost is hardly equal to the cost of the bribe of the manager. The politician operates with the State funds, but the manager operates with the company's funds; for this reason the evaluation of these funds would be different for these two agents. As Esfahani (2000)shows, the politicians put a premium on public funds, because of the opportunity costs the public funds contain. The costs of the bribe would probably depend as well on the ownership of the firm. As a result, in the present model, the utility functions of the manager $U_m = \alpha \cdot (\pi + t - w \cdot L) - z$ and the politician $U_p = B(L) - C(T) + z$ should reflect the diversity in the cost of bribes and could not contain the same *z*.

2.4.2. Corruption and ownership

It is proved that under manager control over L and under corruption the level of bribes does not depend on ownership on cash flow rights (α). That is, with the manager control the level of bribes is the same in the case when

the manager is the owner of the firm or the State is the owner of the firm. Such a preposition seems to be doubtful. The situation where the firm is completely private and has the complete freedom of decisions seems different from the situation where the firm is public and the manager's decisions are limited. Ades, Di Tella (1999) proves by using cross-section data that the increase in competition and private ownership can decrease the corruption. Moreover, where the manager of a private firm works for his own benefit, the manager of a public firm could choose to behave for his own benefit or for that of the company. For these reasons it is hard to suppose they would choose the same amount of bribe: in the first case the manager decides about his own money, in the second – the State's money. That is why the level of bribes probably depends on the ownership of the firm.

2.4.3. Privatization and commercialization under corruption

The model proves that in the presence of corruption neither privatization nor commercialization matters, i.e. if bribes are allowed, enlargement in private property and the deregulation of public firms have no effect on allocation of *L* and *T*, and therefore on restructuring. However, the Dewenter and Malatesta, (2001) empirical studies show, using cross-section analysis on the firms around the world, that labour intensity decreases after privatization and restructuring becomes possible. The same result is proved by Nombela (2001). Clearly, it is improbable that all the firms under research do not suffer corruption. Even though bribes are limited they are frequently used, especially in countries with such unstable economical, political situation and weak institutions as transition countries (Wei and Shleifer (2000), Goldsmith (1999), Acemoglu and Verdier (1998)). These countries indeed represent the situation where privatization, restructuring, commercialization came about in post soviet period.

Furthermore, the analysis on importance of cash flow rights proves that without corruption privatization matters for the firms with politician control over *L*, but not for the firms with manager control over *L*. The authors find it unrealistic and try to overcome this difficulty by introducing the decency constraint. The decency constraint finally reflects the importance of cash flow rights for restructuring in the firms with manager control of *L*. For the above reason, why do the authors consider it realistic that in the presence of corruption privatization does not matter and does not lead to restructuring in the firms with both politician and manager control over *L*? As was shown by Acemoglu and Verdier (2000) corruption can even represent a mechanism to overcome market failures, so one can suppose in certain circumstance it could contribute to restructuring. Therefore, the model could leave space to possible extension that offers an instrument (similar to decency constraint) that shows privatization and restructuring in the presence of corruption.

Chapter 3. Market failures, State intervention and rent-seeking

3.1. Introduction

State intervention in the economy normally requires the use of agents or bureaucrats who are often self-interested. In fact, asymmetric information that persists in relationships between the State and its agents leaves lot of room for the bureaucrats opportunistic behaviour. However, even with a high costs of bureaucracy introduction State intervention may result as necessary, especially in the presence of market failures.

The theoretical literature dedicated to rent-seeking regarding State intervention is relatively new, although it is very vast. Generally speaking, it can be divided into the following four categories: the appearence of rent-seeking, the control over rent-seeking, the interaction of rent-seeking on different levels of hierarchies, and the implication of rent-seeking. The latter category has proved to be of a major interest among economists. The discussion about the persistence of rent-seeking activity and its influence on economic performance is at the forefront of recent literature. We will go examine some recent models that study the interaction of the State and the market in the context of rent-seeking activity.

Public sector corruption is analysed by Auriol and Benaim's (2000) growth model. Their model undertakes a stable equilibrium approach and suggests that a corruption may not influence the growth but certainly affects income redistribution. However, as the authors confirm, corruption equilibrium may be preferred to no corruption one when the public good is provided for. As

argued, this happens because the red tape may be alleviated thanks to the corruption mechanism.

Guriev (2004) offers a model that deals with market failure; introducing interaction between the red tape and corruption. The agent's type can not be known because of the presence of externalities that leads to the market failure. Hence, the State hires the bureaucrats to find out agents' types in order to provide them goods. Bureaucrats introduce red tape to screen the agents. The agents of the good type receive the good from the State, while those of bad type do not. The State maximizes the social welfare function, while the rest of agents maximize their utility function. Ex post and ex ante corruption and informative red tape are introduced into the model and the mechanism of their integration is evaluated. The model shows the general equilibrium where the level of red tape is above the social optimal level due to the corruption mechanism. The author argues that even though the corruption may have positive effects, its overall effect is always destructive, since it increases the red tape and decreases the social welfare.

Normally, it is supposed that rent-seeking appears in the relationship between the principal and the agent where the former is those who suffers more from corruption. Olsen and Torsvik (1998) criticize this result and present a model that demonstrates that the prospective corruption can make a principal better off. It is shown that corruption results in a negative static effect, but in a positive dynamic effect in the long run, since corruption can be utilized as a commitment mechanism.

Infante (1999) represents a growth model, where the presence of rent-seeking is determined endogenously and depends on the different reward structure of the technologies used in the production and rent-seeking sectors. Analyzing agents allocation between the two sectors, the author underlines

that rent-seeking even though may give a positive contribution, it can not represent an ever-lasting mechanism. Rent-seeking in the long-run produces a negative externality, and what in the short-run is evaluated individually as "good", in the long run turns out to be a social "bad". In fact, rent-seeking subtracts resources from and shrinks the production sector.

In Acemoglu and Verdier's (1998) general equilibrium model, the State has a role of reinforcing the contracts in the private sector. Both, private and public sector are involved in the rent-seeking process, searching for extra rents. As the authors prove, preventing corruption can be very costly (the cost is measured as misallocation of talents), so that the optimal allocation involves some degree of corruption and poorer contract reinforcement. This result, as they argue, confirms the experience of underdeveloped countries that do not dispose of sufficient resources for preventing corruption.

The successive Acemoglu and Verdier (2000) paper is similar to the above model and analyzes government intervention to correct market failures. The model uses the principal-agent approach that involves the interaction between two kinds of agents: entrepreneurs and bureaucrats. Bureaucrats are designed as an institute to increase system efficiency by controlling market externalities produced by entrepreneurs. This institute can fail to be efficient due to corruption that is inherent in an agent's activity. Therefore, the model aims to determine the equilibrium between State intervention and market externality. The results show that the second best allocation requires some level of corruption when the externality in question is very important.

As a result, Acemoglu and Verdier's (2000) model offers a simple framework where the benevolent State intervention aims to improve the performance of the private sector. The model studies a reversed situation of the Shleifer and Vishny (1994) model, where the State intervenes in the

economy, introducing the inefficiencies. Hence, we consider Acemoglu and Verdier (2000) model of great interest for our further research. We analyze it in details in this chapter.

3.2. Model

3.2.1. Settings of the model

In the model the government looks for an optimal allocation of agents (of mass *1*) between two categories: entrepreneurs (fraction *n*) and bureaucrats (fraction *(1-n)*). Entrepreneurs choose between good (fraction *x*) and bad (fraction (n-x)) technology. Good technology has the cost of production c[1] and produces an externality β that has a positive effect on all agents' pay-offs (total positive effect of externality on all agents is then given by $\beta \cdot x$). Firms that use good technology receive a subsidy *s*. Bad technology has zero cost of production and doesn't produce the externality, such firms have to pay a tax τ.

The government introduces bureaucrats in order to monitor the choice of technology and report its type to the government. Bureaucrats can in their turn be corrupted or not corrupted. The subject of corruption is the declaration on the entrepreneurs' choice: the good or bad firm's technology. Self-interested bureaucrats for a bribe can declare technology to be good when it is bad, or can threaten the entrepreneur in change for a bribe to declare a good technology to be bad. If the bureaucrat is corrupted, the bribe he gets is $z=\sigma \cdot (\tau+s)$, where σ is the proportion of maximum possible bribe. Uncorrupted bureaucrats receive the wage *w*. Bureaucrats' inspection

[1] For technical reasons the variable "e" that states for "costs" in Acemoglu, Verdier (2000) model is substituted by "c".

is a random variable and the probability to be inspected is $p(n) = \max\left(\frac{1-n}{n};1\right)$.

The main settings of the model are summarized in Figure 4.1.

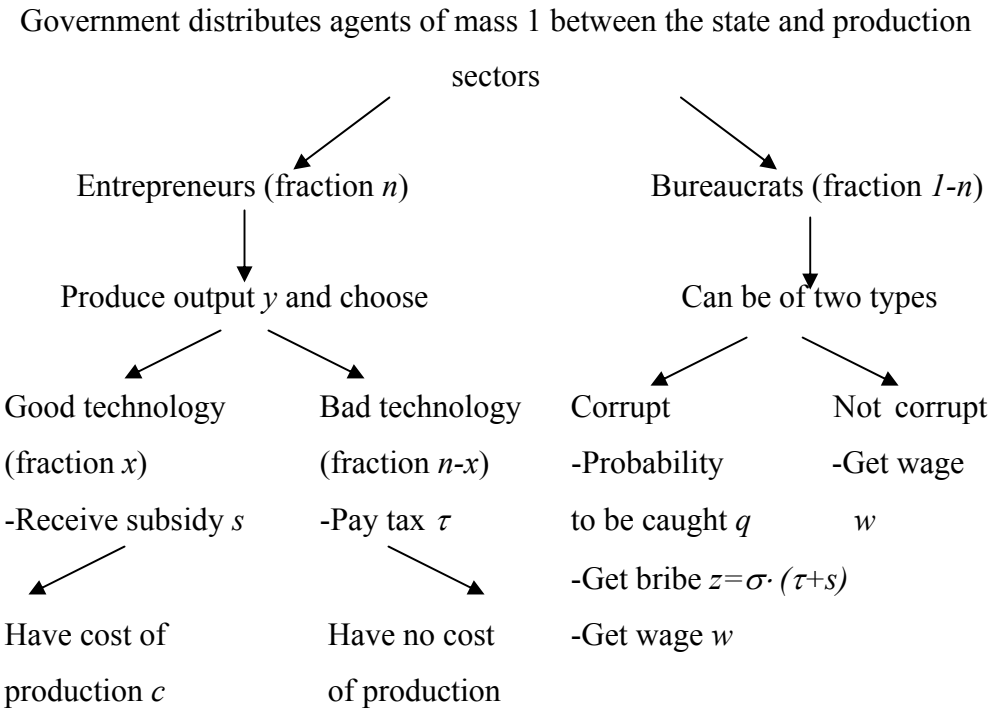


Figure 3.1: Settings of the model

The level of tax, subsidy and wage for bureaucrats are endogenously defined in the model by the government. Game is solved by backward induction; therefore, the task of the government is to find such levels of these variables that the allocation of entrepreneurs and bureaucrats is optimal, given the optimal level of good technology application.

The government maximizes the total social surplus presented as:

$SS=n\cdot y+(\beta-c)\cdot x$ *(3.2.1)*

i.e. is equal to the value of output produced by all the entrepreneurs plus the positive externality produced by the firms that use the good technology.
The general structure of the model is the following:

1. Define the first and the second best solutions and equilibrium government intervention for centralized and decentralized economy cases without corruption;
2. Allow for bribes and analyze the change they bring to the model; calculate the optimum regulation level;
3. Introduce the heterogeneity of bureaucrats, i.e. introduce their possibility to choose whether to be corrupted or not. Figure out the general equilibrium settings and compare the outcome with previous results.

3.2.2. Equilibrium allocation without corruption

At the first stage corruption is not considered. In a decentralized system (no government and no corruption) pay-offs for entrepreneurs with good and bad technology are figured out:

$$\pi_g = y + \beta \cdot x - c \qquad (3.2.2)$$

$$\pi_b = y + \beta \cdot x \qquad (3.2.3)$$

Since $\pi_g < \pi_b$ the entrepreneurs choose bad technology. Therefore, the allocation of agents is given by $n=1,\ x=0$ and the first best solution with $n=1,\ x=1$ i.e. (all entrepreneurs choose good technology) can't be achieved. In this case the level of social surplus takes the following form:

$$SS_{notgood} = y \qquad (3.2.4)$$

Once the State intervenes to the production sector, introducing the bureaucrats, the pay-offs of firms with bad and good technology change: now the probability of inspection is taken into account:

$\pi_g = y+\beta \cdot x-c+p(n) \cdot s$ *(3.2.5)*

$\pi_b = y+\beta \cdot x-p(n) \cdot \tau$ *(3.2.6)*

Let us find now the second best solution in the case of State intervention.

In order to maximize the social surplus (3.2.1) the State has the following constraints to be hold:

a. Government liability constraint that assures the taxes can't exceed the value of the output produced, i.e:

   $\tau < y;$ *(3.2.7)*

b. Technology constraint that ensures firms to choose good technology:

   $$s + \tau = c \cdot \left(\frac{n}{1-n} \right)$$ *(3.2.8)*

   that follows from the requirement $\pi_g \geq \pi_b$;

c. Some of the agents have to become bureaucrats, thus there should be a constraint that induces them to do this job (called talent constraint):

   $$w \geq y - c + \frac{1-n}{n} \cdot s$$ *(3.2.9)*

   i.e. the wage the bureaucrats receive has to be at least equal to the earnings that the entrepreneurs obtain*;*

d. Government budget constraint that insures government doesn't spend more than earns:

   $$\frac{(1-n)}{n} \cdot (n-x) \cdot \tau \geq (1-n) \cdot w + x \cdot s \cdot \frac{(1-n)}{n}$$ *(3.2.10)*

   i.e. the cost of subsidies and bureaucrats' wages cannot exceed taxes the government collects.

Combining the above conditions, we get the constraint set that gives optimal allocation of entrepreneurs' fraction that chooses good technology:

$$x = \frac{(1-n)^2 \cdot y}{n \cdot c} \qquad (3.2.11)$$

Since the constraint set is nonconvex in x, the maximization problem has two solutions shown on the figure 3.2. The first solution is given by *n=1, x=0* (point A in the figure 3.2.), thus nobody produces with good technology and the level of social surplus becomes *y*. The second solution is $n=x^2$, i.e. the part of the agents are entrepreneurs that use good technology and the other part are the bureaucrats. In this case the level of social surplus is given by:

$$SS_{good} = x \cdot y + (\beta - c) \cdot x \qquad (3.2.12)$$

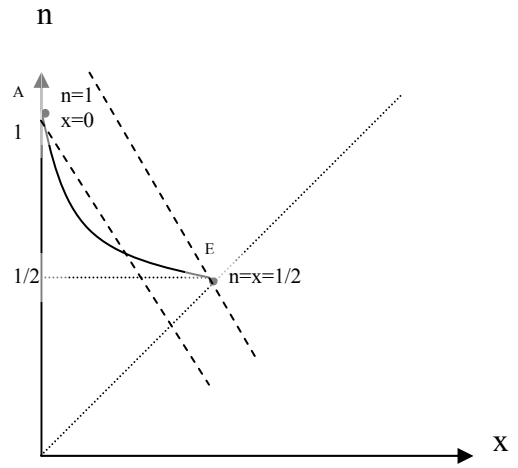


Figure 3.2. Solutions to the State optimization problem.

In order to reach the second solution, *x* is substitute by *n* in equation (3.2.11) that gives the following allocation of agents:

$$\hat{n} = \frac{\sqrt{y}}{\sqrt{y} + \sqrt{c}} \qquad (3.2.13)$$

[2] In order the probability of monitoring stays in the interval *(0;1)*, should hold the inequality: *n≥1/2*. Another motivation is that the number of bureaucrats can not exceed the number of entrepreneurs, otherwise some of the bureaucrats have no entrepreneurs to monitor.

that for the sake of future comparison can be left at the following stage of simplifying (as well as other variables below):

$$n = \frac{-2 \cdot y + \sqrt{4 \cdot c \cdot y}}{2 \cdot (c - y)} \qquad (3.2.14)$$

This solution gives the following level of maximized social surplus:

$$SS_{good} = \frac{\sqrt{y} \cdot (y + \beta - e)}{\sqrt{y} + \sqrt{c}} \quad \text{or:} \qquad (3.2.15)$$

$$SSgood = \left[\frac{-2 \cdot y + \sqrt{4 \cdot c \cdot y}}{2 \cdot (c - y)} \right] \cdot \left[y + (\beta - c) \right] \qquad (3.2.16)$$

That implies this level of positive externality necessary for maximization of social surplus:

$$\beta \geq \sqrt{c \cdot y} + c \quad \text{or:} \qquad (3.2.17)$$

$$\beta \geq \frac{(c - y) \cdot \sqrt{4 \cdot c \cdot y}}{-2 \cdot y + \sqrt{4 \cdot c \cdot y}} \qquad (3.2.18)$$

When this equation doesn't hold, the outcome is laissez-faire: *n=1; x=0* (i.e. all entrepreneurs chooses bad technology) and social surplus is not at its optimal level and is equal to *y*. In the case the equation holds, all the entrepreneurs produce with good technology and the State maximizes the social surplus.

The following conclusion comes out:

Government intervention is worthwhile only in the case when its costs (decrease in fraction of entrepreneurs n and thus, the decrease of output y by introducing bureaucracy) don't exceed its benefits (the increase of fraction of the firms that use good technology and create positive externality

βx thanks to monitoring activity of bureaucrats). Therefore, the change in βx should be sufficiently large as compared to the change in y.

3.2.3. Optimal regulation with corruption

When corruption is allowed, a new "corruption constraint" is added. Given the probability to be caught *q* and maximum available amount of bribe:

$$Z = \sigma \cdot (\tau + s), \qquad (3.2.19)$$

the constraint that ensures the absence of corruption is:

$$w \geq \frac{1-q}{q} \cdot \frac{n}{1-n} \cdot \sigma \cdot c , \qquad (3.2.20)$$

i.e. the wage the honest bureaucrats receive should be at least equal to the rents that receive the dishonest bureaucrats.

Taking into consideration this constraint and adding it to the constraints of the above section, the new constraint set is calculated:

$$x = \frac{y}{c} - n \cdot \left(\frac{y}{c} - \frac{(1-q)}{q} \cdot \sigma \right) \qquad (3.2.21)$$

that given the efficiency condition $n=x$ takes the following form for government intervention:

$$n_c = \frac{y}{c + y + \frac{1-q}{q} \cdot \sigma \cdot c} \qquad (3.2.22)$$

with social surplus:

$$SS_{cg} = \frac{y \cdot (y + \beta - c)}{y + c + \frac{1-q}{q} \cdot \sigma \cdot c} \qquad (3.2.23)$$

and the level of externality required for government intervention:

$$\beta \geq c \cdot \left(2 + \frac{1-q}{q} \cdot \sigma \right) \qquad (3.2.24)$$

Now let's compare the optimal government intervention with and without corruption. There are the following options (shown in the Figure 3.3) described by the model:

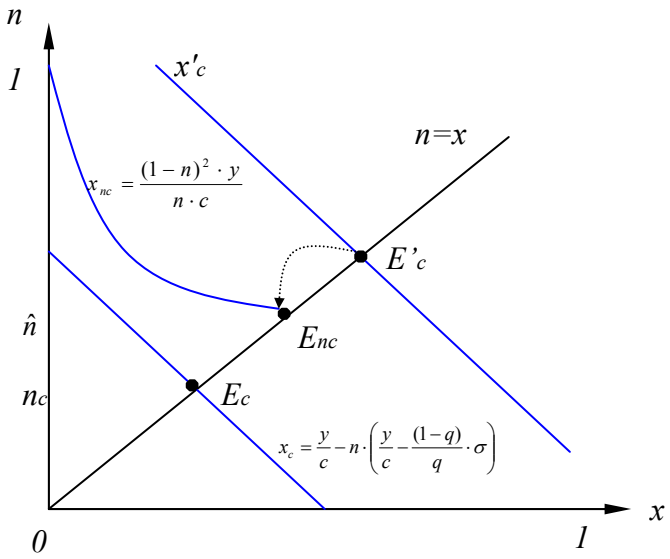


Figure 3.3. Optimal government intervention. Source: Acemoglu and Verdier (2000)

a. Recall the corruption constraint is given by: $w \geq \frac{1-q}{q} \cdot \frac{n}{1-n} \cdot \sigma \cdot c$.

Suppose the allocation of entrepreneurs with good technology without corruption, i.e. x_{nc} curve in the Figure 3.3. is under those with corruption curve x'_c. Then the number of entrepreneurs is very high so that the wage of bureaucrats is high as well (point E'_c), up to the level that they are not interested in bribes any longer. In this situation we go back (the allocation moves from point E'_c to the point E'_{nc}) to the no-corruption case previously discussed. Therefore, the optimal government intervention gives the following optimal size of production sector:

$$\hat{n} = \frac{\sqrt{y}}{\sqrt{y} + \sqrt{c}} = n = x \qquad (3.2.25)$$

b. Another situation occurs when the curve for the optimal number of firms with good technology and corruption (x_c) is lower than those without corruption (x_{nc}). In this case the number of entrepreneurs is low and the wage for the government sector is low as well (point E_c). In this situation, low wages cause the appearance of bribes. With the presence of corruption, the optimal government intervention, as it was already mentioned, is given by:

$$n_c = \frac{y}{c + y + \frac{1-q}{q} \cdot \sigma \cdot c} = n = x \qquad (3.2.26)$$

c. In the case it is imposed that *n=1/2* the optimal government intervention is the following:

$$x = \max\left\{\frac{1}{2} \cdot \left(\frac{y}{c} - \frac{1-q}{q} \cdot \sigma\right); 0\right\} \qquad (3.2.27)$$

Here y can become too small and some agents have to choose bad technology and pay taxes, in order for the government to maintain its tax base.

d. Other allocations bring to laissez-faire with no entrepreneurs choosing good technology.

As it is shown in the figure, the number of entrepreneurs with corruption case is less than those without corruption: $n_c < \hat{n}$. Therefore, the introduction of a corruption constraint increases the optimal size of bureaucracy even though it decreases the social surplus ($SS_c < SS_g$) and thus decreases desirability of government intervention. When the corruption is very high (low q and large σ) public wages have to increase which requires more revenue from the government and thus more bureaucrats to submit it.
The following conclusion comes from the above analysis:

The increase in bargaining power of bureaucrats σ and their informational advantage 1-q reduce the desirability of government intervention, i.e. implies less social surplus. But if the optimal allocation still requires government intervention, the number of bureaucrats would increase together with their wages.

3.2.4. Heterogeneity and equilibrium corruption

Now the goal is to allow the presence of corruption and to find its equilibrium level. Bureaucrats can choose to be of two types: dishonest and honest. Dishonest bureaucrats are good at taking bribes; their probability to be caught is $\hat{q}$. Honest bureaucrats are not good at taking bribes and their probability of being caught is greater: $q > \hat{q}$. The probability to be dishonest is *m* and therefore to be honest is *(1-m)*.

With corruption the model offers three possible situations:

1. There is no government intervention, i.e. laissez-faire equilibrium with *n=1, x=0.*

2. There is government intervention, but there is no corruption. This situation refers to situation a) of the previous paragraph where

$$w \geq \frac{1-q}{q} \cdot \frac{n}{1-n} \cdot \sigma \cdot c \text{ and } \hat{n} = \frac{\sqrt{y}}{\sqrt{y}+\sqrt{c}} = n = x$$

3. There is "partial corruption" where honest bureaucrats don't take bribes and dishonest ones do.

The last situation implies the change in some of the constraints of the model:

a. Technology constraint becomes: $\tau + s \geq \frac{n}{1-n} \cdot \frac{1}{1-m} \cdot c$, *(3.2.28)*

where respect to the previous technology constrain the probability of being dishonest for bureaucrats is added;

b. There is new corruption constraint "partial corruption constraint" that ensures that honest bureaucrats don't take bribes (i.e. the wage of honest bureaucrats should be at least equal to their rents in case they decide to accept the bribes:

$$w \geq \frac{1-q}{q} \cdot \frac{n}{1-n} \cdot \frac{\sigma}{1-m} \cdot c \qquad (3.2.29)$$

c. Budget constraint that now takes into account the probabilities to be honest or dishonest for bureaucrats, the probability to pay subsidies and collect taxes, the fact that caught bureaucrats don't receive wages:

$$(1-n) \cdot w + (1-n) \cdot (1-m) \frac{x}{n} \cdot s + (1-n) \cdot n \cdot (1-\hat{q}) \cdot s \leq (1-n) \cdot m \cdot \hat{q} \cdot (w+\tau) +$$
$$+ (1-n) \cdot (1-m) \cdot \left(1 - \frac{x}{n}\right) \tau \qquad (3.2.30)$$

d. Allocation that ensures that a fraction of agents to become bureaucrats:

$$(1-n) \cdot w + m \cdot (1-\hat{q}) \cdot (w + \sigma \cdot (\tau + s)) \geq y - \frac{1-n}{n} \cdot \tau + \frac{1-n}{n} \cdot n \cdot (1-q) \cdot (1-\sigma) \cdot (\tau + s) \qquad (3.2.31)$$

which is different from the previous constraint because of this type by the fact that agents now know if they become bureaucrats or entrepreneurs, there is the probability *m* of being corrupted or suffering from corruption.

Now the optimal government intervention can be figured out.

To simplify calculations σ is taken equal to *1,* i.e. bureaucrats receive the maximum possible amount of bribe. Therefore, the optimal government intervention is given by:

$$x \le \min\left\{ n; (1-n)\cdot\frac{y}{c} - n\cdot\underbrace{\left[\frac{m}{1-m}\cdot(1-\hat{q}) + \frac{1-q}{q}\cdot\frac{1-m\cdot\hat{q}}{1-m}\right]}_{\text{Define this term by } A}; \frac{(1-n)^2}{n}\cdot\frac{y}{c} \right\} \qquad (3.2.32)$$

where the first term ensures $x \le n$, the second ensures that *(1-m)* of bureaucrats don't take bribes, and the third that some agents become bureaucrats.

Since the probability to be caught for the honest bureaucrat is greater than the probability for the dishonest bureaucrat ($q > \hat{q}$*),* there is certain critical level for $\hat{q}$ called Q that in the case $\hat{q} < Q$ optimal government intervention involves *m* bureaucrats that accept bribes and in the case $\hat{q} > Q$*,* involves no corruption. The latter case brings us back to the situation already analyzed in section 2. The former case brings to the situation with partial corruption that is a subject to the analysis similar to the previous analysis fulfilled.

Different levels of β together with dominance of partial-corruption constraint or dominance of allocation of talent constraint give different allocations of the optimal government intervention represented by Figure 3.4.

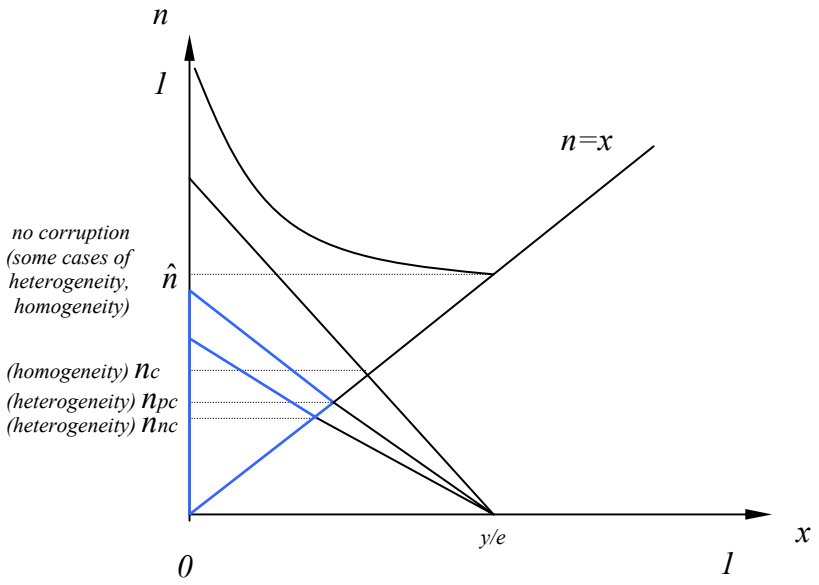


Figure 3.4. Equilibrium corruption with heterogeneous bureaucrats. Source: Acemoglu and Verdier (2000)

According to the figure 3.4., the partial-corruption optimal allocation n_{pc} is greater than no-corruption allocation n_{nc}, therefore the partial-corruption is preferred to no-corruption (the blue triangle presented in figure 3.4. is larger in the case of partial corruption). In the former case the externality level is:

$\beta_{pc} > 2 \cdot c + A \cdot c$ in the latter case: *(3.2.33)*

$$\beta_{nc} > 2 \cdot c + c \cdot \frac{1 - \hat{q}}{\hat{q}}. \qquad (3.2.34)$$

Allocation n_c with heterogeneous bureaucrats (that get caught with probability q) would not be achievable, since the fraction m of bureaucrats can be caught only with probability $\hat{q} < q$. Finally, allocation $\hat{n}$ that is verified in heterogeneity and homogeneity occurs, as before, for the levels

of externality $\beta \geq \sqrt{c \cdot y} + c$ where the corruption is prevented by higher wages.

Using these results it is possible to compare optimal government intervention without corruption with partial corruption (Figure 3.5.). The critical level Q defines the cut-off level for partial-corruption and no-corruption. The level of β separates two government regimes: intervention and no intervention.

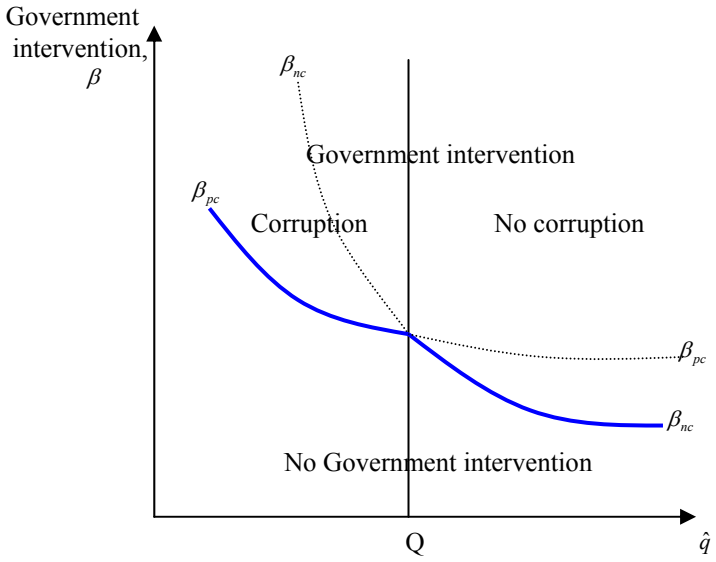


Figure 3.5. Patterns of government intervention. Source: Acemoglu and Verdier (2000)

Both levels of β_{pc} and β_{nc} decrease with the increase of $\hat{q}$ (probability to be caught for honest bureaucrats, i.e easy monitoring) because less corruption of bureaucrats makes government intervention desirable. In the partial corruption regime, β_{pc} should increase with m (probability to be honest bureaucrats) and decrease with q (probability to be caught for dishonest bureaucrats). In the no-corruption regime, β_{nc} depends only on

$\hat{q}$ and decreases with it. The lower m (or higher q) influences only the partial corruption and shifts down the line β_{pc}. It allows for more government intervention that is optimal, hence making the partial corruption more desirable.

The authors underline that the model suggests that it is easier to justify corruption as the cost of optimal government intervention in advanced economies, but not in LDC, because their level of corruption seems to be too high to be optimal for the correction of market failures. Therefore, the application of these findings suggests that even though corruption in LDC represents a possible equilibrium, it would probably not be optimal.

3.3. Model results

The model formalizes the problem of identifying the optimal government intervention to correct market failures. This intervention itself is associated with government failures that arise with the appearance of corruption. The paper produces the following results:

a. The government intervenes in the market when the externality impact on social surplus is high enough compared to the cost the government pays for the intervention;
b. Even though corruption decreases social surplus, the level of externality can be so high that government intervention becomes the less harmful distortion. In this case the number of bureaucrats increases together with bureaucrats' wages;
c. In the case bureaucrats are heterogeneous, the government intervention is optimal when market failure is important and corruption is easy to prevent;

d. The model seems to give a plausible explanation for the situation in advanced developed countries where corruption exists.

3.4. Critique of the model

3.4.1. Achievement of final equilibrium

Acemoglu and Verdier (2000) represent the model where the entries of the State's budget are composed exclusively by the specific tax τ that bad technology entrepreneurs pay to the State. The value of specific taxes is used for paying bureaucrats' wages and good technology entrepreneurs subsidies. It is to be remembered that State balance constraint is given by:

$$\frac{(1-n)}{n}\cdot(n-x)\cdot\tau \geq (1-n)\cdot w + \frac{(1-n)\cdot x\cdot s}{n} \qquad (3.4.1)$$

where on the left hand side there is the value of specific taxes paid by bad technology entrepreneurs, while on the right hand side there are the wages paid to bureaucrats and the subsidies released to good technology entrepreneurs.

Consequently, the bad technology entrepreneurs should represent the necessary part of the final equilibrium otherwise the State can not respect its budget. However, the final equilibrium is given by the point $x=n$ where the bad technology is completely neutralized. In accordance with the models' settings, such allocation of agents can not be supported by the State that falls short of funds to pay to the bureaucrats and good technology entrepreneurs. As a result, the State would always desire some entrepreneurs to use bad technology. In order to overcome this problem, Acemoglu and Verdier (2000) permit the subsidy to be negative, hence good technology entrepreneurs in their model are taxed, but less than bad technology

entrepreneurs. In the case one is interested in the positive subsidy, another source of State's entries should be introduced.

Let *t* be the general tax paid by both types of entrepreneurs. Suppose, the tax *t* is random and is paid in the case the entrepreneur is monitored by the bureaucrat[3]. Now the value of specific taxes paid by bad technology entrepreneurs and general tax paid by all the entrepreneurs constitute the substantial part of State's income. The new budget constraint obtains the following form:

$$\frac{(1-n)}{n}\cdot(n-x)\cdot\tau+t\cdot n\cdot\frac{(1-n)}{n}\geq(1-n)\cdot w+\frac{(1-n)\cdot x\cdot s}{n} \qquad (3.4.2)$$

where the second term on the left hand side is the value of general taxes paid by both types of entrepreneurs.

Obviously, the technology constraint is going to include *t*:

$$y+\beta\cdot x-c-t\cdot\left[\frac{(1-n)}{n}\right]+\frac{s\cdot(1-n)}{n}\geq y+\beta\cdot x-t\cdot\left[\frac{(1-n)}{n}\right]-\frac{\tau\cdot(1-n)}{n} \qquad (3.4.3)$$

as well as the talent allocation constraint that becomes:

$$w+\beta\cdot x\geq y+\beta\cdot x-c-t\cdot\left[\frac{(1-n)}{n}\right]+\frac{(1-n)\cdot s}{n} \qquad (3.4.4)$$

With the above settings of the model, the final allocation of agents resulting achievable, given the positive subsidies for good technology entrepreneurs. The model developed in chapter six includes the general tax *t,* paid by both types of entrepreneurs, among its settings

[3] Such an introduction of the tax corresponds to the reality of weak institutions, where avoidance of tax paying is a frequent problem.

3.4.2. The degree of State intervention

Talent constraint is seen in the Acemoglu and Verdier's (2000) model as the propensity of the agents to prefer the activity of the entrepreneurs or bureaucrats. The government determines the size of the bureaucracy and of the production sector through the wage of bureaucracy set by the government. Such an assumption implies complete government control over sectors. It is worth it to noting that such a determination of the bureaucracy sector could hardly be realistic. On the one hand, very often the size of bureaucracy moves out of government control and large state bureaucracy generates an even larger public sector in search for extra rents (Wei and Shleifer, 2000). On the other hand, rent-seeking may represent a mechanism that the State may utilize in order to achieve a better allocation of agents. Acemoglu and Verdier's (2000) model represent a good framework for a demonstration of the latter process.

Let us assume that the institutional environment is weak, thus, the bureaucrats may practice rent-seeking. Suppose, the State gives subsidies and collects taxes through the bureaucrats. For the self interested bureaucrats each dollar under State control values more than a dollar, because it can be utilized for private purposes and increase the bureaucrats' rents. Let us say that bureaucrats may place a "premium" on public funds. Such a premium is represented by Esfahani (2000) as a reflection of a certain institutional environment.

According to Esfahani, the premium is inversely related to the administrative capability of the State. The administrative capability is the parameter that includes a set of bureaucratic institutions developed to control and promote the activities of the entrepreneurs. If the State is administratively capable it collects taxes and give subsidies with less

distortions and bureaucratic costs. Define $\gamma=\varphi/b$, where φ describes all other factors that influence γ other than administrative capability: corruption, financial and economic stability etc. We define the premium the bureaucrats earn in term of delay of transferring specific taxes from bad technology entrepreneurs to the State and of giving subsidies from the State to the good technology entrepreneurs. The subsidies and the taxes are available after a given duration of delay (or red tape).[4] Less red tape is considered social welfare increasing as it reflects bureaucrats' efficiency.

To sum up, the bureaucrats represent an institute that transfers subsidies to the entrepreneurs that use good technology and collects taxes from those with bad technology. They are self interested and extract rent from the subsidies and taxes that influence their pay-off. The rent that bureaucrats extract depends on the strength of institutional environment. In the weak institutional environment the bureaucrats extract a larger premium from public funds which attracts more bureaucrats since it augments their pay-off:

$$\pi = w + \beta \cdot x + \left(\frac{1-n}{n} \right) \cdot (s + \tau) \cdot \gamma \qquad (4.4.5)$$

where the third term on the right hand side the is the value of the premium a bureaucrat may extract giving the subsidies and collecting taxes. In the case of strong institutions γ is modest or null, in the case of weak institutions γ is high. Thus, a weaker institutional environment that offers more rent for the bureau contributes to the enlargement of public sector.

[4] An example of such a rent can be the interest rate gained from the delay in payments of subsidies and in transfer of taxes, a common experience in transition countries (Saha, 2000).

The introduction of the coefficient that reflects institutional environment implies substantial changes in the model, starting with the changes in the talent constraint that obtains the following form:

$$w + \beta \cdot x + \left(\frac{1-n}{n} \right) \cdot (s + \tau) \cdot \gamma \geq y + \beta \cdot x - c - t \cdot \left[\frac{(1-n)}{n} \right] + \frac{(1-n) \cdot s}{n} \quad . \tag{3.4.6}$$

The third term is the premium the bureaucrats extract which is random, since it depends on probability of monitoring. In chapter six it is going to be demonstrated that the rent-seeking contributes to the enlargement of the private sector in the case where the State handles an appropriate policy.

3.4.3. Cost of State intervention

The introduction of bureaucrats presumes a very high cost the State should bear. The cost of bureaucracy is measured by the loss in production due to increase in the amount of State officials and decrease in the amount of entrepreneurs. Thus, the level of positive externality should be high enough to compensate the loss in output in the case of State intervention. However, considering the loss of output as a unique cost of the introduction of bureaucracy could be misleading. In reality, the bureau depends on investments in the State sector: the creation of infrastructure, training, organization, monitoring and other costs. Even though models simplify the reality, measuring of bureaucracy cost by the loss of output is not sufficient. Another variable already included into the model, such as corruption, should be considered as a part of the measure of bureaucracy costs (Shleifer and Vishny, 1993); the decision on State's intervention should be based on the comparison of the change in $\beta \cdot x$ to the change in y plus the loss due to the rent-seeking activity. Ehrlich and Lui (1999) write about the cost of corruption: "Rent-seeking consumes economic resources that could otherwise be used for production or investment in human capital. This is the

source of the social loss from corruption…"; thus, the social loss represents a part of corruption costs and should be taken into consideration.

The introduction of a premium on public cost permits to consider such costs. It must be remembered that, the proposed measure of rent-seeking is the delay in transfer of taxes and release of subsidies. Thus, the cost of rent-seeking can be defined as an opportunity cost. Think of a good technology entrepreneur who has invested into good technology waiting for a subsidy. In this case, the entrepreneur bears the opportunity cost. This cost is measured as the loss in production due to the expenses in good technology. In the case with bad technology entrepreneurs the opportunity cost bears the State that is waiting for the specific taxes to be transferred by bureaucrats. The State's cost can be evaluated as the loss in the value of subsidies and wages it has to pay. As underlined before, the premium bureaucrats may extract are defined by the strength of the institutional environment and depends on the delay of the funds and on the rate of interest in the economy.

3.4.4. Corruption as a part of efficient allocation

The peculiarity of the model is finding that the second best allocation may include a certain degree of corruption. The corruption is represented as a necessary collateral effect of government intervention to fight market failures and hence should not be eliminated. Normally corruption is seen negatively and is shown as a consequence of agents' rent-seeking activity that leads to the distortions and therefore should be limited. The vision of corruption as a part of optimal allocation goes in the same direction as with the previous Acemoglu and Verdier (1998) paper that considers the influence of corruption on property rights and proves that in some situations some corruption is a more efficient choice than enforcement of property rights.

The desirability of corruption can be considered unusual at first sight. At the same time such singularity finds its logical explanation when the objectives of government are analyzed in details. "Without understanding why the State exists, it is difficult to assess why corruption arises, what its consequences are, and whether and how it should be prevented" (Acemoglu and Verdier, 1998). In fact, the State supplies public goods that could not be offered by private agents; it performs such functions as the correction of market failures which can be difficult to achieve without its intervention, it redistributes the resources in order to find efficient allocation in the markets and provides other necessary services. It is easy to deduce that the more important public goods are to supply, the more important market failures are to correct and the more important are State's provisions, the more government intervention is desired. In the situation where the State intervention is very important, the failures of the government (e.g. corruption, bribing, etc.) become more insignificant. Once the necessity of State intervention appears, the question to be raised is not about the rent-seeking elimination but about the equilibrium between State failure and market failure.

By introducing the institutional environment, it can be demonstrated that the rent-seeking may not only be unavoidable in the final equilibrium, but also contribute to a better allocation of agents. In fact, the rent-seeking can permit to the State to decrease the cost it should bear to obtain positive externality. To motivate the agents to become bureaucrats, the State should guarantee their wages:

$$w \geq y - c - \left(\frac{1-n}{n}\right)\cdot(t-s) - \left(\frac{1-n}{n}\right)\cdot\gamma\cdot(s+\tau) \qquad (3.4.12)$$

Note that the increase in the premium decreases the wage level:

$$\frac{dw}{d\gamma} = -\left[\left(\frac{1-n}{n}\right)\cdot(s+\tau)\right] \leq 0 \qquad (3.4.13)$$

Therefore, greater premium permits the State to fix a lower wage level and, thus, decrease the expenses for externality introduction. Moreover, as is going to be demonstrated in chapter six, the level of social surplus may go up with the increase of rent-seeking.

Chapter 4. Institutional environment, government and enterprises ownership

4.1. Introduction

The role of institutions in economic development is a quite new subject of research. There has been done a lot of empirical research on the importance of institutions, while the theoretical approach is more concise. The main problem the theoretical research faces dealing with institutions is their vast nature that creates difficulties in introducing institutions into economic models. The majority part of the papers dedicated to institutions present a single institution or a set of similar institutions in an economic framework. We will analyze some of the most common theoretical approaches in the analysis of institutional environment.

One of the approaches is to study the organizational aspect of institutions. A good example of this approach is the Huang and Xu (1999) model that deals with financial institutions and their organization. The model shows the dependence of economic growth rates on merged or centralized financial institutions. An R&D project may be financed by one or two institutions and that implies studying soft or hard budget constraints influence on investment levels. The organizational choice of the financial institutions may influence the financing of the R&D project. Using equilibrium investment level the Huang and Xu (1999) model calculates and compares the economic growth rate for merged or centralized financial institutions. It has been proved that in the case of the latter the economy achieves a higher growth rate.

A similar approach is the analysis of the quality of a single institute. Skaperdas and Syropoulos (2001) offer a model dedicated to the security of

trade. Obviously, the security can be considered as an informal institute necessary for the economic development of a society. The authors show how various trade regimes differ from each other in terms of the trade security. Comparing the prices for the traded goods, the opportunity costs and the marginal benefits for buying arms in autarky and open trade, the levels of social welfare are determined. The model offers various conditions under which countries may impose trade restrictions because of high trade insecurity. Skaperdas and Syropoulos (2001) represent an unusual insight of the link between international trade and institutions that is barely explored in economic literature.

Another approach is the introduction of new institutions into economic systems to study the change in their efficiency. Using this, Jack (2002) demonstrates the effect of the introduction of a new institution on social welfare in transition economies. In this model social welfare is defined in terms of operating hospitals, where closing down inefficient hospitals leads to welfare improvement. In the context of the model, the Ministry of Health introduces the National Health Insurance Fund as an institute that guarantees the efficiency of a hospital's functioning. Jack (2002) shows interaction between hospitals and Ministry of Health, comparing social surplus with/without National Health Insurance Fund. It is demonstrated that the presence of effective public institutions in transition economies leads to a closure of ineffective government enterprises.

Grossman (2001) concentrates attention on the creation of property rights. The two proposed models represent a general equilibrium approach where agents allocate time and effort to create the property rights. While in the first model the agents appropriate the common resources, in the second model the agents have already the initial claims, thus they create their effective property rights. The models define the first order conditions for

agents' consumption function, subject to the technology function necessary for the achievement of equilibrium allocations of time and effort for the creation of property rights.

An alternative way to include institutions in theoretical models is that the introduction of coefficients that reflect not a single institution, but an institutional environment, i.e. a set of different institutions. This approach is very limited in the literature, however, it gives the possibility for a more broad analysis of institutions and their influence on the economy. Using this approach, Brezis and Verdier (2003) construct a model that studies the diffusion of democracy as well as the process of privatization among former socialist countries. The authors introduce parameters that measure the effectiveness of a "repression apparatus", demonstrating that in the case where effectiveness is low, the optimal action of the rulers is to relinquish political power. Calculating the pay-off of rulers and workers, they determine the privatization type and the nomenklatura choice of whether to resign or not, that defines political and economical regimes.

A similar approach is used by Esfahani (2002). This model merits particular attention, because it introduces the coefficients that measure institutional environment in a very broad manner. Moreover, the model captures the interaction between the State and the market. It is commonly accepted that a way through which institutions influence the economic performance is mainly government intervention and its interaction with enterprises. Hence, the model contributes to an innovative field of economic research, where the influence of institutional environment on the economy can be theoretically formalized. The results of the model were further developed, in a latter Esfahani and Ramı´rez (2003) paper that offers a structural growth model that studies the mutual effects of infrastructure on the rest of the economy. The authors construct a growth model based on the Cobb–Douglas

production function and study the effect of infrastructure on growth. Great attention is again dedicated to institutions introduced as a coefficient that summarizes the variety of potential variables that influence the adjustment rate for capital and infrastructure. The model is then tested empirically, introducing variables that reflect the effectiveness of different institutions.

We will now go through the Esfahani (2000) paper in order to apply in our personal contribution. Particularly, we will use the model that sheds light on the choice between private or State operation and ownership of enterprises that depends on institutional environment of the society. The model uses the principal-agent approach with asymmetric information and infinite horizon. The institutional factors such as administrative capability of government control, evaluation of public funds by private agents, reliability of government policy, corruption etc have crucial role in the model. The following analysis shows how these factors influence the ownership of enterprises and the degree of State intervention in the industrial sector.

4.2. Model

4.2.1. Settings of the model

A private or public firm runs a project financed by the public funds that are distributed to managers through politicians. Managers possess the private information about project's costs and politicians are not able to extract this information. To run the project managers receive the payment p from the government; the politicians supply this payment to the managers.

The project requires input that is has two characteristics of quality and quantity. Quality q and its cost $v(q)$ are observable only by managers.

Quantity Q can be observed by managers and by politicians, but politicians bare the cost ω to discover it. When politicians choose to control Q the firm is *State operated*, when managers control Q, the firm is *private operated*. Total amount of input given by quality q and quantity Q is denoted by a random variable a.

The productivity of the firm depends of amount of input required for production and can be high or low, as shown in Figure 9.

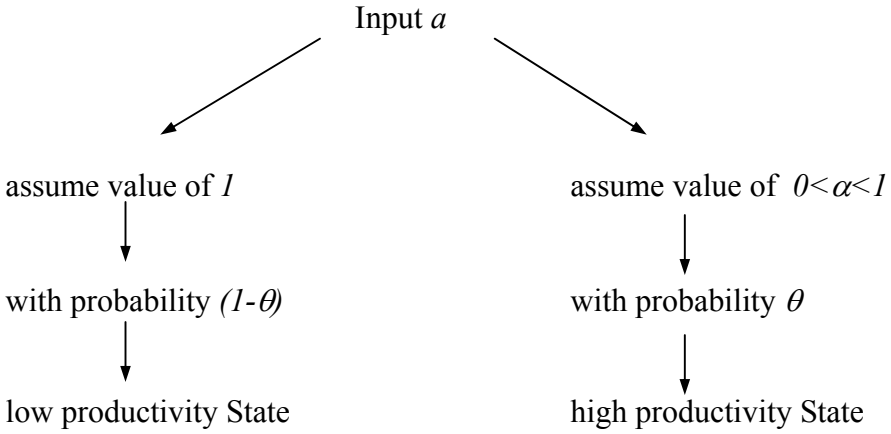


Figure 4.1. Possible input dimensions of the project

Given these settings:

- The pay-off of the managers to run the project is:
  $\pi=p-v(q)\cdot Q$ *(4.2.1)*
- The most efficient levels of input are represented by:
  minimization of $v(q)\cdot Q$
  subject to $q\cdot Q=a$ *(4.2.2)*
  applying differentiation respect to q and Q, gives as a solution:
  $v'(q^*)\cdot q^*=v(q^*)$ *(4.2.3)*
- The most efficient levels of quantity is given by:

$Q_L^* = 1/q^*$ in the low-productivity State and (4.2.4)

$Q_H^* = \alpha/q^*$ in the high-productivity State. (4.2.5)

To introduce into the model the institutional environment, the following parameters are used:

1. The cost ω plays important role in definition of State or private operation of the firm. It defines the "administrative capability of government" denoted by index *b*. Administrative capability is the parameter that includes a set of bureaucratic institutions developed to control and promote the activities of the firms. Administrative capability is represented as:

   $b = \xi/\omega$ (4.2.6)

   where ξ is another parameter that describes all costs of control other than administrative capability, such as technological complexity of the project, innovations etc. From this definition it is easy to see that strong administrative capability of the government implies smaller cost ω that government has to pay to discover input quantity *Q*.
2. In the model the government finances the project and the politicians dispose the money. But for the politicians each dollar under government control values more than a dollar, because it could be utilized for private purposes and increase the politicians' rents. Therefore, politicians place a premium on public funds, denoted by λ. This premium is inversely related to *b,* because if government is administratively capable it collects revenue with less distortions and bureaucratic costs. Denote:

   $\lambda = \varphi/b$ (4.2.7)

   where φ describes all other factors that influence λ other than administrative capability, e.g. corruption.

Politicians' utility in high and low productivity cases ($j=H,L$) is calculated after the organizational choice is made (therefore, cost ω is not included):

$$U_j = u + \pi_j - (1+\lambda)\cdot p_j = u - v(q)\cdot\theta - \lambda\cdot p_j \qquad (4.2.8)$$

where u is the utility the politicians attach to project's output. From this expression it is easy to see that politicians gain by minimizing the payment p to the firm.

4.2.2.Equilibrium under private operation

Under private operation the politicians have no information on firm's quality and quantity of input. If the payment received from government (through politicians) exceeds the costs of production, the firm produces. Managers choose q and Q so that:

to minimize $v(q)\cdot Q$

subject to $q\cdot Q=a$ *(4.2.9)*

that gives the optimal Q and q in high and low productivity States:

$$q_j^p = q^*$$
$$Q_H^p = \frac{\alpha}{q^*} \qquad (4.2.10)$$
$$Q_L^p - \frac{1}{q^*}$$

Therefore, managers' pay-off is given by:

$$\pi_j^p = p_j^p - v(q^*)\cdot Q_j^p \qquad (4.2.11)$$

To induce managers to produce efficiently (choose the high productivity), the politicians set:

$$p_H^p = p_L^p = p = \frac{v(q^*)}{q^*} \qquad (4.2.12)$$

that implies:

$$\pi_H^p = \frac{(1-\alpha)\cdot v(q^*)}{q^*} \text{ and } \pi_H^p = 0. \qquad (4.2.16)$$

Therefore, politicians expected utility is:

$$V^p = u + \theta \cdot \pi_p^H - (1+\lambda)\cdot \frac{v(q^*)}{q^*} \qquad (4.2.17)$$

It can be rearranged to show the part of information rent that the politicians loose because of managers' private information on *q* and *Q*:

$$V^p = \underbrace{u - (1+\lambda)\cdot\left[\alpha\cdot\theta + (1-\theta)\right]\cdot\frac{v(q^*)}{q^*}}_{\text{expected utility}} \underbrace{- \lambda\cdot\theta\cdot\pi_H^p}_{\text{loss due to information rent, } >0} \qquad (4.2.19)$$

The above equation shows that in order to run the project as private operated this expected utility should be positive which requires *b* high enough. The increase in administrative capability of government *b* (recall, $\lambda=\varphi/b$) decreases the politicians' loss due to informational rent.

4.2.3. Equilibrium under State operation

Managers choose between high productivity production and low productivity:

$$q_H^s = \frac{\alpha}{Q_H^s} \qquad (4.2.20)$$

$$q_L^s = \frac{1}{Q_L^s} \qquad (4.2.21)$$

The managers decide as well if to declare the truth or the false about productivity State. To avoid the false information the State sets the payment to the firm so that its pay-off is higher in case of high productivity State:

a. managers' pay-off in high productivity State:

$$\underbrace{p_H^s - v \cdot \left(\frac{\alpha}{Q_H^s}\right) \cdot Q_H^S}_{\text{if true}} \geq \underbrace{p_L^s - v \cdot \left(\frac{\alpha}{Q_L^s}\right) \cdot Q_L^s}_{\text{if false}} \qquad (4.2.22)$$

b. managers' pay-off in low productivity State:

$$\underbrace{p_H^s - v \cdot \left(\frac{1}{Q_H^s}\right) \cdot Q_H^S}_{\text{if true}} \leq \underbrace{p_L^s - v \cdot \left(\frac{1}{Q_L^s}\right) \cdot Q_L^s}_{\text{if false}} \qquad (4.2.23.)$$

Rearranging, it is easy to get:

$$p_L^s = v(q_L^s) \cdot \frac{1}{q_L^s} \text{ and } p_H^s = v(q_H^s) \cdot \frac{\alpha}{q_H^s} + v(q_L^s) \cdot \frac{1}{q_L^s} - v(\alpha \cdot q_L^s) \cdot \frac{1}{q_L^s} \qquad (4.2.24)$$

that gives the following expected utility of politicians:

$$V^P = u - (1+\lambda) \cdot \theta \cdot \alpha \frac{v(q_H^s)}{q_H^s} - \left[(1-\theta+\lambda) \cdot v(q_L^s) - \lambda \cdot \theta \cdot v(\alpha \cdot q_L^s)\right] / q_L^s - \omega \qquad (4.2.25)$$

The optimal choice of quality (or quantity) should minimize the probability of low productivity (taking λ into consideration):

$$\left[(1-\theta+\lambda) \cdot v(q_L^s) - \lambda \cdot \theta \cdot v(\alpha \cdot q_L^s)\right] / q_L^s \qquad (4.2.26)$$

such quality is denoted by $\overline{q} = q_L^s$.

Recall that $q_H^s = q^*$ and $q_H^s > q_L^s$ therefore:

$$\overline{q} < q^* \text{ and } Q_L^s > Q_L^p \qquad (4.2.27)$$

that demonstrates the State operated firm is less productive than the private operated firm with the same characteristics because it tends to produce more quantity with lower quality.

Again, in order to show the part that politicians loss due to the expected input distortion, the expected utility can be written in the following form:

$$V^s = u - (1-\rho)\cdot\left[\theta\cdot\alpha + (1-\theta)\cdot\frac{v(q^*)}{q^*}\right] -$$

$$\left[(1+\rho)\cdot(1-\theta)\cdot\left[\frac{v(\bar{q})}{\bar{q}} - \frac{v(q^*)}{q^*}\right] + \rho\cdot\theta\cdot\pi_H^S + \omega\right]$$

(4.2.28)

It is useful here to underline the role of government administrative capability *b*. As *b* (since $\lambda=\varphi/b$) increases the loss from the expected input distortions is getting smaller. When *b* decreases, the loss grows, but more slowly respect to the case with the private operation. It happens because the politicians offset the decrease in *b* by allowing a lower quality in State with low productivity.

From the above analysis follows that the State operated firms are less efficient than private operated firms. The increase in administrative capability of the government brings to better productivity in State and private operated firms.

4.2.4. Choice between State and private operation

Politicians prefer private operation if $V^p > V^s$ and prefer public operation when $V^p < V^s$.

The difference between the expected utility of politicians can be written as the difference between ω and the excess cost of information rent and distortion under private operation:

$$V^p - V^s = \omega - \underbrace{\left[\lambda \cdot \theta \cdot \left(\pi_H^p - \pi_H^s \right) - \left(1-\theta\right) \cdot \left(1+\lambda\right) \cdot \left[\frac{v(\overline{q})}{\overline{q}} - \frac{v(q^*)}{q^*} \right] \right]}_{>0}. \qquad (4.2.28)$$

The above equation proves that the private operation doesn't dominate until there is no cost of controlling of the project.

Recalling that $b = \frac{\omega}{\lambda} = \frac{\xi}{\varphi}$ let's find the condition for b that gives $V^p > V^s$ or $V^p < V^s$. Subtracting $V^p - V^s$ and evidencing *b* gives:

$$\frac{1+\omega}{\rho} = \left[\theta \cdot (1-\alpha) \cdot \frac{v(q^*)}{q^*} - \theta \cdot \left(\frac{v(\overline{q}) - v(\alpha \cdot \overline{q})}{\overline{q}} \right) \right] \cdot \frac{\overline{q} \cdot q^*}{(1-\theta) \cdot \left(v(\overline{q}) \cdot q^* - v(q^*) \cdot \overline{q} \right)} - 1 \qquad (4.2.29)$$

As a result, the increase in φ rises V^s and the increase in ξ lowers V^s.

Therefore, the increase of factors (other than administrative capability) that influence positively the premium on public funds for politicians (i.e. corruption) makes the State operation more attractive; the increase of costs of control (specific to the project) decreases the utility of politicians and makes private operation more attractive.

What influences have the information asymmetry on the choice of the project operation? Information asymmetry arises when the managers have lower levels of input α with higher probability θ, i.e. high productivity case. In this case the managers could obtain information rent since they can always declare the false (i.e. low productivity case in order to receive a

higher contingent from the State). That is why it is worthwhile to check how the difference $V^p - V^s$ changes when α, θ change:

$$\frac{\partial(V^p - V^s)}{\partial \alpha} = \left[v'(q^*) - v(\alpha \cdot \bar{q})\right] > 0$$

$$\frac{\partial(V^p - V^s)}{\partial \theta} = -\left[\frac{v(\bar{q})}{\bar{q}} - \frac{v(q^*)}{q^*} - \lambda \cdot \alpha\left(\frac{v(\alpha \cdot \bar{q})}{\alpha \cdot \bar{q}} - \frac{v(q^*)}{q^*}\right)\right] < 0$$

(4.2.30)

The increase in α brings to private operation dominance while the increase of θ brigs to public operation dominance. *Thus*, *in the situation with high information asymmetry (when α is low and θ is high) more government intervention is required in order to correct inefficiencies.*

4.2.5. Investments and commitment

Further extension of the model deals with private and public investments to the project. The introduction of investments permits to define different organization forms of the firm. There are four possible variants analyzed:

a. State investment and State operation
b. State investment and private operation
c. Private investment and private operation
d. Private investments and State operation

Now the game has infinite horizon. It is supposed that the project requires private or public investments *s*. In the case of public investments the politicians again have premium on public funds of $1+\lambda$. Private investments, in their turn, require the assurance that government will not change its policy and take away the rent from the private investors (e.g. loss

of policy credibility). So, there is a new institutional mechanism introduced into the model: *commitment.* The commitment implies the cost *c>0* that politicians bare in the case they don't maintain their promises. The commitment is chosen by the State policy; it can be represented by the law and therefore difficult to alternate, it can be as well a subject of politicians' choice. Therefore, the commitment and its cost differ in different institutional environments. The parameter "commitment capability" $\mu \in (0;\infty)$ is introduced into the model and depends on countries' institutional characteristics.

Now, taking into consideration these factors, the politicians' lifetime expected pay-off is calculated for the four types of organizations:

a. State investment and State operation

Since we have a public enterprise where the government invests and operates the projects, there is no need of commitment and lifetime expected pay-off for politicians is given by:

$$W^{ss} = \frac{V^s}{(1-\delta)} - (1+\lambda)\cdot s \qquad (4.2.31)$$

where δ is a discount factor.

b. Public investment and private operation

Example of this organization can be corporation with State ownership, but full autonomy of managers. In this case:

$$W^{sp} = \frac{V^p}{(1-\delta)} - (1+\lambda)\cdot s \qquad (4.2.32)$$

W^{ss} can be smaller or greater than W^{sp}.

c. Private investment and private operation

In completely private firm the commitment c is required. It is supposed as well that politicians pay to the managers amount r in addition to the payment p for the quasi-rents of their investments. The r and c are set in the way that pay-off of politicians in this situation is greater than pay-off in the case of reorganizing the project to public operated. Then the lifetime expected pay-off for politician is given by:

$$W^{pp} = \frac{V^p - \lambda r}{(1-\delta)} - s - \frac{c}{\mu} \qquad (4.2.33)$$

But the levels of r and c have to be also defined so that the managers are attracted to invest into the project and run it. After defining their levels that correspond to this requirement, the lifetime politicians' pay-off becomes:

$$W^{pp} = \frac{V^p}{(1-\delta)} - s - \left(1+\frac{1}{\mu}\right)\cdot\left[\max\left\{0, \lambda s - \frac{\lambda\cdot\theta\cdot\pi_H^p}{(1-\delta)}\right\}\right] - (1-\mu)\left[\max\left\{0, \frac{V^s - V^p}{(1-\delta)}\right\}\right] \qquad (4.2.34.)$$

d. Private investments and public operation

In this case the money has to be paid back by the government to private investors, so commitment is necessary as well. Under private investments and private operation the pay-off of politician is greater than under private investments and State operation, because in latter case managers require higher values of r and c. Defining for this case r and c the politicians' expected lifetime utility is:

$$W^{ps} = \frac{V^s}{(1-\delta)} - s - \left(1+\frac{1}{\mu}\right)\cdot\left[\max\left\{0, \lambda\cdot s - \frac{\lambda\cdot\theta\cdot\pi_H^s}{(1-\delta)}\right\}\right] \qquad (4.2.35)$$

For all four cases the pay-offs become negative when *b* approaches to zero.

Let's consider the case where the information rents of private operation $\theta \cdot \pi_H^p$ is smaller than quasi-rents of investment $(1-\delta)\cdot s$. Than, denote the level where $W^{ij} = 0$ by b_{ij} and the level where $V^p = V^s$ by b_0. To go ahead it is convenient define as well:

$$\mu^p = \frac{(1-\delta)\cdot s}{\theta \cdot \pi_H^p} - 1 \qquad (4.2.36)$$

as the indicator of "significance of investments quasi-rents" for private investments. Taking as example the case where $\mu^p > 0$, and $b_0 > b_{ss}$ the choice of politicians in accordance with institutional capabilities is show on the Figure 4.2.

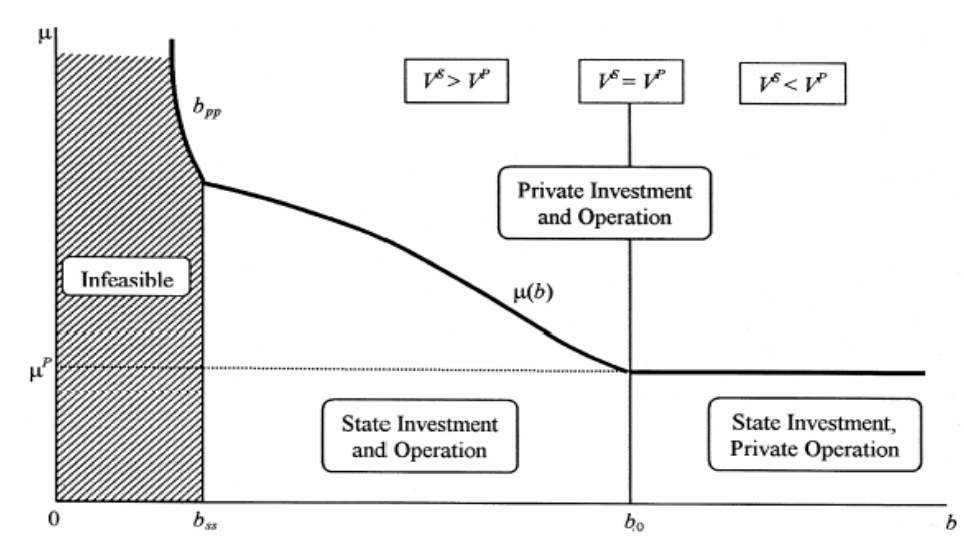


Figure 4.2. Politicians choice in case of high investment quasi-rents. Source: Esfahani, 2000

As Figure 4.2 shows, the heavy line separates the totally private enterprise with the State or regulated firm. The vertical line that passes through b_0 separates the regions with greater State or private politicians' expected

utility of operation. When the administrative capability *(b)* decreases, the higher level of commitment capability μ is required, and the range of State investments and operation expands. It happens because the administrative weakness is associated with high premium politicians attach on public funds. Therefore, in this case the model predicts that the rise in λ (e.g. increase of corruption) implies more government intervention. The line through μ^p defines a certain level of commitment capability that stays constant when b goes up; at this point the comparison shifts State investment and operation versus State investment and private operation. Another cases as well could be deducted from the Figure 4.2.

The above analysis confirms the previous findings and permits extension of some conclusions made before:

a. The increase in φ (other factors than administrative capability that influence λ) rises $V^s - V^P$ and shifts $\mu(b)$ to the right increasing the field of government operation and investments;
b. Increase of ξ (project operation costs of control) shifts $\mu(b)$ and b_0 to the left and increases the range of private investments and operation;
c. Increase of information asymmetry between managers and politicians (low α and high θ) increases the chance for private investments decreasing $\mu(b)$, and in the same time increasing b_0. It happens because managers' informational rent increases under higher information asymmetry (therefore, less commitment is required).

As a result, the administrative and commitment capabilities have great importance on efficiency and represent powerful instruments of government

policy. Governments with lower capabilities, i.e. weak institutions are more likely to have State-owned enterprises and regulated firms.

4.3. Results of the model

The present model analyzes the role of institutional environment on the relationship between the government and enterprises, particularly on the ownership and control of the firms. It argues that the government's incentives to control and own the firms are related to the rents a government aims to receive. The politicians apply their government's regulatory power to use public funds for extracting the rents that would be otherwise extracted by the managers. Analysis provided by this model offers the following results:

a. Enterprises under private control are more efficient than those under State control, given the same institutional environment;
b. The weak administrative capabilities of government implies the higher premium that the politicians put on public funds and therefore make government intervention more attractive;
c. Environment with weak institutions and high uncertainty implies high commitment required by private investors; this commitment can be excessively high and lead to large State ownership;
d. A situation with high informational asymmetry between managers and politicians attracts more government intervention (because of high informational rents of managers) but in the same time expands private investments (since less commitment is required).

4.4. Critique on the model

4.4.1. Incentives for State intervention

The model emphasizes that the incentives for government intervention in the production sector are given by the rents that government aims to extract. That is how the extension of public sector is interpreted in the present paper. However, as empirical research proves, the influence on government's rent of private or State ownership is ambiguous. It is doubtful that the extension of the public sector indeed brings higher rents to the government. As was shown in Shleifer and Vishny (1994) model, the government could prefer the private ownership of enterprises since it increases efficiency and thus, the rents politicians could extract. This point of view is in agreement with Boyko (1996) who underlines that private ownership gives more incentives to restructure and to produce efficiently, increasing the government's revenue. In the above cases the government can not be considered as a benevolent party. Yet, in the Acemoglu and Verdier (2000) model there is the evidence of benevolent government. State intervention in the production sector is justified because of externalities the sector can produce. It seems hardly probable that government intervention into the production sector is limited by the rent-seeking it expects.

4.4.2. Institutional environment

As previously discussed, there has been considerable work on institutional environment influence on the economy (Acemoglu and Robinson (1994) Djankov et al (2003), Elliot (1997) and others) in the last decade. Many authors define institutions as one of the most important reasons of success or failures of transition in post-communist countries (Stiglitz (1998), Intrilligator (1994) and others). However, there has been limited formal

theoretical research on general institutional influence on relationship between State and market. Institutions are complex and multi-factored, they are understood and described in many ways. That is why it could be difficult to formalize the role of institutions and describe their contribution. In the present model the author makes anattempt to introduce the institutional environment that plays an important role and influences greatly the outcomes. The institutions are introduced into the model in a clear and comprehensive way in the form of parameters that are easy to manipulate. Therefore, the introduction of institutions and the study of their influence on the model's results makes the paper particularly interesting and inspiring.

4.4.3. Politicians as a benchmark

In the thesis the choice of private or public operation and ownership of the firm is analyzed from a politicians' point of view; the politicians represent the core of the model. The influence of such factors as institutional environment, firms' efficiency, government intervention, and incomplete information are shown exclusively on politicians' pay-offs. The drawback of such an approach is that the intermediate conclusions of the model like " the increase of factors that influence positively the premium on public funds for politicians makes the State operation more attractive", " the increase of project costs makes private operation more attractive", "high information asymmetry implies more government intervention is required", etc are referred to the politicians' preferences and have little to do with the managers or the society. A certain choice of politicians implies a certain response of other agents and this responce may not coincide with politicians' best choice. For example the fact that for politicians "the increase of project costs makes private operation more attractive" doesn't mean that for the managers the operation is indeed attractive. Therefore, the

model offers very strong results using the politicians' pay-offs, but shows the response of other agents at a very intuitive level.

4.4.4. Commitment

To promote investments the institutional mechanism of commitment is used. As the model shows, the commitment defines the investments to the enterprise to be public or private. But, as the authors underline, it is improbable that commitment explains the degree of State intervention in the economy. Empirical evidence shows that even when the guaranties of political stability are offered by the government, (in reality, by international organizations, such as the World Bank) the share of State ownership in an economy can still be very big (e.g. Indian, Chinese economy).

It is worthwhile to note that the commitment, as a stabilization instrument, is unlikely to be applied at the industrial level. International organizations normally offer the funds in exchange for stability conditions applied to the economy as a whole and not to a single enterprise. The commitments that we face in the reality are those offered to the concession firms (e.g. railroad transportation companies, telephone companies and many other firms that have a long run contract with the government to provide services to the population). Such firms indeed receive the compensation in the case the government changes its policy (e.g. nationalizes the firm). The situation where the private enterprises receive commitment from the government because of a change in its policy would be a good solution to the problems of transition economies and developing countries that suffer high political and economical instability. Unfortunately, such a tool is hardly realizable in reality even though it is very handy to work with in a model.

4.4.5. Corruption as an institution

As the model predicts, the increase of corruption (that is reflected in φ) increases the value of public funds and brings a large government influence. Again here there is a reference to the empirical and theoretical debate: some studies show that corruption has a negative effect on an economy (Mauro, 1995) but there is evidence of positive influence of corruption as was shown in a previous model by Shleifer and Vishny (1994), and is demonstrated in the works of Olsen, Torsvik (1998), Acemoglu and Verdier (1998) and others. Therefore, corruption plays ambiguous role in the economy and under differing circumstances can be proved to be helpful or harmful.

However, discussing corruption and working on the institutional parameters, a contradiction can be noted in the results of the present model. The administrative capability of the government, $b=\xi/\omega$ that depends on the costs of government control is considered as a positive characteristic of the model. In fact, strong administrative capability of a government implies less government intervention and increases the efficiency of production. In the same time $b=\varphi/\rho$, where φ describes corruption; therefore, administrative capability of a government increases with the increase of corruption. As a result, corruption also contributes to the efficiency of the system that contradicts the conclusion that corruption enlarges the government intervention.

Chapter 5. Quality of government and weak institutions in transition economies

5.1. Introduction on personal contribution

The following two chapters integrate the models described in the previous three chapters. The aim of such integration is to show the influence of the institutional environment on the performance of the production sector, given market failures and government quality.

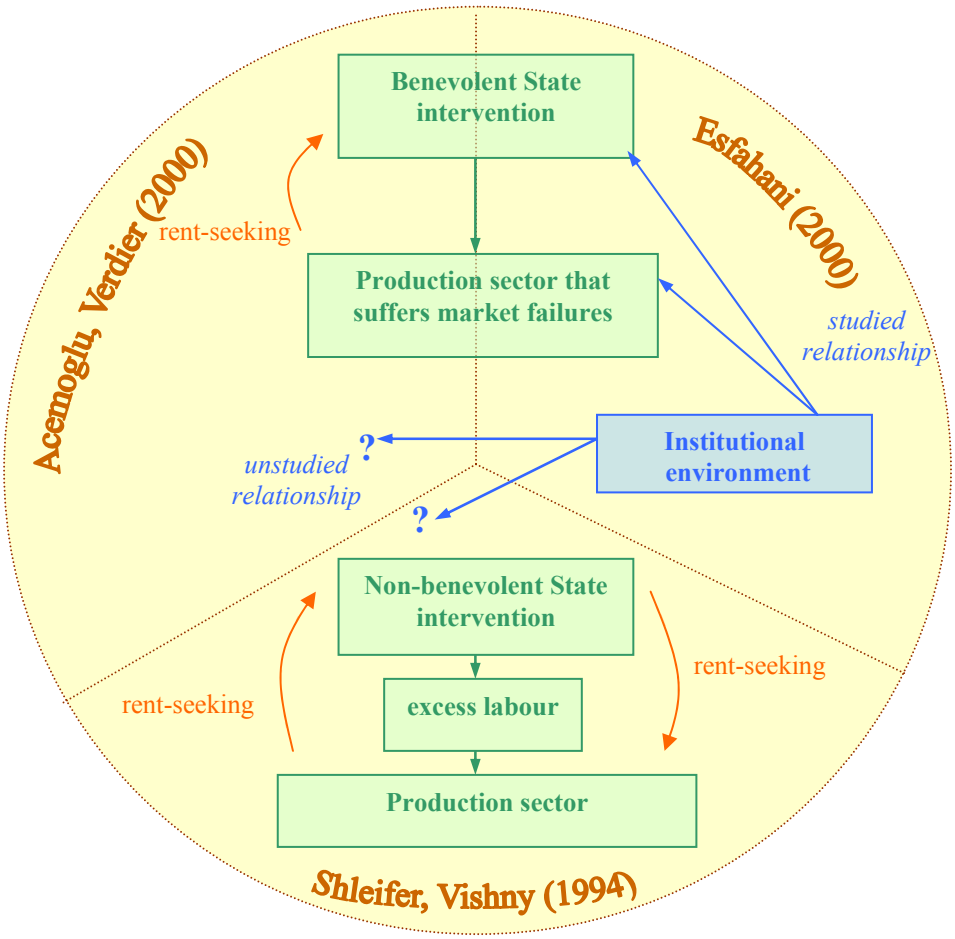


Figure 5.1. Integration between the tree models

Figure 5.1 describes briefly common features and differences of the three models.

As the figure shows, all three models deal with the performance of the production sector. However, the circumstances are different: in the Acemoglu and Verdier (2000) and Esfahani (2000) models the production sector suffers market failures, whereas in Shleifer and Vishny's (1994) it suffers from low government quality. In the Acemoglu and Verdier (2000) model State officers are introduced in order to correct the market failures, whereas in the Shleifer and Vishny (1994) model they provoke the malfunctions of the market. Rent-seeking is presented in all three models; firms as well as State officers can be corrupted. Corruption in Esfahani's (2000) model is introduced indirectly, using the coefficients of institutional environment that, as the author argues, have a great impact on the performance of the production sector and on the State sector.

It seems worthwhile to say some words about the coefficients represented by Esfahani (2000). The author uses coefficient λ to describe the strength or the weakness of institutional environment. He explains the λ as the premium, i.e. the value of the rents bureaucrats or politicians can extract from public funds. Recall, the coefficient λ can be denoted as:

$\lambda = \varphi/b,$

where b is the administrative capability of government and φ are the factors that characterize an economy such as economic and political instability, weak juridical system, undefined property rights etc. Hence, λ increases with weak administrative capability of government as well as in an environment where corruption, bureaucratic barriers, rent-seeking, high discretion power of State officers are possible, since it facilitates the usage of public funds in personal interests. When government is strong and builds

appropriate institutions to limit the above factors, the premium the State officers put on public funds becomes very limited.

It is worthwhile to note that we do not search for further development of Shleifer and Vishny (1994), Acemoglu and Verdier (2000) and Esfahani (2000) papers. Rather we start from the framework of Shleifer and Vishny (1994), Acemoglu and Verdier (2000) models to analyze the role of the institutional environment, introduced as a coefficient, offered by Esfahani (2000).

This chapter offers the analysis of institutions influence on economic performance in the context of Shleifder and Vishny (1994) model.

5.2. Model

Consider the situation where the State officers use firms to satisfy their interests; suppose, they are interested in a higher level of employment than is efficient, as is discussed in the Shleifer and Vishny (1994) model. Taking this model as a base let us try to analyze the influence of the institutional environment (using the institutional parameters represented in Esfahani (2000)) on the efficiency of resources allocation.

In the Shleifer and Vishny (1994) model the State officers (politicians) and the manager bargain on a firm's decisions. The politician is interested in extra employment (suppose, it provides her more votes at elections) and provides subsidies to the firms that employ extra workers. The extra employment *(L)* does not produce anything, but receives the wage *(w)*, and causes cost μ to society. The politician convinces the firm to take extra employment, paying a transfer (subsidy) *T* at a cost *C(T)*. Social cost of this

transfer is σ. The benefits $B(L)$ are received by the politician in the case where the firm accepts the unneeded employment.

The firm receives profits π before employing extra workers. The social welfare function is given by:

$$S = -\mu \cdot L - \sigma \cdot T \qquad (5.2.1)$$

The firm can be private (manager holds fraction α of profits) or public (government holds fraction $1-\alpha$ of profits). It can be as either State operated or regulated (politician decides on the level of L) or privately operated (manager decides on the level of L). The aim of the model is to analyze the influence of cash flow rights (level of α) and control rights (manager or politician may control L) on allocation of L and T, in a certain institutional environment.

Given these settings the manager's utility is the following:

$$U_m = \alpha \cdot \pi + T - w \cdot L \geq 0 \qquad (5.2.2)$$

i.e. the share of profits that belongs to the manager and subsidies from government should exceed the cots of keeping the extra staff. The politician's utility function is given by the excess of benefits from extra employment on the costs of providing the transfers to the manager[5]:

$$U_p = B(L) - C(T) \qquad (5.2.3)$$

To introduce institutional parameters (used by Esfahani (2000)) into this model the following assumption is made: the politician puts the premium λ on public funds, i.e. on the transfer the politician gives to the firm for extra employment. As in Esfahani (2000), the premium on public funds is a parameter denoted as $\lambda=\varphi/b$, where b is the administrative capability of

[5] See the example of utility function in the Appendix 1.

government and φ describes factors such as corruption, political and economic instability and other factors than the administrative capability of government. Let us think of the premium the politician earns as a delay of transfers to the managers. Hence, even though the manager employs extra workers, the transfer becomes available after a certain period of time. Thus, we analyze the outcomes of the model, given the rent-seeking activity of politician.

By including the parameter λ into the utility of the politician we have:

$U_p^* = B(L) - C(T) + \lambda \cdot T$ (5.2.4)

where $\lambda \cdot T$ is the value of premium the politician puts on State transfer.

5.2.1. No bribing allowed

We shall analyze the influence the institutional environment has on allocation of L and T in the situation where bribing is not allowed.

a. Politician control

Suppose for now, that the politician can' not pay bribes to the manager, so the parameter λ doesn't consider bribing (i.e. φ includes all other factors but not corruption between manager and politician). Let us see how the allocation of cash flow and property rights influence the unneeded employment and the transfers, given the change in λ.

The politician maximizes his utility subject to the utility of the manager, hence:

$U_p^* = B(L) - C(T) + \lambda \cdot T$

subject to

$$\alpha \cdot \pi + T - w \cdot L \geq 0 \qquad (5.2.5)$$

The above maximization problem has the following solution[6]:

$$\begin{cases} B'(L) = \dfrac{w \cdot \Lambda}{\Lambda + \lambda} C'(T) \\ T = w \cdot L - \alpha \cdot \pi \end{cases} \qquad (5.2.6)$$

where Λ stays for Lagrange multiplier.

System (5.2.6.) shows that in the case of politician's control over L, the allocation of the resources depends on the level of α, i.e. on the ownership of the firm. It is easy to see at the figure 5.2. that with the increase of α (α^*), L goes up and T decreases. As Shleifer and Vishny (1994) stay, if a firm is regulated, but private (i.e. there is a high α and politician controls L), there is higher employment excess than in a public firm.

In our model, the allocation of the resources depends as well on the institutional environment, i.e. on λ. Taking into consideration the behaviour of functions $B(L)$ and $C(T)$ and their derivatives, we find that the increase in premium on transfers (λ), i.e. weaker institutional environment, results in lower levels of L and T. In fact, introduction of premium on transfers shifts isoline curve $B'(L) = w \cdot C'(T)$ down (figure 5.2.), decreasing the extra employment and the transfer. This effect may have place when the politician, having received the premium from the transfer, continue to keep maximize her utility for the lower L and lower T. Hence, when a public firm becomes private but still regulated, a better allocation of the resources (L^* and T^* instead of L and T, at figure 5.2.) may be achieved through the rent-seeking activity of the politicians (higher λ).

[6] See the example of the utility function derivatives in Appendix 1.

Proposition 1. Politicians rent-seeking activity may contribute to a better allocation of the resources in transforming a public firm to a private regulated firm.

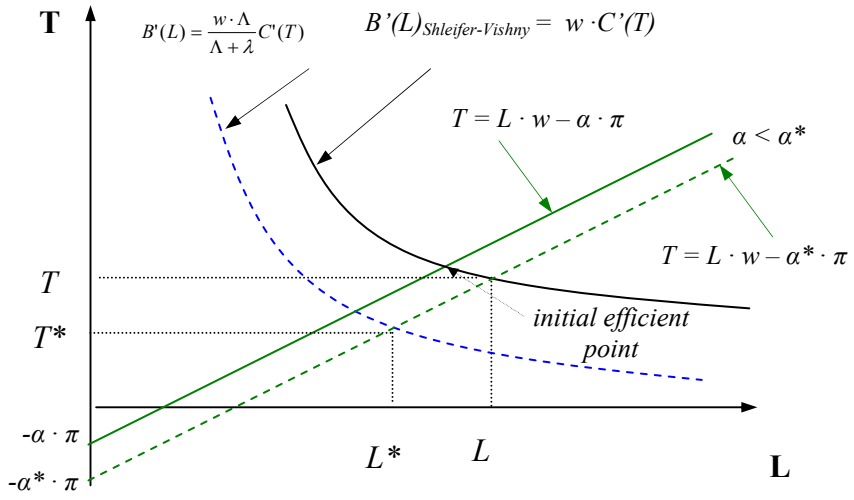


Figure 5.2. Allocation of the resources, given the premium on public funds

b. Manager control

When there is no bribing and manager has control over L the situation corresponds to the Shleifer and Vishny (1994) model. The manager and the politician non-cooperatively choose

$$L = T = 0 \qquad (5.2.7)$$

so, there is no excess of employment and no transfers.

c. Collaboration between politician and manager

Let us verify whether the joint optimal choice of the agents depends on the institutional environment. The joint utility (U^*_j) of the manager and the politician is given by:

$$U^*_j = B(L) - C(T) + \lambda \cdot T + \alpha \cdot \pi + T - w \cdot L \qquad (5.2.8)$$

Differentiating the joint utility function in respect to *T* and *L* gives:

$$\begin{cases} \dfrac{\partial U^*_j}{\partial T} = -C'(T) + \lambda + 1 = 0 \\ \dfrac{\partial U^*_j}{\partial L} = B^{*\prime}(L) - w = 0 \end{cases} \qquad (5.2.9)$$

The solution to the above problem is the following:

$$\begin{cases} C'(T) = \lambda + 1 \\ B'(L) = w \end{cases} \qquad (5.2.10)$$

It is easy to see that under manager control of *L*, the allocation of *L* and *T* does not depend on the property rights (5.2.10 does not include α) but on the control rights. This result corresponds to Acemoglu and Verdier (1994), that stays: giving to the manager the control rights, the privatization would not effect resources allocation. However, as (5.2.10) demonstrates the allocation of *L* and *T* depends on the politician's rent-seeking activity. In fact, the agents extract from the Treasury the transfer till the point where the marginal cost of getting a dollar of this transfer for the politician is equal to a dollar plus the premium on transfer (λ) the politician imposes. Hence, given to the manager the control rights, the increase of λ implies for the politician a greater marginal cost of transfers respect to the situation with lower λ, leading to the decrease in the level of unneeded unemployment.

The following proposition can be formulated:

Proposition 2. In the case of politician control over L, as well as in the case of collaboration between manager and politician in defining the level of L,

the rent-seeking activity of politician may decrease excess labour, thus, to the increase social welfare.

5.2.2. Bribing is allowed

Let us introduce brining into the model through parameter λ, in order to study the effect the institutional environment ~~has~~ on the allocation of L and T. Suppose that φ in the expression $\lambda=\varphi/b$ depends exclusively on the level of bribing. So weaker institutional environment, and therefore weaker administrative capability of the government, increases the value of bribes the managers give to politicians.

As we discussed in the critique on the Shleifer and Vishny (1994) model, the bribe should represent a different value and different cost for the politician and the manager. So, define

$$\varphi = z / k \qquad (5.2.11)$$

where z is the amount of the bribe the manager receives from the politician and k is the costs of the bribe the politician bears, $z < k$.

Given bribes, the politician's $(U_p^{bribing})$ and manager's $(U_m^{bribing})$ utilities functions are:

$$U_m^{bribing} = \alpha \cdot \pi + T - w \cdot L - z \qquad (5.2.12)$$

$$U_p^{bribing} = B(L) - C(T) + T \cdot \frac{\varphi}{b} \qquad (5.2.13)$$

We will start with the analysis of the allocation of L and T given the bribing in a private or public operated firm.

a. Politician control

Here we will use $B(L_d)$ and $C(T_d)$ as the cost and the benefit at the politician's threat or disagreement point as in the Shleifer and Vishny (1994) model. Then, politician's incremental utility from bargaining ($P_p^{bribing}$) is:

$$P_p^{bribing} = B(L) - C(T) + T \cdot \frac{\varphi}{b} - (B(L_d) - C(T_d)) \qquad (5.2.14)$$

And the manager's incremental utility ($P_m^{bribing}$) is:

$$P_m^{bribing} = \alpha \cdot \pi + T - w \cdot L - z \qquad (5.2.15)$$

The product of these utilities and its differentiation with respect to L and T define the Nash equilibrium level of resources:

$$\begin{cases} \dfrac{\partial\left\{(\alpha \cdot \pi + T - w \cdot L - z) \cdot (B(L) - C(T) + T \cdot \dfrac{\varphi}{b} - (B(L_d) - C(T_d))\right\}}{\partial T} = 0 \\ \dfrac{\partial\left\{(\alpha \cdot \pi + T - w \cdot L - z) \cdot (B(L) - C(T) + T \cdot \dfrac{\varphi}{b} - (B(L_d) - C(T_d))\right\}}{\partial L} = 0 \end{cases} \qquad (5.2.16)$$

The first order condition is given by:

$$B'(L) = w \cdot C'(T) + w \cdot \frac{\varphi}{b} \qquad (5.2.17)$$

Let us define the first order condition under manager control over L, before analyzing the results.

b. Manager control

Under manager's control over L, a manager's incremental utility ($M_m^{corruption}$) is given by:

$$M_m^{corruption} = T - w \cdot L - z \qquad (5.2.18)$$

and that of a politician's:

$$M_p^{corruption} = B(L) - C(T) + T \cdot \frac{\varphi}{b} \qquad (5.2.19)$$

The same procedure gives the following expression:

$$\begin{cases} \dfrac{\partial\left\{(T - w \cdot L - z) \cdot (B(L) - C(T) + T \cdot \dfrac{\varphi}{b})\right\}}{\partial T} = 0 \\ \dfrac{\partial\left\{(T - w \cdot L - z) \cdot (B(L) - C(T) + T \cdot \dfrac{\varphi}{b})\right\}}{\partial L} = 0 \end{cases} \qquad (5.2.20)$$

that leads to the same solution as with a politician's control over *L*, where the allocation of *L* and *T* depends on the level of corruption:

$$B'(L) = w \cdot C'(T) + w \cdot \frac{\varphi}{b} \qquad (5.2.21)$$

Recall, Shleifer and Vishny (1994) solution to maximization problem, given politician's and manager's control over L is given by:

$$B'(L)_{Shleifer-Vishny} = w \cdot C'(T)$$

Since the solution in the case of manager's control over *L* is the same that in the case of politician's control over *L*, and both of them do not include *α,* the authors conclude that in the presence of bribing, privatization and commercialization do not matter.

By introducing institutional environment, our model gives different results.

Note that (5.2.17) and (5.2.21) even though offer the same solution for the maximization problem in the case of politician's and manager's control over

L, they include bribes at the efficient point. The allocation of *L* and *T* under private or State operated firms depends on the level of bribing as well as on the administrative capability of government. Moreover, with the increase of bribing the level of extra employment goes down. Higher bribe from manager to politician leads to a less excess of extra employment because it permits to the manager to pay for the reduction of politician's influence. The reason for this finding is that the allocation of control and cash flow rights do influence bribes, and bribes, in their turn, influence the allocation of the resources. Hence, privatization and restructuring are possible in the presence of corruption. Let us see how bribing influences the allocation of *L* and *T*.

Like in Shleifer and Vishny (1994), the equilibrium level of bribe under the manager and politician control over *L* is given by differentiating the product of incremental utilities of the agents respect to *z*. In the case of politician control over *L* the level of bribe is:

$$z^{politician-controls-L} = \frac{1}{2}\cdot\left(\alpha\cdot\pi + T - T\cdot w\cdot L\right) - \\ - \frac{k\cdot b}{2\cdot T}\cdot\left(B(L) - C(T) - B(L_d) + C(T_d)\right) \qquad (5.2.22)$$

and under manager's control over *L*:

$$z^{manager-controls-L} = \frac{1}{2}\cdot\left(T - T\cdot w\cdot L\right) - \frac{k\cdot b}{2\cdot T}\left(B(L) - C(T)\right) \qquad (5.2.23)$$

In both situations, the level of bribes depends on the institutional environment. Weaker institutional environment yields lower administrative capability of government, increasing the equilibrium level of bribes.

Note, cash flow rights influences the resources allocation only in the case of politician's control over *L*. For our model, in contrast to Shleifer and Vishny (1994), this means that under the politician's control over *L*, the final allocation of *L* and *T* depends on the cash flow rights. Since the increase of α implies the increase of bribe for the politician, regulated but private firm would restructure more (*L* goes down) than public firm. As a result, in our model, in equilibrium with bribes, restructuring and privatization matters.

The following propositions come out from the above analysis.

Proposition 3. In equilibrium with bribes, allocation of the resources depends on control rights in the case manager controls L, and on both, cash flow and control rights, in the case politician controls L .

Proposition 4. Rent-seeking of politicians may contribute positively to privatization process and to the restructuring of private and public firms.

5.3. Model results

Based on the Shleifer and Vishny (1994) model, the analysis of institutional environment influence on the allocation of the resources is provided. The institutional environment is introduced by using the coefficient proposed by Esfahani (2000) that reflects the strength or weakness of institutions and represents a simple tool for the analysis of institutional change. The model formalizes the allocation of excess labour, subject to the influence of institutional environment in State, private and regulated firms in transition economies. Here are summarized the results of the analysis:

- *In a weak institutional environment, politicians' rent-seeking reduces the level of excess labour in the process of privatization and promotes restructuring of private regulated firms.*

- *Society in transition process may benefit from politicians' rent-seeking activity since search of rent decreases excess labour level in regulated firms, increasing the social welfare.*

- *The equilibrium level of excess labour depends on allocation of control rights over the firms as well as on the bribe that a manager offers to a politician (in contrast to Shleifer and Vishny's (1994) results).*

- *A weakening institutional environment yields to greater bribing. Bribing lowers excess labour level, contributing to restructuring (in accordance to Shleifer and Vishny's (1994) results).*

- *In equilibrium with bribes the level of excess labour in regulated firms depends on the cash flow rights on firms' profits (in contrast to Shleifer and Vishny's (1994) results) and decreases with the increase of politicians' rent seeking activity.*

Chapter 6. Market failures correction in a weak institutional environment

6.1. Introduction

In this chapter we take a step further introducing the quality of institutional environment in the context of State intervention to correct market failures. To do this we integrate the Esfahani (2000) and Acemoglu and Verdier (1994) models.

6.2. Model

Recall that Acemoglu and Verdier (2000) model considers two types of agents that compose the production sector: entrepreneurs and bureaucrats. The entrepreneurs are interested in maximizing their pay-off that they extract from the production of output. They choose among the good and bad technology of production. In the first case they produce together with the output a positive externality that gives benefits to all the agents.

In its turn the State is interested in maximizing the social surplus that depends positively on output and on positive externality produced by entrepreneurs. The State introduces bureaucrats in order to induce entrepreneurs to choose good technology of production.

The bureaucrats transfer subsidies to the entrepreneurs that use good technology and collect taxes from the entrepreneurs that use bad technology of production. The bureaucrats maximize their pay-off that depends on the

probability of entrepreneurs' monitoring, on the wage paid by the State and the positive externality they receive.

In order to introduce institutional environment into the model the following assumptions are made:

- The bureaucrats transfer subsidies to the entrepreneurs that use good technology and collect taxes from those with bad technology. They are self interested and put the "premium"[7] (Esfahani, 2000) on subsidies and taxes that influences their pay-off. The rent that the premium offers depends on the strength of institutional environment: weak institutional environment implies high rent the bureaucrats obtain while strong institutional environment permits low or null rent. It is supposed that the premium put on subsidies is equal to the premium on taxes. The premium is defined by γ.
- A general tax t paid by both types of the entrepreneurs is introduced. The tax is paid by the entrepreneurs in the case when they are monitored by the bureaucrats, i.e. paying the tax is random.

The State looks for maximizing the social surplus given by:

$$SS = n \cdot y + (\beta - c) \cdot x \qquad (6.2.1)$$

where y is the level of output per entrepreneur, n is the total number of the entrepreneurs, x is the number of good technology entrepreneurs, β is the positive externality produced by each good technology entrepreneur and c is the cost of good technology for a given period of time. Total amount of agents is equal to one.

[7] As discussed in paragraph 4.4, the premium is introduced as a rent offered by the interest rate gained from the delay in payments of subsidies and in transfer of taxes (i.e. by the red tape).

In a decentralized economy (no State intervention), the pay-offs of the entrepreneurs are given by:

$$y + \beta \cdot x - t - c \leq y + \beta \cdot x - t \qquad (6.2.2)$$

where on the left hand side there is the pay-off of good technology entrepreneurs and on the right hand side those of bad technology entrepreneurs. Since the pay-off of the atter is greater, nobody chooses the good technology and the first best allocation is not possible (no State intervention with $n=x$). In this case the allocation of agents is $n=1, x=0$ that gives the following social surplus:

$$SS_{no-State-intervention} = y \qquad (6.2.3)$$

When the State intervenes, it incentives the good technology production. For this goal the bureaucrats are hired. The bureaucrats monitor the technology choice of the entrepreneurs. The monitoring is random and its probability is given by:

$$p(n) = \frac{1-n}{n} \qquad (6.2.4)$$

i.e. a bureaucrat can monitor an entrepreneur.

In the case of being monitored bad technology entrepreneurs pay a specific tax τ and good technology entrepreneurs receive a subsidy s. The pay-offs of bad technology entrepreneurs(π_{bad}) and good technology entrepreneurs (π_{good}) become:

$$\pi_{good} = y + \beta \cdot x - c - p(n) \cdot t + p(n) \cdot s \qquad (6.2.5)$$

$$\pi_{bad} = y + \beta \cdot x - p(n) \cdot t - p(n) \cdot \tau \qquad (6.2.6)$$

To maximize the social surplus the State has the following set of constraints to respect:

1. *Liability constraint.* The total amount of the general and specific taxes paid to the State does not exceed the value of entrepreneurs' output.

$$t + \tau \leq y$$

thus

$$\tau \leq y - t \qquad (6.2.7)$$

2. *Technology constraint.* To induce the entrepreneurs to use good technology of production, the pay-off of good technology entrepreneurs is greater than those of bad technology entrepreneurs.

$$y + \beta \cdot x - c - \frac{1-n}{n} \cdot t + \frac{1-n}{n} \cdot s \geq y + \beta \cdot x - \frac{1-n}{n} \cdot t - \frac{1-n}{n} \cdot \tau \qquad (6.2.8)$$

that implies the following inequality to hold:

$$s + \tau \geq \frac{n \cdot c}{1-n} \qquad (6.2.9)$$

3. *State budget constraint.* The State does not spend more than it earns, hence the amount of taxes it collects is at least equal to the amount of its expenses:

$$\frac{1-n}{n} \cdot (n-x) \cdot \tau + \frac{1-n}{n} \cdot t \cdot n \geq (1-n) \cdot w + \frac{1-n}{n} \cdot x \cdot s \qquad (6.2.10)$$

where on the left hand side there is the amount of specific and generic taxes the State collects and on the right hand side there is the value of wage (w stands for the wage a bureaucrat earns) paid to the bureaucrats plus the value of subsidies released for good technology entrepreneurs.

4. *Allocation of talent constraint.* To induce some agents to become bureaucrats the pay-off of a bureaucrat is greater than the pay-off of good technology entrepreneur:

$$w + \beta \cdot x + \left(\frac{1-n}{n} \right) \cdot (s + \tau) \cdot \gamma \geq y + \beta \cdot x - c - \frac{1-n}{n} \cdot t + \frac{1-n}{n} \cdot s \qquad (6.2.11)$$

where on the left hand side there are the wage and the positive externality a bureaucrat receives plus the premium a bureaucrat extracts from specific taxes and subsidies.

Substituting the equation (6.2.7) and equation (6.2.9) into (6.2.10) and into equation (6.2.11) and solving them for *x*, we get the constraint set the State has to respect:

$$x \leq \frac{y \cdot (1-n)^2}{n \cdot c} + \gamma \cdot (1-n) \qquad (6.2.12)$$

Recall, the Acemoglu and Verdier (2000) result is:

$$x \leq \frac{y \cdot (1-n)^2}{n \cdot c}$$

Thus, the State searches for the second best level of social surplus, neutralizing the market failure, given the above constraint set (6.2.12). As in the Acemoglu and Verdier (2000) model, the constraint set is nonconvex in *x* and social surplus is linear in *x*. The maximization of social surplus has two solutions. The first solution is given by *n=1, x=0*, where nobody of the entrepreneurs uses good technology (point *n=1, x=0* in figure 6.1). This solution gives the level of social surplus that presumes market failure:

$$SS_{not-good} = y \qquad (6.2.13)$$

The second solution is the point along the line $n=x$ (point E_1 at figure 6.1.), where all the entrepreneurs use good technology thus the market failure is neutralized. In this case the social surplus is given by:

$$SS_{good} = n \cdot (y + \beta - c) \qquad (6.2.14)$$

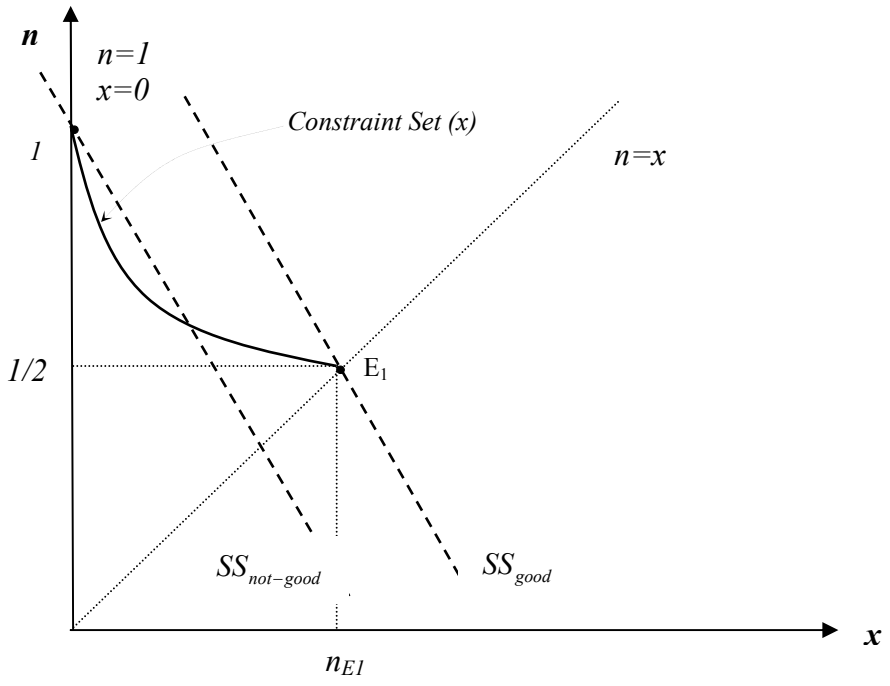


Figure 6.1. Second best allocation of agents in a weakening institutional environment

The optimal State intervention requires reaching SS_{good}, thus, there is another constraint to respect: the number of good technology entrepreneurs should be equal to those of bad technology. Hence, let us substitute x for n in (6.2.12) and call this allocation of agents n_E (the allocation n_E corresponds to the point E_1 at figure 6.1.):

$$n_E = \frac{\left(-2\cdot y + c\cdot\gamma + \sqrt{4\cdot c\cdot y + c^2\cdot\gamma^2}\right)}{2\cdot\left(c - y + c\cdot\gamma\right)} \qquad (6.2.15)$$

Recall, without premium on public funds the solution is:

$$n = \frac{-2\cdot y + \sqrt{4\cdot c\cdot y}}{2\cdot(c - y)} \qquad (6.2.16)$$

Comparing the equations (6.2.15) and (6.2.16), it is easy to see, that every member of equation (6.2.15) is incremented (since $n_E \leq 1$) by a positive member $c\gamma$ with respect to equation (6.2.16). *Therefore, the introduction of premium on public funds (γ) increases the production sector (n_E) at the second best allocation point.*

Substituting n_E from (6.2.15) as equality into the equation for social surplus (6.2.1) gives the level of social surplus that corresponds to the optimal allocation of agents:

$$SS_{good} = \left[\frac{-2 \cdot y + c \cdot \gamma + \sqrt{4 \cdot c \cdot y + c^2 \cdot \gamma^2}}{2 \cdot (c - y + c \cdot \gamma)} \right] \cdot \left[y + (\beta - c) \right] \qquad (6.2.17)$$

In order to find the relationship between the social surplus and the premium of bureaucrats, the first derivative is studied for its sign. As $\frac{dSS_{good}}{d\gamma}$ is greater than zero[8], it can be concluded that *the premium the bureaucrats put on public funds (γ) increases the social surplus (SS_{good}).*

Since the State aims to induce all the entrepreneurs to produce positive externality (β), let us analyze the influence of bureaucrats' premium on the level of externality production. To do this we have to assure that the second best level of social surplus (6.2.17) is at least greater than those of the solution $n=1;\ x=0$ that implies market failure. The following equation should be valid:

$$SS_{good} \geq SS_{not-good} \qquad (6.2.18)$$

or:

$$n_E \cdot \left[y + (\beta - c) \right] \geq y \qquad (6.2.19)$$

[8] See the demonstration of $SS_{good}(\gamma)$ dynamics in Appendix 2.

Substituting n_E into this inequality gives:

$$\left[\frac{-2\cdot y + c\cdot\gamma + \sqrt{4\cdot c\cdot y + c^2\cdot\gamma^2}}{2\cdot(c - y + c\cdot\gamma)}\right]\cdot\left[y + (\beta - c)\right] \geq y \qquad (6.2.20)$$

The above inequality gives the level of positive externality that guarantees the level of social surplus (SS_{good}) greater than in the case of the absence of the externality ($SS_{not\text{-}good}$). Hence, in this context β defines a *threshold* level of positive externality after which any level of β gives an even greater level of social surplus than $SS_{good.}$. Define the threshold level of positive externality by β_{TH}:

$$\beta_{TH} = \frac{\left[c\cdot y\cdot\gamma + c^2\cdot\gamma + (c - y)\cdot\sqrt{4\cdot c\cdot y + c^2\cdot\gamma^2}\right]}{\left(-2\cdot y + c\cdot\gamma + \sqrt{4\cdot c\cdot y + c^2\cdot\gamma^2}\right)} \qquad (6.2.21)$$

From (6.2.20) it is easy to see that β_{TH} is decreasing with the growth of n_E. As proved, n_E increases with the growth of γ, therefore, β_{TH} goes down with the growth of γ, i.e. $\frac{d\beta_{TH}}{d\gamma} \leq 0$.

As a result, *a higher premium on public funds (γ) decreases the threshold level of positive externality (β_{TH}) after which the State intervention in the economy becomes optimal.*

6.2.1. Analysis of the model's outcome

The analysis of the above results helps to derive some propositions we analyze in this paragraph.

Suppose, the State intervenes in the production sector, introducing a certain number of bureaucrats to neutralize the market failure. At some stage institutional environment becomes weaker (γ increases), so that the bureaucrats have a lot of discretion and extracting higher rents. From (6.2.12) it is easy to see that the increase in γ suggests the upward shift of the constraint curve (Figure 6.2). Note, that with the shift the point $n=1, x=0$ (that defines a market failure) remains unchanged, while the point of second best solution goes up along the line $n=x$, passing from E_1 to E_2 and increasing the number of good technology entrepreneurs (n_E) in accordance with (6.2.15). Hence, the increase of γ permits the State to allocate the agents more optimally ($n_{E2}>n_{E1}$), reaching a new second best point E_2.

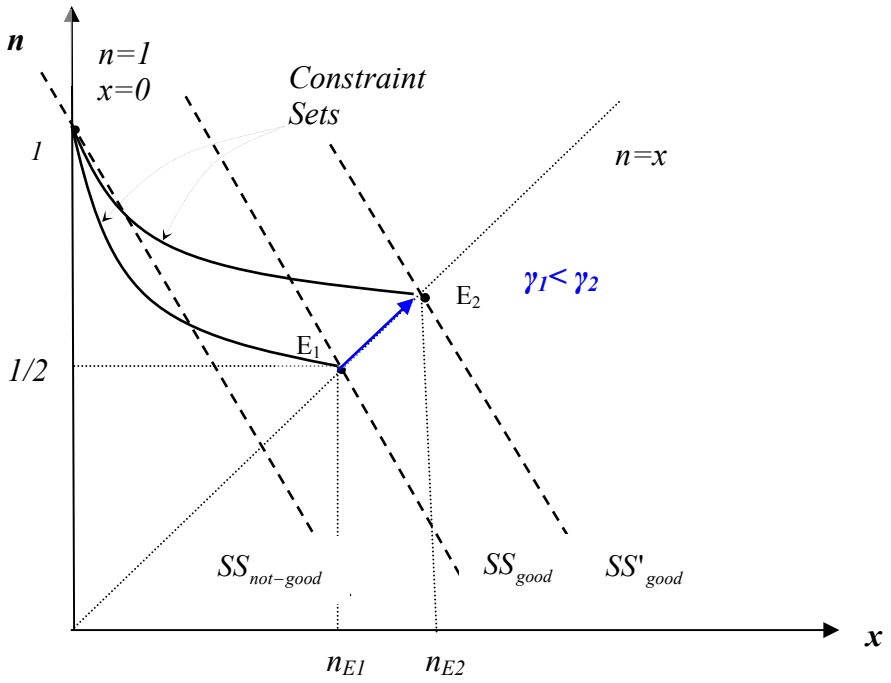


Figure 6.2. The second best allocation of agents in a weakening institutional environment

Let us analyze the mechanism of State intervention in details. In order to operate with the parameters the State can control, (6.2.15) can be written as:

$$n_E = \frac{\gamma\cdot(\tau + s) + (t + s)}{\gamma\cdot(\tau + s) + (s + t) + 2\cdot\tau} \qquad (6.2.22)$$

Note, $\frac{dn_E}{d\gamma} \geq 0$ is still valid.

Although it is not evident at first sight, the increase in γ requires changes in some endogenous parameters in order to get increased n_E (since $n=x$) and satisfy (6.2.22). To prove this, let us rearrange the terms in some of the constraints the State has to respect.

Technology constraint (6.2.8) takes the following form:

$$n \leq \frac{s + \tau}{c + (s + \tau)} \qquad (6.2.23)$$

Budget constraint (6.2.10) can be presented as:

$$x \le n \cdot \frac{\tau + t - w}{\tau + s} \qquad (6.2.24)$$

Talent constraint (6.2.11) becomes:

$$w \ge y - c + \left[s \cdot (1 - \gamma) - t - \tau \cdot \gamma \right] \cdot \frac{1 - n}{n} \qquad (6.2.25)$$

As (6.2.25) shows, the growth in γ decreases w. In the same time, from (6.2.24) it follows that the decrease in w implies higher x. Since the State searches for $n=x$, it means that when x goes up, n has to increase as well. However, as (6.2.23) shows, the increase of n suggests the change in s, τ[9], or/and c[10]. As a result, increasing γ in equation (6.2.22) does not suggest an automatic increase in n_E, but the change in State's policy that results in the increase of n_E.

Obviously, there is a wide range of policies the State may undertake. These could be changing general taxation, bureaucrats' wages, the value of subsidies etc. It is worthwhile to note that the constraint set imposes precise links between some of theses parameters and changing one of them presumes changing another one[11] to meet the imposed constraints. One of the reasonable strategies the State may choose, thanks to the increase of γ, is to cut the level of bureaucrats' wages (w).

[9] Note that τ in its turn depends on the levels of y and t.
[10] Clearly, the cost of good technology (c) and the level of entrepreneur's output (y) can hardly be a subject of the State's policy.
[11] For example, when y is constant, with the increase of t, τ has to go down since $t + \tau = y$.

Higher γ suggests that institutions become weaker so implying higher corruption and rent-seeking. The example of this situation may be countries in transition that suffer from "institutional vacuum", where the State has no control over increasing disorder. What could be the State's policy in this context? One of the alternatives could be to use the growth of γ for lowering the bureaucrats wages in order to invest more into the production sector by increasing subsidies. In fact, while the rent-seeking is very high and corruption costs are substantial, the enlargement of the production sector represent a justified aim for the State policy. Nonetheless common strategy for the growing rent-seeking activity in developed countries is the increase in bureaucrats wages, in countries with weak institutional environment the reduction of wages may represent a good reply.

In fact, the State may decrease the bureaucrats' earnings, keeping in mind that the weak institutional environment offers the additional rent that does not permit their pay-off to go down (6.2.11). Cutting w increases the positive part of the State's budget (6.2.10) that would permit the increase of subsidies for good technology entrepreneurs. Obviously, the increase in s enlarges the pay-off of the latter (6.2.8) which contributes to the increase in good technology production (x goes up). Let us verify whether the model supports the above strategy.

Using the four constraints (6.2.7, 6.2.8, 6.2.10, 6.2.11) and requirement $x=n$), the dependence of w on γ is figured out at the second best point:

$$w = y - \frac{c\cdot\gamma + \sqrt{(c\cdot\gamma)^2 + 4\cdot c\cdot y}}{2} \qquad (6.2.26)$$

The second term of the above equation is positive, that confirms that the increase of γ suggests the decrease of bureaucrat's wage[12].

[12] See the demonstration of *w(γ)* dynamics in Appendix 3.

Now let us check whether the decrease in w can lead to the increase of s. From the above set of five constraints we get $s(\gamma)$[13]:

$$s + \tau = \frac{c \cdot \gamma + \sqrt{(c \cdot \gamma)^2 + 4 \cdot c \cdot y}}{2} \qquad (6.2.27)$$

The above equation demonstrates the following relation is valid:

$$s + \tau + w = y \qquad (6.2.28)$$

In lowering down w, the State chooses a higher s, and the rest of the variables are adjusted respectively. Hence, the decrease in bureaucrats wages permits the increase of the subsidies for good technology entrepreneurs.

Thus, the policy of bureaucrats' wages restriction and the growth of subsidies may represent a good reply to the weakening institutional environment. This means that thanks to the rent-seeking activity the State can neutralize market failure with the better allocation of agents: more good technology entrepreneurs and less bureaucrats, where the bureaucrats should be paid lower wages. Note that the smaller number of bureaucrats necessary for the achievement of second best allocation of agents means also a lower cost of bureaucracy introduction in terms of the loss of output produced by the entrepreneurs. The following proposition comes out from the above analysis:

Proposition 1: The increase in premium on public funds at the second best point permits the State to neutralize the market failure with a larger production sector and at lower costs of bureaucracy introduction.

[13] See the demonstration of $s(\gamma)$ dynamics in Appendix 3.

As follows from the above propositions, in a weakening institutional environment the social welfare may increase thanks to the premium the bureaucrats earn, which is supported by equation (6.2.17). The social surplus is maximized at the point where all the entrepreneurs produce with good technology thanks to the increase in y and β. As the number of these entrepreneurs increases with the increase of γ, the social surplus grows too. A second proposition can be formulated:

Proposition 2: Under a proper State control the increase in rent-seeking may contribute to the increase in social surplus.

Let us see how the rent-seeking (parameter γ) influences the threshold externality level. As shown above, a higher premium put by bureaucrats on public funds implies a lower threshold level of positive externality produced by good technology (6.2.21). This mechanism is described by figures 6.3 and 6.4.

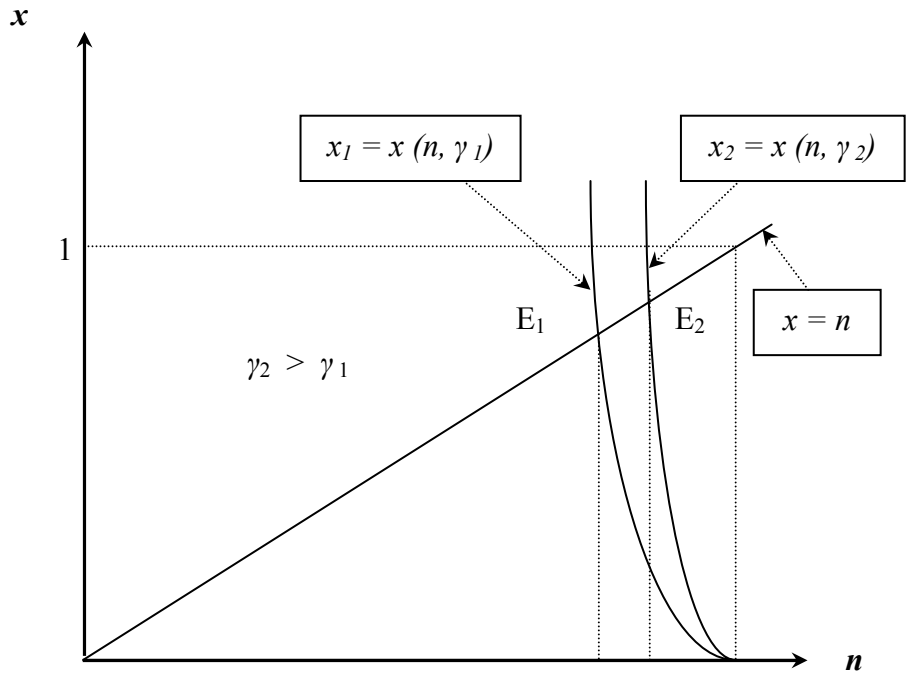


Figure 6.3. Allocation of agents in a weakening institutional environment

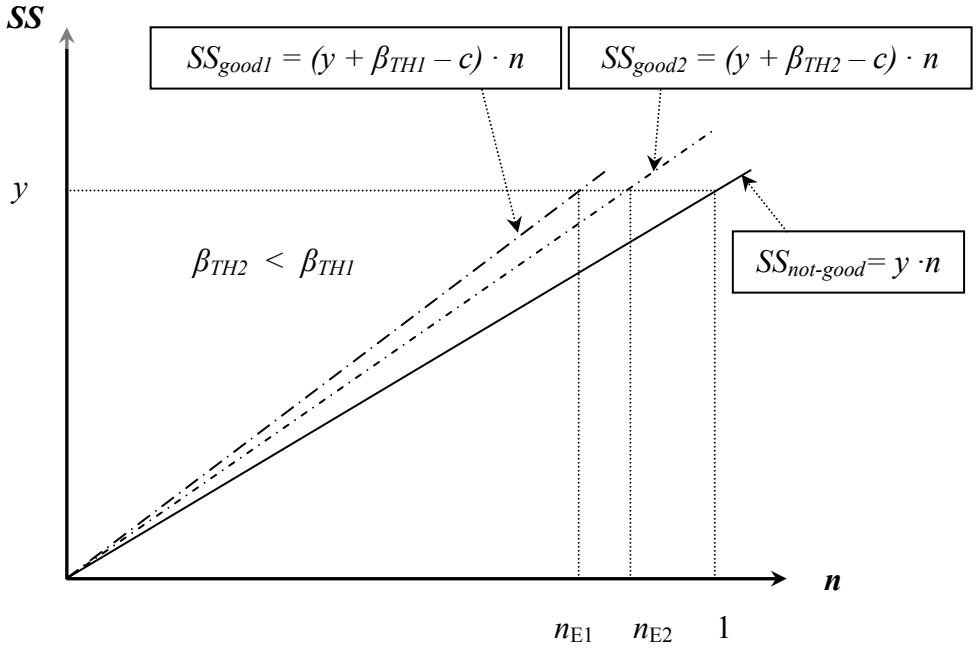


Figure 6.4. Production of positive externality in a weakening institutional environment

The figure 6.3 demonstrates that growing discretion power of bureaucrats ($\gamma_2>\gamma_1$) is reflected in the better final allocation of agents $n_{E1<} n_{E2}$, (recall, $n=x$), passing from the point E_1 to the point E_2 . This change results in a higher level of social surplus SS_{good2} instead of SS_{good1} (figure 6.4.), that offers a lower threshold level of positive externality ($\beta_{TH2}< \beta_{TH1}$). In fact, in figure 6.4 it is easy to see that the cut off level of positive eternality after which the State intervention becomes optimal shifts to the right with the increase of premium. Hence, β_{TH2} offers a wider range of good technology application and higher social surplus (function SS_{good2} implies more good technology entrepreneurs than function SS_{good1}) but this level of positive externality is lower than β_{TH1}.

The level of β_{TH} expressed from equation (6.2.20) confirms this consideration:

$$\beta_{TH} = \frac{y}{n_E} - y + c \qquad (6.2.29)$$

It is easy to see that with the increase of n_E β_{TH} goes down. The reasoning of this mechanism is the following: the increased number of good technology entrepreneurs, that follows after the increase of premium, permits us to reach the level of social surplus which is better than $SS_{not\text{-}good} = y$ with a lower level of $\beta_{TH.}$ Hence, a weakening institutional environment enlarges the range of feasible good technology application, and technology that offers a lower level of positive externality becomes worthy for the State intervention.

The following proposition can be formulated:

Proposition 3: Weakening institutional environment lowers the cut off level of positive externality that guarantees the State intervention into the production sector to be optimal.

As a result, in the process of neutralizing market failures the rent-seeking activity may contribute to the improvement of the entrepreneurs' allocation, enlargement of the production sector, increase of social surplus and, finally, to a wider range of positive externality level necessary for the optimal State intervention.

6.2.2. Dynamics of agents' allocation in a weakening institutional environment

Let us show a possible dynamics of reallocation of agents with the State intervention in a weakening institutional environment.

Recall, the State aims to reallocate the agents between the State and production sector by choosing*, t, w, τ, s,* given a certain *γ,* so that n_E becomes achievable. At the moment the State intervenes in the production sector, nobody produces positive externality (point A, figure 6.5.), since the pay-off of good technology entrepreneurs is smaller than that with bad technology (6.2.8).

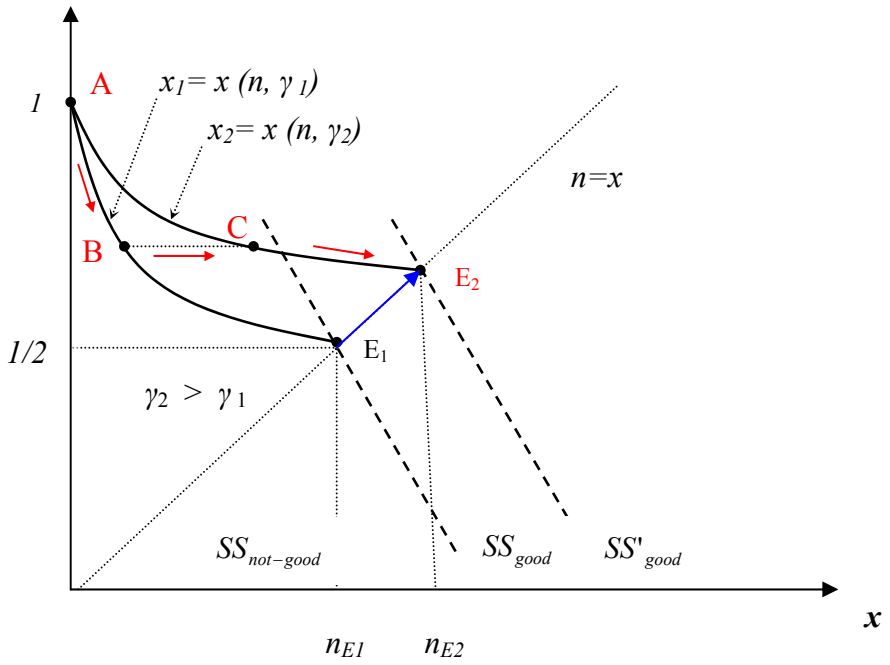


Figure 6.5. Dynamics of agents allocation in a weakening institutional environment

The first bureaucrats introduced by the State intervention face the bad technology entrepreneurs that pay the specific tax τ to the government that create rent $\gamma\tau$ for the bureau. A growing number of bureaucrats increases the probability of entrepreneurs monitoring that in turn influences the pay-off of the latter (6.2.8), making pay-off of good technology entrepreneurs grow. Moreover, the possibility of rents extraction creates a major incentive for the monitoring. Hence, the growing number of bureaucrats and rents seeking increase the number of good technology entrepreneurs.

Once good technology entrepreneurs appear, the bureaucrats have the possibility to get the rent γs form the subsidies too. Clearly, γ stimulates release of subsidies for good technology entrepreneurs, increasing their number. At this stage the allocation of agents moves from point A and

approaches point B, where the number of good technology entrepreneurs increases and the number of bureaucrats goes up as well.

Suppose at the point B the institutional environment becomes weaker and the premium starts growing (from γ_1 to γ_2 at the figure 6.5). As demonstrated above, the State utilizes the growth of premium so that it results in moving the constraint set curve upwards. Hence, the allocation of agents comes to the point C, where the State has changed its policy so as to guarantee the allocation of agents can arrive to the allocation $n=x$, given the new level of premium γ_2.

At the point C the number of bureaucrats continue to grow in accordance with the adopted State policy, stimulating the appearance of good technology entrepreneurs. As a result, the number of bureaucrats continue to grow till a level that is lower than those in the presence of γ_1. Finally, the allocation of agents achieves the second best point E_2 that results in the greater number of good technology entrepreneurs and lower number of bureaucrats ($n_{E1}<n_{E2}$ at the figure 6.5).

6.3. Model results

The analysis investigates institutional environment influence on market failures correction by introducing the coefficient that reflects quality of institutions (Esfahani, 2000) in the framework of Acemoglu and Verdier's (2000) model. The presented model offers the analysis of agents allocation between State and production sectors, given a complex relationship between State, self-interested bureaucrats and failing good technology production entrepreneurs in a weakening institutional environment. The results can be summarized in the following way:

- *Rent-seeking improves allocation of agents in the production and the State sectors through the proper State policy, increasing the number of good technology entrepreneurs and decreasing the number of bureaucrats,.*

- *Discretion power of bureaucrats permits the State to lower the costs of market failures correction.*

- *A weakening institutional environment can result in an increase of social surplus because of the bureaucrats rent-seeking activity under an adequate State behaviour of intervention in the economy.*

- *The threshold level of positive externality is introduced as the lowest level at which social surplus is the same as for the market failure solution. The increase of rent-seeking activity decreases the threshold.*

6.4. Extensions of the model: Correction of market failures in a weakening institutional environment given different premiums on public funds

In this section we analyze how the discretion power of bureaucrats influences economic performance when the premiums on taxes and subsidies are different. Clearly, distinct premiums may represent different set's of institutions involved in extracting taxes or giving subsidies, hence, may influence differently the second best allocation.

6.4.1. Model with different premiums on public funds

In the previous chapter we considered gamma as a sole parameter which described bureaucrat's behaviour. Now we are interested in a more detailed look into its impact and instead of gamma will introduce two new parameters λ and δ that separately represent the premium bureaucrats put on subsidies and on taxes respectively.

Such changes modify some of the model's settings. At first, in the talent constraint the pay-off of the bureaucrats is changed following way

$$w + \beta \cdot x + \left(\frac{1-n}{n} \right) \cdot \left(s \cdot \lambda + \tau \cdot \delta \right) \geq y + \beta \cdot x - c - \frac{1-n}{n} \cdot t + \frac{1-n}{n} \cdot s \qquad (6.4.1)$$

Combining previous constraints (6.2.7) (6.2.9) (6.2.10) with modified (6.4.1) the new constraint set now is:

$$x \leq \left[\frac{y \cdot (1-n)^2}{n \cdot c} \right] + \left[\frac{(1-n)^2 \cdot (y-t) \cdot (\delta - \lambda)}{n \cdot c} \right] + (1-n) \cdot \lambda \qquad (6.4.2)$$

Again, the constraint set is nonconvex in *x*, thus the State maximization problem has two solutions: *x=0, n=1* with $SS_{not-good} = y$ (decentralization case) and *x=n* (State intervention case) with $SS_{good} = n \cdot (y + \beta - c)$.

In order to achieve the necessary condition for the second best solution (State intervention case), let us put *n=x* in the equation (6.4.2) that gives the following allocation of agents (n_E) and bureaucrats:

$$n_E = \frac{-2 \cdot y + c \cdot \lambda - 2 \cdot (y-t) \cdot (\delta - \lambda) + \sqrt{4 \cdot c \cdot y + c^2 \cdot \lambda^2 + 4 \cdot c \cdot (y-t) \cdot (\delta - \lambda)}}{2 \cdot \left[c - y + c \cdot \lambda - (\delta - \lambda) \cdot (y-t) \right]} \qquad (6.4.3)$$

To the above agents' allocation corresponds the following level of social surplus:

$$SSgood = \left[\frac{-2\cdot y + c\cdot\lambda - 2\cdot(y-t)\cdot(\delta-\lambda) + \sqrt{4\cdot c\cdot y + c^2\cdot\lambda^2 + 4\cdot c\cdot(y-t)\cdot(\delta-\lambda)}}{2\cdot\left[c - y + c\cdot\lambda - (\delta-\lambda)\cdot(y-t) \right]} \right]\cdot(y+\beta-c)$$

(6.4.4)

To assure that the level of social surplus with the State intervention is greater than those without it, the following equation should be valid:

$$\left[\frac{-2\cdot y + c\cdot\lambda - 2\cdot(y-t)\cdot(\delta-\lambda) + \sqrt{4\cdot c\cdot y + c^2\cdot\lambda^2 + 4\cdot c\cdot(y-t)\cdot(\delta-\lambda)}}{2\cdot\left[c - y + c\cdot\lambda - (\delta-\lambda)\cdot(y-t) \right]} \right]\cdot(y+\beta-c) \geq y$$

(6.4.5)

That gives the following threshold level of positive externality necessary for the achievement of the second best solution:

$$\beta_{TH} = \frac{c\cdot y\cdot\lambda + c^2\cdot\lambda - 2\cdot c\cdot(y-t)\cdot(\delta-\lambda) + (c-y)\cdot\sqrt{4\cdot c\cdot y + c^2\cdot\lambda^2 + 4\cdot c\cdot(y-t)\cdot(\delta-\lambda)}}{-2\cdot y + c\cdot\lambda - 2\cdot(y-t)\cdot(\delta-\lambda) + \sqrt{4\cdot c\cdot y + c^2\cdot\lambda^2 + 4\cdot c\cdot(y-t)\cdot(\delta-\lambda)}}$$

(6.4.6)

If the value of positive externality produced by good technology entrepreneurs exceeds β_{TH}, the State's intervention to the economy for neutralizing the market failure is optimal.

Thus we have here a set of expressions for the updated model which reflects in more detail bureaucrats behaviour through introducing λ and δ. Let us see now the application of premiums for the State policy.

6.4.2. Rent-seeking and it influence on resources allocation

Let us analyze the impact of institutional environment on the allocation of agents in the State and production sector, given different premiums on public funds.

Suppose the State controls n, x through establishment of w, τ, s, t values, so that (6.4.3) is satisfied, thus the allocation of agents comes up to the point E_1 (figure 6.5). Let us consider first the initial stage where the allocation of agents moves from point A to point B and the number of bureaucrats starts growing. Once appeared, the bureaucrats with bad technology entrepreneurs that pay the specific tax τ to the government. As discussed in the previous section, the increasing number of bureaucrats and their rent augment the pay-off of good technology entrepreneurs, giving the incentive to their appearance. As seen from figure 6.5, passing from point A to point B, the number of good technology entrepreneurs goes up from 0 to x_B.

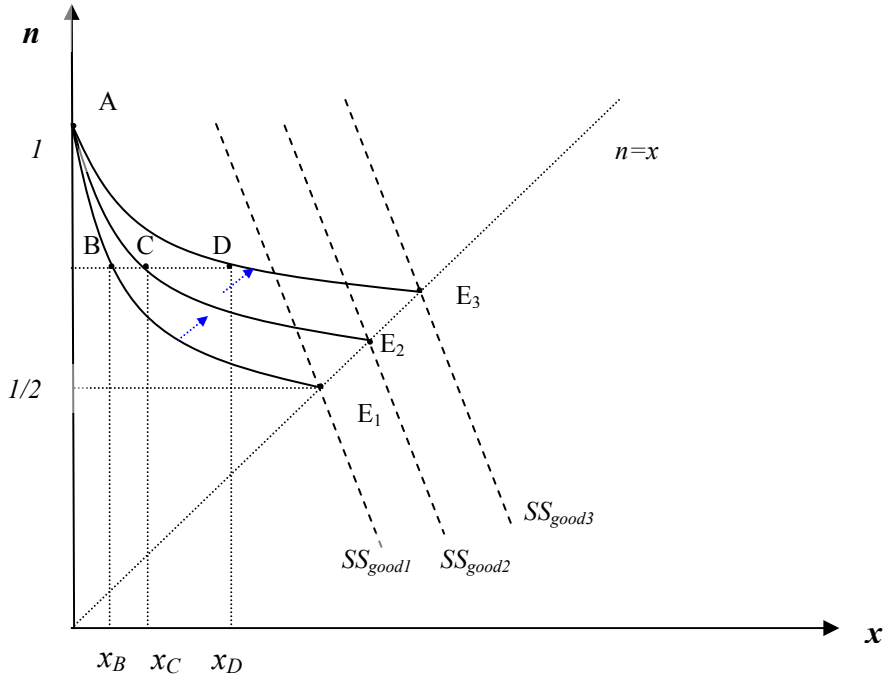


Figure 6.5. The Second best allocation in a weakening institutional environment: positive effect of ren- seeking

Suppose, at the next stage the bureaucrats increase their discretion power (institutional environment at point B becomes weaker i.e. δ goes up). Let us rearrange (6.4.2) to show the influence of premiums,

$$x \le \left[\frac{y\cdot(1-n)^2}{n\cdot c}\right] + \delta\cdot\left[\frac{(1-n)^2\cdot(y-t)}{n\cdot c}\right] + \lambda\cdot\left[(1-n) - \frac{(1-n)^2\cdot(y-t)}{n\cdot c}\right] \qquad (6.4.7)$$

It is easy to see that

$$\frac{dx}{d\delta} = \frac{(1-n)^2\cdot(y-t)}{n\cdot c} \ge 0 \qquad (6.4.8)$$

This means that x increases with growth of δ or in other words the curve $x=x(n)$ moves up with an increase of δ. Hence, the allocation moves to point C where, the number of good technology entrepreneurs increases (x_C). Note that the shift of the constraint $x=x(n)$ curve implies that point E_1 moves too upward along the line $n=x$ to the point E_2 (in accordance to 6.4.3), as shown figure 6.5. and results in a higher level of social surplus (in accordance to 6.4.4)[14].

Once good technology entrepreneurs appear, the bureaucrats extract the rent λs from subsidies too. Going back to the equation (6.4.7) and analyzing the derivative $\frac{dx}{d\lambda}$, it comes out that the premium on subsidies may have positive or negative influence on the allocation of entrepreneurs:

$$\frac{dx}{d\lambda} = \left[(1-n) - \frac{(1-n)^2 \cdot (y-t)}{n \cdot c} \right] \geq 0 \qquad (6.4.9)$$

when

$$c \geq \frac{(1-n)}{n} \cdot (y-t) \qquad (6.4.10)$$

Let us analyze more properly the condition (6.4.10) that defines the interval of the cost of good technology that guarantees the positive impact of λ on the number of good technology entrepreneurs. Recall, the subsidy these entrepreneurs receive is given by:

$s \geq \frac{n \cdot c}{1-n} - \tau$, while

$\tau \leq y - t$.

Substituting these two inequalities with the sign of equity into (6.4.10), the following condition is obtained:

[14] See the demonstration of $SS_{good}(\delta)$ dynamics in Appendix 4.

$s \geq 0$ *(6.4.11)*

Thus, positive subsidy received for the use of good technology is a condition for the positive impact of λ on x.

Let us leave the case of negative subsidy for a latter discussion and suppose that (6.4.11) is valid. In this case, the increase in λ moves up the curve $x=x(n)$ and brings to a more intensive use of good technology making the allocation of agents shift to the point D. At point D the bureaucrats continue extracting premiums λ and δ making entrepreneurs switch to the good technology that offers the greater pay-off. Moreover, the State utilizes bureaucrat's rent-seeking activity in modifying the exogenous parameters and allocates agents $x_E=n_E$ with a smaller number of bureaucrats (e.g. the situation moves to the point E_2). Hence, the weaker institutional environment becomes[15], the higher x_E is, where the market failure is neutralized at a higher level of social surplus.[16]

Regarding positive externality threshold β_{TH}, as we have seen in the previous section and as (6.4.6) shows, weakening of institutional environment[17] reduces its threshold level. This suggests the availability of a wider range of good technology choice that produces the level of positive externality necessary to achieve the second best allocation.

[15] Note, the premium can not increase unlimitedly till achievement of the first best allocation of agents ($n=x=1$) since it would require the negative wage for the bureaucrats. See the definition of the maximum possible level of premium on public funds in Appendix 5.

[16] See the demonstration of $SS_{good}(\lambda)$ dynamics in Appendix 6.

[17] See the demonstration of $\beta_{TH}(\lambda)$ and $\beta_{TH}(\delta)$ dynamics in Appendix 7.

6.4.3. Sensitivity of good technology application to the premiums on subsidies and taxes

It's interesting to note that the sensitivity of x to λ and δ changes could be different since the first derivatives differ. Indeed, from (6.4.7) let us find the ratio of the first derivative of both premiums, to show the implications for the State policy:

$$\frac{\frac{d}{d\lambda}x}{\frac{d}{d\delta}x} = \frac{(1-n) - \frac{(1-n)^2 \cdot (y-t)}{n \cdot c}}{\frac{(1-n)^2 \cdot (y-t)}{n \cdot c}} = \frac{s}{\tau}$$

(6.4.12.)

Equation (6.4.12) demonstrates that x could have a different response to a λ or δ change. This means that the State actually may choose which premium to play a leading role. It could be valuable in a situation when institutions involved in bureaucrats premiums are different for subsiding and taxation. For example, subsiding may be given a primary role if in the near future the State is not going to improve the corresponding institution but wants first of all to impose as much good technology as possible.

6.4.4. Cost of good technology and the level of subsidy

Finally, it seems worthwhile to find out the condition that guarantees the positiveness of subsidy, since $s \geq 0$ would reflect real situations where the State aims to promote, and not punish, good technology application.

As shown above, the positiveness of subsidies is related to the level of costs spent on good technology application. As equation (6.4.10) demonstrates, there is a minimal cost of good technology that guarantees the positive

influence of λ on x. However, we are interested in the point of second best allocation of agents that would give us c_{min} that guarantees $s \geq 0$ in n_E point. To do this we substitute $s=0$ in the four constraints and applying condition $n=x$ find:

$$c_{min} = \left(\frac{1-n}{n} \right) \cdot \tau \qquad (6.4.13)$$

The above equation shows that if $c < c_{min}$ then even in the absence of subsidies, the good technology entrepreneurs have always a greater pay-off respect to bad technology entrepreneurs. In other words, if $c < c_{min}$ there is no τ such that $s \geq 0$, i.e. the State may avoid giving subsidies and it is sufficient just to penalize the bad technology entrepreneurs extracting τ through the bureaucrats. However, a low cost of good technology would probably mean a low level of positive externality produced that would deteriorate the quality of the production sector when market failure is neutralized.

6.4.5. Rent-seeking influence on resources allocation in the case of negative subsidy on good technology

Let us analyze now the case of negative subsidy, i.e the case where (6.4.11) does not hold. Obviously, the negative subsidy means taxation, i.e. it means that the good technology entrepreneurs are taxed instead of receiving subsidy. Recall, Acemoglu and Verdier (2000) model admits the situation, where good technology entrepreneurs can be taxed too. Here comes the analysis that considers s as a tax ($s \geq 0$) that changes the settings of our model.

Some of the constraints the State should respect are now modified, starting with the technology constraint that obtains the following form:

$$y + \beta \cdot x - c - \frac{(1-n)}{n} \cdot t - \frac{(1-n)}{n} \cdot s \geq y + \beta \cdot x - \frac{(1-n)}{n} \cdot t - \frac{(1-n)}{n} \cdot \tau \qquad (6.4.14.)$$

where s represents the tax.

Another constraint to be modified is those of budget:

$$\frac{(1-n)}{n} \cdot (n-x) \cdot \tau + \frac{(1-n)}{n} \cdot x \cdot s + \frac{(1-n)}{n} \cdot t \cdot n \geq (1-n) \cdot w \qquad (6.4.15.)$$

where s stays in the part of State's entries.

And finally, talent constraint that takes into consideration the change in pay-off of the good technology entrepreneur:

$$w + \beta \cdot x + \left(\frac{1-n}{n} \right) \cdot (s \cdot \lambda + \tau \cdot \delta) \geq y + \beta \cdot x - c - \frac{(1-n)}{n} \cdot t - \frac{(1-n)}{n} \cdot s \qquad (6.4.16.)$$

Using the same as before procedure of the elaboration of the four constraints (note, the liability constraint $\tau \leq y - t$ is kept unchanged, since $s \leq \tau$), the constraint set has the following form:

$$x \leq \left[\frac{y \cdot (1-n)^2}{n \cdot c} \right] + \delta \cdot \left[\frac{(1-n)^2 \cdot (y-t)}{n \cdot c} \right] + \lambda \cdot \left[\left[\frac{(1-n)^2 \cdot (y-t)}{n \cdot c} \right] - (1-n) \right] \qquad (6.4.17.)$$

Let us analyze now the role of premiums λ and δ in the allocation of agents in production sector (x).

From (6.4.17.) it is immediate to see that the premium on bad technology entrepreneurs taxes (τ) has a positive impact on the number of good technology entrepreneurs (x), since

$$\frac{d}{d\delta} x \geq 0 \qquad (6.4.18.)$$

While the premium put on taxes of good technology entrepreneurs (λ) increases x if:

$$\frac{dx}{d\lambda} = \left[\frac{(1-n)^2 \cdot (y-t)}{n \cdot c} \right] - (1-n) \geq 0 \qquad (6.4.19.)$$

that implies:

$$c \leq \frac{(1-n) \cdot \tau}{n} \qquad (6.4.20.)$$

That corresponds to the condition $s \geq 0$, since:

$$s = \tau - \frac{n \cdot c}{1-n} \qquad (6.4.21.)$$

In fact, (6.4.20) can be obtained by putting (6.4.21) greater than zero.

As a result, the mechanism of rent-seeking may contribute to the achievement of a better allocation of agents in the production sector in the case of negative subsidy as well as in the case of positive subsidy on good technology entrepreneurs.

It is worthwhile to note that in the case of good technology entrepreneurs are taxed, the number of entrepreneurs derived from technology constraint results smaller than in the case, where good technology entrepreneurs are given subsidy:

$$n = \frac{\tau - s}{c + \tau - s}$$

Obviously, this constrain as well yields lower x. Thus, using taxes instead of subsidies on good technology entrepreneurs, the State allocates resources optimally at low level entrepreneurs and higher level of bureaucrats.

Carrying an analogy to our previous model (section 4.2.), it is clear that the bureaucrats premium put on specific tax of good technology entrepreneurs leads to a better second best allocation of agent, increase of social surplus and lower threshold level of positive externality. Using different policies, the State may utilize the mechanism of bureaucrats rent-seeking in subsidiary and taxation for a better allocation of the resources in a weak institutional environment.

6.5. Results on model extension

The extension model provides a more detailed approach, introducing different premiums on specific taxes and subsidies. This approach helps to investigate more properly the mechanism through which rent-seeking influences the achievement of the second best allocation. Here are summarized the analysis results:

- *The rent bureaucrats extract from both specific taxes and subsidies improves the second best allocation of agents through an adequate State policy.*

- *The State may utilize the mechanism of rent-seeking to improve the second best allocation of agents in both cases of positive and negative subsidies on good technology entrepreneurs.*

- *The State achieves a better second best allocation of agents in the case with positive subsidies in respect to the case with negative subsidies released to good technology entrepreneurs.*

- *The State may have at its disposal various policies of market failures correction since the agents allocation behaves differently with the change in the premium on taxes and subsidies.*

Concluding Remarks

The present dissertation is dedicated to the analysis of institutional environment influence on economic performance, in particular to the impact of the weakening institutional environment on resources allocation in the State and production sectors.

As economic research demonstrates, institutions are of a great importance for the economy of any society. It is argued that institutional environment is responsible for successes and failures in development processes. Institutions play a particular role in transition economies that nowadays are involved in complicated processes of transformation. Understanding of the mechanism through which institutional environment influences the economic performance is necessary for successful economic development.

To perform the analysis two models are developed as a specific integration of the theoretical framework of the Shleifer and Vishny (1994), Acemoglu and Verdier (2000), and Esfahani (2000) models.

I. The first of the two proposed models takes as a base the Shleifer and Vishny (1994) and Esfahani (2000) papers. The first paper describes resources allocation in a transition economy, where the State officers (politicians) abuse power by imposing excess labour that influences negatively the economic performance of the production sector. The Esfahani (2000) paper analyzes the ownership of enterprises and their efficiency, introducing the institutional environment in a rigorous way by using a coefficient that reflects the strength of institutions. Thus, the integrated model is designed to provide analysis of institutional environment influence on the excess labour allocation by affecting

cash flow rights and property rights of a firms' managers and of politicians. Self-interested politicians and managers define the excess labour, and its equilibrium level depends on the strength of institutional environment. The analysis demonstrates that the increase in politicians rent-seeking activity, as a consequence of a weakening institutional environment, can lead to lower equilibrium level of excess labour. Here are the main results of our model:

- *The processes of privatization and restructuring are influenced by the changes in institutional environment through the rent seeking activity of politicians.*

- *Politicians' rent seeking reduces the excess labour level in the process of privatization and promotes restructuring of private regulated firms.*

- *Weak institutional environment yields to higher bribes from manager to politician that permits the lowering of the equilibrium level of excess labour.*

- *The equilibrium level of excess labour depends on the control rights and on the cash flow rights over the firm, since it depends on bribing.*

II. The second model is built on the framework of the Acemoglu and Verdier (2000) and Esfahani (2000) papers where the former deals with resources allocation under market failures and the State officers (bureaucrats) are introduced to conduct economy policy in order to improve the performance of the production sector. The proposed

model contributes to investigate institutional environment influence on allocation of agents in market failures correction. Neutralizing market failures suggests introducing bureaucrats (self-interested) for the elimination of bad technology production. The State allocates agents between the government (bureaucrats) and production sectors (entrepreneurs who produce with good and bad technology), so that market failures can be neutralized in a weak institutional environment through the proper State policy. The analysis demonstrates that the State may use the bureaucrats' rent-seeking as a mechanism to achieve a better second best allocation of agents in a weak institutional environment. The following results are derived:

- *The subsidies and taxes that bureaucrats transfer between the State and the production sector are the subject of their extra rent. Weakening institutional environment results in growth of bureaucrats' discretion power that influences the allocation of agents in both State and production sectors.*

- *The bureaucrats' rent-seeking may be utilized to achieve, in a weakening institutional environment, a second best solution with a better allocation of agents through the proper State policy.*

- *The increase of rent-seeking activity permits the neutralization of market failures with lower costs of bureaucracy introduction.*

- *The level of social surplus in a weakening institutional environment can be increased by application of an adequate State policy as a feedback for the rent-seeking activity.*

- *The rent-seeking activity decreases the threshold of positive externality that defines the level of social surplus to be greater than in the case of market failure. Thus, in a weak institutional environment the State has the possibility to neutralize market failures at a lower level of positive externality production respect to a situation with a strong institutional environment.*

- *The State may utilize bureaucrats' rent-seeking activity to neutralize market failure in both cases of positive and negative subsidy on good technology entrepreneurs, however, a better second best allocation of agents is achieved by using the positive subsidy.*

- *The second best allocation of agents responds differently to the increase of the rent extracted from taxes and from subsidies. Thus, the State has at its disposal various policies of market failure neutralization that depend on the strength of institutions related to taxation and subsidizing.*

As was demonstrated, in a weakening institutional environment rent-seeking can play a central role in resources allocation, working as a constructive mechanism for economic performance. However, the positive effect of rent-seeking should not be considered as an everlasting one. In fact, once the institutional environment is strong, which is an important issue for a modern society, rent-seeking activity becomes a negative factor,

since it exhausts the economic resources, slowing down economic development.

The present work introduces institutional environment into the models using a parameter that reflects institutions in a broad manner, but refers mainly to the administrative capability of government. Further analysis would involve more sophisticated parameters that refer to different fields of institutional activity such as legislation, market regulations, electoral processes etc. Finally, an empirical cross-country research could test the propositions of the rent-seeking effects on economic outcomes in a weak institutional environment.

Appendix

Appendix 1. Utility functions and their derivatives

Functions of politician's cost and benefits utilized for the construction of the model are given by[18]:

$B = a \cdot L^{1/s}$

$C = c + g \cdot T^{r}$

where *s, r* and *g* are parameters and *c* is a constant.

Utility function has the following form (figure 1):

$U = B - C$

Derivatives of the above functions:

$$B'(L) = \frac{a}{s} \cdot L^{(1/s)-1}$$

$$C'(T) = g \cdot r \cdot T^{r-1}$$

The solution to politician's maximization problem is given by (figure 2):

$B'(L) = w \cdot C'(T)$, subject to

$T = w \cdot L - \alpha \cdot \pi$

[18] These function are chosen in such way that the difference of their derivatives gives the curve described by Shleifer and Vishny (1994)

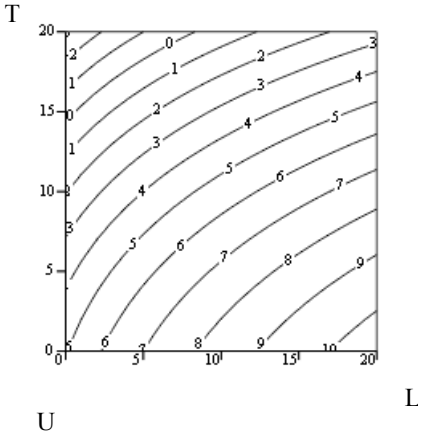


Figure 1.Politician's utility functions

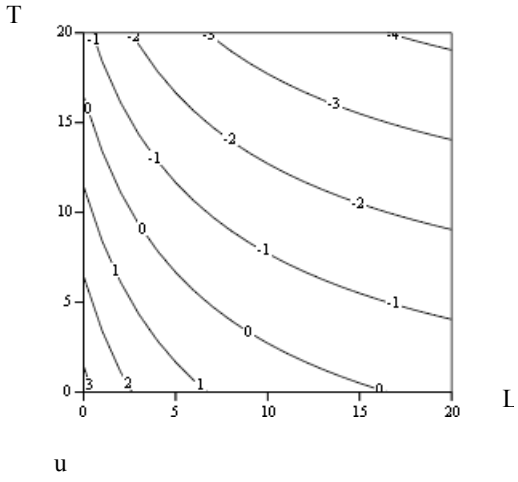


Figure 2. Functions $B'(L) = w \cdot C'(T)$

Appendix 2. Dynamics of SS with the growth of γ

$$SS_{good} = \left[\frac{-2 \cdot y + c \cdot \gamma + \sqrt{4 \cdot c \cdot y + c^2 \cdot \gamma^2}}{2 \cdot (c - y + c \cdot \gamma)} \right] \cdot \left[y + (\beta - c) \right]$$

Change in social surplus (*SS*) when premium (γ) increases from 0.1 to 0.9

given y=1, c and β take value: low= 0.2, medium= 0.5, high=0.9.

№	β	c	change in SS								
			γ=0,1	γ =0,2	γ =0,3	γ =0,4	γ =0,5	γ =0,6	γ =0,7	γ =0,8	γ =0,9
1	h	h	0.525	0.537	0.548	0.560	0.571	0.583	0.594	0.604	0.615
2	h	m	0.832	0.844	0.856	0.867	0.879	0.890	0.901	0.912	0.923
3	h	l	1.183	1.191	1.199	1.207	1.214	1.222	1.230	1.237	1.244
4	m	h	0.315	0.322	0.329	0.336	0.343	0.350	0.356	0.363	0.369
5	m	m	0.594	0.603	0.611	0.620	0.628	0.636	0.644	0.652	0.659

6	m	l	0.904	0.911	0.917	0.923	0.929	0.934	0.940	0.946	0.952
7	l	h	0.158	0.161	0.165	0.168	0.171	0.175	0.178	0.181	0.184
8	l	m	0.416	0.422	0.428	0.434	0.439	0.445	0.451	0.456	0.461
9	l	l	0.696	0.700	0.705	0.710	0.714	0.719	0.723	0.728	0.732

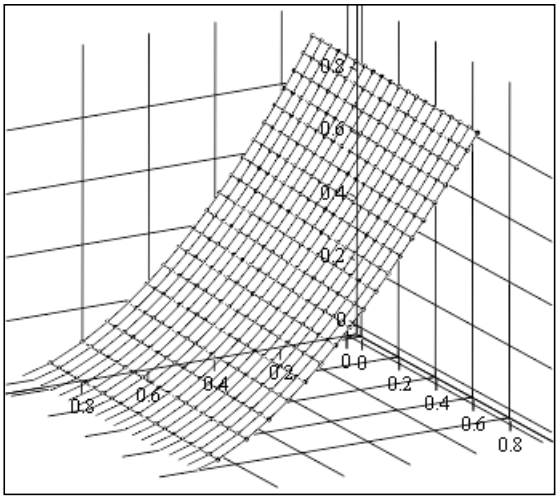
$y := 1$

$\gamma := 0.01, 0.05 .. 0.95$

$\beta := 0.2$

$$SSgood(\gamma, c) := \left[\frac{\left(-2 \cdot y + c \cdot \gamma + \sqrt{4 \cdot c \cdot y + c^2 \cdot \gamma^2}\right)}{2 \cdot (c - y + c \cdot \gamma)} \right] \cdot [y + (\beta - c)]$$

$M := CreateMesh(SSgood, 0.01, 0.95, 0.01, 0.95, 20)$

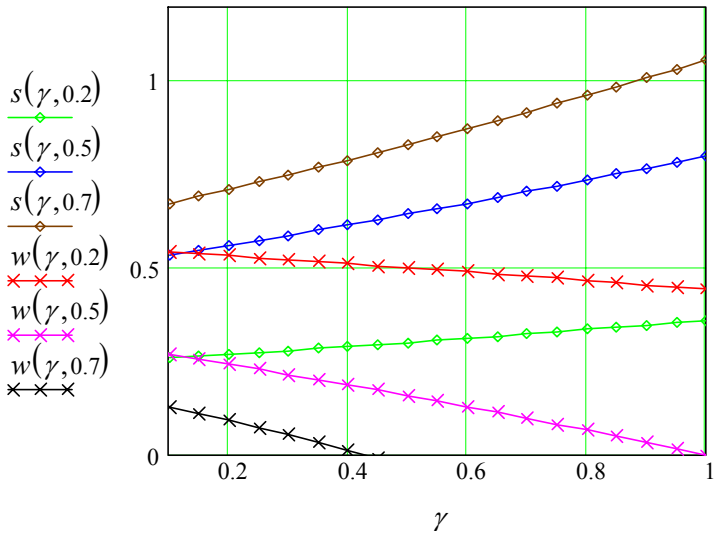


M

Appendix 3. Dynamics of w and s when γ changes[19]

$$s(\gamma, c) := \left[\frac{c \cdot \gamma + \sqrt{(c \cdot \gamma)^2 + 4 \cdot c \cdot y}}{2} \right] - \tau$$

$$w(\gamma, c) := y - \frac{c \cdot \gamma + \sqrt{(c \cdot \gamma)^2 + 4 \cdot c \cdot y}}{2}$$



[19] The following parameters are taken for the figure:
y=1; *c =0.4*; *γ* changes from *0.1* to *0.9* given *c=0.2; 0.5;0.7.*

Appendix 4. Dynamics of SS with the growth of δ

$$SSgood = \left[\frac{-2 \cdot y + c \cdot \lambda - 2 \cdot (y - t) \cdot (\delta - \lambda) + \sqrt{4 \cdot c \cdot y + c^2 \cdot \lambda^2 + 4 \cdot c \cdot (y - t) \cdot (\delta - \lambda)}}{2 \cdot [c - y + c \cdot \lambda - (\delta - \lambda) \cdot (y - t)]} \right] \cdot (y + \beta - c)$$

Change in social surplus (*SS*) when premium on specific taxes (δ) increases from 0.1 to 0.9,

given λ=0.2; c and β take value: low= 0.2, medium=0.5, high=0.9; t takes value: low=0.1, medium=0.3, high=0.5.

№	β	*t*	*c*	change in SS								
				λ=0,1	λ=0,2	λ=0,3	λ=0,4	λ=0,5	λ=0,6	λ=0,7	λ=0,8	λ=0,9
1	h	h	h	0.531	0.537	0.542	0.548	0.553	0.557	0.562	0.566	0.571
2	h	h	m	0.849	0.857	0.865	0.872	0.879	0.885	0.892	0.898	0.903
3	h	h	l	0.836	0.844	0.852	0.859	0.866	0.872	0.878	0.884	0.890
4	m	h	h	0.319	0.322	0.325	0.329	0.332	0.334	0.337	0.340	0.342
5	l	h	h	0.159	0.161	0.163	0.164	0.166	0.167	0.169	0.170	0.171

6	h	m	h	0.529	0.537	0.544	0.552	0.558	0.565	0.571	0.576	0.582
7	h	l	h	0.526	0.537	0.546	0.555	0.564	0.571	0.579	0.585	0.592
8	m	m	m	0.595	0.603	0.610	0.617	0.624	0.630	0.636	0.641	0.647
9	m	m	h	0.317	0.322	0.327	0.331	0.335	0.339	0.342	0.346	0.349
10	m	m	l	0.901	0.911	0.919	0.927	0.935	0.942	0.949	0.955	0.961
11	h	m	m	0.833	0.844	0.854	0.864	0.873	0.882	0.890	0.898	0.905
12	l	m	m	0.416	0.422	0.427	0.432	0.437	0.441	0.445	0.449	0.453
13	m	h	m	0.597	0.603	0.608	0.613	0.618	0.623	0.627	0.632	0.636
14	m	l	m	0.592	0.603	0.612	0.621	0.629	0.637	0.644	0.650	0.656
15	l	l	l	0.691	0.700	0.709	0.717	0.724	0.730	0.736	0.742	0.747
16	l	l	h	0.691	0.700	0.709	0.717	0.724	0.730	0.736	0.742	0.747
17	l	l	m	0.415	0.422	0.429	0.435	0.440	0.446	0.451	0.455	0.459
18	h	l	l	1.175	1.191	1.205	1.219	1.231	1.242	1.252	1.261	1.270
19	m	l	l	0.898	0.911	0.922	0.932	0.941	0.950	0.957	0.965	0.971
20	l	h	l	0.695	0.700	0.705	0.710	0.714	0.718	0.722	0.726	0.730
21	l	m	l	0.693	0.700	0.707	0.713	0.719	0.725	0.730	0.734	0.739
22	h	m	l	1.178	1.191	1.202	1.213	1.223	1.232	1.241	1.249	1.256

23	m	l	h	0.316	0.322	0.328	0.333	0.338	0.343	0.347	0.351	0.355
24	h	l	m	0.829	0.844	0.857	0.870	0.881	0.891	0.901	0.910	0.919
25	m	h	l	0.904	0.911	0.917	0.923	0.929	0.934	0.939	0.944	0.949
26	l	m	h	0.159	0.161	0.163	0.165	0.167	0.169	0.171	0.173	0.175
27	l	h	m	0.418	0.422	0.426	0.429	0.433	0.436	0.439	0.442	0.445

$y := 1$

$t := 0.2$

$n := 0.6$

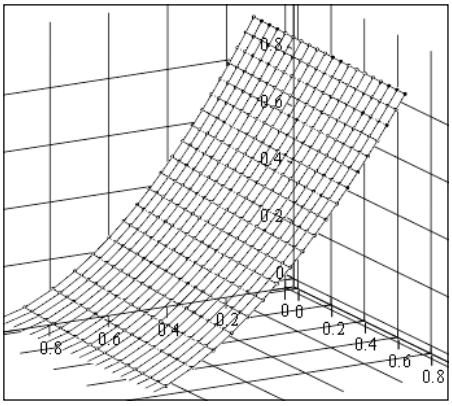
$\lambda := 0.2$

$\delta := 0.01, 0.05 .. 0.95$

$\beta := 0.2$

$$\text{SSgood}(\delta, c) := \left[\frac{-2 \cdot y + c \cdot \lambda - 2 \cdot (y - t) \cdot (\delta - \lambda) + \sqrt{4 \cdot c \cdot y + c^2 \cdot \lambda^2 + 4 \cdot c \cdot (y - t) \cdot (\delta - \lambda)}}{2 \cdot \left[c - y + c \cdot \lambda - (\delta - \lambda) \cdot (y - t) \right]} \right] \cdot \left[y + (\beta - c) \right]$$

$M := \text{CreateMesh}(\text{SSgood}, 0.01, 0.95, 0.01, 0.95, 20)$



M

Appendix 5. Maximum level of premium on public funds

The increase in premium on public funds (γ) at the second best allocation point (n_E) should be limited by the decrease in bureaucrats wage (w) the State can permit. Clearly, the wage can not be negative since it overcomes the limits of the model.

Let us find the maximum possible level of premium at the second best allocation point. Substituting $w=0$ into the four constraints (6.2.7-6.2.11), we find the constraint set that gives the second best allocation point (n_E) by setting $n=x$. Now the maximum premium (γ_{max}) can be put in evidence:

$$\gamma_{max} = \frac{y}{c} - 1$$

This level of premium guarantees the positiveness of bureaucrats wages.

Appendix 6. Dynamics of SS with the growth of λ

$$SSgood = \left[\frac{-2 \cdot y + c \cdot \lambda - 2 \cdot (y - t) \cdot (\delta - \lambda) + \sqrt{4 \cdot c \cdot y + c^2 \cdot \lambda^2 + 4 \cdot c \cdot (y - t) \cdot (\delta - \lambda)}}{2 \cdot \left[c - y + c \cdot \lambda - (\delta - \lambda) \cdot (y - t) \right]} \right] \cdot (y + \beta - c)$$

Dynamics of social surplus (*SS*) when premium (λ) increases from 0.1 to 0.9,

given δ =0.2; where t takes value: low=0.1, medium=0.3, high=0.5; c and β take value: low=0.2, medium=0.5, high=0.9

№	β	*t*	*c*	change in *SS*								
				λ=0,1	λ =0,2	λ =0,3	λ =0,4	λ =0,5	λ =0,6	λ =0,7	λ =0,8	λ =0,9
1	h	h	h	0.531	0.537	0.543	0.550	0.556	0.563	0.570	0.578	0.585
2	h	h	m	0.840	0.844	0.848	0.852	0.857	0.000	0.866	0.871	0.877
3	h	h	l	1.191	1.191	1.190	1.190	1.189	1.188	1.188	1.187	1.186
4	m	h	h	0.318	0.322	0.326	0.330	0.334	0.338	0.342	0.347	0.351

5	l	h	h	0.159	0.161	0.163	0.165	0.167	0.169	0.171	0.173	0.176
6	h	m	h	0.533	0.537	0.541	0.545	0.549	0.554	0.559	0.565	0.570
7	h	l	h	0.535	0.537	0.538	0.540	0.542	0.544	0.547	0.549	0.552
8	m	m	m	0.602	0.603	0.603	0.604	0.605	0.606	0.607	0.608	0.609
9	m	m	h	0.320	0.322	0.324	0.327	0.330	0.333	0.336	0.339	0.342
10	m	m	l	0.914	0.911	0.907	0.904	0.900	0.896	0.892	0.887	0.882
11	h	n	m	0.843	0.844	0.845	0.846	0.847	0.848	0.849	0.851	0.852
12	l	n	m	0.422	0.422	0.422	0.423	0.423	0.424	0.425	0.425	0.426
13	m	h	m	0.600	0.603	0.606	0.609	0.612	n.d.	0.619	0.622	0.626
14	m	l	m	0.604	0.603	0.601	0.599	0.597	0.595	0.593	0.590	0.587
15	l	l	l	0.705	0.700	0.696	0.691	0.685	0.679	0.672	0.663	0.653
16	l	l	h	0.161	0.161	0.162	0.162	0.163	0.163	0.164	0.165	0.166
17	l	l	m	0.423	0.422	0.421	0.420	0.418	0.417	0.415	0.413	0.411
18	h	l	l	1.198	1.191	1.183	1.174	1.165	1.154	1.142	1.127	1.110
19	m	l	l	0.916	0.911	0.905	0.898	0.891	0.883	0.873	0.862	0.849
20	l	h	l	0.701	0.700	0.700	0.700	0.699	0.699	0.699	0.698	0.698
21	l	m	l	0.703	0.700	0.698	0.695	0.693	0.690	0.686	0.682	0.678

22	h	m	l	1.195	1.191	1.187	1.182	1.177	1.172	1.166	1.160	1.153
23	m	l	h	0.321	0.322	0.323	0.324	0.325	0.327	0.328	0.330	0.331
24	h	l	m	0.846	0.844	0.842	0.839	0.836	0.833	0.830	0.826	0.822
25	m	h	l	0.911	0.911	0.910	0.910	0.909	0.909	0.908	0.908	0.907
26	l	m	h	0.422	0.422	0.422	0.423	0.423	0.424	0.425	0.425	0.426
27	l	h	m	0.420	0.422	0.424	0.426	0.428	n.d.	0.433	0.436	0.438

$y := 1$

$t := 0.2$

$n := 0.6$

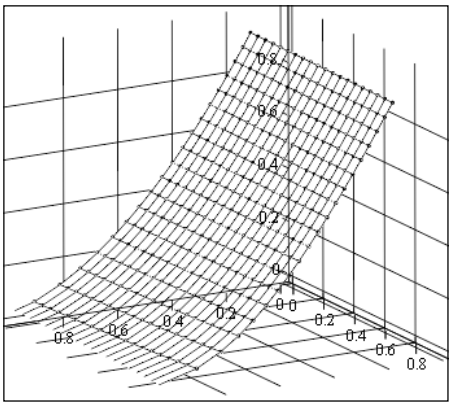
$\delta := 0.2$

$\lambda := 0.01, 0.05 .. 0.95$

$\beta := 0.2$

$$\text{SSgood}(\lambda, c) := \left[\frac{-2 \cdot y + c \cdot \lambda - 2 \cdot (y - t) \cdot (\delta - \lambda) + \sqrt{4 \cdot c \cdot y + c^2 \cdot \lambda^2 + 4 \cdot c \cdot (y - t) \cdot (\delta - \lambda)}}{2 \cdot \left[c - y + c \cdot \lambda - (\delta - \lambda) \cdot (y - t) \right]} \right] \cdot \left[y + (\beta - c) \right]$$

$M := \text{CreateMesh}(\text{SSgood}, 0.01, 0.95, 0.01, 0.95, 20)$



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Appendix 7. Dynamics of β with the growth of λ

$$\beta_{TH} = \frac{c\cdot y\cdot\lambda + c^2\cdot\lambda - 2\cdot c\cdot(y-t)\cdot(\delta-\lambda) + (c-y)\cdot\sqrt{4\cdot c\cdot y + c^2\cdot\lambda^2 + 4\cdot c\cdot(y-t)\cdot(\delta-\lambda)}}{-2\cdot y + c\cdot\lambda - 2\cdot(y-t)\cdot(\delta-\lambda) + \sqrt{4\cdot c\cdot y + c^2\cdot\lambda^2 + 4\cdot c\cdot(y-t)\cdot(\delta-\lambda)}}$$

Change in threshold externality level (β) when premium on subsidies (λ) increases,

where t takes value: low=0.1, medium=0.3, high=0.5; c and δ take value: low=0.2, medium=0.5, high=0.9.

№	*t*	*c*	*δ*	change in β								
				λ=0,1	λ =0,2	λ =0,3	λ=0,4	λ=0,5	λ=0,6	λ=0,7	λ=0,8	λ=0,9
1	h	h	h	1.670	1.653	1.635	1.617	1.599	1.580	1.562	1.544	1.527
2	h	h	m	1.729	1.710	1.690	1.670	1.650	1.630	1.609	1.589	1.569
3	h	h	l	1.784	1.763	1.742	1.720	1.698	1.676	1.653	1.631	1.608
4	m	h	h	1.631	1.619	1.607	1.594	1.581	1.568	1.554	1.540	1.527

5	l	h	h	1.598	1.590	1.582	1.573	1.565	1.556	1.546	1.537	1.527
6	h	m	h	1.080	1.073	1.065	1.057	1.050	1.042	1.034	1.025	1.017
7	h	l	h	0.571	0.570	0.570	0.569	0.569	0.568	0.567	0.567	0.566
8	m	m	m	1.106	1.103	1.100	1.096	1.093	1.089	1.086	1.082	1.078
9	m	m	h	1.050	1.047	1.043	1.039	1.035	1.031	1.026	1.022	1.017
10	m	m	l	1.161	1.159	1.157	1.155	1.153	1.151	1.148	1.146	1.143
11	h	m	m	1.125	1.117	1.109	1.101	1.093	1.085	1.076	1.067	1.058
12	l	m	m	1.088	1.089	1.090	1.092	1.093	1.095	1.096	1.098	1.100
13	m	h	m	1.704	1.691	1.678	1.664	1.650	1.635	1.620	1.605	1.589
14	m	l	m	0.588	0.590	0.593	0.597	0.600	0.604	0.608	0.612	0.617
15	l	l	l	0.619	0.628	0.637	0.647	0.659	0.673	0.689	0.708	0.731
16	l	l	h	0.535	0.538	0.541	0.545	0.548	0.552	0.557	0.561	0.566
17	l	l	m	0.576	0.581	0.587	0.593	0.600	0.607	0.616	0.625	0.636
18	h	l	l	0.627	0.628	0.628	0.629	0.630	0.631	0.631	0.632	0.633
19	m	l	l	0.623	0.628	0.633	0.638	0.644	0.650	0.657	0.665	0.674
20	l	h	l	1.768	1.763	1.757	1.751	1.744	1.737	1.729	1.720	1.711
21	l	m	l	1.155	1.159	1.163	1.168	1.174	1.180	1.187	1.195	1.204

22	h	m	l	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
23	m	l	h	0.552	0.553	0.555	0.556	0.558	0.560	0.562	0.564	0.566
24	h	l	m	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600
25	m	h	l	1.776	1.763	1.749	1.735	1.720	1.704	1.688	1.671	1.654
26	l	m	h	1.025	1.024	1.023	1.022	1.021	1.020	1.019	1.018	1.017
27	l	h	m	1.681	1.674	1.666	1.658	1.650	1.641	1.632	1.622	1.611

$y := 1$

$\lambda := 0.01, 0.05 .. 0.95$

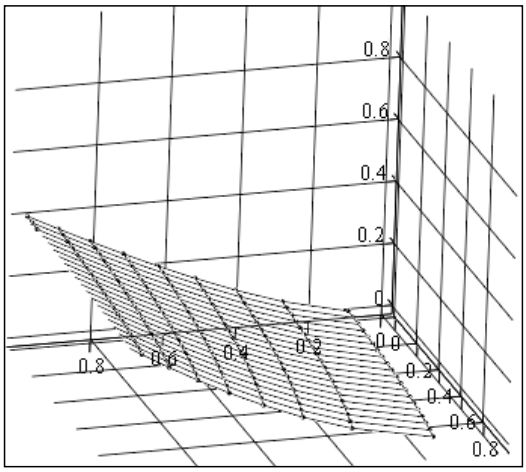
$c := 0.01, 0.05 .. 0.95$

$\delta := 0.2$

$t := 0.2$

$$\beta(\lambda, c) := \frac{c \cdot y \cdot \lambda + c^2 \cdot \lambda - 2 \cdot c \cdot (y - t) \cdot (\delta - \lambda) + (c - y) \cdot \sqrt{4 \cdot c \cdot y + c^2 \cdot \lambda^2 + 4 \cdot c \cdot (y - t) \cdot (\delta - \lambda)}}{-2 \cdot y + c \cdot \lambda - 2 \cdot (y - t) \cdot (\delta - \lambda) + \sqrt{4 \cdot c \cdot y + c^2 \cdot \lambda^2 + 4 \cdot c \cdot (y - t) \cdot (\delta - \lambda)}}$$

$M := \text{CreateMesh}(\beta, 0.01, 0.95, 0.01, 0.95, 20)$



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Appendix 8. Dynamics of β with the growth of δ

$$\beta_{TH} = \frac{c\cdot y\cdot\lambda + c^2\cdot\lambda - 2\cdot c\cdot(y-t)\cdot(\delta-\lambda) + (c-y)\cdot\sqrt{4\cdot c\cdot y + c^2\cdot\lambda^2 + 4\cdot c\cdot(y-t)\cdot(\delta-\lambda)}}{-2\cdot y + c\cdot\lambda - 2\cdot(y-t)\cdot(\delta-\lambda) + \sqrt{4\cdot c\cdot y + c^2\cdot\lambda^2 + 4\cdot c\cdot(y-t)\cdot(\delta-\lambda)}}$$

Change in threshold externality level (***β***) when premium on taxes (***δ***) increases,

where t takes value: low=0.1, medium=0.3, high=0.5; c and λ take value: low=0.2, medium=0.5, high=0.9.

№	***t***	***c***	***λ***	**change in β**								
				δ=0,1	δ=0,2	δ=0,3	δ=0,4	δ=0,5	δ=0,6	δ=0,7	δ=0,8	δ=0,9
1	h	h	h	1.623	1.608	1.594	1.581	1.569	1.557	1.547	1.536	1.527
2	h	h	m	1.716	1.698	1.681	1.665	1.650	1.636	1.623	1.610	1.599
3	h	h	l	1.783	1.763	1.744	1.726	1.710	1.694	1.680	1.666	1.653
4	m	h	h	1.680	1.654	1.630	1.608	1.589	1.571	1.555	1.540	1.527

5	l	h	h	1.757	1.711	1.672	1.640	1.611	1.586	1.564	1.544	1.527
6	h	m	h	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
7	h	l	h	0.647	0.633	0.621	0.610	0.600	0.591	0.582	0.574	0.566
8	m	m	m	1.178	1.153	1.131	1.111	1.093	1.077	1.062	1.048	1.035
9	m	m	h	1.171	1.143	1.118	1.097	1.078	1.060	1.045	1.030	1.017
10	m	m	l	1.181	1.159	1.138	1.120	1.103	1.087	1.073	1.059	1.047
11	h	m	m	1.150	1.134	1.119	1.106	1.093	1.081	1.070	1.060	1.050
12	l	m	m	1.210	1.174	1.143	1.117	1.093	1.072	1.054	1.037	1.021
13	m	h	m	1.748	1.720	1.694	1.671	1.650	1.631	1.613	1.596	1.581
14	m	l	m	0.662	0.644	0.628	0.613	0.600	0.588	0.577	0.567	0.558
15	l	l	l	0.647	0.628	0.610	0.595	0.581	0.569	0.558	0.548	0.538
16	l	l	h	0.783	0.731	0.692	0.661	0.636	0.614	0.596	0.580	0.566
17	l	l	m	0.686	0.659	0.637	0.617	0.600	0.585	0.571	0.559	0.548
18	h	l	l	0.638	0.628	0.618	0.609	0.600	0.592	0.584	0.577	0.570
19	m	l	l	0.643	0.628	0.614	0.602	0.590	0.580	0.570	0.561	0.553
20	l	h	l	1.800	1.763	1.730	1.700	1.674	1.650	1.628	1.608	1.590
21	l	m	l	1.188	1.159	1.133	1.110	1.089	1.071	1.054	1.038	1.024

22	h	m	l	1.175	1.159	1.144	1.130	1.117	1.105	1.094	1.083	1.073
23	m	l	h	0.700	0.674	0.652	0.633	0.617	0.602	0.589	0.577	0.566
24	h	l	m	1.175	1.159	1.144	1.130	1.117	1.105	1.094	1.083	1.073
25	m	h	l	1.792	1.763	1.737	1.713	1.691	1.671	1.653	1.635	1.619
26	l	m	h	1.256	1.204	1.162	1.128	1.100	1.075	1.053	1.034	1.017
27	l	h	m	1.785	1.744	1.709	1.678	1.650	1.625	1.603	1.583	1.565

$y := 1$

$\delta := 0.01, 0.05 .. 0.95$

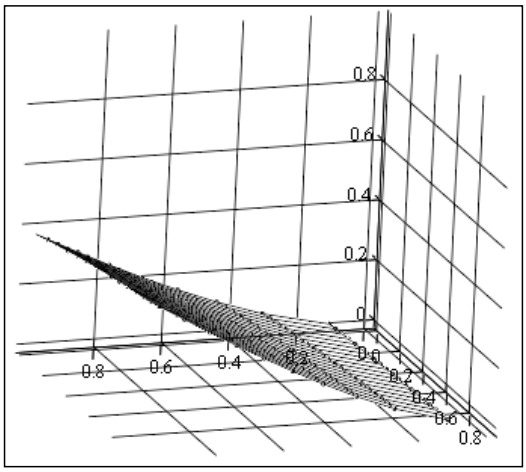
$c := 0.01, 0.05 .. 0.95$

$\lambda := 0.2$

$t := 0.2$

$$\beta(\delta, c) := \frac{c \cdot y \cdot \lambda + c^2 \cdot \lambda - 2 \cdot c \cdot (y - t) \cdot (\delta - \lambda) + (c - y) \cdot \sqrt{4 \cdot c \cdot y + c^2 \cdot \lambda^2 + 4 \cdot c \cdot (y - t) \cdot (\delta - \lambda)}}{-2 \cdot y + c \cdot \lambda - 2 \cdot (y - t) \cdot (\delta - \lambda) + \sqrt{4 \cdot c \cdot y + c^2 \cdot \lambda^2 + 4 \cdot c \cdot (y - t) \cdot (\delta - \lambda)}}$$

$M := \text{CreateMesh}(\beta, 0.01, 0.95, 0.01, 0.95, 20)$



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