THE ROLE OF NATURAL RESOURCES IN ECONOMIC DEVELOPMENT: TURKEY'S BORON EXPERIENCE

A Master's Thesis

by
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September 2008

To my family

THE ROLE OF NATURAL RESOURCES IN ECONOMIC DEVELOPMENT: TURKEY'S BORON EXPERIENCE

The Institute of Economics and Social Sciences
of
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by

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I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in International Relations.

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ABSTRACT

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September 2008

This master thesis aims to analyze the utilization of boron deposits in Turkey and to elaborate Turkey's performance in deriving economic benefits from boron production. This research finds out that there is not a prescribed contribution of natural resources to economic development unless the resources are associated with comprehensive policies that are placing the investment in knowledge in the forefront. In this regard, this thesis asserts that, deriving significant contributions for its economy depends on Turkey's ability in knowledge creation for high value added production rather than geological endowment.

Keywords: natural resources, economic development, institutions, boron minerals

ÖZET

DOĞAL KAYNAKLARIN EKONOMİK KALKINMADAKİ ROLÜ: TÜRKİYE'NİN BOR DENEYİMİ

Okan, Menekşe

Yüksek Lisans, Uluslararası İlişkiler Bölümü

Tez Yöneticisi: Ass. Prof. Dr. Paul Williams

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Bu yüksek lisans tez çalışması, Türkiye'nin bor kaynaklarını değerlendirmesini ve bor üretiminden ekonomik fayda sağlamadaki performansını analiz etmeyi amaçlamaktadır. Bu çalışma, doğal kaynakları, bilgi odaklı yatırımları ön plana çıkaran kapsamlı politikalarla desteklemedikçe, bu kaynakların ekonomik kalkınmaya katkıda bulunamayacağını tespit eder. Bu kapsamda, bu tez, bor kaynaklarından önemli faydalar sağlayabilmenin, Türkiye'nin yüksek katma değerli bir üretim için bilgi üretebilme kabiliyetine bağlı olduğunu savunmaktadır.

Anahtar kelimeler: doğal kaynaklar, ekonomik kalkınma, kurumlar, bor madenleri

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CHAPTER I

INTRODUCTION

Turkey holds the largest boron deposits in the world that is estimated to be %64 of proved boron reserves and also is sufficient to meet current global boron demand around 400 years alone. In terms of its reserve potential, variety of boron minerals, tenor quality of the deposits and low extraction costs, boron minerals have implied for Turkey to be one of the promising sources of economic development for long years. What is striking about the issue is that, Turkey has not generated the expected benefits from its natural endowment in boron minerals, which are considered to be the one of the most important and valuable resources of Turkey. In this regard, the purpose of this thesis is to analyze the utilization of boron deposits in Turkey and to elaborate Turkey's ability in driving economic benefits from boron production.

Boron production in Turkey started in the mid 19th century with foreign entrepreneurship. Until the nationalization of boron mining in 1978, private producers and state enterprise continued boron production. The outstanding rationale of nationalization has been designated to increase Turkey's share of boron production and to capture more weight in the world boron market, where USA stands as the major boron producer. Even after the nationalization, Turkey's income from boron production has not been proportional to its potential in its reserves and tenor quality of its boron minerals. After the nationalization of boron mining, the state enterprise Eti in Turkey and U.S. Borax, Inc. (a wholly owned subsidiary of UK based Rio Tinto) in USA together make up %75 of total world production. Despite the proximity in the production shares of Eti's and U.S. Borax's, that are %35 and %40 respectively, Eti's share in boron revenues of the world market is %20-23 whereas that of U.S. Borax is %65-70. The difference between their respective shares in boron income is a result of the fact that USA is specialized in boron processing and derives its income from refined boron exports; whereas boron ore exports have been the main source of Turkey's earnings from boron sales for long years.

The literature on the contributions of natural resources to economic growth establishes the central role of mineral policies that are supplementary to

natural endowment. Based on the idea that resource industry may display skill and knowledge spill-over across industries by generating forward and backward linkages, the shift towards high value added production from basic mining activities is the real potential of mineral industries. The value of raw mineral exports is far less than the value of advanced forms of production. Accordingly, complementing the resource wealth with knowledge and skills provides the principal impetus for development during the utilization of resources. In this regard, boron production in Turkey is a significant case to be analyzed in defining the scope of contributions of resource wealth to domestic economy.

Boron minerals are used in hundreds of products and processes by diverse industries in various application areas such as magnetic devices, fuel cells, rocket and flight fuels, heat storage, fiber optic, fiberglass, photography, nuclear applications, cleaning chemicals, metallurgy, flame retardants, construction, cement, waste disposal and health. In the recent years, the studies on the hydrogen energy systems, in which sodium boron hydride is used as a hydrogen carrier and heat storage, indicates an increasing potential for boron minerals. The determining role of science in boron products is a result of basic physical and chemical features of the mineral. Usage of boron in diverse industries depends on its synthesis with other elements and

materials. In this respect, value of boron compounds and special boron products vary according to their chemical composition; thus the income from export of a boron product is not determined according to the amount of boron mineral used in it, but according to the input of chemical and industrial knowledge used for its production. In light of these facts about boron mineral, adopting a value-added strategy with heavy emphasis on science and technology has an essential role in utilizing boron minerals for industrial and economic purposes. That is why; this thesis agrees that the development of Turkey's boron industry depends on the knowledge creation for more advanced products rather than geological endowment.

Building mineral policies which utilize resource abundance for development of human capital and advanced research activities can lessen dependency on primary commodity exports and pave the way for diversification around a value-added production and exports base. Mineral policies establish the role and function of the state and market forces over mineral use. As the institutions establish the legal and regulatory framework governing the use of resources, they provide incentives and the opportunities for resource use, either for primary commodity exports or higher value-added production.

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With the purpose of testing how the resource endowment contributes to economic development, Turkey's boron case is suitable to highlight the importance of which mechanisms determine the level of success or failure in generating contributions to domestic economy. The boron case of Turkey reveals that abundance of a mineral does not necessarily lead to correspondent revenues from its production and exports unless some distinctive value is added to the products. The advantages or flaws of the institutional design and the positive or negative externalities of the regulatory framework play the prevailing role in generating economic wealth from resources.

The structure of this thesis is as follows: The second Chapter provides an insight to the theoretical framework by elaborating the role of the natural resources in contribution to economic growth and development. It indicates the importance of the mineral policies and related institutions in utilization of the resources. The legal and regulatory framework governing mineral production is explained under three categories: insufficient regulation, state as the coordinator, and over-regulation. The characteristics and tendencies of each regulatory framework are explained; and boron policy of Turkey is placed under the over-regulatory category.

In Chapter III, the factors leading Turkey's boron production towards an over-regulatory framework are explored. Besides to external, economic and political factors, 'mineral value' is identified as a source for over-regulatory boron management. Deacon and Mueller (2004: 12) express that "the natural resource curse literature raises the novel possibility that a nation's natural resource endowment may influence the political system in adopts". While this preposition points to a larger linkage between resource endowment and the formation of country's basic governing institutions, it has inspired this thesis to explore how the value and the importance attached to the mineral affect and change the formation of mineral-related institutions, policies and regulations. This approach is instrumental in analyzing over-regulatory boron management in Turkey given that the state has gradually assumed a coordinator role for other kinds of industrial minerals.

The institutional design for boron production in Turkey is explained in Chapter IV. The fundamental elements of over-regulatory framework comprising the scope of nationalization law, structure and competence of state enterprise and relevant policy instruments are presented in order to identify how the established policy has determined the extent of boron utilization. After evaluating the utilization of boron deposits in line with the advantages and limitations set out with the institutional design, Chapter V explores the

contribution of boron endowment to domestic economy. The evaluation of the current economic weight of boron exports in the context of Turkey's overall exports designates that the significance attached to boron deposits is greater than its actual weight in domestic economy.

The conclusion Chapter asserts that, in the long-run, the achievement of Turkey in the world boron market needs to be assessed according to the diversity, quality and distinction of its products. The disproportion between Turkey's boron production and its export income reflects this urgent necessity. The thesis reaches a conclusion that Turkey needs to find a balanced approach between state-managed and market-led production in a way that is conducive to diversify into high value added boron products.

CHAPTER II

A THEORETICAL APPROACH TO NATURAL RESOURCES, INSTITUTIONS AND ECONOMIC DEVELOPMENT

The role of the natural resources in contribution to economic growth and development has been a matter of debate in the recent literature. The findings about the negative implications of resource abundance on development dynamics are challenging to the idea of resource-based development. As Auty indicated, "since the 1960s the resource-rich developing countries have under-performed compared with the resource deficient economies" (Auty, 1998: viii). The economic explanations for the under-performance of many resource-rich countries explore the source of the problem as the inherent characteristic of resource sector. Resource-based activities are assumed to be inferior to manufacturing because of the low elasticity of world demand, which leads to a deterioration in the long-run trend of relative prices, their lack

of technological intensity and their vulnerability to boom and bust cycles. The political explanations for under-performance locate the source of the problem in the inherent characteristic of resource wealth which generates sufficient revenues to lower incentives to promote domestic development. Moreover, government actors engage in rent-seeking and avoid accountability pressures when national budgets are based on revenues from resource exports, not on domestic taxation. In contrast to the many examples of resource-rich but economically poor developing countries, some of the world's richest countries, such as Australia, Canada, Finland, Sweden, and the United States, have developed and used mineral industries as a platform for broader industrial development (Wright and Czelusta, 2002) implying that resource abundance and wealth need not be detrimental for economic development. Accordingly, the answer to why some resource-rich countries perform well and others do not should be embedded in an intervening casual variable between the resource endowment and economic performance.

Resource abundance and wealth are direct sources of neither economic under-performance nor development. The instruments by which the resources are utilized in order to generate income and by which the resource wealth is re-distributed, better determine how the resource endowment and resource wealth will affect the performance of the overall economy. These instruments and

mechanisms are the output of the institutions within the country. As the institutions establish the legal and regulatory framework governing the use of resources, they provide incentives and the opportunities for resource use, either for primary commodity exports or higher value-added production or both. In this way, institutions can expose the economy to, or shield the economy from, negative externalities such as dependence on primary exports and boom-bust cycles, established by the resource curse hypothesis. For instance, building comprehensive public policies which utilize resource abundance for development of human capital and advanced research activities can lessen dependency on primary commodity exports and pave the way for diversification around a value-added production and exports base. On the distribution side of resource wealth, institutions play an important role in framing how the wealth will be allocated among the domestic actors and sectors.

On the basis of the assumption that institutional quality, which refers to the rule of law, political stability, governmental effectiveness, control of corruption, effective regulation, secure property rights and rule-based governance, is an important component of a sustained and equitable socio-economic development, deriving long-term advantage from mineral endowment depends on the broader sphere of endogenous institutions and

political-economic context. While these domestic dynamics are crucially important in providing instruments and mechanisms for deriving benefits from the resources, particular arrangements for production and related activities can be adopted for specific minerals to control the risks and opportunities associated with the global political economy.

Differential distributions of resources around the world underlie the scope of domestic practices in accordance with the international political economic conditions. Export restrictions, which are designed or intended to regulate resource management as a tool of political leverage, are the salient examples of such practices. OPEC's oil embargo on Israel and its allies during the Arab-Israeli war and the US strategic minerals embargo on Soviet bloc during the Cold War underscore the interaction between international politics and commodity-specific regulations. As Zacher puts it, "One of the central issues in international political economy of natural resources has always been the ability of states controlling strategic materials to pressure importers to make 'political concessions' as a price for receiving the resource" (Zacher, 1988: xii). The fuels and minerals which are crucially important for industrial and military power and considered strategic minerals (Haglund, 1986: 221) can be affected in terms of output and price levels of producer countries.

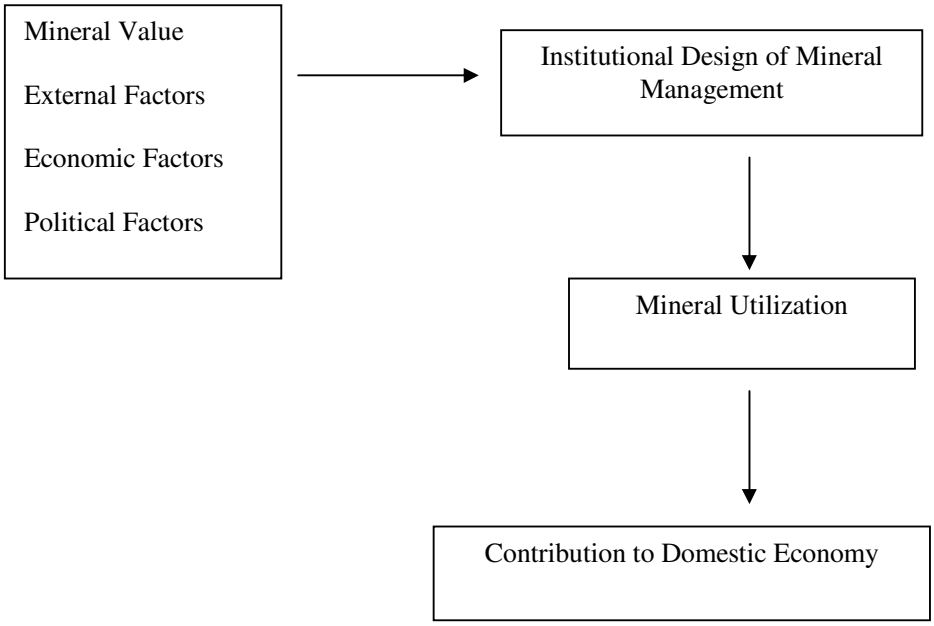
Apart from specific regulations imposed on mineral-related activities to achieve international political goals, the unique value of a specific mineral that originates from the dynamics of demand in the world market can also affect the mineral policies and regulations of the producer countries. Export opportunities, which are based on the abundance and often relatively low production and transportation costs, and stem from international demand, combined with production opportunities can bring forth particular domestic concern for a mineral; thus it may lead to a specific policy for the utilization of that mineral. It is to say that besides the political and strategic value, the economic value of a mineral has an affect on the shaping of the instruments through which the resource is utilized to reach the expected returns.

On the linkage between the institutions and resources, Isham et al. (2003: 26) indicates that, “Institutions surely matter a lot, but types of natural resource endowments and the corresponding export structures to which they give rise, play a large role in shaping what kinds of institutional forms exist and persist".

Deacon and Mueller (2004: 4) note that "the natural resource curse literature raises the novel possibility that a nation's natural resource endowment may influence the political system it adopts". While this statement points to a broader linkage between resource endowment and formation of a country's

fundamental governing institutions, we can also explore how the economic value and weight of the mineral can affect and change the formation of mineral-related institutions, policies and regulations, without having to look into the less tractable and more complicated analysis of how this shapes the larger political system. This approach enables analysis of different management structures designed for different minerals within the same country. The casual relationship between the antecedent factors, institutional design of the mineral management and contribution to domestic economy is laid out in Figure I.

Figure I ***Consequential steps towards contribution to domestic economy***



The course of resource-based development needs to be assessed in conjunction with the international factors that influence these processes. Being in a more sophisticated world market-different from the experiences of today's developed countries- the resource rich developing countries are more constrained by the structure of the world market. As long as they remain followers in the system, they remain vulnerable to international factors that are determined and/or caused by multiple external actors, both on the demand and supply side. In order to decrease this vulnerability and increase their control over the global market, they face two alternative paths. The first is influencing prices through supply reductions if the producer country has significant market share. Given increases in the number of alternative supply channels and advancements in transportation, a single country does not seem to hold such leverage unless its resources have a distinct product quality. Therefore an open or a secret agreement or cartel among the producers of the same resources is required in order to create an influential position vis-à-vis the consuming countries. "Through restricted competition, oligopoly offers producers higher than normal rents plus greater market control and predictability" (Shafer, 1983:127). Significantly, the number of the producers and their shares in the market determine the success of this kind of policy. Controlling the supply and manipulating prices at best in the short-term yields

increased export earnings. The second path to decrease vulnerability is reducing dependence on raw material exports by promotion of human development, research and investment in skills with adequate public policies. This requires domestic capacity building along with national learning. Therefore it would take a longer period of time to get the same level of returns from this policy as by attempting to manipulate raw material prices.

The path, by which a country seeks to improve its position in the global market, constitutes its development strategy, which basically refers to the appropriate actions and interventions that are used to promote defined development objectives. The economic and political significance of the resource, internationally and domestically, presents the potential benefits that are to be gained by the producer country; therefore affect the formation of the specified objectives around these foreseeable benefits. For instance, the relative abundance of mineral deposits, greater foreign demand than domestic demand, favorable commodity prices and price trends, and low transportation costs may produce an export mentality resulting in neglect of other domestic sectors. On the contrary, discovery of mineral deposits, products of which have a wide range of use within the country, may lead to utilization of the minerals in a way to assist development of domestic industries. It is possible to cite other examples with the combination of the conditions in a single

country's domestic economy and that of the world market. The approach focusing the extent and nature of the contributions that mineral industry can make to overall economy determines the path by which the country chooses to develop and utilize its resources.

The contribution that mining can make to overall growth is not limited to gaining economic surplus through export revenues. Mining sector has the potential to create employment, provide raw materials for various branches of domestic industry, generate financial flows through the state's collection of taxes and customs duties, and generate broader linkages to the domestic economy. Backward linkages are generated through investments in domestic production of inputs, machinery, technological upgrading and transportation functions. Forward linkages occur with investments in industries which are using the output of the mineral industry; thus these generate possibilities for further processing of the minerals and lead to increasing value-added in the mineral products. These linkage effects determine the range of investment opportunities in domestic economy and the extent of diversification around the production and export base. The significance of the resource lies in its "tying in of one activity with another, the way in which [the resource] sets the general pace, creates new activities and is itself strengthened by its own creation" (Watkins, 1963: 144).

Inclination to generate export revenues or recognition of the spread effects of mineral industry determines the chosen mineral utilization strategy. It is to say that the domestic understanding about the potentials of resource industry determines how the domestic resource sector will or will not be used as an asset for virtuous development. In short, the specified objectives shape the formation of mineral policy. Mineral policy is carried out by domestic institutions, especially by the mineral-specific institutions which are assessed to be the most effective to promote the established objectives. Accordingly, the institutional design of mineral production and management is crucial in assessing the relation between the mineral deposits, economic activities and economic returns from the sector.

The legal and regulatory framework governing resource ownership, extraction, production and development basically encourages the "chosen" goals, while at the same time; it discourages and restricts the use of alternative utilization models that might have yielded other benefits and costs. The negative side-effects and the shortcomings of the institutional setting, if not minimized or compensated by the chosen model, may slow down or hinder the development of the resource industry, or even distort the overall economy because of misallocation of revenues, over-dependence on commodity exports or reluctance to promote domestic development. Though not necessarily having

negative side effects, the role of the institutions is not limited to what is intended; it also extends to creating a suitable environment for further progress via the development of human capital, inducement of knowledge spill-over, transfer of skills from the resource sector to other sectors, and technological progress and innovation.

Mineral policy and related institutions basically include ownership structure and mining rights. It formally establishes which actors will play dominant roles by pointing to the relative influence of the state and market forces over mineral use. This establishment is important in terms of asserting which actors are supposed to be the best to run a desirable utilization of resources and to promote development. These actors include private entrepreneurs, state and central governments, local authorities or a corporatist model. According to the position that is set by the institutional framework and policy-induced structures, these actors carry out distinctly assigned roles and their learning and performance evolves within this framework. The legal and regulatory framework governing mining rights, such as the access to and control over minerals and other means of production can be categorized as insufficient regulation, state coordination, and state acquisition/over-regulation. Table I summarizes the main features of each framework also by referring to the domestic context within which it is established.

Table I ***Types of institutional framework for mineral production***

Type:	**Insufficient regulation**	**State as the coordinator**	**Over-regulation**
Power distribution	: group rivalries	diffuse (decentralized)	state-dominated
Institutional quality	: weak	good	weak/ moderate
Actors relied on	: none	state and private	state
Mining institutions	: weak	powerful	powerful
Main tendencies	: rentier effects	spill-over effects	dependence on commodity exports
	underdevelopment	innovation	slow learning process
	civil conflict	knowledge accumulation	bureaucratic failures and rentier effects

Insufficient regulation arises in the absence of a state capacity to enforce a coherent and feasible mineral policy. Under-regulation may occur in several circumstances. Firstly, the mineral deposits may be left undiscovered due to

underdevelopment of the domestic economy or socio-political unrest within the country. Neither the state nor the private entrepreneurial class may be strong enough to initiate resource activities and investments. Also the domestic environment may not be suitable for establishing an economic and development policy due to political competition such as civil war or party politics.

Secondly, in the wake of a discovery of deposits, domestic groups may fight for access and control over the resources, which sometimes lead to civil strife, given the condition that the state does not have the means to restore order and is not capable of ensuring control over the resources. In such circumstances, mineral abundance causes a decay of institutional quality. Civil wars over the control of natural resources, as in Nigeria, Angola and Congo, are the concrete examples of destruction of institutions (Mehlum, *et al*, 2005: 4).

Thirdly, poor financial systems and inefficient audit mechanisms may inhibit the state from collecting taxes and fees even if the extraction of minerals is initiated by private domestic or foreign actors. The fundamental economic, political and social structures of backward countries expose an impediment to the utilization of resources for the goal of overall development. The weak state capacity leads to a failure in formation of a sound mineral policy and a

failure in establishment and promotion of institutions. This inability results in insufficient management or regulation to extract economic benefits from the mineral deposits for overall economy. Even if the mining activities are initiated, the resource wealth is exposed to power rivalries and rent-seeking activities since the respective roles and positions of the domestic actors are not established and secured by sound institutions. Therefore in the case of insufficient regulation, a contribution of the mineral deposits to the overall economic development is quite low.

State emerges as the coordinator of mineral production and related activities according to the balance that it establishes between the public and private sectors. The private entrepreneurs are the key actors perceived as most capable of making an optimum allocation of resources and development-promoting utilization of the minerals. Some state involvement may arise at the early stages of the resource industry, where the initial investment costs are high; for this reason the public enterprises may be used as a catalyst for private investment. The instruments of the state involvement are aimed at creating a favorable climate for development of private sector's activities by providing a set of financial incentives to encourage private initiative (Bouin and Michalet, 1991: 32).

The difference between this facilitative kind of involvement and state-dominated production of the resources is embedded in their prospected structures that the governments aim to reach gradually. With the regulatory and institutional framework, the state basically defines its role not in opposition to the private sector. The state gradually transfers the industry to the private sector and provides the basic legal and institutional foundations for the development of the resource-based industry.

Another kind of involvement may arise, i.e., whereby the state considers it necessary to secure stable supplies of resources that are vital for domestic industries. Although the state may choose to continue its involvement in mining activities, it does not ban other actors from the sector by law and it performs its activities like a private firm in a competitive environment. The state ensures consistency in mineral policy and the financial means to attract investments into the sector and to secure the continual improvement of existing business. Besides these, the coordinator state implements a sound taxation policy and an accurate supervisory mechanism. Establishment of research institutes and creation of intellectual property rights system are the other means of state coordination. While this design appears to be the most "virtuous" and self-reinforcing one in terms of development, its formation and functioning depend on the presence of a sufficiently strong and dynamic

entrepreneurial class and strong-state mechanism. Therefore, depending on the domestic dynamics, the mineral sector is suitable for generating linkage effects and knowledge spill-over.

Over-regulation or the state-acquisition of the mineral resources refers to the public management of the minerals, state ownership of the means of production and the exclusion of private actors form the extraction and production activities. The basic principle is that public enterprises are substitutes for the private firms with a view of achieving a number of development objectives. This kind of framework may occur for several reasons. Firstly, state acquisition can arise in order to establish national sovereignty over mineral resources. The country may desire to take control over its mineral deposits from foreign firms. The logic of national economic independence leads to the expropriation of foreign firms that are exploiting mineral resources. The public sector taking control of production performs the guarantor role in terms of keeping the resource wealth in the domestic economy for the welfare of its citizens. Secondly, the rationale behind nationalization of the resources can be rooted in state-managed development, which favors the use of public enterprises as engines of growth. There is an implied assumption that the private sector prioritizes exploitation of the resources because it lacks the incentives to switch to higher value-added

production from primary commodity exports, but that states can channel resource export revenues to increase state income and undertake required investments to establish more advanced forms of production. The over-regulatory management is different from the transitory type of state participation, in that the interventions are intended to redress economic backwardness, the underdevelopment of domestic markets and the absence of a sufficiently competitive domestic entrepreneurial class. Within the over-regulatory framework, political leaders prefer the state and its bureaucracy to the market as the primary mechanism for allocating resources and investments. Private management is considered to lead to waste of a specific resource or all resources.

Most of the questions about the success of the state-managed mineral production stem from the general problems of state-owned enterprises. Public funds may be used for building public support instead of productive and development promoting investments. State enterprises may not be established merely for productivity and nationalist purposes, but may exhibit populist tendencies as well. Apart from this, self-seeking politicians and bureaucrats may form coalitions to control resource management and seize the resource wealth according to their narrow interests. The appointment of the top managers can be carried out politically in turn making them vulnerable to

political influence and depriving them of the means and independence to operate effectively. Corrupt behavior among the politicians and the state officials may prevent "wealth" from contributing to overall economic development when public companies become captured by politicians and officials rather than become a tool for implementation of the mineral policy. As well as corruption, appointment of personnel on non-merit-based criteria emerges as another problem related to the management performance of the enterprise. As with the politically appointed top managers, recruitment processes for the lower officials would also reflect the influence of personal connections and political affiliations. The absence of competent administrators with the necessary understanding of economics and business operations and the absence of skilled and qualified employees weaken the performance of resource-based industry. Apart from managerial problems, with the state as monopoly power in the resource industry, primary export revenues are more concentrated than in a competitive environment; therefore the state monopolist face weaker incentives for greater researches and investment in higher value-added forms of production.

Besides these problems, once established, over-regulatory management is resistant to corrective change since state-owned management is guaranteed its sphere of activity with institutional framework. Several reasons exist for this

institutional rigidity. Firstly, high-ranking civil servants, in the state enterprise, are worried about reform since this could directly challenge their established positions and advantages. For less personal reasons, civil servants may resist structural reformation since they regard reform attempts as a challenge directed at the state's capacity, because they consider themselves as extensions of the state, rather than as part of business-type entities. Given the widespread agreement that the military and civil bureaucracies in most developing countries are the strongest and best-organized interest groups (Martinussen, 1997: 185), other social forces are less capable of ending state domination. The prevailing resistance to change, identified with the over-regulatory framework, reinforces the failures and shortages of institutional design. Therefore once the mineral management is designed around public enterprise, it is difficult to modify the institutional design or move to alternative models due to the over-protected structure of the design and bureaucratic dynamics. This characteristic is crucially important if the initial institutions are to be suitable for optimum utilization of the minerals in economic development and re-distribution of the mineral revenues.

The problems related to the state-owned enterprises are not necessarily endemic to state-dominated mineral management. It is important to note that the management in the over-regulatory framework need not be dysfunctional

management. The shortages and risks associated with design can be identified at the initial stages of policy formation, or at the later stages, due to the improvement of overall institutional quality. High level civil servants are not necessarily self-seeking and self-calculating. An efficient system for appointing and rotating skilled labor without political interference and a sufficiently independent auditing mechanism for the financial performance of the enterprise can be incorporated into the institutional design. That is to say, the problems discussed above are rectifiable flaws of the management that can be corrected by modern management methods and complementary institutional settings. While these flaws are not necessarily overriding and can be ameliorated in interaction with general institutional quality, comprising the rule of law and effectiveness of the government, the negative side-effects of the design cannot be underestimated. Even if the over-regulatory design is made consistent with an effective and functional management, it generates negative externalities for technological improvement which are inherent to the monopolistic model. The alienation of multiple private actors from the industry can retard the national innovation that comes from competition dynamics.

Concentration of mining activities under the state is more often detrimental to knowledge accumulation and technological development. Limiting the number

of the actors involved in production activities entails a decrease in the number of actors involved in knowledge accumulation, which militates against the notion of 'learning by doing', since "the research sector uses human capital and the existing stock of knowledge to produce new knowledge" (Romer, 1991: 79). National innovative or learning capacity is strengthened by the large number of actors involved in some kind of relation to the industry, whether it is in production of goods, supply of production inputs or transportation and research activities. Wright argues that the United States' success in mining "was fundamentally a collective learning phenomenon" formed in intellectual networks linking world class mining universities and government and private research bodies (Wright, 1999: 308). The alienation of the private sector from mineral processing especially also alienates it from the mineral science and production technologies; as Hirschman puts it, "an innovation in producing a given commodity could only be introduced by someone who has already engaged in its production by the old process" (Hirschman, 1958: 57). Artificially created monopoly power, by denying the participation of alternative actors in the production, sustains anticompetitive forces and therefore undermines knowledge spill-over. This side-effect created by state domination and an over-regulatory framework places an unduly burden on the state to conduct the necessary research on its own given the condition that other actors are excluded from national innovative capacity.

Therefore, within the over-regulatory framework, the state must consciously and strictly give importance to compensating for the deficiency that it creates.

Comparison of different types of institutional arrangements for mineral management is largely based on their relative success or failure in achieving development objectives. Adoption of the most suitable institutional setting requires a comprehensive understanding of international market forces and also the opportunities and risks associated with alternative regulations. This does not imply that the creation of appropriate or improper institutions for the best use of minerals is purely an outcome of political will and action. Mineral-related institutions are established and developed in interaction with the country's overall institutional capacity and within the domestic political economic context, both of which are products of historical process. Still, the formation of the mineral management is also affected by the value of the mineral, which is determined by international political economy via export-oriented activities; thereby mineral management partially becomes an outcome of the political will and action centered on the international value of the mineral.

Comparing and contrasting the discussed managerial designs for resource use indicates different contexts in which the design is generated. For insufficient

regulation, fundamental ingredients of a stable and arbiter state capacity, which is essential to implement consistent mineral policies, do not exist. The deficiency in institutional setting leads to arbitrary use of the minerals and inability to generate benefits for economic growth. For the designs in which the state is the coordinator or sole producer, there exists a state capacity to establish purposive mineral policies. Yet, the difference between these two lies in the act of the state in reserving production rights to the public sector or granting them to the private sector. The effect of the political economic value of the mineral on its ownership and production structure is lay to this fundamental decision. Retaining the evolution of the mineral industry within a particular country, the transition from commodity exports to higher value-added products decreases national dependency on the international market for commodity exports; therefore this evolution override an attraction for state intervention. On the occasions, when special restrictions for mineral exports are deemed necessary, enforcement is a temporary type of over-regulation, but evidently diverges from the broader over-regulatory institutional framework in terms of its temporality and basic preservation of private property rights. The main difference between the outcomes of two structures lies in their impact on technological progress and linkage stimulation. This impact is constructive when the state is the coordinator, whereas it is potentially destructive when state domination is established. The reason is that wider distribution of

production vitalizes research activities, while domination of production by a single actor captures but potentially stifles research activities. This impact determines if resource industry can be used as a base for growth because technological progress is central to successful natural resource-based development.

A historical view of resource-led development and why it has worked in some countries but not in others highlights the role of knowledge as a key to successful transition towards manufacturing and export diversification. Maloney argues that one of the fundamental factors behind the poor performance of Latin American resource-rich countries was deficient national learning or innovative capacity arising from low investment in human capital and scientific infrastructure (Lederman, Maloney, 2007: 18). Wright and Czelusta examine the experiences of resource-led growth from a historical perspective, with a focus on mineral-rich countries and suggest that the linkages to the resource sector and complementary innovation were vital in the broader story of United States' economic success (Wright, Czelusta, 2002). For the cases of Sweden and Finland, the key to the success of resource-based sectors, according to Blomstörm and Kokko, lies in the continuous process of technological upgrading in an environment of knowledge clusters of universities, private think-tanks and within-firm research units. They

emphasize the role of domestic raw-material industries, such as timber and iron ore, in their development experiences by mentioning that, due to the knowledge accumulation, Sweden and Finland were able to upgrade the technological level of their resource industries and create a base for diversification with linkage effects by entering related activities such as engineering products, transport equipment, machinery and various types of services (Blomstörm and Kokko, 2002: 52). These cases point to the role of the potentially high degree of complementarities between natural resources and knowledge for resource-based development. Concerning the implications of institutional design, the success cases expose the importance of public policies which embrace investment in human capital and establish effective links between different sectors and various sources of research.

Turkey's boron production is a convenient case-study for examining the factors which shape the legal and regulatory framework governing use of the mineral, how this framework interacts with mineral use within domestic and international markets, and consequently, how this institutional design determines the relative success or failure of the boron sector to contribute to domestic economic development. The boron case of Turkey reveals that abundance of a mineral does not necessarily lead to correspondent revenues from its production and exports unless some distinctive value is added to the

products. While Turkey possesses a significant share of the world boron reserves and accounts for one third of world boron production, its revenues from sales have never been significant. In order to recognize this imbalance, the difference between highly processed boron products and lightly processed boron products is lay. Still, a more comprehensive explanation, which accounts for this backwardness in technical skills and innovative capacity, is required to evaluate the appropriateness of the policy and the institutional design of boron management in respect to the established objectives and the expected profits. At this point, the flaws of the institutional design and the negative externalities of the framework play the prevailing role. Implications of boron management, after nationalization in 1978, are useful for testing the role of the institutions in mineral-based economic development. By 1978, EtiBank, a state enterprise, was given the right to execute all mining of boron deposits and activities associated with those operations with the aim of bringing economic profits to domestic economy. Having mentioned that the over-regulatory institutional framework is designed to counter the feared exploitation of the subsoil, the main focus has evolved around elimination of private actors and building barriers to entry into the state's sphere of activity. At this juncture, 'goal displacement' sets in "when rules, designed as means to ends, becomes ends in themselves" as a dysfunction of state enterprises (Smith, 1988: 6). The major motive behind state acquisition, originally being

to end the mere exploitation of subsoil wealth and to create a productive boron sector, evolved to exclude private actors not only from extraction but also from processing activities. Since the main concentration has persisted in ownership and mineral rights issues, the state's domination, not necessarily in extraction, but in processing activities, has slowed the development of domestic expertise in boron production. Dissociating the private actors from production and reducing the number of stakeholders to a single entity has practically confined the research activities and added-value generation under the state.

The driving forces of economic nationalization, which incarnated in state-domination and an over-regulatory framework for the utilization of boron deposits, can be analyzed in terms of external, economic and political inducements. Beside these factors, which influence endogenous policy formation, the effect of 'mineral value' on the policy formation and institution building is straightforward in Turkey's boron case. As the mineral value represents the expected benefits and thereby prompts complementary measures the particular institutional framework attached to boron management reflects the specific value attached to the boron endowment in Turkey. Tracing a uni-directional causal linkage between the endogenous political economic forces and resource management would entail a state-led

monopolistic practice for all of the minerals extracted and produced in Turkey. While raw minerals production has had a heavy state presence, exploration and production of most industrial minerals other than boron is concentrated in the private sector in Turkey. Privatization of chromium, aluminum, silver and copper mines and plants also indicates that broader institutional principles do not completely dominate the type of resource management. If different management structures exist for different minerals within the same country, it becomes important to add "the mineral value" as an input for the policy formation and institutional framework.

Other than Turkey being a suitable case to analyze how the over-regulatory framework is produced, it is also a suitable case to test how this framework affect the management and shape the utilization of boron deposits, and then how it offers contribution to domestic economy. While the framework is envisaged to create an engine for economic development, the negative externalities associated with the design are ample enough to forestall the achievement of established objectives. Since the ability of a country to generate benefits from its resource base depends on the nature of the learning process involved (Stijns, 2002: 1), the state as the sole stakeholder in the boron sector has narrowed the country's learning process within the capability of public enterprise.

Process-tracing is the chosen methodology to explore the casual links between the variables in this case study to present the sources and outcomes of an over-regulatory framework for resource management. As being one of the within-case methods of analysis, "process tracing focuses on whether the intervening variables between a hypothesized cause and observed effect move as predicted by the theories under investigation" (Sprinz and Nahmias, 2004: 22). By tracing the operation of casual mechanisms in Turkey's boron case, the goal is to develop a continuous chain of paths establishing the linkage between boron endowment and its contribution to domestic economy. The independent variables are selected as the value of the mineral and the economic, political and external factors. The intervening variables are the institutional design of the mineral management and the utilization of mineral. The expected outcome, which is the dependent variable, is the success or failure in generating contributions to domestic economy.

While an uninterrupted causal mechanism is aimed to be set forth through a step-by-step approach, Sprinz and Nahmias (2004: 24) indicates that "there are practical limits in our ability to observe or trace processes in all of their nearly infinite detail and to establish fully continuous sequences". In order to minimize these practical limits, the independent variables are explained separately as the mineral value, which implies the distribution of the deposits

and the usage areas, the external factors, which indicates the global political economy of the resource including the production and consumption patterns, the economic factors, which inhabit in resource economics; and finally the political factors, which shape the mode of production. These independent variables together shape the institutional design of the mineral management, which is the intervening variable.

In order to evade generalization, institutional design is divided into three classifications as insufficient regulation, state with a role of coordinator and over-regulation. Following the institutional design, the second intervening variable is the utilization of the minerals. It is intervening because the institutional structure provides the means and limitations on utilization; in response, it leads to the dependent variable which is the contribution of mineral resources to domestic economy.

According to Bennett and George (2005: 206-207) "process tracing forces the investigator to take equifinality into account, that is, to consider the alternative paths through which the outcome could have occurred". In order to overcome this pitfall, it is necessary to establish the particular weight of the independent and intervening variables through comparative case studies. Since the scope of this study is limited to Turkey's boron management, it was not possible to

test the impact of each variable at different cases. Since the operation of the variables is presented in accordance with the selected case, the practicability of the causal links is best suitable for over-regulatory framework for mineral management.

Despite some shortcomings of process tracing, Checkel (2005: 22) suggests that "the signal benefit of process tracing is that, if done properly, it places theory and data in close proximity". With the purpose of testing how the resource endowment contributes to economic development, Turkey's boron case is suitable to highlight the importance of which mechanisms determine the level of success or failure in generating contributions to domestic economy.

CHAPTER III

FACTORS DRIVING TURKEY'S BORON POLICY

Boron production in Turkey has been carried out by a state monopoly, Etibank, EtiHolding and EtiMine successively, following the nationalization of boron production in 1978. Unlike the other state-owned economic enterprises, Eti was not designed to meet the domestic boron demand. Indeed, the domestic boron consumption has been insignificant due to the characteristics of domestic industry.

Turkey's boron policy has been export-oriented both before and after 1978. With the nationalization, Turkey's boron policy was designed to create an internationally competitive Turkish boron company, which conducts exploration, extraction, raw boron production, refined boron and compounds production, marketing and sales as a single entity. By increasing Turkey's

share in the global boron market through a state-owned company, export revenues were originally expected to bring economic profits to domestic economy.

EtiMine establishes the general framework of Turkey's boron policy as including the following goals:

- to increase boron export revenues and contribute to the domestic economy,
- to control the boron industry as a single entity, which is the state-owned Eti Mine,
- to increase the export share of refined boron and special boron products at the expense of raw boron in the international boron market,
- to widen the marketing network.

The export-oriented and single-owner characteristics of the boron policy are driven by several factors. The first factor is the mineral value. The value associated with the importance of boron and the amount of reserves has generated a distinct stance about the management of boron deposits and production and about the profit expectations for the development of overall economy. The second factor is external forces. The structure of the

international boron market, world boron consumption, trade trends, the strength and the influence of the world's major boron producers contributed to the Turkey's boron policy formation. The third factors are economic. In order to realize the most profitable returns from boron exports, the prior attention is given to commodity prices. The elimination of domestic competitors would provide the state monopoly with the ability to control prices and, therefore, with more leverage in international market. The gradual shift from raw boron exports to refined boron compounds and special boron products exports would necessitate huge investments, which would be carried out by the state. Higher prices and value-added boron production would enable the country to convert its comparative advantage in boron deposits into economic profits. The fourth factor is the political approach. The state-owned production is politically salient. The state possession of natural resources is argued to be the most convenient instrument to prevent foreign acquisition of the resources and to utilize the national resource riches for the development of the country.

3.1. Mineral Value

The term "mineral value" refers to the utility of the mineral for economic activities such as trade and industrial production. The potential of the mineral

deposits, which can be converted into economic profits by means of its useful function, gives value to a mineral. The domestic and international usage of the mineral, the vitality of the mineral as an industrial input, strong anticipation for an increase in the importance of the mineral as a result of technological developments and promising research about the use of the mineral in critical sectors in the medium or long-term point out to what extent the mineral deposits within a country are valuable. The value of the mineral deposits within the context of a national economy is assessed in terms of its abundance, quality, and production costs.

The rational assessment of the mineral value is crucial to seek optimal profits from extraction, production, national use and export of the mineral. Determining mineral value entails appropriate measures and strategies to realize tangible profits. Underestimation or unawareness of the value of the mineral deposits leaves the resources ineffectively exploited. The lack of exploration activities, the absence of extraction and production technologies or the absence of sufficiently developed domestic economy may lead to this underestimation or the unawareness. On the other hand, overestimating the mineral value brings about unattainable targets, even worse, it produces inadequate management. If the tangible value does not correspond to the assessed value and so to attainable profits, the means for mineral utilization

such as ownership structure and mineral policy would not result in optimal utility. Cognitive elements are certainly included in optimistic assessments of the mineral value. Having large mineral deposits might generate an expectation for economic development just through possession of the reserves. At this point, an instant linkage between the natural endowment and economic development is considered to exist by the policy-makers. Even if the mineral value is rationally assessed, and it points to high returns, converting the potential mineral value into real profits requires appropriate institutions and competent management. Poor policy formation or implementation may prevent mineral utilization even if the mineral value implies high profit potential.

3.1.1. Why do Turkey's boron deposits have global importance?

Boron minerals have an intensive and increasing usage in glass, ceramics, textile, detergent industry, in metallurgical, nuclear and agricultural applications, and in energy technologies. Raw boron, refined boron and its special end products are used in more than 250 fields. Boron is one of the main inputs into advanced industries and the annual world consumption of boron is 1.5 million tones.

The world boron reserves are estimated to be 885 billion tones. The most important boron reserves in the world are located in Turkey, USA and Russia. Of the world boron reserves, %64 are in Turkey, %11 are in Russia and %9 are in USA (Sapmaz, Gözen, Gözler, 2002). Table II indicates the volume and geographical distribution of world boron reserves.

Table II World Boron Reserves (million tones, B2O3)

	Visible Economic Reserves	**Possible Reserves**	**Total Reserves**	**The Share In the Total Reserve (%)**	**Reserve Life (years)**
Turkey	224.000	339.000	563.000	64	389
USA	40.000	40.000	80.000	9	55
Russia	40.000	60.000	100.000	11	69
China	27.000	9.000	36.000	4	25
Chile	8.000	33.000	41.000	5	28
Bolivia	4.000	15.000	19.000	2	13
Peru	4.000	18.000	22.000	2	15
Argentina	2.000	7.000	9.000	1	6
Kazakhstan	14.000	1.000	15.000	2	10
TOTAL	**363.000**	**522.000**	**885.000**	**100**	**610**

Source: Roskill, 2002.

Table II enables to make a comparison between the volume of boron reserves in Turkey and in other boron rich countries. If the world boron consumption remains constant, Turkey can supply the world demand for nearly 400 years alone. Moreover, the high tenor quality and mineral variety -tincal, ulexit and colemanit - of Turkey's boron deposits is an important characteristic of its reserves. The proximity of deposits to the surface enables open pit mining, which decreases production costs. The usage of boron in various industries and Turkey's abundant reserves with high tenor quality and low production cost comprise the value of the mineral for Turkey. For a more precise assessment of the potential boron value for Turkey, some further points are needed to be mentioned.

Firstly, boron products are good substitutes for each other. This substitutability makes their prices volatile. Investments in specific kinds of compounds may not attract the present demand because of substitution effect. Besides, other minerals can substitute for borates as well. "Borates in detergents can be replaced by chlorine bleach, phosphates can be used in enamels, and fiberglass can be substituted by long-chain carbon compounds. The use of boron for agricultural purposes is causing concern in some countries because of concentration in water cycle" (Cave, 2002: 271). Although boron compounds have intensive and increasing usage in various

industries, the substitution effect indicates that they are not indispensable inputs for some of the major boron consuming industries.

Secondly, even if lightly processed boron compounds are not replaced with substitutes, Turkey's gain from boron ore and refined boron exports would not be enough to create an impetus for overall economic development. The boron abundance and low production costs of Turkey and existence of foreign boron consumers have enabled Turkey to acquire a share in the international boron market as the major raw boron exporter in the world. Therefore, Turkey is giving importance to increasing its share of refined boron production and has been increasing its investments in developing refined products and boron compounds. As the major exporter of boron ore, Turkey is obviously significant for boron processing industries in the world; however, Turkey has not developed distinct specialty in boron end products. While the current world market for boron ore and compounds totals $1.2 billion, abundant boron reserves cannot serve as an engine for economic development even if Turkey supplies this market by itself. This is because the $80-90 billion of world transactions of advanced boron products comprise the most profitable boron sector. Technology and know-how is the key determinant for the volume of the economic turnover in the special boron products sectors. The use of boron in nuclear energy, the aircraft and space industry, in computer and mobile

phone batteries and in automobile energy cells highlights the importance of boron for advanced technologies and industries. The quantity of the boron used in advanced boron products in the world is quite small, even less than Turkey's annual boron production (Karakoç, 2004). In order to derive economic gain from boron reserves and acquire a share in this bigger market, natural endowment is not sufficient. Specialization in boron end products requires an advanced domestic industry to generate demand. The countries with the most developed chemical industries are not only the major producers of boron chemicals, but also they are the major consumers of boron products (Ertuğrul, 2004: 15).

EtiBor's 2003 Report points to the fact that Turkey has reached world standards in terms of boron mining and manufacturing basic commercial boron compounds, but not in special boron chemicals and advanced end products. Given the current sectors and quantities of world boron consumption, the value of Turkey's boron deposits would be overestimated if boron richness is considered as sufficient to spur huge benefits for the country's economy. The optimistic approaches to Turkey's boron, which suggest that economic value of the reserves is more than $1 trillion, disregard world consumption trends, overrate the deposits as a development asset by itself, and finally lead to failure in capturing the crucial role of technology in

utilizing reserves for more advanced forms of production. For such evaluations, possessing the largest reserves has obviously stimulated cognitive and emotional biases in the assessment of the mineral value.

3.1.2. Increasing importance of boron in the global energy sector

Considerations about energy security and greenhouse gas emissions have prompted research on alternative energy sources to fossil fuels. Dependence on non-renewable energy sources and global warming trends necessitate novel and environmentally friendly energy sources in the medium and long term. Especially the developed countries, which depend on oil and natural gas imports, require substitutes to become self-reliant. The concentration of oil in politically unstable areas necessitates diversification of energy resources. To address energy security and environmental goals, hydrogen energy is a promising alternative.

The increased use of hydrogen energy can create a large demand for boron chemicals. Storing hydrogen to produce energy has the potential to generate strong demand for sodium boron hydride. In the recent years, it has been sodium boron hydride that has appeared as a potential hydrogen carrier.

Chemical hydrogen storage –in particular through the use of sodium boron hydride is a way to combine high energy density and ease of hydrogen release. Reacting hydrides with water generates hydrogen. Millennium Cell has developed systems utilizing sodium boron hydride to store hydrogen, which does not emit greenhouse gases. To solve the problems related to hydrogen energy, such as storage, transportation and security, boron will have an increasing role in hydrogen economy.

Major car companies such as General Motors, Honda and Toyota are investing for R&D to develop hydrogen vehicles. GM has announced plans to commercialize fuel-cell vehicles sometime between 2010 and 2020. Fuel cell vehicles address one of the most important shortcomings of abundant and environmental energy sources such as solar power, and they are several times as efficient as gasoline-powered cars. General Motors carries out an encouraging research and investment for fuel cell vehicles. GM plans to be the first manufacturer to sell one million fuel cell vehicles profitably. GM has launched a test version of a fuel-cell-powered vehicle Chevy Sequel that burns no gas and produces no harmful emissions and has set a deadline of 2010 by which to develop a fuel-cell unit that is competitive in price and suitable for the mass market. GM projects that by 2020, %10 of the world's 90 million new cars and trucks will be powered by fuel cells.

Besides boron use in hydrogen-energy-powered systems, boron itself has been suggested as a promising motor fuel in the future (Demirbaş, 2005; Cowan, 2001). Boron fuel vehicles are zero-emission and are not flammable. "Boron has a very high energy density, much better than that of liquid hydrogen" (Demirbaş, 2005). Also, its use gives much safer combustion power than hydrogen. Nevertheless, boron is a non-renewable resource, and the studies and investments on hydrogen power are far more advanced. Cowan notes that the use of boron as a potentially mass-market fuel has not been demonstrated (2001: 1). It's more likely that the function of boron in the developing energy sector will be storing and transporting hydrogen.

In order to switch to fuel cell vehicles, there are several technical and economic hurdles. The initial costs of mass production, constructing refueling stations, making standardized codes and getting the combined support of government and energy companies make the hydrogen cars a post-2030 technology at the earliest. Nevertheless, the research on hydrogen energy is inspiring for an increase in boron demand. Even before fuel-cell vehicles are launched, hydrogen batteries will be commercialized as the computer companies have recently concluded their researches. Millennium Cell with Hydrogen on Demand has over 25 issued patents for hydrogen generation with boron hydride compounds. The use of hydrogen energy in mobile-phone and

computer batteries has initiated the novel mass-consumption of an alternative energy source. Hydrogen energy, sustained with boron, will certainly create new areas of demand for special boron compounds and contribute to the higher valuation of the mineral for the energy industry. Yet, Scientific American argues that even if all cars in the US are fueled by hydrogen cells, boron consumption in the field would be less than %5 of US boron production. Since the know-how of the production of special boron compounds for hydrogen energy generates the value for boron, even if the demand for boron dramatically increases, the owners of the hydrogen energy technologies will be the ones who produce valuable boron products.

3.2. External Factors

The structure of the international market of a mineral has implications for the producers in terms of setting the standards to produce for maximum utility. The challenges and benefits of the existing and foreseeable world market of a specific mineral shape the production and marketing strategies of individual producers. External factors are simply the dynamics and features of the world mineral market. These dynamics are determined by production and consumption trends, which imply supply and demand patterns. The number of

the producers signifies intensity of the competition and the structure of supply in the mineral market. If the market is limited to a few producers, they can control supply and the prices. If there are multiple producers in the market, competition among them leads to a decrease in prices and eliminates relatively inefficient and high cost producers.

Equilibrium prices are achieved by market forces provided that the supply and demand match in the world market. If the world supply is less than demand, prices in the international market would go up and favor the producers. When supply is potentially larger than the actual demand, as in boron market, market forces may pull the commodity prices downwards, as multiple producers enter into the market and compete by pricing tactics. Due to such market forces, concentration of production in few producers, which is an oligopoly, enable them to control both supply and the prices. Apart from the production side of the world market, consumption trend is a determining external factor on the mineral policy. Annual increases in consumption or a regular decline due to substitutes or environmental concerns, compel the producer to develop plans for the foreseeable future. Product diversification and product quality are two more of the requirements of the demand side in an international market. Products in question should at least match the existing standards of substantial alternative products

Geographical location of major consumers also poses a challenge or opportunity for producers. Relatively high transportation costs make it more difficult for some producers to be influential in every consuming region, unless their products are purchased for their specialty and high added-value.

3.2.1. Structure of the world boron market and industry

World boron market is different from regular minerals and metals market. Borates are not traded as commodities. "There is not a trading centre for borates in say London or New York and prices are negotiated individually between buyers and sellers" (Cave, 2002: 28). The feature shaping the borate market is that the supply and demand curves are less effective on the equilibrium price for boron than on other mineral commodities. Boron demand is relatively price inelastic due to the consumption patterns and the concentration of supply in a few producers.

Before the nationalization of Turkish boron mines, US Borax was the biggest producer in the world. The development of marketing, technological and organizational skills due to the long history of US boron production combined with abundant reserves enabled US Borax to establish dominance in the world

boron market. With such an advantage and influence in the market, the US has had leverage in determining and controlling the prices.

One of the external factors that had driven and still drives Turkey's boron policy is the fact that the international boron market with few producers can sustain high and stable prices and maximize export revenues for those producers. With the nationalization of boron production in Turkey, the international boron market has been a highly concentrated oligopoly; even it is called a duopoly (Cave, 2002). In such a market, the biggest two producers can maintain higher prices more easily than multiple producers. It's also in their interest to perform this way given that the US reserves are in the latter stage of their lifecycle and Turkey's boron reserves depend on raw or lightly processed exports.

World boron market is described as an oligopoly since seventy-five percent of the market is controlled by Rio Tinto Borax with its mine at Boron in California and Etimine based in Turkey. Of world boron production, %25 is realized by smaller suppliers. World production of boron minerals is displayed in Table III.

Table III ***Production of boron minerals by country***

Country	**Company**	**Production**	**(2001)**
USA	US Borax		1.300.000
	Ford Cady	**B2O3**	650.000
	IMC Chemical		
	ABC		
Turkey	Etimine		1.476.000
		B2O3	517.000
Chile	Quiborax		340.000
		B2O3	119.000
Peru	JSC Inkabor		9.000
Argentina	Borax Argentina		360.000
	Processora de Boratos Argentinos	**B2O3**	61.000
	Ulex SA		
Bolivia	Compania Minera Tierra Ltd.SA		35.000
	Corban SA		
Russia	JSC Energomash-JSC Bor		700.000
		B2O3	60.000
Kazakhstan	JSC Inderbor		
115.000			
		B2O3	12.000
China	State Corporations		314.000
		B2O3	110.000
Other			5.000
		B2O3	17.000
Total			**4.654.000**
Source: Roskill, 2002		**B2O3**	**1.546.000**

Apart from the US and Turkey, Russia is the most significant country in terms of its reserves and potential production among the other suppliers of boron. Due to the geographical location of its deposits, the Joint Stock Company Bor is an export-oriented enterprise. Its basic consumers are the countries of

Asian-Pacific region (China, Japan, republic of Korea) while %15-25 of its production is delivered to the home market. The geographical location of boron deposits is the most important factor determining the identity of Russia's consumers because transportation cost is a disadvantage for Russia in terms of diversifying its markets towards West.

Argentina is one of the two leading boron producers in South America. Two multinational companies carry out boron production in the country. Borax Argentina SA, which is the biggest producer in country, is a subsidiary of Rio Tinto. The other producer Processora de Boratos Argentinos is owned by Ferro Corp. and Canadian JEM Resources& Engineering Inc.

On the consumption side of the world boron market, there occurs rather slightly shifts in demand and there exists a few sizeable customers, who comprise most of the business. Of the refined boron products, %45 is consumed in Europe, %25 in US, %11 in Asia and %1.6 by Asia and Middle East. Apart from the environmental concerns and availability of substitutes for boron, the intensity of boron consumption is closely related to industrialization. Boron consuming sectors and regions are shown in Table IV.

Table IV World boron consumption by sectors and regions (thousand tones)

	America North/South	**Europe** West/East	**Asia**	**Africa/ Middle East**	**Total**	**Share**
Insulation-grade glass fibers	180 / 5	100 / 5	10	**-**	300	**20**
Textile-grade glass fibers	80 / 20	75 / 10	40	**-**	225	**15**
Borosilicate glasses	25 / 10	70 / 5	10	**-**	120	**8**
Ceramics, glass	15 / 30	80 / 20	45	5	195	**13**
Agriculture	15 / 10	35 / 5	5	5	75	**5**
Detergents and soap	25 / -	185 / 10	20	-	240	**16**
Other	35 / 75	140 / 45	35	15	345	**23**
Total	375 / 150	685 / 100	165	25	1500	**100**
Share %	**25 10**	**45.65 6.75**	**11**	**1.6**	**100**	

Source: Roskill, 2002.

Since borates are not traded as regular mineral commodities and supply and demand curves are not the dominating element in pricing boron, development of marketing skills is a critical factor for in reaching the customers. Price stability, continuous supply, product quality and effective distribution channels emerge as factors differentiating the producers from each other.

Firstly, ownership disputes over boron mines and production within a country negatively affect the customer's requirement for stability of supply. Since boron demand doesn't reveal major shifts, guarantee of a continuous supply is important for establishing and maintaining long-term customer relations. Secondly, product quality developed with production knowledge and technological advancements is essential to catching the attention of customers. Given the fact that major boron customers are developed and industrialized countries, improvement in product quality, diversification of products and sustained customer support for specialty products are necessary for flourishing in the world boron market. Thirdly, developing strong marketing networks through distribution channels and sales agents in consumer countries is equally important. As US Borax notes "list prices are established annually with standard quantity discounts for large users" (Marcus, 1997), so the development of long-term business relations significantly influence the world boron market.

3.2.2. US Borax, the world giant boron producer

US Borax, Inc is a wholly owned subsidiary of London, United Kingdom-based Rio Tinto plc, which is one of the world's largest mining and metal

companies. Rio Tinto produces non-ferrous metals, platinum group metals, coal, oil and gas, steel and stainless steel. Rio Tinto is among the world's main producers of coal and one of the major producers of coking coal for the world market. US Borax is the leading producer of refined boron in the world, with its main mine in Boron, California. Of the world production, the share of US Borax is around %40. Of the world revenues on boron sales, the company's share is around %70.

Boron mining in US started in 1872 with Smith Brothers Borax Co. The company's name has evolved several times and since 1993 it has been called US Borax, Inc. US borax is one of the United State's longest surviving mining firms, which celebrated 125th anniversary of continuous business in 1997.

Besides its rich boron deposits and long experience in the world boron market, rapidly growing domestic industries have enabled US Borax to develop its production base. In 2005, about one half of domestic production was consumed within the US (Lyday, 2006). With a high domestic demand for boron products, it's an advantage for the company to interact with different sectors which develop specialty products.

Being the oldest boron producer in the current world market, US has developed its production technology, product diversification, distribution channels and marketing network. US Borax supplies to agricultural, industrial and specialty customers in more than 80 countries through international distribution centers (Marcus, 1997). The company has shipping facilities and international distribution centers in the Netherlands, France, Spain and Belgium. US Borax also has secondary storage points in Austria, Germany, Norway, the republic of Korea, Taiwan and Ukraine (Lyday, 2004). A worldwide network of sales representatives and agents facilitate the sophisticated distribution system. US Borax has more than 200 nation-wide distribution offices. Around the world, it has 4 regional offices, 20 sales offices, and distribution and sales agencies in 52 countries (Üncü and Yerlikayalar, 2004). Such a strong distribution and marketing network enables US Borax to maintain and develop its business relations, thus becoming the dominant boron supplier in the world.

Apart from the marketing skills and abilities, US Borax is the most effective boron producer in terms of its product range, special products for sector-specific markets, R&D efforts, ISO 9001 and 14001 certificates and service supply. The linkages between the boron industry and other domestic industries have certainly stimulated innovation and production knowledge. US industry

also produces boron minerals with a higher productivity per worker hour than those produced in other countries (Lyday, 2004).

Existence of such a powerful competitor in the market has affected Turkey's boron policy formulation on the grounds that boron production and management, including the extraction, production, distribution, marketing of boron products and adequate investment for high-value products, ought to be operated in one hand in order to make Turkey's boron products competitive in the world market. According to the Etimine officials, numerous private producers would not be able to compete with US Borax. Therefore Turkey's boron policy under single-producer control reflects apprehension about the magnitude and weight of US Borax in the international boron market.

3.3.Economic factors

The dynamics of natural resource economics affect the formation and changes of mineral policies and institutional design of mineral management. Mineral deposits to generate wealth and spur economic growth can be utilized through exploitation of minerals for domestic industrial development and/or through export revenues, which strengthen the balance of payments.

Exploiting the mineral deposits as a platform for domestic industrial development, like the United States, Canada and Australia depends on the structure and course of the learning process of mineral management. According to Wright (1990), if natural resources are developed through advanced forms of knowledge development, their spill-over effects may be just as powerful as in any other high-value added sector. Mining industry has the potential to generate multiple spill-over effects at the local and national level. The linkages between mining and other industries, which consume mineral products or supply goods and services to mineral processing industries, maximize the potential and economic value of mineral-based industrialization. Utilization of mineral deposits as an impetus to domestic industrial development via multiple linkages to domestic industrial and service sector occurs through knowledge development and creation of social and human capital.

Developing and using mineral deposits as a platform for broader industrial development is a longer term policy than generating revenues from raw or lightly processed mineral exports. The comparative advantage in the abundance and quality of a mineral, low exploration, extraction and processing costs and geographical proximity to international consumers may encourage domestic actors to give priority to non-processed mineral exports, because

these advantages make the mineral production a profitable business even without large capital investments and R&D expenditures.

The intensity of raw mineral exports makes the revenues vulnerable to commodity price fluctuations and declining terms of trade. Commodity prices fluctuate more than that of manufactured goods. Boom and bust cycles destabilize export revenues and hamper long-term economic forecasts and investments. Therefore the fluctuations in resource prices hinder stable economic growth if the intensity of raw mineral exports is greater than processed product exports. Declining terms of trade is another economic challenge for raw commodity exporters. A large trade imbalance in the economic exchange of raw or lightly-processed minerals for high value-added products worsen the national balance-of-payments position. Therefore a short-sighted wealth generation through a focus on unprocessed mineral exports does not confer long-term prosperity based on mineral wealth; moreover it may lead to escalating internal conflict. The economic benefits associated with mineral endowments and the challenges of realizing these benefits affect the formation of mineral policies. Policy-makers develop institutional arrangements in order to maximize the benefits that they seek and to manage the challenges of mineral-led economic growth. Broader policies focused on industrial development and export revenues differ according to their tools of

regulation, methods for eliminating the obstacles, and timeframe for achieving defined objectives and terms of success.

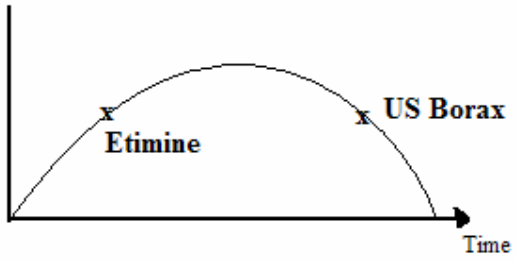
Institutional design of mineral management is constructed in order to realize the expected economic benefits and reduce the challenges of mineral economics. For Turkey, its comparative advantage in boron deposits has been a central motivation for state acquisition of reserves for extraction and production purposes. Export revenues have been defined by the policy-makers as the means of realizing economic benefits from its comparative advantage in boron. Export-focused boron production and management has brought with greater recognition of possible challenges of mineral economics. Export-concentrated boron policy, eliminating the effects of commodity price fluctuations and declining terms of trade together form the economic bases of Turkey's boron policy and thus the institutional design of boron management.

3.3.1. Comparative advantage

Turkey's comparative advantage in boron abundance has been central to nationalization of reserves. First and foremost, Turkey is in the early stages of its boron mine lifecycle and it's estimated that boron deposits in Turkey can

meet the world demand for 400 years, boron-processing companies and industries can develop their investment and production plans according to the availability of boron in Turkey. The capability of Turkish reserves to supply boron for centuries encourages not only capital investment for boron products, but also R&D activities to extend boron use in new technologies.

Figure II ***Mine(s) Lifecycle***



Source: Cave, 2002.

Secondly, boron mines in Turkey are cheaper to operate than in other countries. While mining operations in Turkey are either underground or open cast, US Borax's open pit mine in Boron is already 750 meters deep (Cave, 2002). Turkey's reserves being close to the surface make the extraction less capital intensive and less costly. As the reserves in US remains deeper, US Borax has to invest in new equipment and its production cost increases.

Thirdly, the tenor content of Turkey's boron is higher than other boron-rich countries. High tenor content makes it less costly to produce refined boron, such as borax and boric acid, with Turkish boron. Even more importantly, raw Turkish boron is used by some branches of business as an input without any processing due to high tenor content , while boron ore of other countries is needed to be processed more in order to reach the same tenor content as Turkey's.

Finally, the geographical location of Turkey's boron reserves reduces transportation costs. Proximity to Europe, which consumes approximately 1/3 of world boron, allows Turkey to increase its market share at the expense of US Borax. JSC Bor in Russia has significant reserves and potential production capacity, but the most serious obstacle is transportation costs. Boron mines in Russia are far away from major markets and the nearest port to mine is unsuitable for ships other than small coasters.

The quantity and quality of its mines, low extraction, production and transportation costs create comparative advantage for Turkey in the area of boron. These fixed advantages make boron extraction profitable without the

need for huge capital investment and innovative technology; this is why these advantages also pose a threat for development of boron industry in Turkey.

3.3.2. Commodity price fluctuations

One of the economic rationales behind nationalization was to preserve high and stable commodity prices for boron mineral. Before nationalization, low production costs related to the comparative advantage of Turkey enabled the entry of multiple domestic and foreign private producers into the market in the country. The existence of many producers in the market led to a cut-throat competition, as a result boron prices and the export revenues declined during the 1970s. Given the absence of a domestic-boron consuming industry, policy-makers recognized that export revenues would be the most profitable and rapid way to generate welfare from boron abundance. Declining price was the biggest challenge for increasing export revenues. In 1974, the Ministry of Energy and Natural Resources set a minimum desired price of boron at $70/ ton, a more than two-fold increase, from $30/ ton. In the competitive boron market, however it was not possible for the state to increase prices to higher levels (Karakoç, 2004). Consequently, the severe decline in boron prices ended up with the nationalization of boron production.

3.3.3. Declining terms of trade

Declining terms of trade thesis, established by Singer (1950) and Prebisch (1950) anticipates a deterioration of the ratio of the prices between primary commodities and manufactured goods to the disadvantage of the prior. Based on the income elasticity of demand, which is suggested to be higher for manufactured goods than for commodities, terms of trade for primary commodity exports have a tendency to decline over time. Furthermore, according to declining terms of trade, "the producers of industrial goods have market power and they can capture the benefits of higher productivity in the form of higher incomes, while the producers of primary commodities generally take their prices as given" (Mollick, *et al,* 2007: 685).

Declining terms of trade relate to Turkey's boron policy in two different aspects. Firstly, an increase in the raw boron prices is not expected compared to the rise in processed boron prices. If production is purely left to domestic market dynamics, as it was prior to nationalization, it is not practical to control and lift the raw boron prices up, while any shortage in international boron market is not foreseen with the world reserves, which are estimated to meet the current boron demand for more than 600 years. Therefore capturing the whole production would lead to an increase in state company Eti's income

while the revenues are not expected to increase in response to raw boron prices in the short or long term. Secondly, as a remedy to declining terms of trade, developing countries are suggested to diversify into manufactured exports. Having a well-established political economic tradition in line with state enterprises, at least rhetorically, state enterprise is viewed as a vehicle to undertake capital-intensive projects to realize investments for diversifying towards processed boron products.

3.4. Political Factors

The type of the political regime, structure of the state institutions and socio-political position of the citizens has a direct effect on the institutional design of natural resource management. Many cross-country studies have assessed the relation between the political systems and resource use. Democratic and authoritarian political regimes present the main contrasts in terms of how they organize the ownership structure of the resources and how they establish the legal and regulatory framework for resource production and management.

The role of the state as owner and producer of rentable resources, or the role of the state as regulator and coordinator, is created according to the impact of

political tradition on the organization of the economy and vice versa. In democratic regimes, political institutions generally serve to organize and regulate market economy. Therefore, the private sector engages in production, while the state acts to regulate. The dynamic relationship between the market economy and liberal political institutions further limits the function of the state in the economic sphere. The mutual interaction of political and economic organization does not locate one above the other.

In authoritarian regimes, the state dominates economic organization. In order to consolidate its position through resource wealth, an unrepresentative state claims ownership to rentable resources. Given the fact that the political institutions and the economic activities are subordinated to the ruler and the rule of law is not entrenched, resource wealth is likely to lead to benefits for political elites, rent-seeking behavior, corruption, and even violence to obtain the ownership of resources.

The evolution of the political regimes in developing countries makes it difficult to precisely fit their institutional design of resource management to any of above groups. A wide range of political systems, such as transitional democracies, unstable democracies with a legacy of authoritarian rule, stable authoritarian governments, unstable and unrepresentative authoritarian

regimes, have their own political dynamics and traditions. Due to the individual characteristics and evolution of political systems, diverse regulatory approaches on mineral management have evolved over time.

The political tradition within a country determines the acceptability of state-owned companies and the extent of state influence on specific economic sectors. The flourishing private sector in mineral production may make state production unnecessary or undesirable according to the improvement of liberal institutions and changing perceptions of ruler and citizens about the proper role of the state in the economy. Yet, the long experience of state-owned companies enlarges state influence within the political system through the development of bureaucratic capabilities and socio-economic relations with their employees. Once the political system allows state-owned enterprises, their large role in national political economy becomes difficult to change even if the country is otherwise developing liberal democracy. Attempts to change the long tradition of state companies are usually perceived by at least some influential elites to be rent-distribution to other actors and a lost of power by the state.

The tradition of state-owned companies can also lead the state into new sectors or new resources. If natural resources generate significant rents, the familiar

process of state acquisition can block the entry of private producers from the sector and bring resource wealth under state control. Deficient characteristics of the political system, such as poor definition of property rights over resources and weak legal regulation, lead to easy acquisition of the resource by the state.

3.4.1. The role of the state in Turkey's domestic mining sector

Mining industry in Turkey was established by the state for the purposes of industrialization and economic development. As mining is very capital intensive, state investments were required to initiate the sector. In 1935, The Mineral Research and Exploration Institute (MTA) was established along with the Etibank to develop a domestic mining industry. Prior to the mid 1990s, public sector funding represented about %80 of total investment in mining sector in Turkey and the investments had been undertaken by MTA and through Etibank.

Divestment of companies in the mineral sector (primarily cement companies) was most noticeable in 1989, 1992, 1993 and 1996. Especially after the mid 1990s, relations with the European Union and the foundation of the Turkish

Privatization Administration motivated further privatizations and review of state-owned enterprises. In 1998, Etibank was restructured as Eti Holding A.Ş. with the co- partnerships of Eti Boron A.Ş., Eti Aluminum A.Ş., Eti Chromium A.Ş., Eti Copper A.Ş., Eti Silver A.Ş., Eti Electrometallurgical A.Ş. and Eti Marketing and Foreign Trade A.Ş. In 2000, Eti Copper, Chromium, Electrometallurgical and Silver A.Ş. were transferred to the Privatization Administration. In 2004, Eti Aluminum was transferred to the Privatization Administration as well. In 2004, the state-owned Eti Holding A.Ş. was restructured and named as Etimine General Directorate. The co-partnership regulation of Eti Boron A.Ş. was revoked and boron extraction and production became the main field of activity for Etimine. With the privatization of the mentioned enterprises in 2004, privatization of mineral sector organizations resumed at a brisk pace (Mobbs, 2004). The state's weight in the mining sector has started to decrease except for boron production. The private sector has started to dominate the industrial minerals production.

The most important factor that paved the way for privatization of mining enterprises was the state's inability to realize profits. Mining has contributed around %2 to Turkey's GDP in the past few decades. The annual growth rate of mining has lagged behind manufacturing and the overall Turkish economy.

The share of mineral exports has also been small in comparison to agricultural and industrial exports. Between 1983 and 2001, the average shares of agricultural, mineral and industrial exports within the entire export volume are 15.%9, %2.2 and %81.7 respectively (Yılmaz and Arıoğlu, 2003).

The burden of the state-owned-enterprises on the state budget had negatively affected the political perception about state power and its function in the domestic mining sector. Yet, even with the evolution of political institutions and traditions, which has led to privatization of other minerals, revision of mineral policies has not involved production of boron minerals. The long-lasting experience of state-owned-enterprises is still a factor supporting state ownership if the ownership returns profits. Therefore, the decreasing role of the state in general mining industry is not valid for the boron mining and production. The anticipated profitability of boron mining is keeping the extraction and production activities under the state domain through Etimine.

CHAPTER IV

INSTITUTIONAL DESIGN OF BORON PRODUCTION IN TURKEY

4.1. Private enterprises until 1978

Boron production in Turkey started with foreign entrepreneurship at late 19th century. After the foundation of Turkish Republic, the country's insufficiency to realize and assess the value of economic resources was also reflected in the mining industry. Combined with the negative impacts of the First World War, the Great Depression and the Second World War on the world economy and on the production capacities, boron production in Turkey has been insignificant and foreign enterprises driven until the end of Second World War.

After the 1950s, domestic boron enterprises have started to flourish in Turkey besides foreign companies. Yakal Borasit Ltd., Şayakçı Mining, Rasihsan Mining Ltd., Mortaş and Bortaş were the domestic private boron producing companies which were established in this period. Etibank, the state-owned company, has started boron production after the first domestic private companies. US Borax continued boron production with its subsidiary Borax Consolidated Ltd. and successively with Turk Boraks Mining. A partnership was established with US Borax and a domestic company Garanti Bank A.Ş. under the title of Garanti Trade A.Ş. Besides to these companies, American Potash& Chemical Corp., a rival of US Borax, established a subsidiary in Turkey with the name of Kemad A.Ş. in 1962 (Çetin, 2005: 59).

During the period between 1950s and 1978, until boron production was nationalized, the picture of boron producers in Turkey appears quite diversified in terms of ownership structures and trade relations. In an environment of newly developing boron sector, mining fields were sometimes being handed over between companies (Buhler, 1996). Despite the initial deficiencies of domestic private and state enterprises due to the lack of experience, technical knowledge and know-how, boron production in Turkey has improved in a short-time thanks to the high-tenor quality of boron ores,low extraction costs and geographical proximity to Europe. Following the entry of

multiple actors, competition dynamics has led to a decrease in the boron prices in the newly developing boron sector in Turkey. At the beginning of 1970s, some of the domestic enterprises reached a capacity to process boron and increased their market share in Europe significantly (Buhler, 1996). First boron products factory was established by a domestic private enterprise and this was followed by Etibank (Çetin, 2005: 69). While boron production in Turkey started to shift towards processed products besides ore extraction, especially with the driving force of domestic private enterprises, the suspicion about US Borax ownership of boron mines and falling boron prices prepared an atmosphere for nationalization of boron production. Partnerships between domestic producers and foreign companies, sharp decline in boron prices and the changes in the owners of mines seemed like shady business and exploitation of Turkish boron by external forces. As a remedial measure, cancellation of mining licenses and seizure of all mining equipment and means that belonged to private enterprises has brought with the full state control over boron mines. What is more noteworthy is that the wave of nationalization went further to cut the boron ore supplies by the state-owned enterprise Etimine to domestic boron manufacturers.

Probably not dissociating private actors from extraction activities, but rather alienating them from processing operations has slowed the evolution of boron

sector in Turkey a result of loosing competition dynamics, waste of private sector's experience accumulated until then, and private sector dynamism for business operations. Table V shows private refined boron producers in Turkey with their production capacities and closure dates.

Table V *Refined boron producers in Turkey*

Company name	**Borax**		**Boric acid**	**Perborate**	
Closure date					
Göknur Kimya	15.000	3.000			1984
Kimsan	24.000	6.000			1983
Atabay İlaç				5.000	
1984					
Murat Kimya			5.000		
1990					
İnterkim		5.000			
1993					
Alev Maden		2.500			
1993					
Bor Ltd.		5.000			
1997					
Private Sector Total		**51.500**	**14.000**	**5.000**	
EtiMine Total	**55.000**	**20.000**			**1986**

Source: Çetin, 2005.

4.2. The legal framework of nationalization

In 1978, the government passed Mines Expropriation Law No.2172 which authorized the expropriation of private mines deemed essential to the state and cancelled all mining permission to private companies by giving all mining rights to Etibank. With this law, all the activities related to boron comprising exploration, production and marketing are put in possession of state-owned enterprise Etibank. Also the law established a restriction to transfer of competence or privilege over boron mines from Etibank to real persons or legal entities. In 1983 the Parliament passed another Law No.2840, which replaced the previous Law No. 2172 by re-stressing the emphasis on boron production by state monopoly. In 1985, the Parliament made an amendment to the Mining Law by widening the extent of state monopoly for trona and asphaltite besides boron mines. In 1994, another amendment to the Law was established in order to transfer the exploration and production of trona and asphaltite to private sector; while adjudicated that the state possesses the sole right to mine and operate boron salt, uranium and thorium.

The legal framework over boron production has aimed to establish a full state control over the boron resources. Although the law was amended two times in order to regulate or change the ownership status of other minerals which are

included with the law, mining rights of boron has not changed with the amendments. Dissociating private sector from boron production in a sharp manner while leaving production of trona and asphaltite to private sector exposes the specific value attached to boron minerals. The difference in the regulatory approach to boron and other minerals minifies the impact of the state's settled institutional approach on mineral governing attitude. On the contrary, this difference reveals that the value of boron has determined the scope of the legal framework.

4.2.1. Policy instruments of Eti and its outcomes

After the nationalization, with the purpose of developing its position in the global boron market, Eti has employed specific instruments, which fall into two categories. The first set of instruments is directed on domestic producers and generally has taken the shape of supply cuts, irregular supplies and unfavorable prices. These instruments derive its incentives from monopolistic attitude, and find basis in the supportive political power and complementary legal setting; as a result gradually expose an expansive trend in Eti's domestic scope of competence. The second set of instruments is employed to increase Eti's own capacity such as investments to increase production capacity,

institutional re-structuring, marketing and R&D activities to diversify and advance product range. These instruments derive its incentives from business expansion. Since the second set of instruments is among the basic strategies of a company whether it is private or state-owned, and not limited to the protective attempts of a state monopoly, they will be presented in Chapter IV.

The first set of instruments, which include supply cuts, irregular or low-grade supplies and unfavorable prices, were not expressed as a part of official policy, but gradually have become a part of policy implementation. The law establishing the legal basis for state-ownership has cancelled all private mining licenses and referred mining and production rights to state monopoly Eti. However the private producers, which continued its production with refined and processed boron products were exposed to the mentioned set of restrictive instruments in the course of time.

There are several reasons for the expansive trend in the implications of Eti's sphere of monopoly. As Eti started to make investments in refined boron products and diversify its products, private producers whose production is potentially competitor to that of Eti have been exposed to irregular supplies, low-grade raw boron or unfavorable prices compared to their foreign counterparts. Atabay firm is one of the examples of the local boron producers

which had to end its production as a result of the price policy and irregular supplies of Eti. In 1970s, Atabay firm has started its production of perborate, which is a refined boron product, with a capacity of 5000 tons per year; and in a short while, has come to meet domestic perborate demand in Turkey. Eti supplied the firm with boron ore at a price of $250 per ton while foreign firms were supplied at a price of $120-140/ ton. At the same time, Eti has started to produce perborates after it has contracted with a French company to install a perborate facility in Turkey. As the Atabay firm has become a competitor to Eti's perborates, low quality and irregular ore supplies to Atabay besides to the unfavorable sale prices had led to the closure of the firm in 1984 (Önür, 2002). In response to the questions about the differences in price settings, the interpretation of Eti is quite noteworthy. A former high official of Eti explains the price settings in favor of international competition dynamics. According to his explanation, when foreign firms buy Eti's boron, their payment to Eti at a price of $120-140 for a ton of boron combined with their transportation and insurance costs, the total cost of one ton of boron import reach the price of $250/ton, which is the price for domestic buyers. For this reason, if domestic and foreign buyers are supplied with the same price, it would distract international competition.

This approach implies that domestic producers are regarded by Eti as critical competitors as the foreign producers. The underlying rationale, developed with the monopoly situation domestically, is a result of lack of comprehension about the utilization of minerals as a base for economic development so that Eti's own revenues and success are considered as the single indicator of how Turkey accrues benefits from boron endowment rather than taking the progress of domestic actors in boron production techniques into notice. The negative approach directed towards domestic producers is at the expense of developing the national learning capacity. An extreme focus on eliminating domestic producers has led to negligence of their knowledge in production; and also has equalized national learning to Eti's knowledge capacity. Contracting with foreign firms to build refined boron facilities, whereas the domestic firms which had already started to produce those products were exposed to closure is a significant example in the context of national learning ability.

An important reason which has contributed to the expansion of Eti's monopolistic power at the expense of domestic private producers is the success of state monopoly in raising boron prices, increasing its share of world production and increasing its boron revenues For instance, while in the pre-1978 period prices of boron products had been between $40-60 per ton, in

1989 the prices of the same products reached to $150-200 per ton and in 1999 the prices has reached to $290-295 (Karakoç, 2004: 23). Such positive figures have not only consolidated but also justified Eti's competence in following its own strategies on account of its monopolistic position.

In the long-run, the achievement of Turkey in the world boron market needs to be evaluated according to the diversity, quality and distinction of its products rather than entirely according to the market share that it gained immediately as a result of capturing large deposits under state monopoly. The difference between the market share of Eti in world boron production and its share in world boron revenues reveals the necessity to utilize efficient policy instruments that are inherent to company strategies for moving into higher value-added production.

4.2.2. Overprotecting the state domain of boron

In the period after nationalization and up to present, the international economic and political implications of who gains control over boron resources explains how boron deposits are viewed as a potential developmental asset. The consumption of mineral commodities is closely linked to the level of

industrial activity; accordingly presents the economic opportunities of commodity sales in a given domestic market. Beside to this, international economic and political value of a commodity presents export opportunities and sometimes political leverage for the commodity owner countries. Being in a more sophisticated world market -different from the experiences of today's developed countries- the resource rich developing countries are more bounded with the dynamics of the world market. In the boron case, while US has developed its boron deposits in relation to its industrial activity, widened the usage fields of boron and advanced world boron trade, it also has created the international opportunities to be utilized by itself. Through its boron deposits and developing boron industry, the ability to control supply and price mechanisms has given the country a leader position in the world boron market. In other words, being not only an important producer, but also a significant consumer of boron has made US to be the most dominant actor in the world boron market. Since the 1900s, at least half of the and usually 2/3 of the reported boron production in US has been consumed within the country. For instance, in 2001, 650 million tons of the total production of 536 million tons was consumed by various domestic industries in US (Buckingham, *et al*, 2005).

Given the fact that Turkey is still a developing country, which implies that Turkish industry is behind that of major boron consuming countries, the evolution of boron industry has not been a respond to domestic demand forces. During both the pre-nationalization period and the period after 1978, the production incentives has been occurred and developed in correspondence to international boron demand. For example in 2001, only 1/15 of the boron revenues was derived from internal sales (DTM, 2003: 16). Since Turkey is not among the major boron consumers in the world due to the capacity of its domestic boron consuming industries, the utilization of the deposits orients towards world market opportunities.

At the preliminary stage while the state monopoly holds a significant position in the global market by capturing mining and production rights, it starts to take additional measures which are complementary to protecting and strengthening its position in the global market. This expansive trend, which develops as the domestic attitude of the state monopoly, also ascribes the cost of research and development activities and investment in knowledge and human capital to the state. In order to achieve long-run success in the natural resource industries, Blomström and Kokko (2002:1) indicates the significance of public policies and company strategies that create skills and competence that are needed to remain competitive in the face of changing technologies. In the case of a state

monopoly, as the same actor is responsible to generate policies and develop company strategies, the knowledge and skills used by the industry need to be continuously updated by the state in response to changes in competitive environment and moving into productions with higher value-added needs to be the top priority of the official policy.

While the creation of a state monopoly eliminates the domestic competitive forces, it contributes to the stability of world market in terms of increasing predictability of price and supply levels. As a result, Eti is able to derive higher benefits from a boron market, where the number of suppliers have decreased. On the other hand, contributing to the stability has a positive impact on the side of the existing producers in the world boron market. As the boron prices become more convenient to control and manipulate by few producers, the position of the foreign competitors are also strengthened. Substantially controllable and high prices in a market of few producers makes the mining and production activities of the competitors economically more feasible and sustainable through decreasing the level of uncertainty in the commodity markets. For this reason, the genuine area of competition in the global boron market appears to take place in high value-added production which is apparent at the income shares of each producer from its sales of highly processed products.

4.3. The public opinion and the views of prominent domestic actors

The concept of strategic mineral ascribed to boron has shaped the public opinion and the views of prominent domestic actors, including political, judicial and business figures, in conformity with the state-owned production. Defining boron as a strategic mineral started in 1958 with the placement of boron on the strategic minerals list of Coordinating Committee for Multilateral Export Controls *"COCOM"*. Following the launch of Sputnik by the Soviet Union in 1957, the NATO member states and Japan developed COCOM in order to regulate and limit exports to Warsaw Pact, especially of the goods related to military activities. In this context, boron exports to Warsaw Pact were prohibited between 1958 and 1961 for the reason that rocket and flight fuels are usage areas for boron. Although boron was removed from the strategic mineral list in 1963, definition of boron and evaluations about its importance has evolved around this concept in Turkey.

In line with the developments related to hydrogen energy, the importance of boron in terms of bringing solutions to such problems as storage, transportation and security of hydrogen systems has contributed to the consolidation of strategic mineral concept in Turkey. The usage areas for boron like energy production, heat storage, fuel cells beside to the areas like

nuclear applications, rocket and flight fuels have together become the main point of government authorities, political parties, prominent business unions, media and the public opinion (Çınkı, 2001; Güler, 2002; MMO, 2002; EtiMine, 2004). The consensus about the strategic importance of boron has carried the questions or critiques about the state-owned production and policies into a realm of concern that narrow the point of views under a state versus opportunist private enterprises or state versus foreign competitors discussions. Accordingly, preserving the boron wealth under state guardianship with labels such as *"petroleum of the 21st century"* has surpassed the importance of the means through which the country can turn this mineral wealth into economic gains. As the notion of preservation and protection of boron wealth has gone beyond the utilization aims, it has prevented the development of a national boron industry by the joint endeavor of state and private sector.

About the supervision of the state enterprise in terms of checking its activities that expose difficulties for private boron producers, the decisions and advisory opinions of state institutions such as Competition Authority and Council of State are reluctant to cause an amendment to Eti's sphere of activity. Bor Sanayi Dış Ticaret Ltd. Şti, a domestic firm which produced borax –a type of refined boron- with ore supplies from Eti, applied to Competition Authority

with the claim that the state-enterprise Eti Holding abused its monopoly position in the domestic boron market by supplying the firm at higher prices than its foreign customers. In the context of the Competition Law, Eti was conducting unequal treatment by setting the price for domestic customers at $230/ton while it supplied its own works at $42/ton and its foreign customers at $141/ton. According to the claimant, any Turkish citizen or firm had right to buy Eti's products on equal terms with the foreign customers. In response to the claims, the decision of the Competition Authority in 2000 asserted that Eti Holding is not covered within the scope of Competition Law since it is using monopoly right based on law; and therefore the Authority did not start an investigation. Following, the same firm applied to Council of State by demanding annulment of this decision.

In 2003, Council of State declined the demand for annulment by confirming that Eti's monopoly right covered not only mining but also processing of boron by state hand. This decision is contrary to the institution's advisory opinion in 2000 when it asserted that there is not a legal obstacle for domestic producers to process the boron that they buy from Eti; and Turkish citizens and firms have right to buy Eti's products on equal terms with foreign customers. Although domestic boron processing firms were not legally closed after the nationalization of mining rights, with the decisions of Competition

Authority (2000) and Council of State (2003), the legal basis for further processing the products of Eti by the domestic private producers has come under question.

4.4. Privatization discussions, attempts and reactions

The letter of intent submitted to IMF by government of Turkey in 2000 envisaged the transfer of Eti Holding to Privatization Administration with some other state economic enterprises as a part of the privatization program. In accordance with the letter, Privatization High Commission issued its decision that comprised Eti Holding within privatization program and envisaged the completion of preparatory works in 6 months. This decision after its publication on the Official Gazette, led to indignation in the country. Various domestic institutions, organizations, political parties, trade associations, labor unions and NGOs organized symposiums, panels, press meetings and issued declarations in order to provide annulment of the privatization decision (Karakoç, 2004: 24). As a result of the increasing pressure form public opinion, the privatization decision was declined after 6 months of its declaration.

The reaction to privatization has taken its basis from country's long tradition of state –owned enterprises and also from being an attempt related to IMF program. Despite the roots of the reaction, state's mineral enterprises within the Eti Holding other than boron, was transferred to Privatization Administration in 3 years of time. Besides to being one of the rare state economic enterprises that is highly profitable, privatization of Eti Boron drew significant reaction because of the mineral's strategic importance and related potential for the country's development. By the few opponents to the existing Eti policies, which are made up of prior private boron producers, privatization attempt is regarded even weirder given the condition that they had been excluded from boron production. Especially the critiques and oppositions regarding Eti's domestic policies and practices directed at private producers had never raised the privatization of mining licenses including extraction and basic mining activities. From this aspect, privatization attempt was quite a radical decision and also was an outcome of external pressures rather than an internal necessity. The decisions of the Competition Authority (2000) and the Council of State (2003) which denied to cause a change to Eti's policy regarding the right of domestic producers to benefit from same terms of purchase like the foreign buyers is verifying that the privatization decision was not a result of internal necessity which aimed to improve economic efficiency or to foster contributions to national economy from boron resources.

CHAPTER V

UTILIZATION OF BORON BY TURKEY

5.1. Turkey's boron trade, revenues and market share

Following the nationalization of boron mining in Turkey, country's share in world boron production has had a steady increase. For example, the share in production rose to %33.4 in 2001 while it was %16 in 1970. In 2000, total boron revenues increased to $208 million while it was $83,4million in 1978. The rise in production and revenues has been realized in response to the increase in world demand rather than as a result of creating new usage areas for boron by Turkey or domestic demand growth. In view of the circumstances, the progress in boron production and revenues has been an outcome of Turkey's ability in taking advantage of the developments in boron consuming industries outside the country.

In case of the knowledge in boron production technologies, which is the second determinant of Turkey's ability in deriving benefits from international boron demand, the country has been relatively weak. For long years exports in raw and lightly processed boron has surpassed production and exports of refined and specialty boron, which are products of high technology. Table VI presents the relative weights of raw/ lightly processed and refined/ highly processed boron in Turkey's boron production.

Table VI ***Boron production in Turkey***

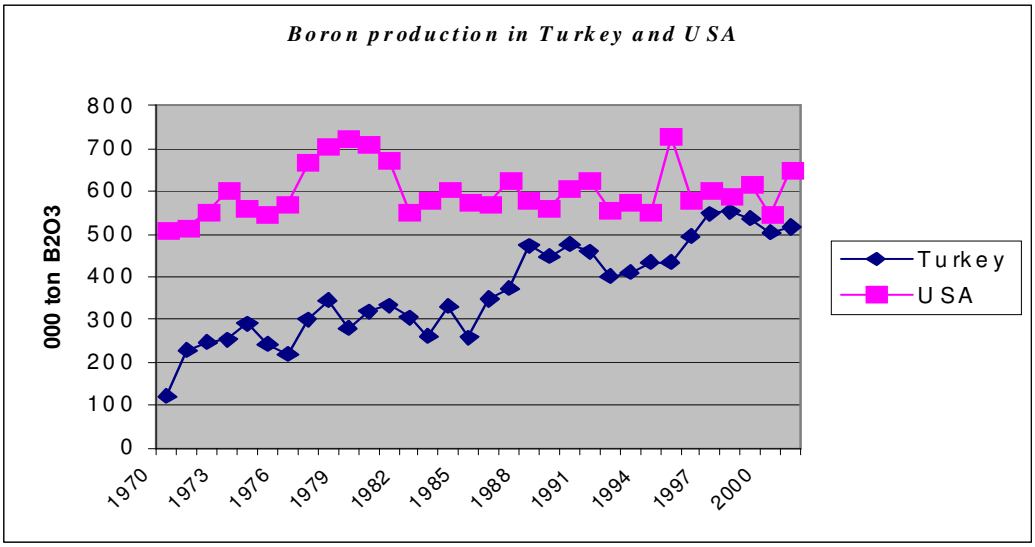
Year	Raw/Lightly Processed Boron		Refined/Highly Processed Boron	
	Quantity (ton)	Revenue ($)	Quantity (ton)	Revenue ($)
1989	820.077	172.500.869	169.101	59.461.693
1990	681.667	147.760.148	143.850	53.317.268
1991	637.524	133.028.121	140.203	48.633.368
1992	617.739	130.813.254	196.812	70.361.680
1993	613.012	120.472.646	195.675	65.720.021
1994	622.194	120.866.940	245.046	81.550.597
1995	684.404	134.135.409	241.838	82.176.705
1996	735.720	140.975.909	249.943	85.220.914
1997	731.618	136.095.150	313.702	101.191.357
1998	655.755	123.944.546	296.183	95.994.684
1999	653.480	121.318.868	360.703	114.775.118
2000	567.760	102.023.724	341.309	106.578.614

Source: DTM, 2003.

As presented in Figure III, Turkey's boron production on the basis of amount has shown an increasing trend; so that by 2000's Turkey's total boron production have reached that of USA. Although production amounts are seen proximate, the share in world boron sales has been %20-23 for Turkey and %65-70 for USA (DTM, 2003: 9).

The proximity between amounts and the gap between revenues is a result of the fact that USA consumes the boron it produces for refined boron production, while Turkey continues to have lightly processed boron as an important share of its sales and lags behind USA in terms of diversity in refined products. Apart from Turkey's %20-23 share in the world boron market of $1.5billion, which is made up boron concentrates and refined boron, Turkey's share in the world market of specialty boron products, which are high-value added products of technology and reaches up to $80-90billion, is around %1.

Figure III ***Boron production in Turkey and the USA***

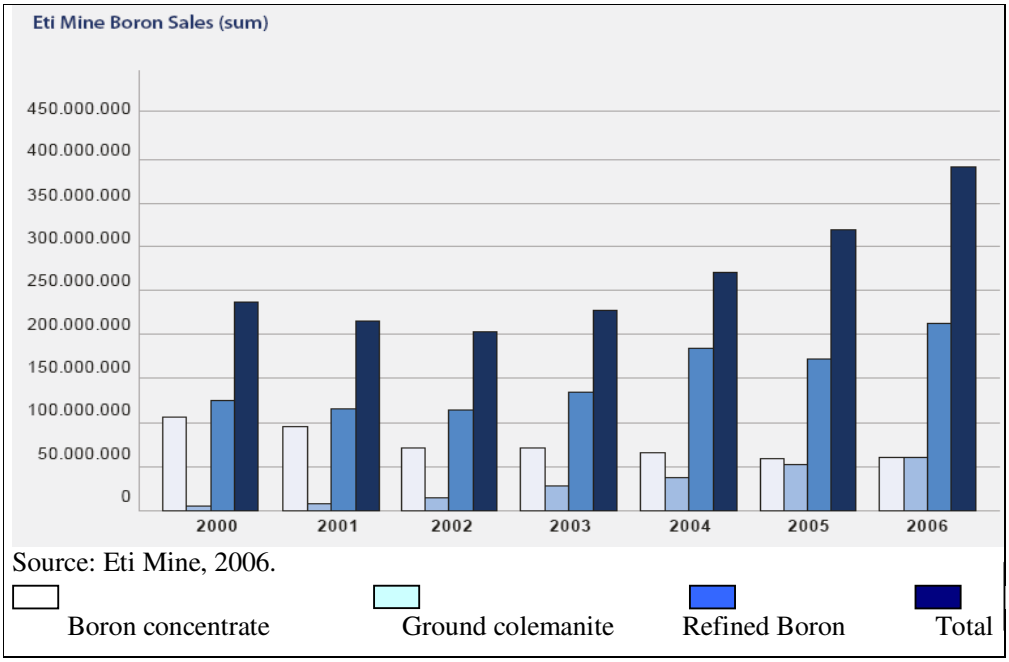


Source: DTM, 2003.

Although boron income of the country hasn't reached a level of making significant contributions to domestic economy, the production patterns that have an increasing trend for refined products after 2002, is promising for development of national boron industry. When distribution of boron sales on the basis of quantity in 2006 is analyzed, it is seen that the rate of concentrate product sales is %25 of total boron sales and the rate of refined and refined equivalence product sales (refined product is %62, refined equivalence product is %13) is %75 of total boron sales. Of total boron sales in 2002, the share of concentrate boron was %46 whereas refined boron product sales were %49. In

4 years of time, the substantial increase in the amount of refined boron sales also reflected in Eti's revenues from total boron sales. Figure IV shows the boron sales revenues of Eti Mine between 2000 and 2006.

Figure IV *Eti Mine Sales ($)*



The major share in revenues from boron sales by Eti Mine is derived from exports. Export revenue in 2000, 2001, 2002, 2003, 2004, 2005 and 2006 was respectively $215million, $208million,$186million, $207million, $252million,

$299million and $365million. The rise in boron exports by %11 on the basis of quantity and by %15 on the basis of revenue in 2006 was realized in parallel with the upsurge of world boron demand. Accordingly, the increase in the export revenues is reflected in the increase of boron sales after 2002.

Due to the capacity increase and utilization rate for refined boron production following the year 2002, the share of refined boron exports showed an increasing trend that on the basis of quantity it raised by %96 and on the basis of revenue raised by %99 in 2005 compared to 2002 (EtiMine, 2005: 14). Table VII indicates the improvement in the share of refined boron in Eti Mine's sales comparing the figures of 2002 with 2006.

Table VII *Eti Mine Boron Sales, 2002 and 2006*

Products	**2002**		**2006**			
	Ton	Sum $	Based on Ton		Based on Sum	
			Ton	Ratio of Increase	Sum$	Ratio of Increase
Boron Concentrate	371.871	67.691.213	347.600	-%7	62.213.452	-%8
Ground Colemanite	44.865	16.782.988	181.912	%305	62.053.611	%270
Refined Boron	396.028	116.684.537	867.991	%119	264.359.719	%127
Total	**812.764**	**201.158.737**	**1.397.503**	**%72**	**388.626.779**	**%93**

Source: Eti Mine, 2006.

In 2002, production capacity for refined boron was 730.000 ton/year while the capacity utilization rate was around %60. As a result of the investments in 2003 and 2004, the production capacity increased to 831.000ton/year in 2005. With an overcapacity production rate in 2005, refined boron output doubled in 2005 compared to 2002 (EtiMine, 2005: 8). Table makes it more clear that refinery of boron doubles the price of concentrates. In parallel with the increase in the share of refined boron production and sales, total revenue proved a sharp rise in 2006. The increasing trend in production of refined boron is promising provided that the concern for processing activities are maintained and knowledge input to the products are increased.

5.2. Bureaucratic limitations

Bureaucratic limitations are the institutional barriers to growth that inhibit in state enterprises as a result of the political connection with company strategies, recruitment processes, financial flows or distribution of gains. Based on the notion of 'state enterprise', these companies are vulnerable to political interventions in the name of generating national benefits rather than maintaining the ability choose the best mechanisms and strategies for itself within the context of business dynamics. Appointment of the high officials is

the main source of the limitations and problems related to the functioning of the enterprises because the management becomes basically a reflection of politicization. If the high-ranking officials of the enterprise are refrained from competence in developing new strategies and making own reforms, it becomes more difficult to keep pace with the changes in the competitive market.

The top management of state enterprise Eti has also been exposed to such limitations in its functioning in accordance with the changes in governments. The extremely unsteady structure of the executive committees of Eti underlies the inability of forging of any kind of definite and consistent policymaking and effective execution the policies. Since 1978, only 6 of the 14 general directors stayed in their office for three years or more. The political dynamics in the executive branches of the enterprise is reflected in the change of all permanent staff, who is working in the upper executive branches, at least once every three years. Politically connected changes in the personnel rather than a merit-based recruitment leads to loss of learning process and experiences of the existing officials and therefore causes the waste of human capital. Given the stock of human capital is an important determinant of the rate of growth (Romer, 1991: 71), politically-induced changes of the officials in Eti has had a negative impact on the utilization of boron minerals. According to Gylfason (2000: 6-7) “Nations that believe that natural capital is their most important

asset may develop a false sense of security and become negligent about the accumulation of human capital". The failure of the governments in their approach to human capital lacked the enterprise from competent administrators with the necessary understanding of economics and business operations; therefore delayed the elaboration of boron industry below the expectations in Turkey.

Strong political patronage over Eti together with the characterization of the enterprise as an extension of state more than a business enterprise also has led to several other limitations on the effectiveness As Por (2003: 8) suggests, related to the non-transparent and weak structure of decision-making bodies, adjustments in respect to quick changes in world market become difficult. The complex decision-making procedures and multiple political authorities having influence in these central bodies impede the enterprise from making day-to-day responses and marketing strategies to global trends in boron market. Lack of continuity in administrative boards has contributed this inability.

The questions on the performance of the enterprise are to a large extent covered by the increase in the prices of products after nationalization. The evaluations on the performance of Eti depend on the reports of the same enterprise without an external auditing mechanism. This shortcoming also

creates transparency problems for the reason that objective information about the activities and performance of the enterprise is difficult to reach. The state owned enterprises shouldn't be exempt from the application of general rules and regulations, especially from competition law for efficient management purposes (OECD, 2005: 189). When the Council of State has confirmed the ruling of the Competition Authority, which agreed that Eti is not covered with the Competition Law, this ruling deprived the enterprise without a checking mechanism for its domestic activities as well.

The general problems of state owned enterprises, which emerge from the injection of politics into a business entity that is initially designed for economic purposes, have decreased the performance of Turkey in utilizing its boron deposits. Political appointments, interference in management, inattention about monitoring the investment decisions, and insufficient checking of the execution and performance of Eti has put negative impacts on the ability of Turkey to derive the expected results of the assigned policy.

5.3. Marketing strategies

Marketing strategy is fundamental to outward-looking boron production of Turkey in terms of capturing more share in world boron market and correspondingly higher share from boron revenues. Thanks to its rich reserves, low production costs and geographical proximity to major markets, Turkey has become the major supplier of boron ore in the world without developing a decisive strategy to market its products. Being the major supplier of ore has increased the country's share in world boron market; but its share in revenues has not increased equally.

The inconsistencies in marketing are part of the deficiencies in the general boron policy of Turkey. While Eti has not allowed domestic entrepreneurs to buy ore or processed boron for producing any kind of refined boron according to competition rationale, it has maintained to supply foreign customers without any distinction over products. In this context, its customers, which are able to buy ore from Eti, are also able to re-export although Eti has sales agents and distributors around the world. What makes the re-exports of Eti's customers profitable is revealed in the explanation of an ex-general director of Eti as he informed that Eti provides boron to some customers at lower prices than it provides to its own sales agent Etimine S.A. (Arslan, 2003).

In this context, Eti has taken advantage of the ore demand in the world market to increase its sales share per ton not per income. Deficiency in the marketing strategy can also be observed when comparing the prices of Eti's products with that of other producers. For example, Turkey has lost a part of its sales share in French market to Italy and in German market to USA although Eti's prices have been more favorable compared to competitor suppliers. In the light of these examples, Turkey needs to develop more marketing intelligence with qualified human capital other than using price cuts as a part of marketing strategy.

The consequences of the shortcomings in the marketing strategy are not limited to the loss of returns in the complicated web of sales agents, distributors and privileged customers. The purpose to increase Eti's exports had brought with lower prices for foreign customers than domestic ones, therefore the concern for Eti's income had surpassed the concern for developing domestic boron industry. Lower prices for foreign producers had put domestic boron processing companies at an unfavorable position in the international competition. While Eti was eliminating its domestic competitors and increasing its marketing share in the world, at the same it has contributed to the growth of foreign producers, which are the competitors of Eti's itself in the world market. For example, domestic firms are prevented to produce

'perborates', for the reason that the monopoly established by the law does not allow to produce any of the products of Eti. On the other hand, Eti has supplied ore to the major producers of perborates in the world, which in turn supplies the 'perborates' demand in Turkey. Lowering the prices for foreign customers in order to increase its market share has eventually caused Turkey to become an importer of perborates, which make up %99 of its boron product imports.

The negative consequences of the marketing strategy on Eti's income and also on the development of domestic boron industry reveal the necessity of the concern for improving business intelligence besides to increasing production. For Eti's income, the instabilities in the marketing tools are correctable flaws if sound strategies are complemented with specialized human capital. On the other hand in order to correct the impacts of marketing policy on domestic entrepreneurs, the overall boron policy needs a revision in a way that promotes the domestic processing of boron by actors beside to state enterprise.

5.4. Investment

The most important feature of the investment decisions is that the capital intensive projects are irreversible. Investments of state enterprises, once decided upon, shall cover the burden it has made to national budget by being carried out effectively and also flexibly to the changes in market and products. Making the right choice in the scope, location, timing and technology of a project, requires understanding of market forces, experience in responding them, trading-off between alternatives and predicting the direction of future change, and therefore is the main tool for productive and development promoting investments.

In making these calculations, two different limitations have played role on the investments for boron industry in Turkey. Firstly, since the ownership of the means of production and wealth by state enterprises is not simply economic power but also a political power (Walstedt, 1980: 13), investment promotion for boron processing industries has not been vested in purely economic basis. The general policy on boron, which has established an over-regulatory management through state hand, has generated limitations on domestic investment. For example, even when private entrepreneurship was forthcoming for some refined boron products, the state enterprise invested for

the production of the same products; and private producers were pushed out of the market based on the interpretations about the scope of Eti's monopoly right. As a result, the investments for processing of boron have been limited to state's ability.

Second limitation has been rooted in Turkey's overall development levels in industry, science and technology. Investment for boron products with high returns doesn't depend on solely the capital to finance the projects but also depends on the knowledge and human capital of the domestic economy. Finding of new usage areas for boron products to a large extent appears in response to the developments in various industries of the developed countries. Establishing productive technologies and diversifying towards high-value added boron products improves in parallel to the industrial development level associated with knowledge accumulation in science and technology. In parallel with the industrial development level in Turkey, production high-value added boron products have shown an increasing trend. This trend is correlated with the rising concern for improving the capacity of existing facilities and making new facility investments for boron technologies, productive methods, and high-value added boron chemicals. With the activation of on-going and scheduled investments, Eti's production capacity in boron chemicals and equivalent products is targeted to be increased by %80 to 1.499.000 ton/year

from existing capacity of 831.000ton/year (EtiMaden, 2006: 50). The capacity for refined boron products in Turkey by the late 1990s has been increasing. Following the investments for the capacity in refined boron production, the share of refined boron sales showed an increasing trend higher than raw boron sales. Increasing share of investment for refined boron within Eti's whole investment projects is a reflection of the knowledge and experience gained by Eti in production technologies and also a reflection of industrial and technical capacity of Turkey. The on-going investment projects for establishing boron oxide, borax pentahydrate and agricultural boron production facilities, increasing the capacity of borax decahydrate and boric acid facility and building a new packaging facility to minimize the transportation costs and loss of product are the examples of how investments are determined by knowledge and experience accumulated by a country in years.

5.5. Domestic boron consumption

Gains from utilization of boron deposits in Turkey have mainly derived from export gains since boron consumption in Turkey is insignificant compared to the boron consuming countries that Eti sells its products. Domestic private sector is not promoted to consume boron ore or refined boron as an input for

producing other refined products. Therefore the consumption of boron in Turkey depends on the usage of Eti's products as an input for own production and on the usage of Eti's products by domestic industries as an input as it is bought. Consumption trends by domestic private sector are fundamentally determined by the potentials of existing industries. Glass sector, ceramic-frit sector and detergent-cleaning sector are the major boron consuming sectors in Turkey with a share of %36, %30 and %26 respectively. The remaining share of %10 is consumed in other sectors. In 2006, domestic boron sales of Eti have reached to %5 of its total sales that returned around $20million revenue. Beside to Eti's supply to domestic industries, Turkey imports perborates, a kind of refined boron, to consume in glass and detergent sector. The major suppliers of perborates to Turkey are Italy, Germany, Spain and Slovenia.

5.6. Research and Development

Long-run success in minerals industry requires acquisition of knowledge that is needed to remain competitive in the face of changing usage areas and production technologies. Adopting a value-added strategy with heavy emphasis on R&D has an essential role in utilizing boron minerals for industrial and economic purposes. The determining role of knowledge in

utilizing boron results from the basic physical and chemical features of the mineral. Usage of boron in diverse industries depends on its synthesis with other elements and materials. Value of boron compounds and special boron products vary according to their chemical composition. Therefore the price of a boron product is not determined according to the amount of boron mineral used in it, but according to the input of chemical and industrial knowledge used in its production. In light of these facts for boron mineral, development of Turkey's boron industry depends on the knowledge creation for more advanced products rather than geological endowment.

The studies for boron production were pioneered by the Marmara Research Center under the structure of Scientific and Technical Research Council of Turkey in 1973. The studies for boron chemicals conducted by TUBITAK-MAM and Istanbul Technical University contributed to production of refined boron products by Eti. Until 2000s, almost all of the knowledge on boron chemicals in Turkey was developed with the studies of TUBITAK-MAM, Istanbul Technical University and Middle East Technical University, which accounted for %21, %27 and %11 of all R&D studies. The R&D on boron chemicals started to spread to various universities and other institutions and to develop more systematically by 2000s, which corresponds to the years that Turkey's refined boron production has increased. With the cooperation of state

universities and the Chamber of Mining Engineers, international boron symposiums, which gathered the studies on boron chemicals, have started to take place with the beginning of 2002. In 2003, National Boron Research Institute (Boren) was founded in order to organize and sponsor scientific studies to widen the consumption areas of boron products as well as the scientific studies for the development of new boron products. Boren also supports R&D studies of companies, universities and research centers. The institution is also designed to encourage the consumption of boron products in domestic markets by supplying scientific and practical knowledge to potential customers. In 2005, EtiMaden, with collaboration of Boren, organized 1st National Boron Workshop with the participation of representatives from the institutions related to boron, universities and private sector.

In line with the historical development of R&D on boron in Turkey, which started in 1970s, the level of boron industry has lagged far behind the major boron chemicals producers in the world. As the research institutes and universities has accounted for almost all of the advanced research, adaptation of knowledge to industry has also followed behind the foreign producers due to the industrial development level in Turkey. As Wright and Czelusta (2002: p.14) indicates that "mineral development as a knowledge industry evokes institutional relationship among government agencies, academic institutions

and private corporations", the accumulation of scientific knowledge and the rise in R&D studies, development of a comprehensive framework for combining the accumulated knowledge and promotion of studies under a coordinating institution is promising for utilization of boron in Turkey. What is necessary the way forward is the efforts in adapting boron knowledge to domestic boron consuming industries. Together with the development of knowledge, transferring knowledge into practical value with industrial adaptability is central to economic growth.

5.7. Contribution of boron endowment to Turkey's economy

Contribution of boron endowment to Turkish economy has been far below the economic importance attached to the mineral. The shares of industrial, agricultural and mining exports of Turkey have respectively been %86.2, %11.4, and %2.4 in 2006. Total export revenues of Turkey were $85 billion in 2006. This number is extremely important in comparing it to the world market for raw and refined boron products, which makes $1.2- 1.5 billion. Unless Turkey remains as the sole producer of boron in the world with an ability to manipulate the prices for own interest, the potential for Turkey to benefit from boron production is limited around $1billion export revenues.

Since the nationalization of boron production, total export revenues from boron has been approximately $5 billion in 30 years with $200-250 million annual revenue in last ten years. In the recent years, the increasing trend of refined boron production has reflected to the export revenues, which reached to $365 million. Compared to Turkey's income from mining exports, which was equal to $2 billion in 2006, revenues from boron exports appears to hold %18.25 of total exports in mining. On the contrary to the favorable share of boron exports within mining exports, the revenues from boron exports are equal to only %0.4 of total export revenues of Turkey in 2006. With these figures, production of raw and refined boron is a source of export revenues; but far from making major contributions to domestic economy.

The contributions of boron endowment to domestic economy have so far fallen short of expectations. In order to accomplish a balanced approach in setting the profit expectations, what is needed to be done is a genuine assessment of economic potential of boron resources. Being the major producer and exporter of raw boron, boron concentrates or refined boron has very limited growth potential for Turkey in the context of actual size of Turkish economy and the revenue potential for these products in the world market. On the other hand, specialty boron products, which are products of high technology and equal to $60-80 billion in world economy, emerge as a real potential to specialize in.

According to Romer (1991: 72), “technological change arises in large part because of intentional actions taken by people who respond to market incentives”. Conformably, the specialty boron products have been developed in line with the prominent industries of specific countries. Reconciling the private sector with boron production in Turkey will be the fundamental pace in benefiting from this potential; because the production of specialty boron products appertains to the endeavors of diverse industries consuming boron.

CHAPTER VI

CONCLUSION

Resource abundance and wealth are direct sources neither of development nor economic under-performance. The instruments by which the resources are utilized in order to generate income to the economy and by which the resource wealth is re-distributed, better determine how the resource endowment and resource wealth will affect the performance of the overall economy. Building comprehensive public policies which utilize resource abundance for development of human capital and advanced research activities can lessen dependency on primary commodity exports and pave the way for diversification around a value-added production and exports base. In this context, this thesis tried to display the utilization of boron deposits in Turkey and to elaborate Turkey's ability in driving economic benefits from boron production. The boron case of Turkey reveals that abundance of a mineral

does not necessarily lead to correspondent revenues from its production and exports unless some distinctive value is added to the products.

This thesis establishes three modes of mineral management, which are insufficient regulation, state coordination, and state acquisition/over-regulation. The legal and regulatory framework governing resource ownership, extraction, production and development basically encourages the "chosen" goals, while at the same time; it discourages and restricts the use of alternative utilization models that might have yielded other benefits and costs. The negative side-effects and the shortcomings of the institutional setting, if not minimized or compensated by the chosen model, may slow down or hinder the development of the resource industry, or even distort the overall economy because of misallocation of revenues, over-dependence on commodity exports or reluctance to promote domestic development. The advantages or flaws of the institutional design and the positive or negative externalities of the regulatory framework play the prevailing role in generating economic wealth from resources.

According to the boron policy and related institutions, which basically include ownership structure and mining rights, this thesis places the boron production in Turkey under the category of state-acquisition/over-regulation. Most of the

questions about the success of the state-managed mineral production stem from the general problems of state-owned enterprises. Nevertheless, it is important to note that the management in the over-regulatory framework need not be dysfunctional management and the problems related to the state-owned enterprises are not necessarily endemic to state-dominated mineral management. On the other hand, even if the over-regulatory design is made consistent with an effective and functional management, it generates negative externalities for technological improvement which are inherent to the monopolistic model. The exclusion of multiple private actors from the industry can slow down the national innovation that comes from competition dynamics and the scale of research activities. Limiting the number of the actors involved in production activities entails a decrease in the number of actors involved in knowledge accumulation, which militates against the notion of 'learning by doing'. The alienation of the private sector from mineral processing also alienates it from the mineral science and production technologies; in other terms, monopoly of mineral production results in monopoly of knowledge production.

The economic and political significance of the resource, internationally and domestically, presents the potential benefits that are to be gained by the producer country. Adoption of the most suitable institutional setting requires a

comprehensive understanding of international market forces and also the opportunities and risks associated with alternative regulations. In this regard, the institutional design should be established appropriately to realize the potential benefits. This thesis finds out that there will not be a prescribed contribution of boron deposits to economic growth of Turkey unless the resources are associated with comprehensive policies that are placing the investments in knowledge and human capital in the forefront. While the current world market for boron ore and compounds totals $1.2 billion, abundant boron reserves cannot serve as an engine for economic development even if Turkey supplies this market by itself. On the other hand, the use of boron in nuclear energy, the aircraft and space industry, in computer and mobile phone batteries and in automobile energy cells highlights the importance of boron for advanced technologies and industries. Technology and know-how is the key determinant for the volume of the economic turnover in the special boron products sectors.

Long-run success in minerals industry requires acquisition of knowledge that is needed to remain competitive in the face of changing usage areas and production technologies. Therefore, in the long-run, the achievement of Turkey in the world boron market should be assessed according to the diversity, quality and distinction of its products. Adopting a value-added

strategy with heavy emphasis on R&D has an essential role in utilizing boron minerals for industrial and economic purposes. In this regard, the thesis reaches the conclusion that Turkey needs to find a balanced approach between state-managed and market-led production by avoiding or compensating for both state and market failures in a way that is conducive to diversify into high value added boron products. Reconciling the domestic private sector with boron production in Turkey will be the fundamental pace in benefiting from boron endowment.

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