INDUSTRIAL POLICY UNDER TRANSITION ECONOMY: THE CASE OF UKRAINIAN FERROUS METAL INDUSTRY

by

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A thesis submitted in partial fulfillment of
the requirements for the degree of

Master of art in Economics

Economics Education and Research Consortium,

National University of "Kiev-Mohyla Academy"

2003

Approved by _____
Ms.Svitlana Budagovska (Head of the State Examination Committee)

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Program Authorized
to Offer Degree Master's Program in Economics, NaUKMA

Date _____

National University of "Kyiv-Mohyla

Academy"

Abstract

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This study seeks to reveal the true role of the Ukrainian government in promoting the recent development of Ukrainian ferrous metal industry. The paper investigates the effect of the implementation of the industrial policy called "The Economic Experiment in Metallurgy and Mining Industries" on the ferrous metal industry performance. The paper conducts econometric analysis of supply and demand functions for Ukrainian steel products and of different measures of enterprise performance. The obtained results suggest that the Economic Experiment had positive effect on enterprise profits, revenues and technologies and no considerable effect on overall steel production in Ukraine, indicating the general fulfillment of the primary targets of the Economic Experiment. On the basis of these results the author argues that an industrial policy can indeed play an important role in promoting the industry growth.

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ACKNOWLEDGMENTS

I wish to thank my friends from Kryvorizhstal and especially Nikolay Razhda, who helped me in developing the idea of this work. I am very grateful to my advisor, Prof. Eyal Winter, for his support and insightful comments. The special words of gratitude are devoted to Prof. Tom Coupe for the guidance on the initial stages of the research, his invaluable encouragement and helpful comments, ideas and advice. I am also indebted to Nataliya Mishchenko and Sergey Verstyuk for their enormous help in obtaining data, as well as to Anna Cherednychenko for her revision of the thesis and correcting the final version of it. Numerous and varied comments I have received from my fellow Vadym Yepishov, whose questions have helped me to substantially improve the final draft of the paper. Finally, I reserve the warmest words to Nataliya Zaderey for her kindly support and generous inspiration.

Chapter 1

INTRODUCTION

One of the major causes of the recent economic growth in Ukraine was a rapid increase in industrial production throughout the world in 1998-2000 (after the 1998 financial crisis). The Ukrainian respond to this increase was the renewal and expansion of plant facilities of export-oriented enterprises in order to take industry competitive advantages (such as closeness to the sources of primary materials and skillful and low-cost labor force). Under these circumstances the role of government increases significantly: in an outward-oriented economy there are a lot of instruments – direct subsidies, tariffs, capital control with non-equilibrium interest rate or exchange rate - that can be used in different situations.

The Ukrainian government widely used these instruments during the last four years, but an important question arises: have these instruments been used effectively or not? It is possible that the recent increase in Ukrainian industry production has roots in the increase of the outside demand and government policies ever had delaying effect. On the contrary, indirect subsidies (such as known *The Economic Experiment in metallurgy and mining,* which started in 1999) have possible observable effects such as increase in production outputs in currency terms and tax revenues from participating enterprises. For this reason, it is worth investigating the industrial policy of Ukraine as that of a country, which inherited a large industrial sector from the former USSR and where industry plays the key role in the economy and it is also worth testing the hypothesis about positive influence of the Ukrainian industrial policy in form of the *Economic Experiment* on ferrous metal industry performance.

The structure of the thesis is the following. In Chapter 2 literature review is presented. This review contains discussion about the importance of the industrial policy in transitional economies for the development of competitive advantages of these economies. Chapter 3 provides the basic overview of the Ukrainian ferrous metal industry, the major players in it and the description of the Economic Experiment in Metallurgy and Mining. Chapter 4 presents the econometric evaluation of the Ukrainian ferrous metal industry performance over the 1995-2001 years. In this chapter we estimate demand and supply functions for the Ukrainian steel are estimated in order to define what factors are most likely to determine the dynamics of steel production in Ukraine and to reveal whether the implementation of the Economic Experiment leads to changes in the industry. In Chapter 5 we concentrate on the "Micro" level (i.e. enterprise level) issues of the industrial policy: econometric estimation of the influence of the Economic Experiment on enterprise performance will be presented. Chapter 6 is devoted to the investigation of one of the possible reasons of the cessation of the Economic Experiment in 2002. The main concern of this chapter is the analysis of the Economic Experiment as of an indirect governmental subsidy that could lead to the increase in the number of antidumping cases against the Ukrainian steel makers. The paper concludes with the comments on the results and the possibilities for further discussions.

Chapter 2

LITERATURE REVIEW

The question of the appropriate role of the state in economic development is one of a tremendous concern in economics. There is perennial debate about the efficiency of government intervention in promoting economic growth. The reviews by Rodrik (1993) and Pack (2000) provide arguments valid for both sides. Some of the earliest works in development economics, based on preliminary understanding of Soviet growth, argued that such sectors as heavy metals production and machinery were particularly important and that these sectors generated externalities whose benefits were so desirable that they warranted government support. Other analysts argued that there were important market failures such as real external economies stemming from research and development and significant imperfections on the market for information. Partly in response to such views many governments initiated import substitution policies in the 1950s.

By the 1970s import-substituting industrialization was widely viewed as a failure. Empirical research in a big number of countries showed that it led to static misallocation of labor and capital across industries and did not improve long-run growth in total factor productivity (Balassa et al, 1982; Bhagwati 1978; Krueger 1978; Little et al, 1970). The 3-decade rapid growth in a number of East Asian economies, including Japan, Korea, Singapore, and Taiwan, all of which widely pursued industrial policies, sometimes without acknowledging it (Hare, Hughes (1992)), suggested that such policies, if executed correctly, could have beneficial effects (Rodrik, 1993 and 1995). But the crisis that began in Korea in

October 1997 and the weak growth in Japan over the 1990's led to the reevaluation of the impact of industrial policy. The questioned policies were import quotas and licenses, credit subsidies, tax exemptions, public ownership, and so on (Rodrik, 1993). Pack (2000) proved that industrial policies were indeed important in Japan and Korea using TFP growth analysis and showed that the increase in aggregate growth rates induced by an industrial policy varied from 0.5 to 1 percent a year. The main conclusion made by the author is that industrial policy has to be incentive generating in order to stimulate firms to improve productivity. He also stated that government not only has to implement industrial policies by imposing tariffs on imported goods or by using preferential interest rates but also should promote competition in the form of political ability to withdraw benefits from non-performing enterprises.

A lot of theoretical and empirical findings support the idea of industrial policies implementation. Empirical findings by Nickel et al (1996) showed that despite the fact that the theory predicts a positive effect of competition on economic growth, this effect is positive only for the firms without a monopolistic shareholder and might be negative when firms or whole industries are owned by a dominant external shareholder. However, in the case of ferrous metal industry in most transition countries the state remains this "dominant shareholder" and, what is more important, this shareholder has enough power to install or to change conditions through implementation of different policies.

Moraga and Viaene (2001) analyzed trade reforms in transition economies (including China and Eastern European countries) and showed that trade liberalization in transition economies can reduce the local firms' output, so, the absence of governmental support in the form of subsidies or exchange rate changes is not optimal for both social welfare of state and enterprises in transition. They also proved the existence of a rationale for a government commitment to use socially optimal trade and industrial policies to release the domestic firm from low-quality production.

Aghion, Dewatripont and Rey (1997) argued that industrial policy can be preferred to competition policy under some circumstances, e.g. in the case of adopting new technologies. In their theoretical framework they assumed two sorts of firms - "competitive" firms (i.e. profit-maximizing firms) and "conservative" firms (i.e. those which incur private cost from adopting new technologies in terms of training costs for labor or costs for reorganizing the existing firm) under a common assumption in the corporate finance theory that large companies (more properly stated, managers of large companies) exhibit "conservative" behavior. The authors used a Shumpeterian growth theory framework to compare competition policy *versus* industrial policy and showed that there is contrast between these two policies since the effect of theses policies goes in opposite direction under changes of technology.

For the purpose of empirical analysis one may follow Rodrik (1993), who divides the "set" of possible industrial policies into two parts: the trade policies, which include quantitative restrictions such as licensing, differentiated tariff rates, export subsidies and taxes and bureaucratic requirements, and the straight "industrial" policies, which include the reforms directed at economic improvement of non-profitable public enterprises, entry and exit restrictions for private enterprises, discretionary tax and subsidy policies (in form of "Economic Experiments" as in the Ukraine case) etc. This approach can allow researchers to use more specific tools in investigating different types of policies in order to be more precise in evaluating and interpreting empirical findings.

There are many theoretical and empirical papers devoted to the analysis of different trade policies. Modern political economy permits to take into account both, rent seeking (corruption, lobbying) and governance effects to study the influence of the state actions on economic performance. One of the most prominent works in this area is *Protection for Sale* by Grossman and Helpman (1994), which became a classical work over the recent years. In this paper, the authors developed a theoretical framework to find and explain the equilibrium

structure of trade protection under the presence of (industrial) lobbies. They developed an explanation of the equilibrium structure of trade protection taking into account the existence of lobbies that affect government decision of trade policies' implementation (under the assumption of free trade efficiency). Lobbies, which represent industry interest, make implicit offers and the government reacts by setting policies (the vectors of import and export taxes and subsidies) to maximize a weighted sum of aggregate social welfare and total lobbies contribution to the trade policies. They consider a small competitive economy (i. e. world prices are exogeneously given) which produces a numeraire good with labor and inputs that are specific to the particular industry sectors assuming high degree of concentration of ownership of many of the (*n*) specific inputs. Restricting the possible set of policies to the trade taxes and subsidies, the authors present a framework in which one can calculate equilibrium tax (subsidy) rate that minimizes the deadweight losses coming from restriction of free trade conditions. One of their findings was that industries that have high import demand or export supply elasticities would have smaller ad valorem deviations from free trade. Another their crucial point was that in the sectors with large domestic output the organized interest groups (i.e. lobbies) collectively manage to raise the domestic prices of goods from which they derive profits (in Ukrainian case export subsidies are most widely used for that) and to lower the prices of goods consumed by them. From the point of view on deadweight losses, in the sectors with large domestic outputs the factor-owners (of enterprise-owners) have much to gain from an increase in the domestic prices (as import demand elasticity is given by assumption of small economy) while the economy has relatively little to lose from protection when the imports are low.

Estefahani and Mahmud (1998) also developed a model of trade and industrial policy where the government can direct the rents generated by different policies toward political or economic objectives through different channels: lobbying, taxation, regulation, and tariff and quota allocation. Authors also show that under

reasonable conditions, a variety of possible policy changes induce a positive relationship between the restrictiveness of policies toward domestic and foreign competition, which helps to explain a number of important empirical regularities such as the positive association of protection with import penetration and output-capital ratio.

Chapter 3

UKRAINAIN FERROUS METAL INDUSTRY REVIEW

3.1. Ukrainian Ferrous Metal Industry: Major Players.

The Ukrainian ferrous metal industry is a huge complex that involves more than 300 steel-making and pipe-making, iron and manganese ore-mining, dressing and processing, coal and coke mining and processing enterprises. The finished steel output in the form of cast iron, semi-finished steel, rolled steel, steel pipes etc is produced by 14 big steel-making and 9 pipe-making enterprises. One should note that metallurgy itself is a multistage production cycle[1], in which these mentioned enterprises constitute only the visible part of iceberg, while their performance is highly dependent on the general state of the industry, which comprises 11 coke plants, 5 biggest ore-enrichment plants, 3 ferroalloy plants and numerous ore and manganese mines, ore-enrichment factories etc. However, producers of the finished steel constitute the most essential part of the industry and they form a major source of the Ukraine's hard currency revenues.

The major players[2] in finished steel-making segment of the industry are:

- *Kryvorizhstal* - the biggest industry player, which produces nearly 23%[3] of total Ukrainian steel output and specializes on producing rolled steel for building and construction purposes. This enterprise also employs more than 60 thousand workers in 2002, which makes it the biggest Ukrainian employer;

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[1] See Appendix 1.

[2] They account for nearly 98 percent of finished steel products; the rest is produced by so-called "mini-steel-plants" such as *Istil*.

[3] This figure and figures in parentheses below are calculated on the basis of the information from *Ukranews* news agency in 2002 (available on-line at www.ukranews.org).

- *Illicha Metal Works* (18%), *Zaporizhstal* (15%), *Azovstal* (14%) - the major companies in the industry that produce the sheet steel as well as building-steel. These three enterprises, together with *Kryvorizhstal,* constitute the known Big Four of Ukrainian metallurgy;
- *Dniprospetsstal* - the biggest Ukrainian producer of electric steel and stainless steel;
- *Alchevsk Metal Works*, *Dneprovskiy Metal Works*, *Donetsk Metal Works*, *Petrovskogo Metal Works*, *Yenakieve Plant*, *Donetskmetallprokat*, *Konstantinovka Metal Works*, *Kramatorsk* and *Makeevka Plants* - the rest of the biggest Ukrainian steelmakers.

The pipe-making segment is represented by *Khartsyzsk Pipe Plant* (the only pipe-producing enterprise in the former Soviet Union with the specialization in big-diameter (more than 1300 mm) pipes), *Nizhnedneprovsk*, *Novomoskovsk*, *Dnepropetrovsk*, *Lugansk* and *Nikopol Yuzhnotrubny*[4] pipe plants.

The iron ore-making and proceeding segment consists of vast number of ore mines, ore dressing and proceeding factories and 6 big ore-enrichment plants (GOK's[5]). The latter are the most important suppliers of the agglomerate needed for the purposes of steel-making. These are *Pivnichny, Tsentraly, Pivdenny, Inguletskiy, Novokryvoriz'skiy*[6] and *Poltava* GOK's.

The coke and coal segment is represented by numerous coal mines and coke coal plants. The latter serve as coke suppliers for the process of steel-making and are mostly located near the steel plants (those being technologically adopted to the particular sort of coke), and some of them are integrated into steel enterprises. There are also some "independent" (not related to the particular steel-making enterprises) coke plants located, however, within the area of high

[4] *Nikopol Yuzhnotrubny Plant* was divided into 4 separate pipe plants, each employed different specialization of pipe-making, in 2000.

[5] GOK is the Russian abbreviation for ore-enriching plant ("Gorno-Obogatitelny Kombinat")

concentration of steel enterprises (Donetsk and Lugansk regions) for the purpose of lowering the transportation costs.

Finally, the manganese ore-extracting and proceeding segment of industry consists of a number of mines, 3 manganese GOKs (*Marganets*, *Nikopol* and *Ordzhonikidze*) and 3 ferroalloy plants (*Nikopol* (produces nearly 62% of Ukrainian ferroalloys), *Zaporizhzhya* (29%) and *Stakhanov* (8%) plants).

3.2. Ukrainian Ferrous Metal Industry: Historical Development.

Historically, Ukrainian steel mills were a primary raw material source for the Soviet Union's tanks, machines and construction projects. Having no possibility for industry players to enter the world steel market it was nothing scientific to predict the industry crisis after the dissolution of the Soviet Union. The fall in consumption after the break-up of the Soviet Union therefore had severe impact on Ukraine ferrous metal industry production throughout the 1990's. The annual raw steel output dropped dramatically from 45 million metric tons (MT) in the early 1990s to 22 million MT in 1995, and annual finished steel output dropped from 30 million MT in 1991 to 16 million MT in 1994. Moreover, the level of capacity utilization also decreased dramatically: while annual crude steel capacity was close to 56 million MT, actual output was only half of that (Metal Bulletin Research and Infomine (1999)).

However, Ukraine's stagnating economic reforms together with overreliance on Russia had to continuation of exploiting the traditional export market rather than to developing integration into world market. In the early 90's Ukraine continued to supply key products to Russia's military-industrial complex led by steel products including heavy machinery and chemicals. In 1994, Ukraine's steel exports to Russia remained strong with exports totaling 1.1 million MT of semifinished and finished products. Situation worsened in 1998, when Russian crisis damaged Ukrainian traditional export markets, and in 1998 exports to

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[6] This plant, known as *NKGOK*, became the structural part of *Kryvorizhstal* in 1999, so now we can say about only *5 independent* GOK's in Ukrainian ferrous metal industry.

Russia dropped to only 700000 MT. This sharp decrease in demand from the Russian side allowed Ukrainian steel producers to look at the world steel market as at an alternative source for generating revenues for the industry survival. Now only about 6% of Ukrainian steel exports are made to Russia, and the major trade partners are Middle East and South East countries (nearly 54% in 2000 (Legeida(2002)), China (nearly 22%), mainly corresponding to rapid economic growth in these countries after 1998 crisis, and North America (nearly 9%).

One should note that the whole Ukrainian economy is highly dependent on the state of heavy industries, just as ferrous metal and machine-building industries. This feature of the economy came from a number of historical advantages, which have helped the steel industry maintain a respectable position among the others, more or less developed, parts of the economy. The steel industry's raw material sources are well developed, and many mines are close to the steel mills themselves. Ukraine is rich in iron ore deposits and other critical raw steel-making materials. Ukraine's largest mills are now well-positioned for export, with easy access to the Black Sea. In addition, Ukrainian steel workers are well-trained, while the cost of labor remains lower being compared with the developed steel producers (as U.S. and Japan) and even with Russia.

However, these competitive advantages are combined together with considerable challenges, as Ukraine tries to sustain its steel industry position at the world steel market. The greatest challenge is outdated equipment and technology. Despite its geographic and labor advantages, Ukrainian steel-making technology, in general, remains behind that of most other major steel producing countries (AISI(2000)). As a result, steel plants have not been able to exploit maximum cost benefit from the country's relatively strong raw material sector. Stale steel-making technology and manufacturing processes include inefficient open-hearth furnaces and limited continuous casting capability that require far more electricity and labor than other methods. Open hearth furnace technology accounted for nearly 60% of the industry steel output in 1998 and remains high

(nearly 50%) even now (Legeida(2002)). While Ukrainian steel sector has worked to implement continuous casting technology over last years, it still accounts for only about 30 percent of total steel production. Without the sufficient adoption of the new technologies, the Ukrainian steel industry continued to need an oversized labor force, which has a strong negative effect on labor productivity. As an example, in 1997 Ukrainian steel industry employed 480,000 workers, more than double the number of steel workers employed in the United States, but even with this sizable labor force, Ukrainian steel output was less than one-third of total U.S. annual steel production (AISI(2000)). Another prominent example is Brazil, a country with annual steel production being almost identical to that of Ukraine, employed an active workforce of 63,000 in 1998 (Legeida (2002), AISI(2000)). The second problem with outdated technology used by Ukrainian enterprises lays in the low quality of the finished steel products, which constraints the potential industry's ability to replace its semi-finished exports with the higher value-added products. By now, only two of Ukrainian steel enterprises (*Kryvorizhstal* and *Azovstal*) successfully met the nowadays international quality standards, have obtained the ISO 9001-2000 quality certificate, while others only managed to fulfill the requirements of the previous version of the ISO certificate (ISO 1994-2000[7]). Finally, the outmoded technology, which requires high amounts of electric energy, hit Ukrainian steel not only from output side, but also from the input side. Ukrainian steel enterprises are non-competitive from the energy point of view (AISI(2000)), and limited Russian energy inputs during 1997-98 years have resulted in growing indebtedness of steel plants to the suppliers of electricity and natural gas (AISI(2000)).

The second challenge of Ukrainian steel industry is the question of ownership of the enterprises. Despite the positive start on the path of privatization and

[7] The ISO1994-2000 quality certificate standardizes only the some of finished products, while ISO 9001-2000 standardizes the whole process of steel-making, therefore definitely ensuring quality of the finished steel. However, the question of standardization itself remains one of the most interesting issues for the further investigations of Ukrainian steel industry.

restructuring in 1996, the Ukrainian government became protective of its steel sector and for now many enterprises, including the largest one, *Kryvorizhstal*, remain under the governmental control. In addition, most privatized enterprises quickly became belonging to some industrial groups that control enterprises through the offshores. Grygorenko (2001) has encountered three such groups (*Industrial Union of Donbass, Interpipe* and *Midland Holding*), that, together with the state, control almost all of the enterprises. Such structure of ownership therefore creates market distortions that should undermine efforts made by the industry to modernize. One big distortion is the presence of bartering schemes (allowing enterprises to trade steel products indirectly for energy and raw material inputs), which have driven up costs and increased companies debt. Another distortion is the absence of bankruptcy regulations for the steel companies owned by the government: bankruptcy remains a concept that is only applied to privately owned companies. AISI(2000) noted that losses of inefficient enterprises simply transferred to the Ukrainian taxpayers.

Keeping in mind all the findings (from the previous chapter) that suggest the importance of industrial policies, one should also take into account the specific state of the ferrous metal industry throughout the world. World ferrous metal market (mainly steel market) is distorted due to the existence of governmental subsidies, cartels, trade restrictions etc. This industry is always defined as "strategic" in all the developed and developing countries. The main reasons for that are existence of strong political forces (lobbies) that tend to defend and support domestic producers of steel (mainly in highly industrialized developed countries such as U.S., Japan and Germany) and existence of competitive advantages in industrialized developing countries (Eastern European countries, China).

For the particular case of Ukraine these stated features are indeed important, so the reasons for the Ukrainian government and Verkhovna Rada (the Ukrainian Parliament) to support the ferrous metal industry are common and clear. One can

easily find a variety of such reasons, and here we want to emphasize on the most important (from our point of view) of them. Firstly, the domestic economic structure is one of the determinants of supporting the industry. Since domestic steel consumption is not very high (from 20 to 30 percent of steel output, according to different sources), the government regards the ferrous metal industry as the primary source of accumulating hard currency (steel exports now account for 40 percent of the country's exports and hard currency earnings, according to the State Committee of Statistics) and the force of driving economic development in the country. Moreover, as economic growth in the country is so heavily dependent on ferrous metal industry growth, the industry growth becomes very important both for short-run and long-run consequences for the whole economy.

The second main reason is the presence of the sectoral lobbying in the Verkhovna Rada and the Ukrainian government. Representatives of the company managers, big industrial groups, trade union leaders can directly affect the political decisions of the government for the purpose of rent seeking (Foreign and Security Policy of Ukraine, 2000; Legeida, 2001).

Thirdly, the social importance of the development of the ferrous metal industry should be taken into account, since great art of Ukrainian workforce is employed in that sector and related industries. Also, many enterprises in the industry are "town-making" (we will return to this phenomenon later in this work), so, employment and social stability in many regions (mostly Eastern oblasts) are very sensitive to the state and development of ferrous metal industry.

Finally, as was already noted, the government remains an owner of a significant part of enterprises in the sector (128 out of more than 300 enterprises were fully privatized at the beginning of 2001[8]).

[8] According to the Ukrainian State Property Fund information.

Despite the negative long-run impact of the mentioned challenges on the industry development and whole country economic growth, only few steps were done by government to change things in the industry before 1998. Under the general absence of private investments, the steel industry should only be waiting for various governmental programs, including low-interest loans, preferential tariffs and tax breaks. Legeida (2002), reviewing the main channels of government support to metallurgical industry in Ukraine, emphasized the time-changing pattern of creating soft budget constraints for the enterprises. In the early 90's, tax subsidies in the form of individual tax privileges, government-guaranteed credits and electricity subsidies were prevailed. In the mid 1990's up to 1999 enterprise arrears to local budgets were accumulating and payables between enterprises and barter operations were increasing.

3.3. Ukrainian Ferrous Metal Industry: The Economic Experiment.

The collapse in domestic and regional demand during the 1998 crisis forced the government to look at structural challenges within the industry more carefully in order to promote modernization of Ukrainian steel industry. To guarantee industry future, in 1998 government has implemented restructuring program to modernize the overall steel sector by 2010. This program aims at reducing overall capacity, at increasing productivity of steel plants, upgrading steel-making and rolling technology and establishing Ukrainian steel industry as an export-oriented engine that would drive domestic economic growth. From the 1998 to 2004 years, the program aimed to shut down four small blast furnaces with annual capacity of 3.3 million MT, fifteen open-hearth furnaces with annual capacity of 5.5 million MT and three outdated rolling mills with annual capacity of 1.5 million MT. From 2006 to 2010, the plan calls for shutting down an additional blast furnace, two open-hearth furnaces and four blooming mills with annual capacity of 14.5 million MT. The government estimated the total cost of this project at somewhere between $1 billion and 1.5 billion (AISI(2000)).

The governmental plans changed in the face of the world steel market boom in 1999. Having the planned increase in steel production of the majority of enterprises and stating the aim of capturing the part of the world steel market, the government decided to slightly modify the plan of modernization of enterprise technologies through the implementation of so-called "Experiment in Metallurgy and Mining".

In July 1999, the Verkhovna Rada adopted the Law "On Conducting an Economic Experiment at the Enterprises in Mining and Metallurgy Complex of Ukraine" that aimed to increase working capital of the enterprises for upgrading their production facilities and to avoid barter transactions in the purchase of critical supplies (gas and energy resources). The main idea of the Law was to provide the industry players with tax benefits in order to assist them in increasing their working capital, uploading their present capacities and upgrading their production facilities and increasing amount of production of high-quality products through the increase of enterprise profits.

The following tax benefits were granted to the participating enterprises:

- Profit tax rate for participating enterprises was decreased from 30% to 9%. Savings resulted from the reduction of profit tax were meant to be directed towards replenishment of the working capital of these enterprises. Starting from January 2001 the profit tax rate was increases to 15% (Article 5 of the Law);
- State innovation tax rate was lowered to the 50% of the existing rate (Article 3 of the Law);
- The use of Environmental Pollution Tax fees was changed: during the experiment, participating enterprises should pay only 30% of this fee to the government budgets; the other 70% were to be used by enterprises themselves for internal environmental protection measures. The deduction should not exceed 0.15% of gross expenditures, and financial sanctions were imposed for the non-targeted usage of these funds;

- The Road Fund Tax was cancelled (Article 3 of the Law);
- State Tax Administration of Ukraine was obliged to grant deferments on paying taxes, fees and other obligatory payments to the participants for up to 36 months and to impose zero payment rate for tax credits (Article 4 of the Law);
- Participating enterprises were exempted from state budget debts prior July 1, 1999.

In October 1999 Cabinet of Ministers of Ukraine issued "The resolution №1820", in which enterprises selected for the participation in Economic Experiment were enumerated. There were chosen 12 out of 14 enterprises (after one year two of them were excluded from the Experiment), all 5 ore-enrichment plants and 3 ferroalloy plants, 9 coke plants (one was excluded after 1 year), 6 pipe plants (one was excluded after 1 year) and numerous ore-enrichment factories, ore mines, metal product plants etc. Primarily the program duration was from July 1999 until January 2002, but it was prolonged until July 2002 due to observable increase in profits of participating enterprises and continued political pressure from the metallurgical lobby, as a result of increase in profits.

The rest of this work is devoted to the investigation of impact of the implementation of the Economic Experiment on the ferrous metal industry performance. We would like to examine the questions about effect of this kind of industrial policy on Ukrainian steel production and on the enterprise profits in order to determine whether governmental actions had really led to fulfilling the targets of the Experiment.

3.2. Ukrainian Ferrous Metal Industry: Empirical Findings.

It seems that there are few empirical works devoted to the investigation of different kinds of industrial policy, which have been implemented in Ukraine in the years of transition. The reason for this lies in the availability and scarcity of existing data in the country where almost any kind of economic data is often considered to be hidden by private and sometimes even official authorities.

However, there are few works concerning Ukrainian ferrous metal industry and these works describe some government actions and the industry responses and economic results came from these actions.

The most recent work in this area was done by Legeida(2002): the author used a partial equilibrium microeconomic model to examine the changes in the country net welfare gain as a consequence of implementation of he Economic Experiment in Metallurgy and Mining. To measure the state influence on the economy Legeida used the model developed by Rosenberg *et al.*(1999) for the case of Uzbek cotton and influence of exchange rate control (similar to Ukrainian one for the purposes of developing and protection of metallurgical industry) on cotton exports, considering the terms of economic experiment to be similar to export subsidy to Ukrainian metallurgical enterprises. Her main finding was that welfare gains for the country (in the form of incentives from decreased tax burden for outward-oriented metallurgical enterprises) outweighed deadweight losses coming from subsidy implementation and, therefore, the results of economic experiment were positive for the Ukrainian economy at least in the short-run. One can conclude that overall effect for the economy was even more favorable if it could be possible to account for all the positive externalities from this government action such as gains from deep world market penetration and the reduction in unemployment in Ukrainian industrialized regions etc

The second empirical work concerning Ukrainian ferrous metal industry is the paper of Grygorenko (2001). This work was devoted to property rights approach to explain disparities between the market situation and a potential market-ruled efficient equilibrium (so-called "third party solution" for efficiency improvement), the author gave a splendid overview of nowadays state and tendencies in the Ukrainian ferrous metal industry and provided readers with a number of empirical findings, which made his work very helpful for conducting further researches in this particular sphere. Firstly, Grygorenko made the cost analysis of Ukrainian metallurgy and estimated the cost function for this industry. Secondly,

he developed econometric estimation of demand and supply functions of Ukrainian metals and found that outside demand for Ukrainian ferrous metals is price inelastic (about 0.1 in absolute value). Thirdly, Grygorenko built an econometric model to estimate enterprise performance at the ferrous metal market by adopting theoretical framework by Bevan, Estrin and Schaffer (1999) to the Ukrainian metal market condition, concentrating on labor productivity as on the "least biased" measure of performance according to findings of Bevan *et al.* The main finding of this work is that third party presence stimulates investment of enterprises and improves firm performance in terms of productivity.

Unfortunately, the most of other works about Ukrainian ferrous metal industry should be treated rather as statistical repots than thorough economic investigations, because authors often tend just to report statistical figures without revelation of the processes taking place in industry during years of transition. In addition, such reports often tend to be over- or understated, according mainly to author's considerations but without clear explanations of causes and effects of industrial policies. Therefore, it seems necessary to make one additional approach to investigate industrial policy in the form of Economic Experiment using mainly econometric tools in order to answer the questions about its impact on industry.

Chapter 4

THE INDUSTRY PERFORMANCE: ESTIMATION OF DEMAND AND SUPPLY FUNCTIONS FOR THE UKRAINIAN STEEL

In this chapter we would like to draw attention to the ferrous metal industry performance during the last years. First of all, we would like to examine the factors that determined production level of the industry. Secondly, we want to investigate the question about the impact of the implementation of the Economic Experiment on the level of steel production. Remember that the primary aim of the Economic Experiment was to modernize the outmoded technologies of the enterprises, but not to increase production of low-quality output. The estimation of the supply function should give the concise answer to the stated question. Note, that the estimation of the demand function yields nothing in the terms of present research. However, as only one empirical work (of appropriate quality) on estimation of the ferrous metal industry performance have been done yet (by Grygorenko(2001)), it seems worth making one more try to look on the whole demand-supply system of this industry (using new data and slightly different approach to estimation).

It is worth noting that when dealing with demand-supply system we can not pass by the potential problem of simultaneity of the demand and supply equations; otherwise, the usual OLS estimates may appear to be biased and inconsistent. On the other hand, if there is no simultaneity, the TSLS estimates could be less efficient than OLS ones (Kennedy(1998)). To check for simultaneity we used the Hausman specification test (see Appendix 2 for the results) and its

results showed absence of simultaneity in our case. Therefore, we will apply the usual OLS procedures to estimate our demand and supply equations[9].

4.1 Estimation of the Demand Function for the Ukrainian Steel.

From the statistics available in Derzhkomstat we know that Ukrainian steel industry is an export-oriented one, as nearly 80% of the Ukrainian steel is consumed outside Ukraine. As was already noted, the main consumers of Ukrainian steel now are Middle East and South Asia countries and also North America and the European Union. Therefore, assessing the main factors that influence demand for Ukrainian steel we must take into account level of economic activity in those countries and regions. However, it is not always possible to truly estimate such index as economic activity and the use of proxies seems then to be inevitable. There are some general variables that can perform the functions of proxies for the countries' economic activity and they are the country GDP or level of industrial production. Here we want to use the latter measure, because steel, in principle, is used directly for the industrial production while GDP, especially in the developed countries account mostly for the production of services.

General economic theory predicts that the demand for the some normal good, such as steel, should be negatively dependent on good's price and be positively correlated with the price of its substitutes (negatively correlated with the quantities of substitutes). However, there is no general definition of what steel price is, because there is no such "ordered" world market for the ferrous metal products, as, for example, world oil market. The prices for steel are determined usually during the bilateral negotiations between consumers and producers (or, more frequently, between consumers and intermediaries who have special rights to sell steel) of steel products, and these prices vary from region to region. So we again need a reliable proxy to capture effect of the "price" variable.

[9] In Appendix 3 the results of both OLS and TSLS estimation are presented, indicating unbiasedness of OLS estimates and their efficiency compared with TSLS ones.

Grygorenko(2001), for example, performing the similar analysis of demand and supply functions, used the U.S. ferrous metal aggregate price as a proxy for the world steel price. Here we would like to present another proxy for the price for Ukrainian steel, as our primary interest is Ukrainian market, not the "world" one. We propose to use the weighted average price at which Ukrainian steel products were sold by enterprises or intermediaries in different periods of time as proxy for this variable of interest.

Our last question is the one about possible substitutes for the Ukrainian steel. Grygorenko(2001) proposed to use price for non-ferrous metals as a reliable proxy for the price for needed substitutes, but this question is not straightforward and probably needs a more detail-specific discussion about the nature and further use of steel produced in Ukraine. For example, the most part of Ukrainian steel exports is the steel used for building and construction, which hardly can be substituted with non-ferrous metals that are mainly used for the machine-building purposes. Then, instead of such approach we would like to consider Chinese and Russian steel products as the main substitutes for the Ukrainian ones, since ferrous metal sectors in these countries now use the same production technologies (AISI(2000)), have the same geographical and labor advantages and face the same problems as Ukraine does. China and Russia are probably the main competitors for Ukraine at the steel markets now throughout the world, and their production levels could have the negative influence on Ukrainian exports of steel.

Having all these issues, the proposed specification of the demand function is the following:

Demand function:

$$Log(Q_t) = \alpha + \beta_1 * Log(Price_t) + \beta_2 * Log(INDPROD_t) + \beta_3 * Log(GDP_t) + \beta_4 * (Log(GDP_t))^2 + \beta_5 * Log(Q_t^{RUS}) + \beta_6 * (Log(Q_t^{RUS}))^2 + \beta_7 * Log(Q_t^{CHI}) + \beta_8 * (Log(Q_t^{CHI}))^2 + \beta_9 * Log(REER_t) + \beta_{10} * Log(Q_{t-12})$$

Where

Q[10] - Ukrainian aggregate production of steel, million MT;

Price[11] - the index of weighted average price at which Ukrainian steel products were sold both domestically and abroad;

INDPROD[12] - the index of industrial production of major industrialized countries (USA, Japan, Canada, Australia and European Union). This variable serves as a proxy for the world economic activity and is expected to have a positive sign;

GDP[13] - the real Ukrainian gross domestic product, billion 2001 hryvnas (calculated as nominal Ukrainian GDP weighted by GDP deflator). This variable is a proxy to Ukrainian economic activity and is again supposed to have a positive sign. Here we also assume a quadratic form of this variable and expect a negative sign on its square, as it seems quite natural to assume increase of steel production at diminishing rate followed by the increase in economic activity within the country;

REER[14] - the real effective exchange rate, hryvnas/$. We expect the sign of this variable to be positive, as hryvna depreciation is expected to have positive impact on Ukrainian steel export, so, on the amounts steel production as well;

Q_{t-12} - seasonally adjusted autoregressive term included due to the high seasonality in steel production in Ukraine. Expected impact of this variable is positive;

Q^{RUS} and Q^{CHI} [15]- Russian and Chinese aggregate production of steel, respectively. However, the expected impact of these indices on the Ukrainian steel production needs some explanation. On the one hand, these variables

[10] These series are provided by Derzhkomstat.

[11] Source: Derzhkomstat.

[12] Source: IMF (available on-line at www.imfstatisics.org).

[13] Source: Derzhkomstat.

[14] Source: TACIS monthly publications.

[15] Source: International Iron and Steel Institute monthly publications (available on-line at www.iisi.org).

should act as proxies for the activity of the major Ukrainian competitors at the steel market, so increase should drive down the Ukrainian steel production. On the other hand, it seems also possible, that those variables would reflect the increase in economic activity of Middle East and South Asian countries, the increase not fully captured by INDPROD variable. So, the expected impact of Q^{RUS} and Q^{CHI} is ambiguous. To verify the true nature of these two variables we would like to include their quadratic form into the regression; if the signs and significance or respective $\beta's$ will appear to be similar to GDP, we should make a conclusion about proximity of these variables to steel consumers economic activity.

All the data used in the estimation are monthly series from January 1996 to December 2001. The results are summarized in the Table 4.1 below.

TABLE 4.1

ESTIMATION OF THE DEMAND FUNCTION FOR UKRAINIAN STEEL

(dependent variable is log(Q))

VARIABLE	Coefficient	Std. Error	t-Statistic	p-value
LOG(PRICE)	-0.434264	0.099619	-4.359259	0.0001
LOG(INDPROD)	1.348284	0.331428	4.068108	0.0002
LOG(RUS)	31.19370	8.953705	3.483887	0.0010
$(LOG(RUS))^2$	-1.833442	0.539349	-3.399363	0.0013
LOG(GDP)	16.28121	8.663607	1.879264	0.0658
$(LOG(GDP))^2$	-0.847971	0.453911	-1.868144	0.0674
$LOG(Q_{t-12})$	0.229968	0.095856	2.399092	0.0201
Constant term	-207.0653	57.49750	-3.601292	0.0007
Adjusted R-squared	*86.99%*	*P(White)*		*0.629214*
P(Reset Test)	*0.261085*	*P(Breush-Godfrey)*		*0.212839*

As $\log(Q^{CHI}), \log^2(Q^{CHI})$ and $\log(\text{REER})$ are jointly insignificant according to the Wald test statistics, we have decided not to include them into the final regression output. The estimated price elasticity of the demand is about -0.434, which is consistent with the general economic theory and with the present features of the Ukrainian steel industry (since we defined "price" as mentioned above). However, we see, that the volume of Russian steel production is more likely to serve as a proxy for economic activity of Ukrainian steel' consumers rather than that of production of the competing good. The regression model seems to be appropriate in terms of econometrics and the sufficiently high R-squared suggests the high enough explanatory power of the regression.

4.2 Estimation of the Supply Function for Ukrainian Steel.

For the estimation of the supply function we firstly must take into account most variables that can influence the cost of steel production, both directly and indirectly. It seems quite natural to suppose that total amount of steel production is highly dependent on the prices for the major inputs, e.g. coke coal, iron ore and electric energy. Wages of enterprise employees, directly entering the production function, should also affect the quantities of steel produced, while the presence of wages arrears (which were enormously high especially during the first years of transition) should affect the production costs indirectly. At first glance, it also seems natural to suppose that interest rates, which may influence the financial expenditures of the enterprises, should have effect on steel production (Grygorenko(2001)). However, as far as Ukrainian ferrous metal industry is highly subsidized one, when debts of the enterprises were often guaranteed by the government and preferential interest rates were forced (again by government) to be applied for some enterprises, one can hardly to expect such preferential interest rates to be coincided with real ones. Finally, we can not omit the presence of the Economic Experiment, which can be supposed to affect the overall supply of the steel products during last years. This is the question of our primary interest in this part of work.

Now we want to formulate the null hypothesis**: "The implementation of Economic Experiment did not lead to change in Ukrainian steel production"**. If this null is true that Economic Experiment should be treated as an indirect subsidy to the participating enterprises and we will make our conclusions about the impact of this kind of industrial policy on industry performance according to the performance of enterprises in the industry. We want to test this hypothesis against the alternative one: **"The implementation of the Economic Experiment had a significant impact on Ukrainian steel production"**. If we find that alternative is true then our further analyses and conclusions will depend on the direction of the influence of the Experiment on the amount of production.

The proposed specification of the econometric model is the following:

$$Log(Q_t) = \alpha + \beta_1 * Log(\mathrm{Pr}ice_t) + \beta_2 * Log(Electric_t) + \beta_3 Log(Coke_t) + \beta_4 Log(Ore_t)$$
$$+\beta_5 * Log(Wage_t) + \beta_6 * DLog(WARR_t) + \beta_7 * D\_EXP_t + \beta_8 * D\_EXP * \log(Ore_t) +$$
$$+\beta_9 * D\_EXP * \log(Coke_t) + \beta_{10} * D98 + \beta_{11} * Log(Q_{t-12})$$

where

COKE, ORE and ELECTRIC are the real price[16] indices of coke coal, iron ore and electric energy, respectively (nominal hryvna price indices weighted by GDP deflator, base=2001). We expect the coefficient on these variables to be negative as higher input prices lead to decrease in output production[17];

WAGE[18] - weighted average real wage in Ukrainian ferrous metal industry (nominal hryvna wage weighted by CPI, base=2001). Its expected influence is again negative, as increase in wages leads to increase in production costs;

WARR[19] - real wage arrears in Ukraine (nominal hryvnas wage arrears weighted by CPI, base=2001). We put this variable in differences because of

[16] Here we employed the same definition of "price" as for the price of steel, e.g., the weighted average price by which finished products were sold to consumers.

[17] Source: Derzhkomstat.

[18] Source: Derzhkomstat.

cumulative nature of wage arrears data series. The expected sign is negative, as economic theory predicts;

Q_{t-12} - seasonally adjusted autoregressive term included due to seasonality;

D_EXPER - variable that takes value 1 for the periods when Economic Experiment was in process, 0 otherwise (1 starting from the October 1999). We also decided to include interaction terms (like $D\_EXP * \log(Coke_t)$) into regression because metallurgy has a multistage production cycle and the Experiment involves not only steel-making enterprises, but also producers of intermediate inputs as coke coal, iron ore, ferroalloys etc. The expected signs of the coefficient on interaction terms are expected to be positive, as price elasticities of supply of the intermediate inputs (in our specific case) should fall in absolute values following the implementation of the Economic Experiment (as producers of intermediate inputs appear to be more likely to expand their levels of production).

All data are monthly series from January 1996 to December 2001.

Our null hypothesis formulated above appears to be true if we find joint insignificance of β_7, β_8 and β_9. Otherwise, the alternative is true.

The results of the estimation are summarized in the Table 4.2.

[19] Source: TACIS monthly publications.

TABLE 4.2

ESTIMATION OF THE SUPPLY FUNCTION FOR UKRAINIAN STEEL

(dependent variable is LOG(Q))

VARIABLE	Coefficient	Std. Error	t-Statistic	p-value
LOG(PRICE)	0.470681	0.215809	2.181007	0.0338
LOG(ORE)	-0.376688	0.141473	-2.662611	0.0103
LOG(COKE)	-0.734525	0.307429	-2.389253	0.0206
LOG(WAGE)	0.564276	0.114201	4.941072	0.0000
D_EXPER	**-2.688834**	**1.886311**	**-1.425446**	**0.1601**
LOG(ORE)* D_EXPER	**-0.068583**	**0.196945**	**-0.348236**	**0.7291**
LOG(COKE) *D_EXPER	**0.648537**	**0.460483**	**1.408386**	**0.1651**
LOG(Q_{t-12})	0.301346	0.099910	3.016191	0.0040
Constant term	7.310429	2.156563	3.389851	0.0014
P(White)	*0.713026*	*Adjusted R-squared*		*86,25%*
P(Reset Test)	*0.162891*	*P(Breush-Godfrey)*		*0.477289*

From the regression output we can see that all the coefficients except for the LOG(WAGE) have expected signs (D98, LOG(ELECTRIC) and DLOG(WARR) are jointly insignificant according to the Wald test statistics), the explanatory power of the regression (more than 86% of variation of the independent variable can be explained by the variation of the independent variables) is sufficiently high, the residual tests suggest no heteroscedasticity and no autocorrelation present in the regression. The unexpected behavior of the LOG(WAGE) variable could be explained by the fact that, as we noted before, the labor costs in Ukraine are not high enough relatively to the cost of material inputs. Then the increase in wages (usually enforced by the state and local governments) may simply reflect the expected increase in profits followed by the increase in the levels of production. This is only one of possible explanation to

this phenomenon: the labor market in Ukraine is much distorted and its specific features require special analyses beyond the scope of present work.

From the table 4.2. we can see that all three coefficient of our interest are insignificant at 10% level. Testing for their joint significance yields the same result, as p-value of the Wald test statistics is equal to 0.54534. So, we can not reject our null hypothesis at any reasonable level of significance and, therefore, the implementation of the Economic Experiment has really had no significant impact on Ukrainian steel production.

We should note that dealing with the different versions of our proposed specification (excluding insignificant variables etc.) we have found that magnitude of LOG(PRICE) variable was not constant although its sign and significance remained constant (the coefficient was always positive and statistically significant at 10% level). After excluding all jointly insignificant variables from the model (so, estimating the long-run price elasticity of supply), we have obtained the following results (see table 4.3. below):

TABLE 4.3

ESTIMATION OF LON-RUN SUPPLY FUNCTION FOR UKRAINIAN STEEL

(dependent variable is LOG(Q))

VARIABLE	Coefficient	Std. Error	t-Statistic	p-value
LOG(PRICE)	0.651371	0.147502	4.416003	0.0000
LOG(ORE)	-0.443026	0.113850	-3.891317	0.0003
LOG(COKE)	-0.359804	0.157828	-2.279716	0.0266
LOG(WAGE)	0.597978	0.102137	5.854648	0.0000
LOG(Q_{t-12})	0.300637	0.081279	3.698809	0.0005
C	4.820724	1.323945	3.641182	0.0006
P(White)	*0.733845*	*Adjusted R-squared*		*86,46%*
P(Reset Test)	*0.145538*	*P(Breush-Godfrey)*		*0.658121*

The long-run value of our price elasticity of supply is +0.65, so 1% increase in steel price should lead to the 0.65% increase in the quantity of steel produced by Ukrainian enterprises in the long-run. Now we can see that value of LOG(PRICE) increased after the exclusion of D_EXPER variables. Moreover, the p-value of Breush-Godfrey serial correlation test also increased (from 0.477 to 0.658), indicating that LOG(PRICE) and D_EXP are positively correlated.

The obvious conclusion we can draw from our results of hypothesis testing and estimation of the long-run supply function is that although the implementation of the Economic Experiment has not led to the increase in production, it has led to the increase in prices at which steel products were sold by enterprises to consumers. Such conclusion supports the idea of subsidizing nature of this kind of industrial policy and proves the general consistency of governmental policy, as the government declared its aim in gradual decrease in steel output in favor of increase in quality of finished steel. The increase in selling price itself is inseparably linked with the question of the impact of the Economic Experiment on enterprise performance (in terms of profits and revenues) and we will return to this question in the next chapter where we will perform the analysis of the Experiment on the "micro" level (level of enterprises).

Chapter 5

ESTIMATION OF INFLUENCE OF THE ECONOMIC EXPERIMENT ON ENTERPRISE PERFORMANCE

In the previous chapter we have found that impact of the Economic Experiment on the steel production appears to be insignificant. However, according to the formulation of the Law in which the conditions of the Economic Experiment were installed, the main aim of that governmental action was "to increase working capital of the enterprises for upgrading their production facilities and to avoid barter transactions in the purchase of critical supplies (gas and energy resources)." Taking into account such formulations, it seems no longer strange that enterprises have paid more attention to the fulfilling these stated purposes than to the increase in steel production for itself.

5.1. Selection of enterprises for the participation in the Economic Experiment.

The first natural question that should be asked before the beginning of the "micro" analysis is the one about the reason for choosing the enterprises participating in the Economic Experiment. As far as this decision was made directly by the Ukrainian Cabinet of Ministers, it involved rather big deal of politics than of economics. Unfortunately, the governmental requirements to the enterprises are not publicly distributed, so we can make only some suppositions about the reasons for choosing, according to the information available. For, example, Orlov (2000), investigating the reasons for subsidizing enterprises in Russia, showed that the main determinants of the selection for subsidizing were the economic prosperity of the region to which a firm was belonged (mainly

through the direct lobbying from the side of representatives of those regions), bigger values of total assets of enterprises and state ownership of enterprises, but in our case things were not so clear. At first glance, it seems likely that state-owned firms are all to be involved in the Experiment, but, for example, *Yenakieve* coke plant, despite being state-owned, did not participate in the Experiment. In addition, there is no obvious empirical evidence that, for example, enterprises with higher or lower profitability or those with large number of employed workers before the Experiment were more likely to be chosen for the participation. The only factors that are supposed to be the criteria for choosing are of the shares of Ukrainian market of the enterprises and their social nature. The latter criterion needs some explanations. It is worth noting that many of the Ukrainian enterprises, particularly in ferrous metal and oil extracting and proceeding industries, are so-called "town-makers", i.e.. the presence of the natural resources or the closeness to the potential customers were among the main reasons behind formation of some Ukrainian towns and cities for the purposes of servicing the plants built near these towns. The most prominent example of such "town-making enterprises" is the *Kryvorizhstal* metallurgical plant, the existence of which is the living necessity for one of the biggest Ukrainian cities, Kryvyi Rih, with urban population of more than 800 thousand people. Hence, it really was observed that "town-makers" were more likely to be among the participants of the Experiment. However, such a reason also lies rather in the political sphere, since representatives of "town-making" enterprises are supposed to have more possibilities to exert political pressure on the government, as large part of inhabitants of manufacturing sites depend on the existence and profitability of those enterprises. So, selection of the enterprises could serve just as good measure of the presence of political power of some single enterprise, but it's hardly to expect the existence of connection between some economic indexes of enterprises and their participation in the Experiment. Therefore, we can assume the certain degree of "randomness" in selection of enterprises for the

participation without any losses of generality. It is worth noting that such an assumption might not be fully appropriate for the realities of Ukrainian ferrous metal industry but the data available for us by the present time do not allow us to make more formal analysis about the right criteria of selection the enterprises for participation. The above considerations about such possible criteria, however, provide with the scope of complementary research and an investigation of the nature of the Experiment, but as our present challenge is to investigate the impact of the Experiment, we should just assume the political nature of the rules of selection of the enterprises for the participation:

Assumption 5.1: *Criteria for selection of enterprises for the participation in the Economic Experiment depend on political reasons and do not depend on economic status of the enterprises before the start of the Experiment.*

5.2. Ukrainian ferrous metal industry: determinants of enterprise performance.

Investigating the issues of enterprise performance, we should mention firstly, that there is a big variety of the potential determinants of it. Here we try to name the most relevant of such determinants, using the theoretical findings of Grygorenko (2001) and our own knowledge of the real and potential problems with the current state of the Ukrainian ferrous metal industry:

A. Cost structure (share of capital expenses, labor outlays, fuel, etc.). There are many enterprises whose production capacities were used for long time without any replacement. There are also many enterprises that cannot change their technologies to the more productive (for example, from open-hearth furnace technologies to the oxygen-converter furnaces) because of lack of available funds during the first years of transition. There are also many enterprises with excessive capacities that cannot be sold at the present time.

All such factors affect cost structure of the enterprises, making them more heterogeneous.

B. Past performance and ownership. Basic economic theory predicts that private-owned firms should be more efficient that state-owned ones. However, this is not so obvious in Ukraine, where state can support own "preferred" enterprises in different ways (such as giving them liberties to access foreign markets, implement hidden tax concessions etc.). The other question comes from the problem of efficiency of privately-owned enterprises due to the [sometimes] different aims of different owners under transition. Grygorenko (2001) showed that presence (entry) of the third party investor (so-called "Industrial Group" like *Industrial Union of Donbass* or *Interpipe*) improves enterprise performance, but he has also noted that his results were not much reliable due to the potential problems with his model and with data availability.

C. Geographic proximity to the borders and access to foreign markets;

D. Initial technological and geographical conditions. There are many enterprises whose technologies require specific inputs that can be produced only by the one specific plant (for example, blast furnaces that are adapted to proceed only with specific sorts of coke and/or ore). While in Soviet times there was no problem of cooperation, now it turns to be a big problem under the threat of monopolistic behavior of some specific-inputs-producing plants (the example of this was observed during 1997-1999 in the interaction of one of the biggest Ukrainian steel-making enterprises with two ore-enrichment plants). The one possible solution for this problem is the vertical integration, but for now only one enterprise is fully vertical-integrated.

E. Quality of the top management of the different enterprises. This is one of the main factors that can determine enterprise performance, especially at the

current time, when new generation of the young managers in the Ukrainian ferrous metal industry became very successful not only because of overall economic growth in the whole country, but also because of their personal skills and abilities to work hard under changing conditions.

F. Exogenous shocks such as economic crisis occurred in 1998, that had affected export potential of the export-oriented steel-making and pipe-making enterprises;

G. Size of an enterprise, which could be measured as the number of employees, the book value of total assets of an enterprise, as the market share captured by an enterprise etc.

H. Belonging to a particular industry branch, such as ore-mining, ore-enriching, coke-producing, steel-producing, pipe-producing plants, etc.

I. The participation in the Economic Experiment

J. The social functions of the enterprises, etc.

It is obvious that most of the stated characteristics are not observable at least for the short periods of time. There are also problems with the potential endogenous nature of a number of described determinants of performance and with their high multicollinearity. Such things themselves create the new problem of choosing and determining the variables that could serve as more or less reliable proxies for the variables that directly affect the performance of enterprises.

This new problem becomes even more complicated if we take into account the potential unavailability of the data on the Ukrainian ferrous metal industry enterprises. In the world of imperfect information it is always difficult to find ideal measures for economic reality, especially for the microeconomic studies of markets in which heterogeneous agents with bounded rationality interact with

each other. Then any kind of analysis of Ukrainian ferrous metal industry becomes the one of such cases. No firm is enough generous to provide the information about its financial statements publicly, especially in the case when things are not going well. Only strong requirements from the side of stock market authorities allow enterprises, whose stocks are publicly traded to report a necessary minimum of information on-line. In addition, the state-owned enterprises do not provide any information about their activities and data on them were obtained by the author from private sources.

There is also a question about the reliability of the data, even of those obtained from the public sources. There was a common tendency of enterprises to conceal their real profits in order to avoid taxation, especially in the years preceding the Economic Experiment, when tax rates were sometimes considered by managers as "too high" to provide enterprises with incentives to work rather than with the incentives to hide real profits. However, we will proceed with this official data because, despite some possibility of measurement error, these data are the "best" among all the scarce sources available to the author. What is more, even if we could have some "more right" data (coming from private sources), it seems impossible to merge them with the official data, because in this case the results can be much inconsistent.

5.3. Methodology, model specifications and results.

As the ferrous metal industry is essentially a multistage production cycle, we can divide enterprises in this industry into the five major groups: ore-enrichment plants, coke-producing plants, ferroalloy plants, steel-making plants, pipe-making plants. Of course, there are also numerous coal-extracting and ore-extracting mines and plants, scrap-proceeding enterprises etc but now we far more interested in those industry representatives that are directly involved in the final good's production. Now our data set contains 39 ferrous metal industry enterprises, 31 of those were participated in the Experiment. 14 enterprises are

steel-making plants (10 participated in the Experiment) , 11 are coke chemical plants (8 participated), 5 ore-enrichment plants (all participated), 6 pipe-making plants (5 participated) and 3 ferroalloy plants (all participated). As these enterprises are accounted for more than 98% of output in each of industry branches, our sample should be considered as the good representatives of the whole population of industry enterprises.

It is also important to note that many characteristics of the agents (for example, the quality of management or firm's endowment with intangible human capital) are unobservable or immeasurable at the micro level. To avoid this problem of omission bias and inconsistency Greene(2000) and Kennedy (1998) propose to use panel data tools and to use firm-specific coefficients that absorb the influence of all these effects. Grygorenko (2001) also suggests, on the basis of the analysis of Frydman *et al*(1999), that the use of individual-specific intercepts can avoid (or, at least, decrease) selection bias, which could arise when Assumption 1 is not really true. In addition, it is important that the status of many enterprises in this respect has been changing over the last years. Consequently, one may try to examine temporal variations in performance should use panel data approach, which again seems to be the most adequate under such circumstances, taking into account assumption that unobservable or immeasurable characteristics of enterprises were time-invariant during the period of our investigation.

Assumption 5.2: *Unobservable and/or immeasurable characteristics of enterprises were time invariant during 1998-2001.*

5.3.1. The Economic Experiment: Impact on Enterprise Profits.

The first question we would like to answer is whether there is an impact of the Economic Experiment on such measure of enterprise performance as profits. Therefore, we can formulate our null-hypothesis firstly as the following:

"The participation in the economic experiment leads to increase in the average profits of the enterprises". We will test it against the alternative one**: "The participation in the economic experiment does not lead to increase in the profits of the enterprises".**

The proposed specification of the econometric model for investigation of this hypothesis is following one:

$$PROFIT_{it} = \alpha_{i0} + \beta_1 * RUS_t + \alpha_1 * D\_EXP_{it} + \alpha_2 * TA_{it} + \alpha_3 EMPL_{it} +$$
$$+\alpha_4 * \frac{INVEST_{it}}{TA_{it}} + \alpha_5 * PIPE\_MRKT_{it} + \alpha_6 * STEEL\_MRKT_{it}$$
$$+\alpha_7 * COKE\_MRKT_{it} + \alpha_8 * FER\_MRKT_{it} + \alpha_9 * GOK\_MRKT_{it}$$

where

$PROFIT_{it}$ [20] - the net profits of the *i*-th enterprise at time *t*, thousands hryvnas, weighted by the ferrous metal producer price index,

D_EXP_{it} - the dummy variable that takes value 1 if the *i*-th enterprise participated in the Economic Experiment at time *t,* or 0 otherwise,

TA_{it} - the book value of the fixed assets (which includes machinery and buildings) of the *i*-th enterprise at time *t*, thousands hryvnas, weighted by the ferrous metal producer price index. This variable serves as a proxy of the size of a firm and represents the potential production capacity;

[20] Sources of data used in this chapter::

- *Invest-Gazeta Top 100 Rating* (originates from the State Property Fund of Ukraine and State Stock Market and Securities Commission);
- *FENIX* electronic database (originates from Derzhkomstat);
- On-line publications of State Stock Market and Securities Commission of Ukraine (originate fron the financial statements of the enterprises) available at www.smida.gov.ua ;
- On-line publications of *MetallurgProm* holding and *Yuzhinformatica* company (originate fron the financial statements of the enterprises) available at www.prometal.com.ua ;
- Private sources.

$EMPL_{it}$ - the number of the employed by an enterprise, persons. This is a proxy for the size of the enterprise, for its real production capacity, and is also supposed to measure the social importance of the enterprise;

$INVEST_{it}$ - the book value of the investments of the *i*-th enterprise made during time *t*, thousands hryvnas, weighted by the ferrous metal producer price index. This variable was calculated using the well-known formula: $INVEST_t = TA_t - TA_{t-1} + DEP_t$. However, we cannot rely too much on the usefulness of this variable, as such definition of investments is often criticized because flows of depreciation in initial periods are going to be transferred to other periods. One should note, that this variable also can be negative, if, for example, some part of net property or equipment of enterprises was sold during the period. But as other measures of investments are even less reliable (Grygorenko(2001)), we have to choose "the best amongst the worst". What we can do is just reduce heterogeneity of this variable by dividing it by the book value of the fixed assets of the enterprise.

$PIPE\_MRKT_{it}$ $STEEL\_MRKT$ $COKE\_MRKT_{it}$ FER_MRKT_{it} GOK_MRKT_{it} - market shares of the *i*-th enterprise at time *t* on the pipe, steel, coke, ferroalloys and enriched ore markets respectively, %'s. These variables serve as proxies for the past performance and inherited initial conditions of the different enterprises and also take into account the belonging to the different types of ferrous metal industry branches. However, the nature of these variables and their calculation need more detailed explanation. As far as many of the enterprises in ferrous metal industry are partially vertically integrated (the word "partially" in this case means that only some stages of the steel producing, such as, for example, coke-producing and steel-producing, are proceeded within one single steel-making enterprise), it is very hard to determine what part of coke market, for example, is occupied by the *Illicha Metal Works* plant, as steel-making enterprises only report data about their final outputs (e.g. outputs of steel and steel pipes), but not about

the production of intermediate inputs needed for the steel-making process. Moreover, even if the yearly financial data could be found with some difficulties, the data on outputs for the early years is available only at the aggregated level, e.g. on the level of the whole industry, but not at the level of particular enterprises. Therefore, it is not always possible to construct good indicators of market shares based on the outputs. To avoid this problem, we propose to define market share' variables in the following way. Firstly, we divided the whole set of enterprises into the five groups, according to their primary specification. Then market share of a particular plant was calculated as the ratio of net sales of this enterprise to the sum of net sales of all the enterprises that belong to this industry. Then all such obtained ratios were pre-multiplied by dummies of membership of each industry. Of course, these are not quite good measures of the real market shares, but thay are supposed to be the best ones that could be calculated on the basis of data available.

RUS - the annual output of steel products by Russian ferrous metal industry, million MT. This variable represents a proxy for the state of the world steel market and for possible exogenous shocks at this market (as there was fall at the world steel market at 1998 and rapid boom in 1999 and 2000 years).

For the estimation of the regression coefficients we used Panel Data Random effects technique according to the results of the Hausman specification test for panel data. The final results of estimation of the model are summarized in the table 5.1.below:

TABLE 5.1

ENTERPRISE PROFITS
(dependent variable is Profit)

VARIABLE	Coefficient	Std. Error	t-Statistic	p-value
Constant	-258992.8	125485.6	-2.06	0.039
RUS	4.055741	2.581250	-1.89	0.116
D_EXP	68940.31	34705.39	1.99	0.047
TA	0.083673	0.0324184	2.58	0.010
EMPL	-9.638051	4.452864	-2.16	0.030
STEEL_MRKT	14186.260	5230.008	2.71	0.007
PIPE_MRKT	2996.947	1418.392	2.11	0.035
COKE_MRKT	4068.873	1800.074	2.26	0.024
Adjusted R-squared	46,29%			

The three variables (EMPL, **INVEST / TA**, FER_MRKT, GOK_MRKT) were jointly insignificant under all possible specifications of the model (according to the Wald test statistics), so, we decided not to include four of them (**INVEST / TA**, PIPE_MRKT, COKE_MRKT, GOK_MRKT) into the final output table. However, the negative sign of the EMPL variable needs more explanations. There are two main reasons why EMPL variable appears to be negative under all versions of this specification of the model. First of all, both TA and EMPL are proxies for the size of the enterprise, so now we can see that value of total assets plays more significant role in determining the profits of the enterprises. The second reason comes form managers' expectations about the more successful times in the nearest future: sometimes enterprises prefer not to fire their workers, but to keep them among the working staff for a couple of years in order to keep workers' abilities because costs of training the new workers (in terms of potential losses to the firm) may outweigh costs of keeping the existing (even not-working) staff. It is also possible that sometimes enterprises do not

have enough power to dismiss even the low-productive workers due to the pressure form the side of local governmental authorities (these things were observed by author in two "town-making" enterprises).

What we also can see is that all the variables have expected signs and are significant, at least at the 10% level, besides RUS, those p-value is slightly exceed critical 10%. The TA variable is positive and significant, just as STEEL_MRKT and FER_MRKT, what is very easy to interpret. The "main" coefficient of the regression, D_EXP, is also positive and significant and, in addition, is very robust to the changes in the specification: its significance, sign and even magnitude didn't change very much under the different specifications. This leads us to the main conclusion of this model: all other things equal, the participation in the Economic Experiment leads to the increase in profits by 68 million of hryvnas on average.

5.3.2. The Economic Experiment: Impact on Enterprise Revenues.

However, despite the cute results, the model also gives fuel for considerations about its economic appropriateness. First of all, only about a half of variation of the dependent variable can be explained by the variation of independent variables, which is can be sometimes referred as not very satisfactory. But even this is not the main our concern. The main problem comes from the fact that dealing with profits we can not make the clear distinction between the impact of the Experiment on the large-sized enterprises and that on the small- and medium-sized ones, because profits could be positive as just as negative. The estimated model provides us with only average figures, so, it could be possible that only profits of large-sized enterprises were raised while the Experiment had no positive impact for the small enterprises. Of course, calculating, for example, the possible budget gains from the Economic Experiment, we can easily stop on the chosen model, but, as far as our case is not only to provide readers with about the governmental gains but is also to give more vivid picture of the enterprise performance following governmental actions, we should be precise enough not to

simplify our analysis only to average indices. Fortunately, we can easily avoid the problem of the nature of the profits, remembering that profits are highly correlated with the net revenues of the enterprises that are positive anyway. Hence, we can extend out analysis to the revenues of enterprises as a possible measure of performance, taking into account the potential differences in the characteristics of the enterprises, using the log-log model specification.

We can now suggest our null-hypothesis: **"The participation in the economic experiment leads to increase in the net sales of the enterprises"**. Therefore, the alternative one**: "The participation in the economic experiment does not lead to increase in the net sales of the enterprises** ".

The specification of the second ("revenues") model then becomes the following one:

$$\log(NETSALES_{it}) = \alpha_{i0} + \beta_1 * \log(RUS_t) + \alpha_1 * D\_EXP_{it} + \alpha_2 * \log(TA_{it})$$
$$+\alpha_3 \log(EMPL_{it}) + \alpha_4 * PIPE\_MRKT_{it} + \alpha_5 * STEEL\_MRKT_{it}$$
$$+\alpha_6 * COKE\_MRKT_{it} + \alpha_7 * FER\_MRKT_{it} + \alpha_8 * GOK\_MRKT_{it}$$

where

$NETSALES_{it}$ - the revenues of the *i*-th enterprise at time *t*, thousands hryvnas, weighted by the ferrous metal producer price index.

It is worth noting that we don't put the *_MRKT variables into the logs since these variables are already measured in the percentage points.

To estimate the model, we used Panel Data Random-effect technique, again according to the statistics of the Hausman specification test for the panel data. We also employed GLS Variance components method to avoid the problem of inconsistency caused by the heterogeneity of the firms. The results of estimation are presented below in Table 5.2.:

TABLE 5.2

ENTERPRISE NET SALES
(dependent variable is LOG(NET SALES))

VARIABLE	Coefficient	Std. Error	t-Statistic	p-value
Constant	-3.144793	3.538634	-0.89	0.374
LOG(RUS)	0.499904	.0891133	2.23	0.026
D_EXP	0.510737	0.0762066	5.61	0.000
LOG(TA)	-0.051376	.1120315	-0.46	0.647
LOG(EMPL)	0.952651	.1572058	6.06	0.000
PIPE_MRKT	0.021868	0.008099	2.70	0.007
COKE_MRKT	0.043124	0.009881	4.36	0.000
STEEL_MRKT	0.010309	0.002263	4.56	0.000
FER_MRKT	0.034508	0.007575	4.56	0.000
GOK_MRKT	0.043619	0.012312	3.55	0.900
Adjusted R-squared	87,61%			

As we can see, all the coefficients, besides the LOG(TA), are statistically significant even at 5% level and as R-squared is much more higher than the one of the first model, we could rely more on the conclusions about the signs and significance of the coefficients made on the basis on this regression model. However, the reason for the insignificance of LOG(TA) is now more obvious than the one for the negativity of the coefficient on EMPL in the first regression. Remember that we have defined TA as the book value of fixed assets of the enterprise, so, as the number that tends to remain more or less fixed, at least for the short and medium time periods. It is hard to expect the big dependence of these two variables, taking into account only the span of four years. Moreover, as it was already mentioned above, both the fixed assets and the number of employees serve as proxies for the size of the enterprise, so, again we can hardly expect the joint significance of both coefficients. The estimated specification can

only show that the number of employees is a more effective proxy for the size when one deals with net sales than the value of the fixed assets of enterprises, because of greater flexibility of employees than that of fixed assets, especially under transition economy' conditions (as particular enterprise can more easily increase/decrease the number of employees than increase/decrease value of its fixed assets under good/bad circumstances).

Again we can note that our main coefficient, D_EXP, is positive and statistically significant (in particular case of net sales, at any level of significance). Ceteris paribus, the participation in the Economic experiment leads to the increase in the net sales of the enterprise by 51% on average. We should also note that the sign and significance of this coefficient were again robust to the changes in the specification (excluding variable LOG(TA) etc.), therefore, implying the clear conclusion about positive impact of the economic experiment on the values of profits and net sales of enterprises (as profits are highly correlated with net sales).

5.3.3. The Economic Experiment: Impact on Enterprise Profitability and Technologies.

However, it is not the end of our analysis of impact of the Economic Experiment on enterprise performance. The next thing that should be noted is that profits or net sales themselves are not very reliable measures of enterprise performance. The more reliable measures are the operating profit - earnings before interest, tax and depreciation - as the percentage either of sales (the markup) or as a percentage of total assets (the return to assets), the returns to labor etc. (see also Bevan et al (1999), where different alternative measures of enterprise performance were defined). For instance, Grygorenko(2001) proposed to use net sales weighted by the number of employees and by CPI for base year as a measure of enterprise performance, but, in our opinion, use of such definition may create bias due to inconsistency of labor policies of different enterprises for the reasons we suggested earlier in this work. Here we propose to

use profitability, defined as the ratio of profits of the enterprise to its net sales, as the better measure of enterprise performance because it does not involve any specifics of the industry, such as accounting for distortions at the labor and capital markets.

The main hypothesis in this case is the following one: **"The participation in the economic experiment leads to increase in average profitability of the enterprises"**. We want to test it against the alternative**: "The participation in the economic experiment does not lead to increase in average profitability of the enterprises"**.

To test this hypothesis we will use the following specification:

$$\frac{PPOFIT_{it}}{NETSALES_{it}} = \alpha_{i0} + \beta_1 * RUS_t + \alpha_1 * D\_EXP_{it} + \alpha_2 * \frac{INVEST_{it}}{TA_{it}}$$
$$+\alpha_3 \frac{EMPL_{it}}{TA_{it}} + \alpha_4 * \frac{EXPORT_{it}}{NETSALES_{it}}$$

where

$EXPORT_{it}$ - the value of exports of the *i*-th enterprise at time *t,* weighted by the ferrous metal producer price index, thousand hryvnas.

For estimation of this model again panel data tools was employed, but in this case we used fixed effects estimation technique instead of random effects, based on the Hausman specification test. To correct for the cross-section heteroscedastity, we used GLS(with cross-section weights) together with White-heteroscedasticity-consistent standard errors and covariance. The results are presented in the table 5.3. below:

TABLE 5.3

ENTERPRISE PROFITABILITY
(dependent variable is PROFIT/NET SALES)

VARIABLE	Coefficient	Std. Error	t-Statistic	p-value
RUS	$1.82*10^{-5}$	$3.45*10^{-7}$	52.80559	0.0000
D_EXP	**-0.097667**	**0.002040**	**-47.88157**	**0.0000**
INVEST/TA	0.007904	0.013908	0.568291	0.5705
EMPL/TA	5.056171	0.640158	7.898320	0.0000
EXPORT/NSAL_R	-0.075519	0.012070	-6.256791	0.0000
Adjusted R-squared	45,41%			

Here we see that coefficient on D_EXP variable is significantly negative, indicating decrease in enterprise profitability following the participation in the Experiment. General economic theory explains such phenomenon quite well, saying that the under the presence of a subsidy, whose existence doesn't depend on the economic status of enterprises might lead to distortions in the incentive structure of enterprises participating, therefore, creating no incentives to care about net profits. However, this explanation seems to be more relevant to the case of a production subsidy, but it is not the case of the Experiment, which proved to be a non-production subsidy. Now we want to introduce an alternative explanation to the decrease in enterprise profitability. Remember that we have defined this indicator of enterprise performance as the ratio of profits to the net sales. Therefore, keeping in mind an increase in both profits and net sales following the implementation of the Experiment, decrease in profitability means higher percentage increase in revenues than in profits. The reason for that may lie in the upgrade in technologies employed by the enterprises, as enterprises could spend some part of their earnings before taxation on the replenishing of their outmoded technologies. As a result, the taxing profits fall, while revenues remain probably the same. Such explanation is also supported by the claims of some of

enterprises that reported upgrade in their technologies during the 2001 (*Metall*, 10 and 12 (2002)). Therefore, when this explanation is true, it indirectly proves the fulfillment of the main aim of the Experiment, i.e. the upgrade in the existing technologies of the enterprises.

There is also one additional indirect index that seems to be helpful in explaining the positive impact of the Experiment on technologies. So far, remembering that revenues are defined as P*Q, where P is the price at which final output was sold and Q is the volume of output, and knowing that P*Q rises whereas Q does not rise, we can say that positive changes in P led to the increase in profits and revenues. In our case we define P not as something similar to the world steel price, but as selling price, which consists of two components - cost price and value-added.

To explain correctly our suggestion about the technological upgrade, we should first mention here that the Economic Experiment can be treated as a governmental subsidy without any loss of generality. Indeed, as output didn't increase due to the implementation of this kind of policy, and profits expanded at the same time, it has roots in the subsiding nature of the Experiment. Implementation of such subsidy should have led to fall in the average cost price of the enterprises. The decrease in the price cost component is the one reason for the increase in enterprise profits and revenues. But can we say that there was also an increase in the value-added component? We suppose, yes, because, while price-cost margin increased, it should have not led itself to the increase in P - this thing can only say about redistribution of the profits from government to the enterprises. However, steel selling prices themselves were also increased during the life of Economic Experiment, and the mere changes in price-cost margin cannot explain the upward direction of the prices. Increase in the absolute values of selling price might have roots both in increase in outside demand for the steel products and in upgrade in enterprise technologies, which allowed enterprise to make products of higher quality than before. While the first reason should lead to

the increase in selling price following the outside demand, the second reason means changes in the value-added of steel products that were sold at higher price. Unfortunately, we cannot clearly distinguish between the impacts of these two reasons, but as coefficients on both LOG(RUS) and D_EXP variables appear to be significantly positive in our Regression 5.2., we can argue that not only changes in outside demand determined the growing pattern of steel prices in Ukraine, but changes in enterprise technologies also occurred during the life of the Experiment.

5.3.4. The Economic Experiment: Impact on Governmental Gains.

Finally, we want to add some words about the impact of the Experiment on governmental gains in the form of taxes collected from enterprises during the period of the Experiment. This question also coincides with the question about efficiency of that kind of industrial policy in comparison with the previous (before the Experiment) situation. What we have observed before is that average profits of enterprises increased following implementation of the Experiment. Hence, analysis of governmental tax gains during this period could shed some light on the question of efficiency on governmental tax policy. According to the theory of Public Sector Economics, decrease in profit tax rates should lead to increase in absolute value of tax collections if government operates at the decreasing part of the Laffer curve. It is also a question of particular importance for Ukraine, because very often managers of different firms (not only of those in ferrous metal industry) claim that 30% profit tax rate is very high to promote incentives to work with maximum efficiency. Here we would like to present the summarized figures on the number of profitable enterprises, their profits and governmental tax collections during 1998-2001 to reveal the impact of the Experiment on governmental revenues and to verify the efficiency of current governmental tax policy, at least for the ferrous metal industry. We should note that these figures are only approximate, because we have no exact data, for example, on enterprises' earnings before taxing and on real governmental

revenues. In addition, some of the profitable enterprises were state-owned during last years, so, our summarized figures on governmental revenues are sometimes understated. However, here we care primarily about the incentive structure for the ferrous metal industry enterprises and try to examine the issues of the most effective profit tax rate and in this case the question about the potential state ownership seems to be not very relevant for our analysis.

Our summarized figures are presented in Table 5.4 below.

TABLE 5.4

GOVERNMENT TAX COLLECTIONS[21]

Year	Number of profitable enterprises	Total profits of profitable enterprises, thousand hryvnas[22]	Profit Tax Rate	Government Tax Collections, thousand hryvnas
1998	20	768662.79	0.30	329426.91
1999	**21**	**1683234.68**	**0.2475**[23]	**553622.04**
2000	30	4332919.62	0.09	428530.51
2001	**34**	**3149105.10**	**0.15**	**555724.43**

We see from the above table that not only average profits rose during the Experiment but also number of profitable enterprises was increasing during 1999-2001. The total amount of enterprises profits achieved maximum in 2000, but government tax collections were not very high in this year because of only 9% tax rate. Therefore, decrease in tax collections compared with those in 1999 can be viewed as a rationale for the government to increase the profit tax rate to 15% in 2001 despite the fact that this action had negative effect on total profits of enterprises, which decreased significantly in 2001 compared with 2000.

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[21] The figures in the last column are calculated as PROFITS*TAXRATE/ (1-TAXRATE), as PROFITS in our case are net profits *after* taxation.

[22] In 2001 hryvnas.

[23] As profit tax rate was 30% during the first three quarters of 1999 and 9% during the last quarter, we calculated average tax rate approximately 24,75% for the whole year.

Two main conclusions can be drawn form the given figures. First of all, we observed that neither 9% profit tax rate, nor 30% profit tax rate are not efficient in terms of potential governmental revenues, as the former lies at the increasing segment of the Laffer curve and the latter is on the decreasing segment. According to our findings, the optimal profit tax rate is probably the one between 15% and 25%. Unfortunately, there are no empirical investigations about the true nature of the Laffer curve for the Ukraine, so, we treat this statement only as a supposition. The second conclusion is that despite the fact that increase in tax revenues was not among the primary aims of the Experiment, the government acted as own-utility-maximizer at the last stages of the Experiment and it became interested not only in better enterprise performance but also in its own gains from the improvement of financial status of the enterprises.

Chapter 6

THE REASONS FOR STOPPING THE ECONOMIC EXPERIMENT: ESTIMATION OF INFLUENCE OF THE ECONOMIC EXPERIMENT ON ANTIDUMPING CASES AGAINST UKRAINIAN STEEL PRODUCERS.

In the previous two chapters we have found that the implementation of the Economic Experiment was indeed beneficial for the majority of the enterprises participating (as their profits, net sales and, probably, level of technologies have increased following the Experiment) and for the government (as the amount of taxes collected by the government in the years of duration of the Experiment was higher than amount of taxes collected by the government in the year preceding the Experiment). If things were so good, why did government decide to cut down the experiment in 2002? There should be considerable reasons to knife the hen that lays the golden eggs or, on the contrary, the Experiment, being beneficial at the early stages, appeared to be not so lucrative after the two years of its duration.

The reasons for cutting down the Experiment could be political factors as well as economic ones. Now we want to stress on the three most important of them. From our point of view they are the following:

1. Ceaseless political pressure on the government from the side of representatives of non-ferrous-metal political and economic groups and unions.

2. Government considerations about the sufficient time for ferrous metal enterprises to fulfill the stated aims. During the experiment, some of the

market-dominating enterprises (especially, *Illicha Metal Works*, *Azovstal* and *Kryvorizhstal*) successfully replaced and modernized some of their inefficient blast furnace technologies. Consequently, government may have decided that 3 years of decrease of the tax burden were enough to accumulate working capital and to replenish the outmoded technologies at least for the leaders of the industry.

3. Increased pressure on the government from the side of Ukraine's trade partners in form of their claims about the unfair trade encouraged by governmental actions.

Here we would like to concentrate on the third reason that could be led to discontinuation of the Experiment by the end of 2002. When we say about the pressure from the side of trade partners, we should note that such "pressure" can in principle be made in two different ways. The first way is the direct appeals to the government to stop or decrease the governmental support of some industries in order to diminish the deviations from the free trade conditions. However, this way is mostly used in bilateral trade negotiations between countries and involves again political deals rather than economic considerations. Moreover, the trade partners' claims are usually take place during different rounds of trade negotiations and are not publicly revealed and available.

The second way of putting pressure on the state and industries is issuing antidumping petitions against particular products, group of products, enterprises, groups of enterprises or against the whole industries. This idea is also supported by the position of two large steel-making plants (that occupied more than 30% of the steel market in 2002). These enterprises asked government to exclude them from the economic experiment, because the future estimated losses of antidumping petitions against them were supposed to be much greater than the

increase in revenues and profits followed by the further use of benefits of the Experiment.

The steel industry, due to the its specific features stated before in this work, appears to be the most vulnerable to antidumping petitions as no other industry all over the world. The reasons for that are obvious: developed countries want to protect their, often non-competitive steel-making sectors from the increasing volumes of the cheaper exports from the transitional countries like China, Russia, India, Brazil and Ukraine. On the contrary, these transitional countries, having geographical and labor advantages over developed countries in the steel-making, try to capture more or less sufficient parts of foreign steel markets and to secure these parts for themselves.

The question of dumping, its determinants and consequences is a very interesting and not straightforward question itself, as antidumping issues are the general and persistent problem of the majority of export-oriented industries in transitional countries like Ukraine. This question needs much more complicated investigations than we can offer in this chapter and definitely lies beyond the scope of this work. Here we would like only to investigate the relationship between antidumping petitions against Ukrainian enterprises and participation in the Experiment in order to clarify the question of validity of the 3rd reason (of stated above) of cutting down the Experiment in 2002

The purpose of a typical antidumping law is to impose a duty on dumped imports in order to compensate materially injured domestic industry for the difference between the foreign market value of the good and the price at which it sells at the domestic market. According to Krupp (1994), domestic industry may be found to be materially injured when it exhibits some, but not necessarily all, of the following characteristics during the period of investigation: significant levels of and/or rising of import volumes, both absolutely and as share of domestic

consumption; declining net profits and incomes for the domestic industry; increasing domestic inventories and declining domestic sales; decreased employment and wage payments; falling domestic prices and evidence of price depression by importers; decreased capital expenditures and cancelled capital investment plans; evidence of lost domestic sales followed to increase in dumped imports. The greater number of these factors leads to increase in the probability that material injury finding will be made. In the case of Ukrainian steel industry, Ukraine is usually accused of granting state subsidies to the enterprises, which allow them to sell products at significantly lower prices than the cost price of products at the external markets, while the Ministry of Industrial Policy of Ukraine argues that the price for the Ukrainian metallurgical products just reflects their low quality (Legeida(2002), Ministry of Economy and European Integration(2001)).

For the purpose of investigating the relation between the antidumping petitions and participation in the Experiment, we utilize the number of antidumping petitions against a single enterprise in a given year, ADCASES, as our dependent variable (as direct material losses for the steel-exporting enterprises are difficult to measure directly, we assume that such losses are the same for enterprises relative to their sizes). According to Krupp(1994), the nature of this variable is such that it occurs randomly and independently through time, so we can model it as a Poisson distributed random variable.

Firstly we want to verify the direct relationship between the antidumping petitions and participation in the Experiment. For this purpose we would like to use one independent variable D_EXPERIMENT (dummy that takes value 1 for enterprises involved into Experiment, 0 otherwise) in our first specification. According to the Ukrainian Ministry of Economy and European Integration (2001), there were 86 antidumping and special investigations against Ukrainian

industries and enterprises during 1992-2001, 60 of which were directed against enterprises in the ferrous metal industry and 28 enterprises were involved into these investigations.

To estimate our primary model we include only 26 enterprises and time dimension is the period from 1994 to 2002. The reasons for cutting our sample is that 2 enterprises involved into early investigations were ferroalloy plants, so, the exporters of raw materials, those were not to be involved into ADCASES during the next years. We include only those enterprises that were put into ADCASES at least once during these 9 years. Such rule of selection could also arises a question about selection bias but as we are interested only in the change in probability of issuing the antidumping petitions against the enterprises followed by their participation in the Experiment, it seems that enterprises that could potentially be involved into ADCASES, but in fact were not, are out of our interest. Our sample is pooled one, so we do not assign the special characteristics for enterprises besides their participation in Experiment. There were 93 ADCASES in which Ukrainian ferrous metal industry enterprises acted as defendants in antidumping investigations.

In our estimation of the model we employed the negative binomial (Quasi-Maximum Likelihood) estimation procedure with GLM robust standard errors and covariances (Greene, 2000). We also used fixed variance parameter equal to 2.12 according to the overdispersion found during the estimation procedure[24]. The results are in the Table 6.1:

[24] See Appendix 4

TABLE 6.1 ANTIDUMPING PETITIONS AGAINST UKRAINIAN STEEL-MAKING ENTERPRISES (1994-2002) (dependent variable is ADCASES)				
VARIABLE	Coefficient	Std. Error	Z-Statistic	p-value
D_EXPERIMENT	**0.525354**	**0.266581**	**1.970706**	**0.0488**
Constant term	-0.930819	0.186804	-4.982873	0.0000

As we can see, our "main" variable appears to be positive and statistically significant at 10% level. The very first conclusion that we can make from this particular regression output is that the percentage by which the expected number of antidumping investigations against enterprises increased followed their participation in Experiment is equal to $67\%\ (=\exp^{0.525354}-1)$, as we deal with dummy variable, which is not continuous.

However, the economic intuition as well as not very high significance of our tested variable allows us to ask a natural question: may be its expected sign and significance were caused by some other factors that have not been included into model? To answer this question we should consider those factors that in principle could affect the probability of issuing the antidumping cases against Ukrainian steel-making enterprises. According to the theory, the usual factors that should affect our dependent variable are price-cost margins, import penetration ratios, number of employees and average production wage in industry, ratios of the value of capital to shipments etc[25]. But, taking into account our data limitations (described in the previous chapter), we could only employ some, and not the very big, part of such possible determinants. However, we suppose that adding even

[25] See Krupp (1994) and TACIS (2001) for more discussion.

some of other possible explanatory variables will shed more light on the question of the dependence of antidumping petitions and Experiment.

Then, if we try to include other explanatory variables besides D_EXPERIMENT, we can not rely too much upon pooled sample of the enterprises; instead, we would like to employ Panel Poisson model, according to Greene (2000). For this purpose we adopted model used by Krupp(1994) in her approach to investigate the determinants of antidumping cases in the U.S. chemical industry.

Here we assume that our dependent variable has an exponential condition mean as follow: $f(n_{it}) = \exp(-\lambda_{it}) * \frac{\lambda_{it}}{n_{it}}$, where *n* represents the number of antidumping petitions, *i* represents the enterprise, *t* represents the time and λ represents the conditional mean. So, the expected number conditional to the values of the dependent variables appears to be the following: $E(n_{it} \mid X_{it}) = \lambda_{it} = \exp(X_{it}\beta)$, where X represents the matrix of observable variables influencing the probability of issuing the antidumping petition and β is the vector of parameters to be estimated.

The explanatory variables we include into our regression are the following:

$EXPORT_{it}$ - the value of exports of the *i*-th enterprise at time *t,* weighted by the ferrous metal producer price index, , in 2001 thousand hryvnas. The expected positivity of the sign of this variable does not need any comments;

MRKT - are market shares of the *i*-th enterprise at time *t* on the pipe, steel, coke, ferroalloys and enriched ore markets respectively, %'s. One should note that here we do not divide these variable into groups, as in the previous chapter. We expect the sign of this variable to be positive.

$EMPL_{it}$ - number of the employed by an enterprise, persons. This variable serves as a proxy for the size of an enterprise; therefore we expect the positivity of this sign again, as bigger enterprises are likely to expect to be involved into antidumping investigations.

$D\_EXPERIMENT_{it}$ - dummy variable that takes value 0 if *i-th* enterprise participated in the Experiment in time *t*, 0 otherwise.

In time dimension we have annual data from 1998 to 2001. Our sample consists of 17 steel-making and pipe enterprises that at least once were involved into ADCASES during these 4 years. The results of random effects Panel Poisson (Krupp(1994), Greene(2000)) estimation procedure are summarized below in table 6.2.

TABLE 6.2

ANTIDUMPING PETITIONS AGAINST

UKRAINIAN STEEL-MAKING ENTERPRISES (1998-2001)

(dependent variable is ADCASES)

VARIABLE	Coefficient	Std. Error	Z-Statistic	p-value
EXPORT	$1.11*10^{-7}$	$2.39*10^{-7}$	0.465	0.642
EMPL	$3.41*10^{-5}$	$2.09*10^{-5}$	1.631	0.103
MRKT	1.680452	1.545103	1.088	0.277
D_EXPERIMENT	**-0.662935**	**0.3528668**	**-0.188**	**0.851**
Constant term	-1.142836	0.3195081	-3.577	0.0000

As we can see, none of our potential explanatory variables is significant at 10%. There can be some reasons for that unexpected phenomenon. Firstly, as our variables themselves are the not best possible determinants of ADCASES, it is very likely that no one of them appear to be significant in reality. It is possible

that other variables as price-cost margin should explain the changes in ADCASES for the enterprises, but our data limitations do not allow us to conduct estimation under different specifications. Secondly, it might also be the problem of small sample, as we used only four years in time dimension. However, the variable of our interest, D_EXPERIMENT has very high p-value of z-statistic test, so it is very unlikely to be significant and, therefore, to serve as explanatory one.

The main conclusion coming from the last regression is that there was at least no general tendency of antidumping petitions against enterprises in the steel industry to be dependent on the enterprises' participation in the Economic Experiment. However, losses of some particular enterprises, such as of those two asked to leave the Experiment, can be sufficiently high, including direct losses in profits as well as indirect future losses of market shares (like potential future worsening of the reputation as of a reliable trade partner) relative to the others. Unfortunately, we could only suppose the last thing, because neither specification nor the data available to the author are not the best for showing this phenomenon directly. But according to our results of estimation we can definitely say that the "dumping issues" themselves were not the valid reason for stopping the Experiment and this discontinuation was caused more for the political reasons than for economic ones.

Chapter 7

CONCLUDING REMARKS.

The main empirical results of the present research are the following: the implementation of the Economic Experiment had positive influence on enterprise profits and revenues and didn't lead to an increase in the metric volumes of finished steel products in Ukrainian ferrous metal industry. Also, the Economic Experiment had negative influence on the enterprise profitability, but in our case such decrease in profitability could be interpreted as not only worsening of enterprises' incentives to make profits but also as indirect evidence of upgrade of the enterprise technologies. The latter statement is also supported by the time-growing pattern of selling price for the Ukrainian finished steel products over the last four years, as such behaviour of selling price can not be explained only by the increase in demand for the Ukrainian steel products. These results allow us to make the conclusion about the fulfilment of the primary aims of the Economic Experiment.

In addition, we showed that current 30% profit tax rate is supposed to be non-optimal for both the enterprises in ferrous metal industry and the government, and this tax rate seems to belong to the decreasing part of the Laffer curve for the ferrous metal industry. The optimal profit tax rate was found to be the one between 15% and 25%. Intuitively, one might expect the further implementation of governmental policies directed at taxation privileges for the ferrous metal industry enterprises. Nonetheless, the government is not free to impose continuos tax benefits for the particular industries due to political pressure form the side of representatives of other sectors of the economy. The latter statement is supported by the empirical results in Chapter 6 of the present

work, as we have found no general economic rationality in ceasing the Economic Experiment, at least, in 2002.

Another kind of caution regarding industrial policies like the Economic experiment is the ambiguous impact of this kind of policy on the enterprise profitability. The long-run effect of the Economic Experiment on enterprise profitability is much less clear, because continuous tax credits could create distortions in the incentives for the enterprises.

However, this study does not intend to go deeply into the issue of possible policy implications as the main idea of this paper is to testify the importance of governmental policy in Ukrainian ferrous metal industry. What we want to demonstrate here is the fact that the industrial policy in the form of Economic Experiment was consistent with its main targets and indeed led to the increase in financial stability of the enterprises in the industry.

Finally, we should also add some words about the potential shortcomings of the present research. First of all, the validity of the two assumptions made in Chapter 5 should be verified to assure the reliability of our conclusions about the impact of the Economic Experiment on the enterprise performance. Secondly, the data limitations and reliability should be taken into account. For example, it is worth employing another approach to the investigation of the effect of the Economic Experiment on steel production by separating participating enterprises from non-participating. Also, the effect of the Economic Experiment on the cost structure of the enterprises could shed light on the question of the effect on enterprise technologies etc. The quantitative researches in these spheres could be done by academicians having the data unavailable for us at present time. Nevertheless, we believe that this work is one not completely useless for the studying the role of government in transitional economies like Ukraine.

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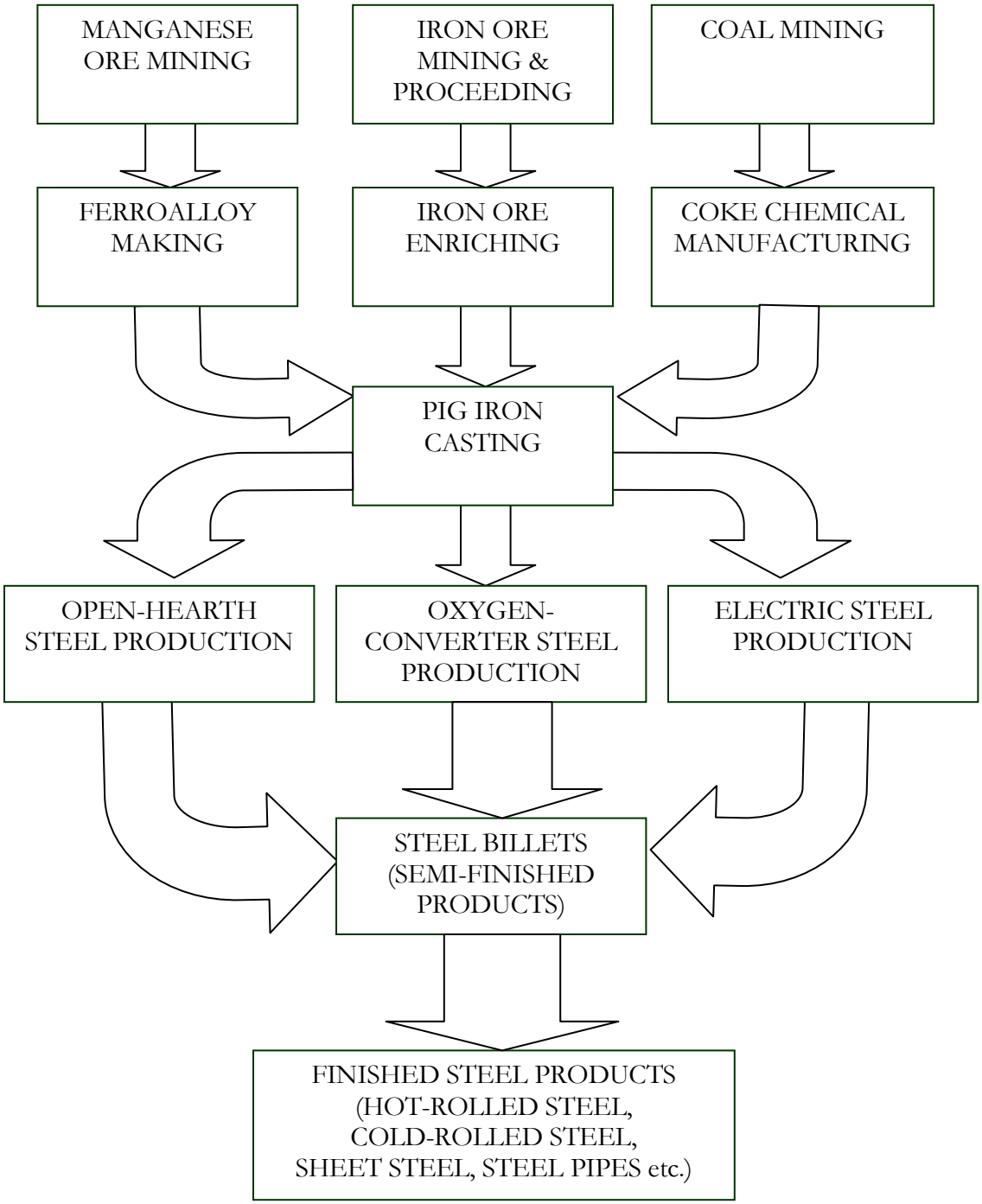
APPENDIX 1: THE INDUSTRY STRUCTURE



APPENDIX 2: THE HAUSMAN SPECIFICATION TEST FOR THE ESTIMATION OF DEMAND AND SUPPLY EQUATIONS.

TABLE A2.1

TESTING FOR SIMULTANEITY: FIRST STEP
(dependent variable is LOG(PRICE))

VARIABLE	Coefficient	Std. Error	t-Statistic	P-value
LOG(ELECTRIC)	0.508025	0.196032	2.591546	0.0131
LOG(WAGE)	-0.098915	0.128191	-0.771624	0.4447
DLOG(WARR)	0.041196	0.176185	0.233823	0.8163
LOG(ORE)	-0.029760	0.212913	-0.139775	0.8895
LOG(COKE)	-0.282088	0.198777	-1.419117	0.1632
LOG(INDP)	0.009938	0.402979	0.024660	0.9804
LOG(GDP)	-4.502644	5.625164	-0.800447	0.4280
LOG^2(GDP)	0.234644	0.294702	0.796209	0.4304
LOG(RUS)	8.181295	5.256648	1.556371	0.1271
LOG^2(RUS)	-0.481447	0.317100	-1.518282	0.1364
LOG(CHI)	-4.857443	3.932231	-1.235289	0.2236
LOG^2(CHI)	0.260346	0.211726	1.229639	0.2257
Constant term	13.54468	35.22313	0.384539	0.7025
D_EXPER	-1.568381	1.110702	-1.412063	0.1653
LOG(REER)	0.117035	0.114458	1.022512	0.3124
LOG(PRICE(-12))	-0.042843	0.117957	-0.363205	0.7183
D_EX*LOG(ORE)	-0.055804	0.201458	-0.277003	0.7831
D_EX*LOG(COKE)	0.400285	0.248207	1.612707	0.1143

TABLE A2.2

TESTING FOR SIMULTANEITY: SECOND STEP
(dependent variable is LOG(Q))

VARIABLE	Coefficient	Std. Error	t-Statistic	p-value
LOG(PRICE)	0.403353	0.240032	1.680418	0.0983
RESID	-0.073393	0.845308	-0.086824	0.9311
C	5.911335	1.102918	5.359725	0.0000

RESID variable here is the residuals from the regression A2.1. As we can see, coefficient on this variable appears to be highly insignificant; therefore we can not reject the hypothesis of no simultaneity in our supply-demand system of equations. So OLS is best specification because in this case it is unbiased and provides with efficient estimates.

APPENDIX 3: OLS *vs* TSLS ESTIMATION PROCEDURE (DEMAND FUNCTION).

TABLE A3.1

ESTIMATION OF DEMAND FUNCTION FOR UKRAINIAN STEEL

(dependent variable is log(Q))

LIST OF INSTRUMENTS: LOG(PRICE), LOG(INDPOD), LOG(RUS), LOG(GDP), LOG^2(GDP), LOG^2(RUS), LOG(ORE), LOG(COKE), LOG(ELECTRIC), D_EXP, D_EXP*LOG(ORE), D_EXP*LOG(COKE), D98, LOG(WAGE), DLOG(WARR)

VARIABLE	Coefficient (OLS)	p-value (OLS)	Coefficient (TSLS)	p-value (TSLS)
LOG(PRICE)	-0.434264	0.0001	-0.434264	0.0002
LOG(INDPROD)	1.348284	0.0002	1.348284	0.0002
LOG(RUS)	31.19370	0.0010	31.19370	0.0014
$(LOG(RUS))^2$	-1.833442	0.0013	-1.833442	0.0013
LOG(GDP)	16.28121	0.0658	16.28121	0.0659
$(LOG(GDP))^2$	-0.847971	0.0674	-0.847971	0.0686
$LOG(Q_{t-12})$	0.229968	0.0201	0.229968	0.0201
Constant term	-207.0653	0.0007	-207.0653	0.0012
Adjusted R-squared	*86.99%*	*P(White)*		*0.629214*
		P(Breush-Godfrey)		*0.212839*

We can see that OLS estimates remain unbiased and they are efficient as some of TSLS p-values are slightly bigger than TSLS ones.

APPENDIX 4: TESTING FOR OVERDISPERSION.

Comparing mean and standard deviation of the dependent variable ADCASES, we could suspect the presence of overdispersion. To test whether this is true or not we can use specification test for overdispersion proposed by Cameron and Trivedi (1990), a regression based test of the Poisson restriction: $v(x_i, \beta) = m(x_i, \beta)$ [26]. In our case the test regression takes the following form: $(\text{ADCASES-ADCASES\_F})^2 - \text{ADCASES} = \beta * \text{ADCASES\_F}^2$, where $ADCASES\_F_i$ are the forecasted values of our dependent variable. The results of this test regression are in the table below:

TABLE A4.1

TESTING FOR OVERDISPERSION

(dependent variable is $(\text{ADCASES-ADCASES\_F})^2 - \text{ADCASES}$)

VARIABLE	Coefficient	Std. Error	t-Statistic	p-value
ADCASES_F	2.120668	0.426203	4.975724	0.0000

The t-statistic of the coefficient is highly significant, so we can reject the Poisson restriction. In addition, the estimated coefficient is significantly positive, indicating overdispersion and $v = m(1 + 2.12m)$. In such case we should re-estimate the model, allowing for mean-variance inequality.

[26] This methodology is presented in Eviews 4.1 software.