M A S T E R T H E S I S

SUBJECT :

PRODUCTIVITY IN THE IRON AND STEEL COMPLEXES IN TURKEY : A COMPARISON

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		1976	1977	1978	1979	1980	1981	1982
LONG PRODUCTS	PRODN.	1.525,0	1.739,3	1.565,2	1.618,0	1.544,0	1.387,4	1.562,5
	CN.	1.840,0	2.088,0	1.728,6	1.787,0	1.717,0	1.382,1	1.253,0 (1.253,0)
FLAT PRODUCTS	PRODN.	938,0	668,4	706,7	718,1	742,7	726,0	853,9
	CN.	1.315,0	1.446,0	1.192,7	1.115,5	1.321,0	1.282,8	1.302,7
OTHERS	PRODN.	473,0	519,8	556,5	462,0	466,0	442,1	439,5
	CN.	629,0	629,5	621,4	533,0	515,0	511,6	547,4
TOTAL	PRODN.	2.936,0	2.927,5	2.828,4	2.798,1	2.752,7	2.555,5	2.855,9 (2.855,9)
	CN.	3.784,0	4.163,5	3.542,7	3.435,5	3.553,0	3.176,5	3.102,1 (3.102,1)

TABLE 4. EXPORT AND IMPORT OF FINAL PRODUCTS IN TURKEY[14]: (thousand tons)

		1976	1977	1978	1979	1980	1981	1982
LONG PRODUCTS	EXPORT	—	—	—	0,2	8,6	70,1	553,8
	IMPORT	170,7	347,2	238,2	160,9	122,5	112,3	101,4
FLAT PRODUCTS	EXPORT	—	—	2,1	5,7	5,7	45,2	129,4
	IMPORT	380,4	624,5	264,3	150,7	329,9	364,9	386,7
OTHERS	EXPORT	—	—	0,9	0,3	2,9	8,6	93,5
	IMPORT	491,1	1.548,8	926,6	659,7	564,2	910,1	1.056,4
TOTAL	EXPORT	—	—	3,0	6,2	17,2	123,9	776,7
	IMPORT	1.742,2	2.520,5	1.429,1	971,3	1.016,6	1.387,3	1.544,4

13) DPT, 1983b: 171
14) DPT, 1983b: 174

I. INTRODUCTION :

Iron and steel industry is of vital importance for developing countries since there is a close relationship between the increase in iron and steel consumption and GNP growth.Estabilishment of iron and steel industry prepares the base for the industrialization of the country or looking the other way round , as the industrialization of the country increases the need for the iron and steel industry increases.But the investment in this industry costs very much and it takes an important share from the limited investment funds of these countries. Turkey for example made 5 percent of her total investment to iron and steel industry during 1960's for the construction of Ereğli Iron and Steel Complex (ERDEMİR) although more than half of the investment requirement was obtained from other countries.

Once such an investment is made,getting the maximum return gains much importance.The value added in this sector is very high but the profitability is not.So,increasing the productivity gains importance from this aspect too.The capacity utilization in the iron and steel industry is about 55-60 percent on the average in Turkey today and in case full capacity utilization is reached the share of fixed costs may decrease by 50 percent.So productivity in this industry has great importance.

In this study the productivity levels of the three iron and steel complexes in Turkey are measured using four different criteria and the results are compared.

In the first section, the properties and the significance of the iron and steel industry from various aspects are analyzed.

In the second section,the structure of the iron and steel industry in the world,the production and consumption levels,the crisis in this sector in the last decade,and the problems of the developing countries are explained.

The third section covers the iron and steel industry in Turkey.A short hist

of this industry in Turkey is given in this section.The production,consumption , export,import levels are given and the projections made for this sector are analzed and finally the effects of the worldwide crisis in this sector on Turkish Iron and Steel Industry is argued.

In the fifth section,the integrated iron and steel complexes are introduced, the stages of production,the four basic production units within the complexes are and the production procedures within these units are explained.

The fifth section covers the major approaches to the productivity problem is compared and the productivity criteria that will be used in the study are introduced and their properties are explained.

In the sixth and last section, the productivity levels of the four production units of each iron and steel complex are measured for the period 1976-1982 using the four different criteria.The results are compared in this section, too, and the conditions of the three complexes are evaluated.

II. THE PROPERTIES AND THE SIGNIFICANCE OF IRON AND STEEL INDUSTRY :

Iron and steel production is realized mainly in three stages.In the first stage iron ore is refined and pig iron is produced out of this refined iron. Secondly,the pig iron produced in the previous stage is processed and steel is produced.In the final stage the iron and steel produced is given shape and the final products are obtained.

Iron and steel industry,together with some other basic industries such as chemical industry and machinery industry constitutes the infrastructure of the industrial sector of a country.There is a close relationship between the increase in iron and steel consumption and GNP growth.Especially in developing countries, iron and steel consumption grows faster than per capita industrial production and GNP.The income elasticity of iron and steel industry in these countries is higher than in developed countries.

The main properties of the iron and steel industry may be summarized under the following points :

- The forward and backward linkages of the iron and steel industry is very strong.

The iron and steel industry is in such a critical position that it can highly influence the rest of the industry since its products are extensively used in other sectors,and since iron and steel industry itself is an important consumer. The forward and backward linkages of this industry may be obtained from input-output tables.According to the results of a study[1] made on Turkey, iron and steel industry is the sixth sector with highest backward linkage coefficient in 1973 and the second sector with highest forward linkage coefficient.

The considerably high backward linkage means that iron and steel industry is highly dependant on the inputs which will be supplied by other sectors.This

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1) KORUM, 1977 : 73

property also gives the power to effect the rest of the economy through the demand for inputs.

The forward linkage of iron and steel industry is even more stronger and this implies a very important power to influence the whole economy since the performance of the rest of the industry is determined by the nature of this sector to a great extent.This strong forward linkage makes the iron and steel industry very sensitive to general demand conditions and fluctuations in the economy.

- The iron and steel industry necessitates a developed infrastructure.

Production of one ton steel requires the transportation of 3-4 tons of iron ore,coal and other raw materials.Additionally,production of one ton steel is equivalent to one ton final product which should also be transported.In other words production of one million tons of final product necessitates an infrastructure and organization for a transportation of about 5 million tons totally.

- The iron and steel industry uses capital intensive technology.

Production capacity of one ton steel necessitates an investment of about 2000-2500 dollars depending on the technology and the scale of production.The minimum optimum production scale on the other hand is accepted to be 3 million tons[2] which means that to establish an iron and steel complex with a minimum optimum scale requires an investment of about 6 billion dollars at least.50 to 70 percent of this investment is composed of capital goods.

- The iron and steel industry is highly dependant on new technology and know-how.

The production scale is very high in this industry and the levels of inputs used is very high as a result of this.So even minor improvements in the technology adds much to the productivity.This property forces to create new technology and as a result of this the minimum efficient production capacity has increased to 3 million tons yearly from 1 million tons in the last decade.

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2) TAN, 1983 : 34-35

- The iron and steel industry is a very important energy consumer.

12 percent of the total energy demand comes from the iron and steel industry and this is consumed in the form of coal,electricity and fuel.There is also a continuous effort to reduce the energy need and improve the productivity in the sector.

- The iron and steel industry has a significant share in the GNP of most economies.

The value added is high in this sector.In developed countries the share of the iron and steel industry is about 2-5 percent.This share amounts to 6-8 percent in those countries which are newly developing thier iron and steel industries.

-The iron and steel industry has a very important share in the world economy and trade.

Every year more than 700 million tons of iron and steel and related raw materials costing 200 billion dollars is subject to international trade .

Today the amount of production of iron and steel per person constitutes an important and common criterion to measure the level of development of a country. A country that produces 400 kgs. or more iron and steel per person yearly is usually accepted as developed.

Depending on this critical role of iron and steel industry on the whole economy,all the developing countries are trying to estabilish their own iron and steel industry disregarding its high cost.The developed countries on the other hand are in a continuous attempt to develop their technology to improve the productivity and to overcome the prevailing crisis in this sector.

As a result of these the geography of production and the technology in the sector changes continuously.

III. IRON AND STEEL INDUSTRY IN THE WORLD :

The iron and steel industry has changed to a great extent in the last 30 years from many aspects.Upto 1950 USA supplied 60 percent of the total world demand,but during 1970's USSR overpassed USA in steel production.Japan also showed an impressive performance during 1955-75 period and increased her steel production capacity to 140 million tons and most of this capacity is used to make export.

An important change in the iron and steel sector during 1960's was that the developed countries started to encourage the estabilishment of iron and steel industry in the developing countries.During this period the developed countries increased their attempts to create new technology and aimed to keep their control on the sector by technological superiority and by producing more specialized and qualified products[3].

This new strategy of the developed countries encouraged the estabilishment of iron and steel industry to a great extent.In 1950,50 countries had their own iron and steel industry and in 1975 this number had increased to 68.As a result of this the steel production of the developing countries increased by 9.2 percent on the average during 1965-1974 period (see table 1),whereas the world production increased only by 5.0 percent during this period.It is estimated that the rate of growth of the iron and steel industry will keep its high level until 1985 in the developing countries[4].

One important point about the iron and steel industries of the developing countries is that they are working at very low scales of production and with old technologies which means an unproductive and high cost production.Developed countries on the other hand improve their technology continuously and the production scales increase parallelly.

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3) KEYDER ,1976 : 30
4) ÇELEBİ ,1979 : 10-11

TABLE 1. GROWTH RATES OF WORLD STEEL PRODUCTION AND CONSUMPTION[5]:

	1965-1974		1974-1985	
	CONSUMPTION	PRODUCTION	CONSUMPTION	PRODUCTION
WEST EUROPE	4.1	4.1	2.7	2.2
EEC	3.7	3.5	2.3	1.7
OTHERS	5.5	7.8	3.9	4.6
EAST EUROPE	5.8	6.2	4.2	4.0
USSR	5.2	4.6	3.1	3.4
NORTH AMERICA	1.6	1.2	2.5	2.0
USA	1.3	0.9	2.4	2.0
CANADA	4.4	4.6	2.8	2.0
JAPAN	11.5	12.3	3.6	3.7
DEVELOPED COUNTRIES	4.4	4.6	3.0	2.8
CHINA	11.5	9.2	6.7	7.5
AFRICA	9.5	17.7	6.5	23.3
ASIA	9.1	8.7	7.7	11.2
LATIN AMERICA	11.0	9.2	8.2	11.2
DEVELOPING COUNTRIES	9.9	9.2	7.8	12.0
WORLD TOTAL	5.1	5.0	3.8	3.8

In addition to these,the developing countries are still the main iron and steel importers in the world,although they achieved considerable improvements in steel production in the last two decades.Developing countries import most of their raw material and intermediate input requirement as well as high quality steel from developed countries.The reasons for these are as follows: first of all 90 percent of the world's coke reserves are in developed countries and coke is a basic input in steel production.Secondly ,during 1960's small scale rolling mills were extensively estabilished in developing countries which was not rational at all since these production units were not productive due to their low production capac and since these production units produce only final products and this creates the need of imported intermediate inputs[6].Lastly,the import of high quality steel

5)ÇELEBİ -1980 : 27

6) ÇELEBİ , 1979 : 168

is due to the technological superiority of the developed countries.

World steel production is about 700 million tons yearly.75 percent of this production is made by the developed countries.USA,Japan and EEC produces half of the total world production and USSR is the biggest producer individually (see table 2). The gap between the developed and the underdeveloped countries in steel production is still very big.According to 1980 data ,the 2.7 billion person living in underdeveloped and developing countries produces 25 percent of the total world steel production whereas a population of 1.1 billion people living in developed countries produces 75 percent of world steel.

The economic crisis in the world ecenomy which started with the increase in oil prices in 1973 effected iron and steel industry deeply.Since the iron and steel industry is highly interrelated with other industries and since it is a big energy consumer,the general economic crisis hit the iron and steel industry from both sides.On the one hand the demand for the products of the sector decreased and on the other hand the costs increased sharply due to the increase in energy prices.

As a result of these negative effects,production is decreased in the sector, inventories have piled up to very critical levels and the prices in the international markets have decreased dramatically.Governments have taken various measures to protect their iron and steel industries[7]. The import of iron and steel products is forbidden totally or permitted only within certain quotas.The governments also give direct subsidy to this industry to compensate the decreases in the world export market prices of steel.

The crisis has reached its top in 1980-1982 period and the price of one ton steel which was 350 dollars in 1979 has decreased to 200 dollars.The American and European steel industries are depressed mostly from the crisis and a hard competition has started between Japan,USA and EEC.The subsidies in EEC amounted

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7) DPT, 1983a: 5

TABLE 2. WORLD STEEL PRODUCTION AND CONSUMPTION[8] (million tons)

	Prodn	Co.	Prodn	Co.	Prodn	Co.	Prodn	Co.	Prodn.	Co.	Prodn	Co.	Prodn	Co.	Prodn.	Co.
	1982		1981		1980		1979		1978		1977		1976		1975	
USSR + E. EUROPE	204.0	204.0	206.1	203.0	209.2	207.0	209.4	213.4	211.1	214.2	204.3	207.9	199.0	200.9	192.6	195.0
JAPAN	99.5	78.6	101.7	72.3	111.4	78.8	111.7	78.5	102.1	67.9	102.4	65.1	107.4	65.2	102.3	67.6
U.S.A.	65.7	98.9	109.6	128.2	101.5	118.4	123.3	143.2	124.3	146.4	113.7	138.5	116.1	127.8	105.8	113.7
CHINA	42.8	42.8	41.1	46.5	42.9	43.0	34.5	48.7	31.8	42.9	23.7	34.2	21.0	29.9	26.0	34.0
W. GERMANY	35.9	30.6	41.6	33.8	43.8	35.4	46.0	37.2	41.3	33.8	39.0	33.9	42.4	36.2	40.4	31.7
ITALY	24.0	21.0	24.8	21.2	26.5	25.6	26.3	23.2	24.3	19.3	23.3	20.6	23.5	21.1	21.9	17.5
FRANCE	18.4	17.9	21.3	18.0	23.2	20.0	23.4	21.1	22.8	20.0	22.1	20.2	23.2	23.1	21.5	19.7
ENGLAND	13.8	K.0	15.6	15.2	11.3	15.1	21.5	20.5	20.4	20.0	20.5	20.0	22.3	21.3	19.8	20.6
BELGIUM+ LUX.	13.4	3.1	16.1	3.0	16.9	3.4	18.3	4.5	17.4	4.2	15.6	4.2	16.7	4.3	16.2	3.6
SPAIN	13.2	8.4	12.9	8.4	12.7	8.6	12.2	8.0	11.3	8.4	11.2	10.1	11.0	10.0	11.1	10.0
BRASIL	13.0	12.3	13.2	12.4	15.4	14.6	13.9	13.3	12.2	12.4	11.3	12.0	9.3	10.6	8.4	11.4
CANADA	11.9	11.5	14.8	14.4	15.9	13.8	16.1	14.9	14.9	13.6	13.6	12.8	13.3	12.6	13.0	13.0
S. KOREA	11.8	7.7	10.8	7.5	8.6	6.1	7.6	7.5	5.0	7.0	4.3	5.7	3.5	4.1	2.0	3.0
INDIA	11.0	13.8	10.8	12.8	9.5	10.9	10.1	11.7	10.1	10.1	10.0	10.2	9.4	8.1	8.0	7.3
HOLLAND	4.3	4.2	5.4	4.1	5.3	4.6	5.8	4.2	5.6	4.5	4.9	4.6	5.2	4.7	4.8	4.6
AUSTRIA	4.3	2.5	4.6	2.5	4.6	2.7	4.9	3.0	4.3	3.0	4.1	2.8	4.5	2.8	4.1	2.2
YUGOSLAVIA	3.9	6.6	4.0	6.2	3.6	5.7	3.5	5.5	3.5	5.4	3.2	5.2	2.8	4.1	2.9	5.3
SWEDEN	3.8	4.0	3.8	4.0	4.2	4.2	4.7	4.3	4.3	4.0	4.0	4.0	5.1	5.4	5.6	5.7
TURKEY	2.9	3.1	2.6	3.2	2.8	3.6	2.4	3.5	2.2	3.6	1.9	4.4	1.9	4.0	1.8	3.0
ARGENTINA	2.9	2.3	2.6	2.5	2.7	3.2	3.2	4.2	2.8	3.2	2.7	3.9	2.4	3.2	2.2	4.7
FINLAND	2.4	2.1	2.4	1.9	2.5	2.2	2.5	1.8	2.3	1.5	2.2	1.5	1.6	1.8	1.6	2.0
OTHER	40.8	83.1	42.1	86.0	41.8	86.2	48.2	78.5	43.0	75.8	37.4	71.5	34.8	68.2	33.6	62.5
WORLD TOTAL	643.7	671.5	707.9	707.1	716.3	719.1	747.5	750.7	717.0	726.2	675.4	693.3	676.4	669.4	645.6	643.1
CHANGE (%)	-9.1	-5.0	-1.2	-1.7	-4.6	-3.9	4.3	3.4	6.2	4.7	-0.1	3.6	4.8	4.1		

8) IISI, 1983 : 12

to 130 dollars per ton and the total bill was about 60 billion DM.The capacity utilization decreased below 40 percent in 1982 and the steel producers lost 100 dollars per ton in USA.The big challanger Japan is also in a difficult position and is planning to subsidize her steel industry, too, starting from 1983[9].

Most of the developed countries tend to produce and specialize on more qualified special to employ new technology and to overcome the decrease in the prices in international market.

In 1990 the world steel production is estimated to be 1 billion tons,the production capacity of the developed western countries is estimated to stay fixed whereas,the capacity of East European countries is expected to increase by 3 percent and the developing countries by 8.5 percent.[10]

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9) DPT,1983a: 5

10) METAL BULLETIN, 1980 : 61

IV. IRON AND STEEL INDUSTRY IN TURKEY :

Turkey is one of the first developing country that has estabilished her iron and steel industry.The attempts to estabilish the iron and steel industry has started in late 1920's.In 1932 Kırıkkale Steel Factory started production with 20.000 ton/year capacity.This factory was constructed by Germany and its major product was heavy weapons.The Kırıkkale Steel Factory had a small scale of production but still it functioned as a school and also contributed much to the extension of the country's railway network during 1930's.The production capacity of this factory was increased to 40.000 ton/year in 1957,to 60.000 ton/year in 1960 and lastly to 78.000 ton/year in 1979.

Kırıkkale Steel Factory has specialized on more qualified products after Karabük Iron and Steel Complex started production and produced equipments for cement and textile industry, The variety in its products has increased even more following the extension in its capacity in 1979 and it started producing high quality pipes.

The capacity of Kırıkkale Steel Factory became insufficient after a few years and the attempts to estabilish a new and more developed steel factory has started.Discovery of the iron ore in Divriği has played an important role in this decision too. In 1938,within the context of the First Five Year Industrialization Plan the construction of the first integrated steel complex of Turkey has started in Karabük.The placement of the complex was not suitable since it was 100 kms. far from seashore which made the complex totally dependant on land transport,but national defence considerations led to such a decision.

Turkey managed to get advantage from the competition between Germany and England to finance the project.[11] The complex is constructed by the English Brassert Company and a credit of 16 million sterling is provided by the English Government. The complex started production in 1939 partially.The production capacity of Karabük Integrated Iron and Steel Complex was 150.000 ton/year steel.

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11) YILDIRIM,1982 : 38

The English firm ran the complex for the first 1.5 year since Turkey did not have the necessary technical staff by then.The complex did not work very productively during 1940's,but still Turkey was able to overcome the great depression of 1930's and the Second World War with the least harm possible depending on her self-sufficient industrial structure.

In 1944,estabilishment of a second iron and steel complex was decided in Ereğli.Turkey demanded technical and financial aid from USA,but USA had totally different plans for the development route of Turkey.The American expert M.W. Thornburg who was sent by the American Government to Turkey in 1945 said in his report that to construct a new iron and steel complex would be meaningless.He also recommended to close the Karabük Iron and Steel Complex[12].As a result of this report,American Government refused to give any technical or financial aid for the project.

Starting from 1952,the increase in the growth rate of construction sector and industry in general,together with Korean War caused an increase in iron and steel demand,and the inventories decreased sharply.As a result of this extension of the Karabük complex was reviewed once more and the capacity of the complex was increased to 600.000 ton/year during 1958-1962 with the German technical aid. A new extension project is being carried out since 1972 in this complex which will increase the capacity to 900.000 ton/year.

The second iron and steel complex of Turkey is ERDEMİR which is estabilished in Ereğli.This complex is built by the financial and technical cooperation with USA. 60's was an era which the developed countries changed their strategy and encouraged import substitution in developing countries. USA's cooperation during the estabilishment of ERDEMİR may be considered within this context.

ERDEMİR was a different case in terms of its capital composition and its administration model than Karabük complex.Fifty one percent of the capital was provided by the public sector and the rest was provided by the private sector. Thirty percent of the private sector's share was owned by an American consortium

12) CELEBİ,1979 : 56

which performed the estabilishment of the complex.

According to the agreements made during the estabilishment, ERDEMİR is run like a private enterprise, independant from public sector and SEE's administrative model although more than half of the capital is owned by public. Later on the shares which were owned by the American firms are bought by the public sector and total share of public sector increased to 70 percent.

ERDEMİR started production in 1965 with a capacity of 378.000 ton/year. The complex produced flat products mainly and these products were the inputs of the newly developing manufacturing industry. After a few years from its estabilishment, ERDEMİR was unable to satisfy the demand and the attempts to extend the capacity started and the capacity increased to 1.5 million ton/year in two stages.

The iron and steel demand in Turkey increased much more fastly than estimated during late 60's and early 70's and domestic production was far from being satisfactory. As a result of this, contacts for the estabilishment of a third iron and steel complex started in 1967 with USSR. The construction of the complex started in 1970 in İskenderun. The production in the complex started in 1976 partially, with a capacity of 1 million ton/year. The construction period of this complex has taken too long and the capacity utilization could not be increased due to various administrative and technical defaults.

In addition to these three iron and steel complexes, there are many small scale production units belonging to private sector. These are mostly estabilished during late 50's and 60's. They produce final products only using the intermediate products produced in the iron and steel complexes or imported. But the capacities of these production units are very low in general and this prevents productive production. Also they do not use their production capacity fully. The production capacity of these production units amounts up to 1.140.000 ton/year whereas the production stays about 500.000 ton/year.

An important amount of Turkey's iron and steel demand is met by import and the extention activities in the existing estabilishments is continuing. In addition to these

addition to these a new iron and steel complex is planned to be estabilisned in Sivas and 405 million TL. is spent for this project between 1976 and 1981 but in 1981 the project is posphoned temporarily together with some other investment projects.

The iron and steel complexes existing in Turkey differ as to their final products.KARABÜK and İSDEMİR produce the so-called long products which are mainly used in construction sector and to some extent in railway construction.ERDEMİR on the other hand produces flat products and these are used in the manufacturing industry mainly.

The steel production capacity of the three main plants is 3.2 million tons per year,the production on the other hand in 1982 including the production made by the other production units too is 2,84 million tons. The production and consumption levels shown on table 3 show that there is excess production in long products since 1980.This basicly due to the sharp decrease in the demand which is because of the deep crisis prevailing in the construction sector since 1980. The flat products production on the other hand cannot satisfy the demand and this is not something new.Flat products are the basic inputs of the manufacturing industry and there is excess demand for flat products since mid 70's.The excess demand for flat products is satisfied by imports (see table 4) and imports of flat products consists the most important part of Turkey's total iron and steel import,if we do not take raw material imports into account.

The excess supply in long products on the other hand has increased the inventories to very critical and expensive levels especially after 1981 and this forced the export alternative to be taken seriously starting from 1981.As a matter of fact iron and steel industry achieved a sharp increase in iron and steel exports in 1981 and 1982,and a great portion of these exports was composed of long products.

But the export prices in international markets is extraordinarily low due

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TOTAL	PRODN.	2.936,0	2.927,5	2.828,4	2.798,1	2.752,7	2.555,5	2.855,9 (2.855,9)
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FLAT PRODUCTS	EXPORT	—	—	2,1	5,7	5,7	45,2	129,4
	IMPORT	380,4	624,5	264,3	150,7	329,9	364,9	386,7
OTHERS	EXPORT	—	—	0,9	0,3	2,9	8,6	93,5
	IMPORT	491,1	1.548,8	926,6	659,7	564,2	910,1	1.056,4
TOTAL	EXPORT	—	—	3,0	6,2	17,2	123,9	776,7
	IMPORT	1.742,2	2.520,5	1.429,1	971,3	1.016,6	1.387,3	1.544,4

13) DPT, 1983b: 171
14) DPT. 1983b: 174

to the crisis in the sector and all the governments are subsidizing iron and steel exports amounting to 150 dollars per ton.As a result of this,the exports realized in last two years resulted with losses although the government has given high subsidies.The rate of subsidy in the export prices amounts to 80 percent in developed countries whereas this rate is about 45-50 percent in Turkey.The export of iron and steel industry is not expected to increase considerably,since the domestic demand will highly exceed production in near future[15]. The demand for iron and steel products increases two times faster than the GNP growth on the average.The demand projections which is based on such a relationship can be seen on table 5.It is assumed that the GNP growth during the related period will be 5 percent on the average.

The demand levels projected show obviously that the production level and the production capacity should be increased fastly.The investment levels on the other hand are discouraging.Total investment made in the iron and steel industry was 0.85 percent of the GNP in 1978 and this ratio has decreased to 0.26 percent in 1982.This means that new production capacity will not be created in the short run.Then the increasing demand must be satisfied by increasing capacity utilization or by imports.As a result of these an increase in the productivity of the existing capacity gains much importance.

Another important point that necessitates an increase in the productivity is the increase in the costs of the industry.The demand especially for the long products is low and the prices of the main inputs increases continuously.These factors cause an increase in the unit costs of the industry.But an increase in the prices of the products obviously,deepens the crisis since iron and and steel products are the main inputs of the industry and such an increase in prices starts a chain reaction.So the increase in the costs of the iron and steel industry should be compensated by the increase in the productivity.

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15) DPT,1983a: 70-72

TABLE 5. FINAL PRODUCT DEMAND PROJECTIONS FOR TURKEY[16] (thousand tons)

	1983	1984	1985	1986	1987	1988	1993
LONG PRODUCTS	2.146,0	2.284,0	2.428,0	2.580,0	2.740,0	2.907,0	3.983,
FLAT PRODUCTS	1.221,2	1.327,4	1.607,0	1.775,0	1.994,0	2.250,0	3,537,
TOTAL*	3.367,2	3.611,4	4.035,0	4.355,0	4.734,0	5,157,0	7.520,

* - Does not include other products.

16) DPT, 1983 a : 70-72

V. THE INTEGRATED IRON AND STEEL COMPLEXES :

Technological developments in the iron and steel industry leads to continuous change in the sector. Even minor improvements in the productivity provides high benefits since the production and relatedly the input level is very high. Vertical integration and the increase in the production scale are the two major technological change axis in the sector.The increase in the production scale increases the labor productivity.Vertical integration on the other hand leads to higher input productivity and to a decrease in other costs such as transportation.

Integrated iron and steel complexes are the basic production units of this industry.These integrated plants are composed of 4 basic units. These are the Coke Factory,Furnace,Steel Producing Unit and Rolling Mill.

V.1. THE COKE FACTORY :

Coke is a vitally important input for the iron and steel production.High temperature is a basic need during the production process and coke is the most sufficient source for this due to its high calory and its other chemical properties.

The kind of coke that is used in iron and steel production is obtained by processing the high quality cokeable coal.During this process which is performed in the coke factory,high quality coal is purified and prepared for the usage in the following stages of the production.The basic input of this unit of the complex is cokeable coal and the basic output is coke and coke powder.

V.2. THE FURNACE :

At this stage of production iron ore is purified and fluid pig iron is produced.The iron ore is melted in this unit at high temperature ,its oxygen is let out and some scrap iron is added too.The purified fluid iron obtained at this production unit is either directly sent to the steel production unit or casted . The basic inputs of this production unit is iron ore,scrap iron and coke.The basic outputs on the other hand are fluid iron and casted iron.

V.3. STEEL PRODUCING UNIT :

The pig iron produced in the previous stage is transferred to this unit and here the levels of C,Si,P and S elements in the iron are brought to the appropriate levels through various manipulations and also some other alloys are added to the pig iron.The basic procedure in steel production is as such but there are a number of different technologies to realize this.The basic ones are:

1)Bassemer procedure,

2)Thomas procedure,

3)Siemens-Martin procedure,

4)Electricity Arc Furnace procedure,

5)LD convertors procedure,

Siemens-Martin procedure has been the most popular technology until mid-60's.But later the LD convertors procedure started to be employed extensively and this procedure is accepted to be the most productive technology currently[17]. KARABÜK iron and steel complex works with Siemens-Martin technology whereas, ERDEMİR and İSDEMİR works with LD convertors technology.

The fluid pig steel with the required qualifications obtained in this unit is either casted into big molds to be processed once more or directly passed to the continuous casting unit. In the continuous casting unit the pig steel is given different shapes with certain dimensions.İSDEMİR works with continuous casting system totally which saves time and energy,whereas ERDEMİR works partially with this system.In KARABÜK on the other hand fluid pig steel is casted into big molds and cooled.After this stage the casted steel is melted again and sent to the rolling mill which is the last stage of the production.

The main inputs of the steel producing unit are fluid pig iron and energy (in the form of electricity and coke gas).The main outputs are casted steel and scrap steel.

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17) ÇELEBİ,1979 : 28

V.4. ROLLING MILL :

The last stage of the iron and steel production is performed in this unit. The products received from the steel producing unit are given their final shapes at this stage.The products are classified into two main groups namely long and flat products.Long products in general,are used in construction sector and building railway network.The flat products on the other hand are extensively used in manufacturing sector such as automobile production and durables production.

VI. PRODUCTIVITY IN IRON AND STEEL INDUSTRY :

Productivity in iron and steel industry is usually defined as the relationship between the steel products and inputs such as labor,equipment and energy.In other words productivity is the effigyency achieved during the transformation of these inputs into steel product.

Productivity criteria may be used as production productivity and economic productivity.If the statistical data that is used is in physical terms or expressed in real terms,the productivity criteria shows production productivity.On the other hand if the output values are expressed in terms of their selling prices then this is called economic productivity.

The economic productivity criteria includes the fluctuations in the market, the subsidies given by the government and other external factors and this prevents the determination of real productivity levels.Economic productivity criteria does not also let international comparisons since the relative prices,exchange rates are different and change continuously.In this study production productivity criteria is used to make the comparison between the three plants.

Productivity in general reminds labor productivity first.This is because , the concept of productivity has emerged in the industrialized western countries. In these countries labor is the scarce resource and is measured more easily compared to other production factors.So labor is the most sufficient criteria to make comparisons between firms and countries.But,in the developing countries,capital is the scarce resource and so maximizing the output is the target in/after making the investment.In other words maximization of the value added/capital ratio is the basic aim.This aim can be realized by minimizing the specific investment cost or by increasing the productivity of the production unit.

There are basicly 4 criteria that is used to determine the productivity levels in iron and steel industry.These are: labor productivity,raw material productivity,energy productivity and production unit productivity[18].

18) MPM , 1981 : 212 -215

demand and iron and steel industry consumes 16 percent of the total energy consumption.The share of iron and steel industry's energy consumption in total industry's consumption is 35 percent and these shares give an idea about the vitality of energy productivity.[19]

The share of energy cost in total cost in iron and steel industry has increased to 25 percent from 18 percent due to the increases in energy prices in the recent years.So a decrease in energy consumption or an increase in energy productivity will add much to the total productivity.

A problem in calculating the total energy consumption is that data about the electricity and fuel oil consumption of the three complexes was not available, so we could calculate the energy productivity only for the furnace since the basic energy source of this unit is coke and data about the coke consumption is available.

VI.4. PRODUCTIVITY OF THE PRODUCTION UNIT :

As mentioned before maximization of output given the capital is more crucial for developing countries rather than labor productivity,since capital is a scarce resource for these countries and this limited capital should be used in the most productive way possible.

To measure the productivity of the production unit,the capacity utilization and time productivity which is a ratio between the total time worked and the time to be worked according to the project.

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19) TAN, 1983 : 113

VII. PRODUCTIVITY IN KARABÜK , ERDEMİR AND İSDEMİR :

In this section productivity levels of the four production units of each complex will be listed according to the four different productivity criteria and the results will be compared.

VII.1. PRODUCTIVITY IN COKE FACTORIES :

VII.1.1. LABOR PRODUCTIVITY IN COKE FACTORIES :

Labor productivity results of the three coke factories within the integrated complexes are given in table 6 and figure 1.

ERDEMİR Coke Factory shows a very high and continuous productivity compared to the other two coke factories.The labor productivity shows a continuous increase too which is basicly due to the decrease in the employment level.The superiority of ERDEMİR Coke Factory is due to the new technology and also due to the low employment level.

KARABÜK Coke Factory on the other hand shows a stable and considerably high labor productivity although lower than ERDEMİR.

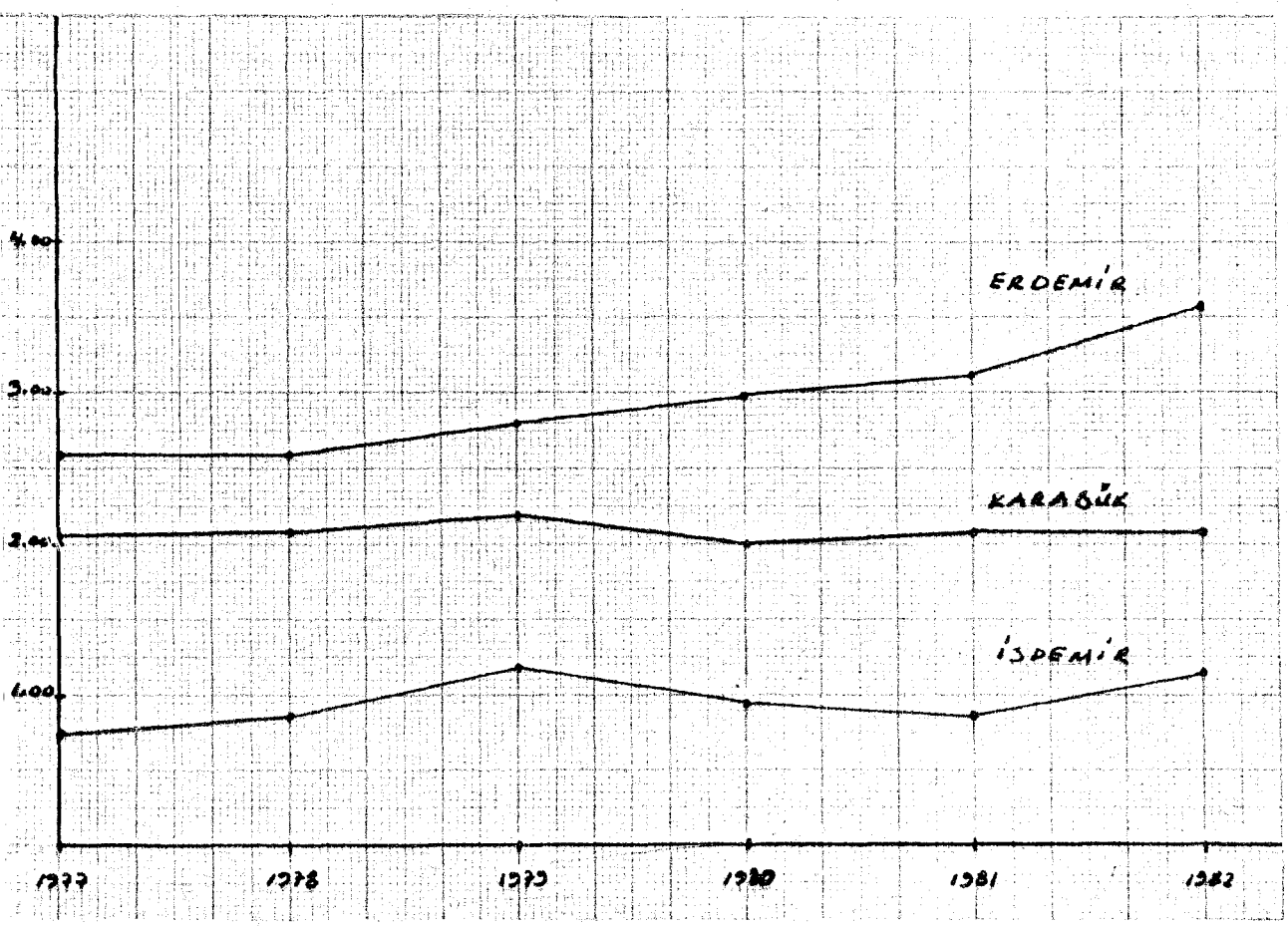
İSDEMİR Coke Factory has a very low labor productivity compared to the other coke factories.This is due to the overemployment in İSDEMİR Coke Factory.The production capacity of this coke factory is equal to the production capacity of ERDEMİR Coke Factory but the employment level of İSDEMİR Coke Factory is 2.5 times higher than ERDEMİR Coke Factory.As it will be seen later,overemployment has been a chronic problem of İSDEMİR.

The continuous increase observed in the labor productivities of the three coke factories is mainly due to the persistent decrease in the employment levels especially after 1980.

TABLE 6. LABOR PRODUCTIVITY IN COKE FACTORIES : (output / w)

	1977	1978	1979	1980	1981	1982
ERDEMİR	2.380	2.302	2.827	2.996	3.126	3.580
İSDEMİR	0.743	0.874	1.190	0.969	0.889	1.143
KARABÜK	2.061	2.098	2.212	2.012	2.091	2.092

FIGURE 1. LABOR PRODUCTIVITY IN COKE FACTORIES :



VII.1.2. RAW MATERIAL PRODUCTIVITY IN COKE FACTORIES :

The raw material productivity results are given in table 7 and figure 2.

It is observed that the raw aterial productivity in the coke factories of KARABÜK and İSKENDERUN fluctuates between 70 and 75 percent.The slight decrease in the productivity of KARABİK Coke Factory is probably due to the depreciation of the complex[20]. The sharp increases in the productivity of İSDEMİR Coke Factory observed in 1977 and 1980 is due to the increase in the share of imported high quality coal in total coal consumption in these years.

ERDEMİR Coke Factory on the other hand has a slightly lower raw material productivity and this is because this factory uses a mix of high quality imported coal with low quality non-cokeable domestic coal.The slight increase in raw material productivity of this factory in 1982 is due to the increase in the share of imported coal in this mix.

The usage of low quality domestic coal in ERDEMİR Coke Factory should be appreciated since the known coal reserves of Turkey is being exhausted gradually and the quality is decreasing continuously.So Turkey may be totally import dependant if these low quality coal is not used.

VII.1.3. ENERGY PRODUCTIVİTY IN COKE FACTORIES :

The basic energy source used in the coke factories is electricity and data about the electricity consumption levels of these production units was not available,so the energy productivities could not be calculated.

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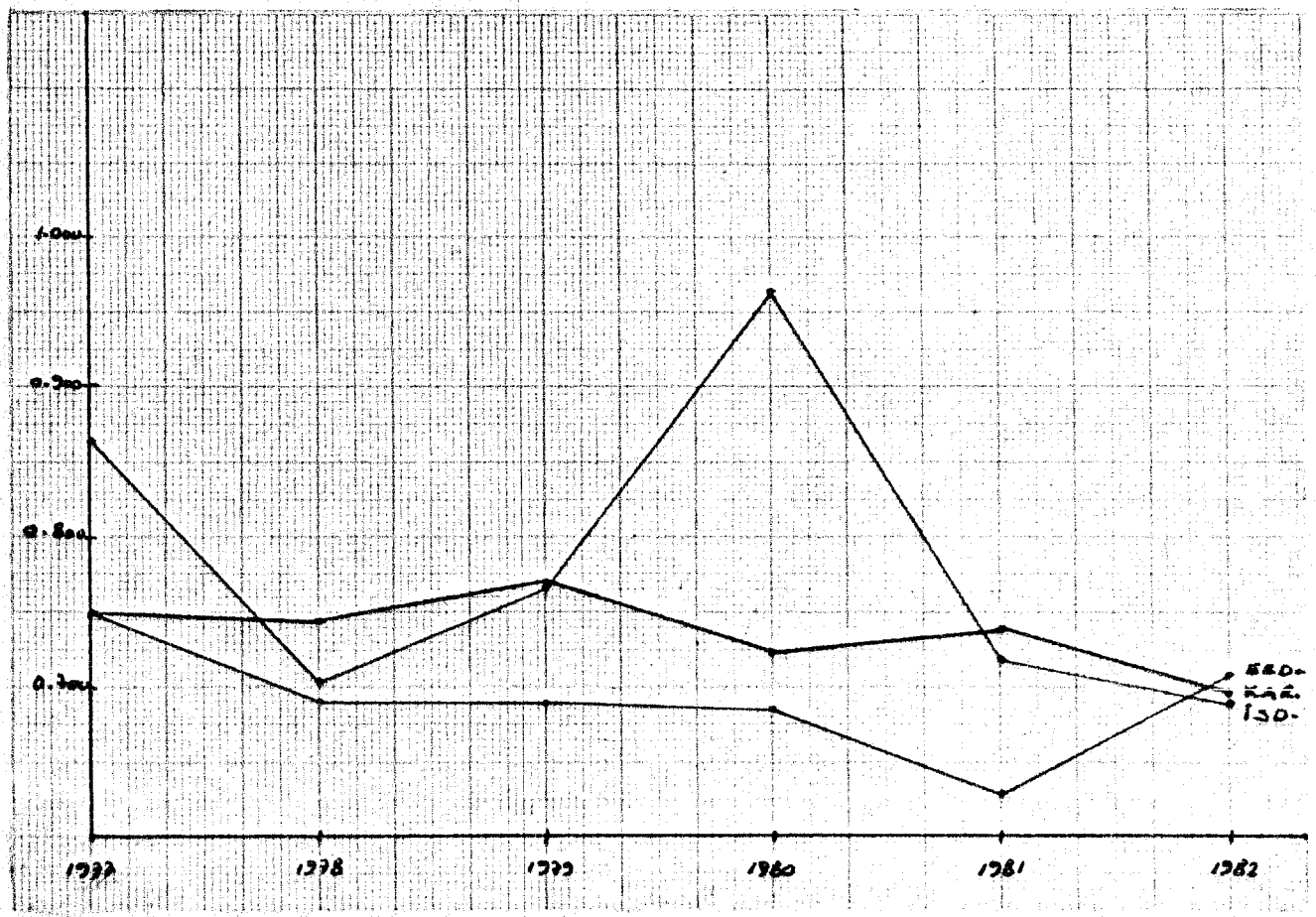
20) TAN,1983 : 166

TABLE 7. RAW MATERIAL PRODUCTIVITY IN COKE FACTORIES : (output / raw material)

	1977	1978	1979	1980	1981	1982
ERDEMİR	0.748	0.690	0.691	0.685	0.628	0.711
İSDEMİR	0.864	0.705	0.768	0.964	0.721	0.691
KARABÜK	0.748	0.744	0.772	0.724	0.742	0.694

FIGURE 2. RAW MATERIAL PRODUCTIVITY IN COKE FACTORIES :



VII.1.4. PRODUCTIVITY OF THE PRODUCTION UNIT :

The productivity levels of the three coke factories are shown on table 8 and figure 3.

The capacity utilization levels are quite low in general,but this is partly due to the low production levels in the following stages.The capacity utilization in KARABÜK Coke Factory is higher than others and stable,but there is a slight decrease in the last years and this is probably due to the decrease in the demand for long products that are produced in KARABÜK.

The capacity utilization in İSDEMİR Coke Factory shows an unstable flow which is mostly due to administrative and technical problems.[21] This complex does not show a stable performance because it has started working newly and its administration and technical performance does not show stability yet.

ERDEMİR Coke Factory has a low capacity utilization but it seems to increase in the last years which is closely related to the steel production level of the complex.

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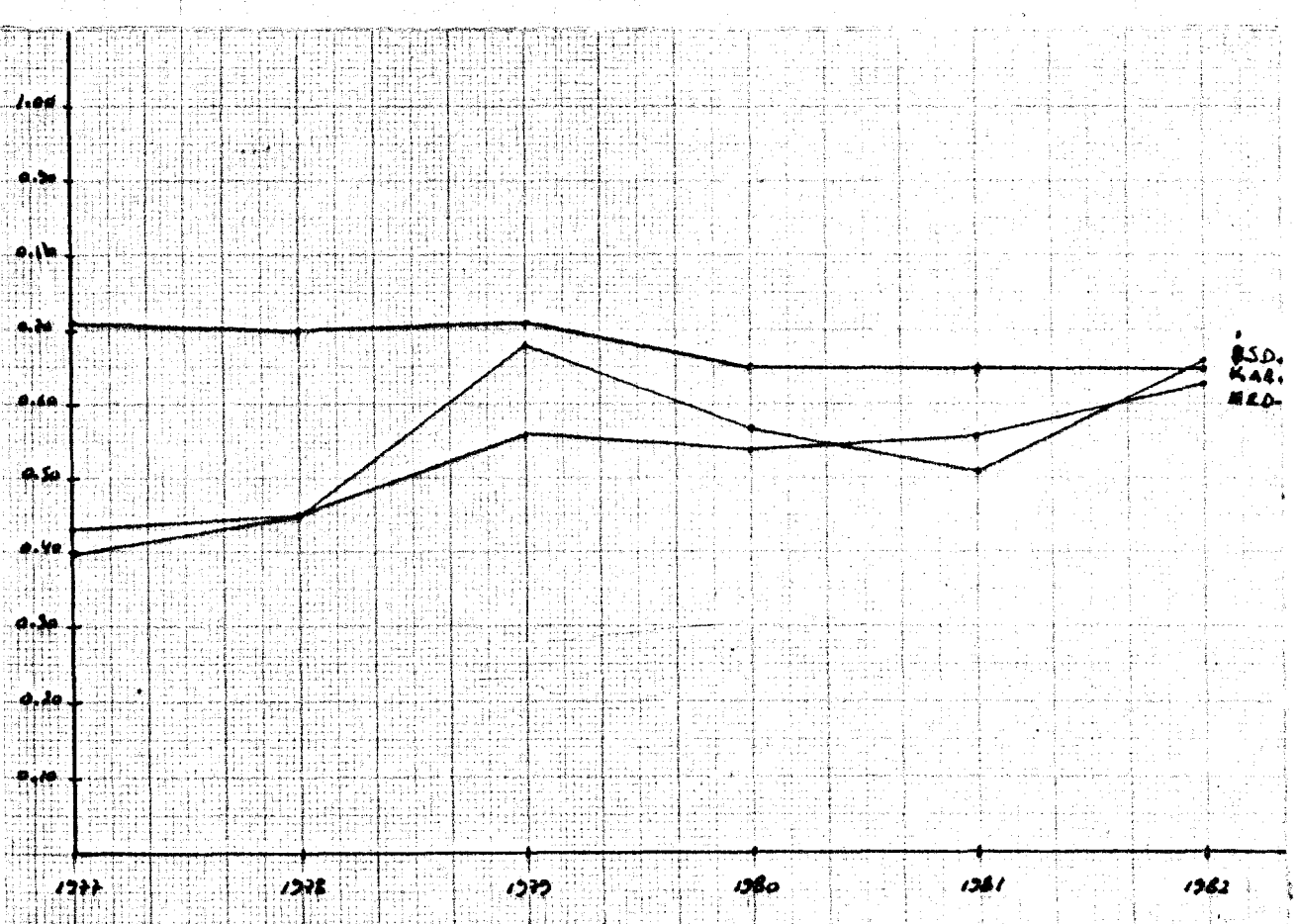
21) YÜKSEK DENETLEME KURULU- 1981 : XIII-XVII

TABLE 8. PRODUCTIVITY OF THE PRODUCTION UNIT : (output/cap.)

	1977	1978	1979	1980	1981	1982
ERDEMİR	0.43	0.45	0.56	0.54	0.56	0.63
İSKENDERUN	0.40	0.45	0.68	0.57	0.51	0.66
KARABÜK	0.78	0.70	0.71	0.65	0.65	0.65

FIGURE 3. PRODUCTIVITY OF THE PRODUCTION UNIT :



VII.2. PRODUCTIVITY IN FURNACES :

VII.2.1.LABOR PRODUCTIVITY IN FURNACES :

The labor productivity results of the three furnaces in the complexes are given on table 9 and figure 4.

Labor productivity results of the three furnaces differ to a great extent. ERDEMİR shows a very high labor productivity compared to the others,and a continuous improvement is observed.This is again the result of the low employment level compared to the others and the decrease in the employment level in recent years.

İSDEMİR on the other hand has an extremely low labor productivity compared to ERDEMİR Furnace, This is basicly because of the overemployment in İSDEMİR Furnace.This overemployment shows its negative effect at all stages of production in İSDEMİR'.In İSDEMİR Furnace 1.17 person falls to per ton production capacity whereas this ratio is only 0.22 in ERDEMİR Furnace.

KARABÜK Furnace shows a stable labor productivity level except the sharp decrease in 1982.The labor productivity level of KARABÜK Furnace is lower than ERDEMİR Furnace and this is probably due to the new technology of ERDEMİR.

The positive effect of the decrease in the employment level in general is observed especially in İSDEMİR and ERDEMİR Furnaces.

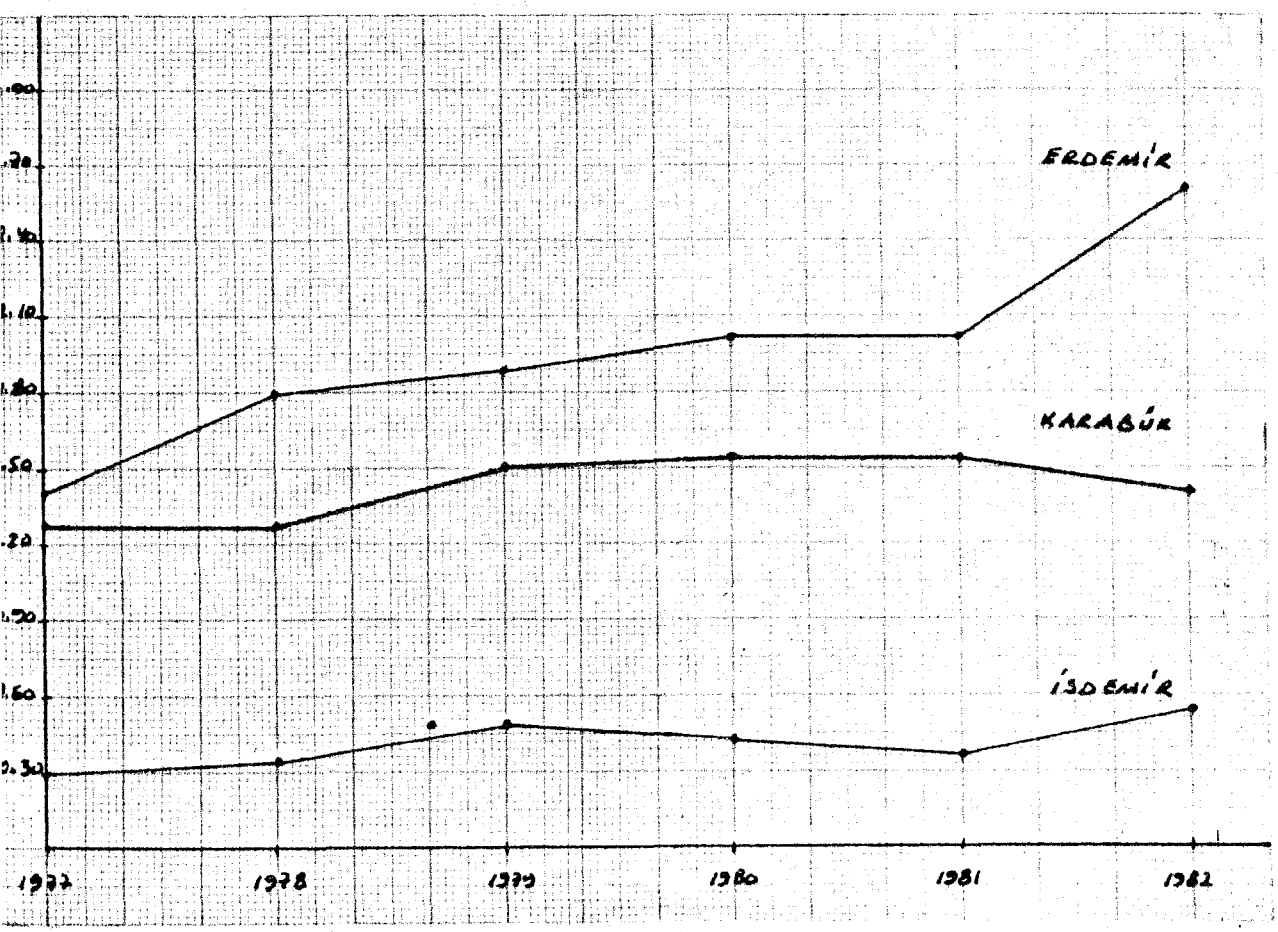
VII.2.2. RAW MATERIAL PRODUCTIVITY IN FURNACES :

The relevant data to calculate this productivity was not available for ERDEMİR.The data that was obtained for KARABÜK and İSDEMİR on the other hand, gave insignificant results ,which were not dependable.So the energy productivity in the furnaces could not be calculated.

TABLE 9. LABOR PRODUCTIVITY IN FURNACES : output / worker

	1977	1978	1979	1980	1981	1982
ERDEMIR	1.41.	1.78	1.93	1.98	2.01	2.59
ISDEMIR	0.30	0.35	0.49	0.45	0.37	0.55
KARABÜK	1.28	1.28	1.51	1.56	1.56	1.40

FIGURE 4. LABOR PRODUCTIVITY IN FURNACES :



VII.2.3. ENERGY PRODUCTIVITY IN FURNACES :

The energy productivity results of the three furnaces are given on table 10 and figure 5.

The main energy source of the furnaces is coke but there are other energy sources used during the production process such as fuel,electricity and coke gas. But the data about the consumption levels of other energy sources was not available and coke is used as the only energy source in the calculations.

ERDEMİR Furnace is significantly more productive than the others.This seems to be contradictory since ERDEMİR uses low quality domestic coal in addition to the high quality imported coal.But the technology used in ERDEMİR is new and the share of high quality imported coal is increasing in total consumption.

The energy productivity in İSDEMİR Furnace on the other hand is low compared to ERDEMİR Furnace although the technology used in this production unit is new too and more than half of the coal consumption is composed of high quality imported coal.This is probably due to the unstable functioning and administration of İSDEMİR in general,again.

KARABÜK Furnace seems to be the least productive between the three.This is simply due to the old technology used in the production process and to the low capacity of the furnace compared to the other two.

A common productivity criteria related to the energy productivity criteria used above is the amount of coke used to produce 1 ton fluid pig iron.This is simply the reciprocal of the energy productivity result obtained before.The results are given on table 11. and figure 6.

It is observed that ERDEMİR uses about 850-900 kgs. of coke to produce 1 ton pig iron,whereas İSDEMİR uses 1000-1050 kgs. and KARABİK uses about 1200-1300 kgs.There are considerably important differences between the three furnaces in terms of coke consumption per ton pig iron production.

An international comparison gives even more dramatic differences.As mentioned before,cokeable coal reserves throughout the world are limited and nearly 90

percent of the reserves are in developed countries.Also the prices of this coal is rising continuously.As a result of this product vity in coal consumption gained much importance and the developed countries intensified their effort on this subject in the recent years and the c ke consumption per ton pig iron production decreased to 650 kgs. from 1100 kgs. in England,to 600 kgs. from 940 kgs. in USA and to 400 kgs. from 900 kgs. in Japan.

It is seen that with the coke consu ption made in Turkey to produce 1 ton pig iron,2-2.5 tons of pig iron may be produced in developed countries.

TABLE 10. ENERGY PRODUCTIVITY IN FURNACES : (output / coke cn.)

	1976	1977	1978	1979	1980	1981	1982
ERDEMİR	1.369	1.032	1.208	1.087	1.104	1.114	1.255
İSDEMİR	0.785	1.018	1.023	0.946	1.000	0.936	0.998
KARABÜK	0.770	0.746	0.752	0.756	0.849	0.834	0.748

TABLE 11. COKE CONSUMPTION PER TON PIG IRON PRODUCTION : (kg
(COKE CN. / OUTPUT)

	1976	1977	1978	1979	1980	1981	1982
ERDEMİR	731	.969	828	920	906	898	797
İSDEMİR	1274	.982	978	1057	1000	1068	1002
KARABÜK	1298	1340	1331	1324	1177	1199	1338

FIGURE 5. ENERGY PRODUCTIVITY IN FURNACES :

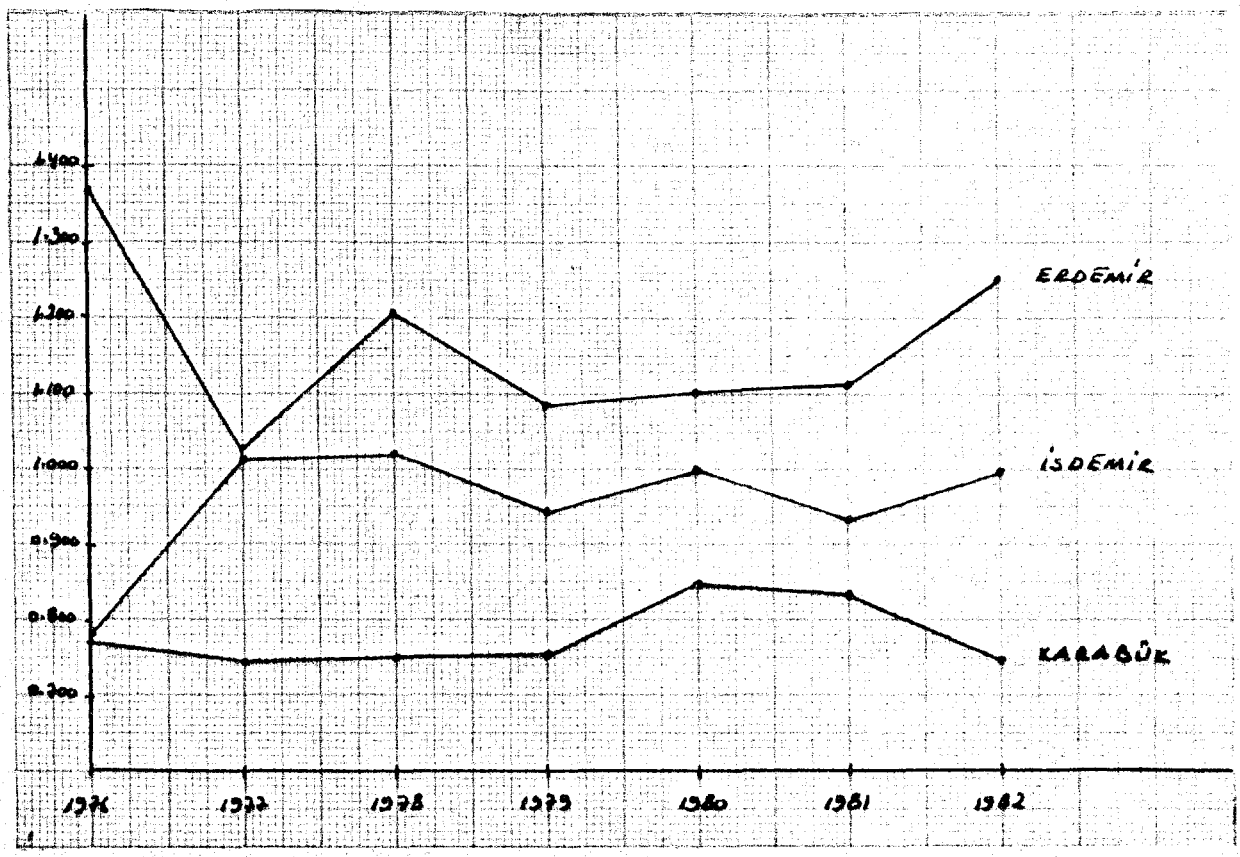
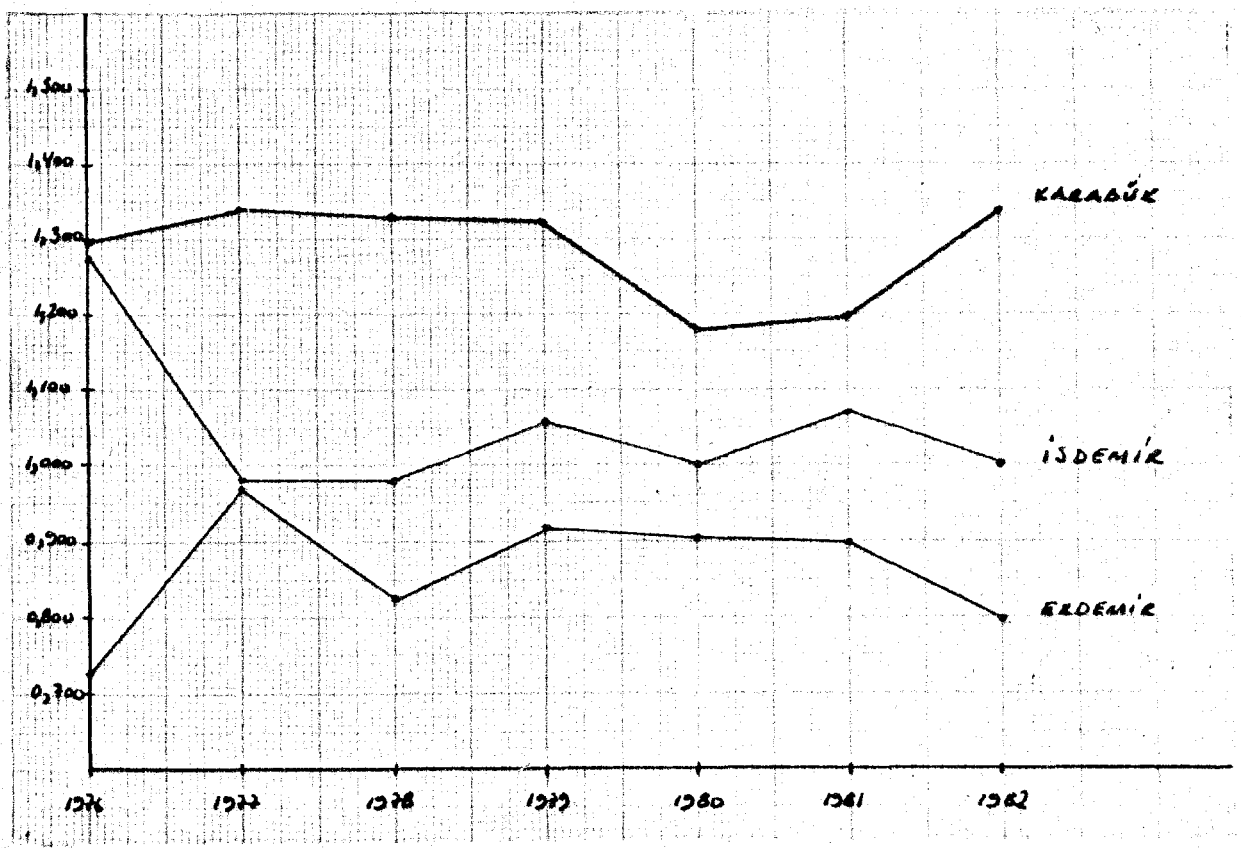


FIGURE 6. COKE CONSUMPTION PER TON IRON PRODUCTION :



VII.2.4. PRODUCTIVITY OF THE PRODUCTION UNITS:

The capacity utilization results of the furnaces are shown on table 12 and figure 7.

KARABÜK Furnace shows a very high performance in capacity utilization which again shows the stable structure of this complex.It seems that the decrease in the domestic demand for long products is avoided by increasing exports.

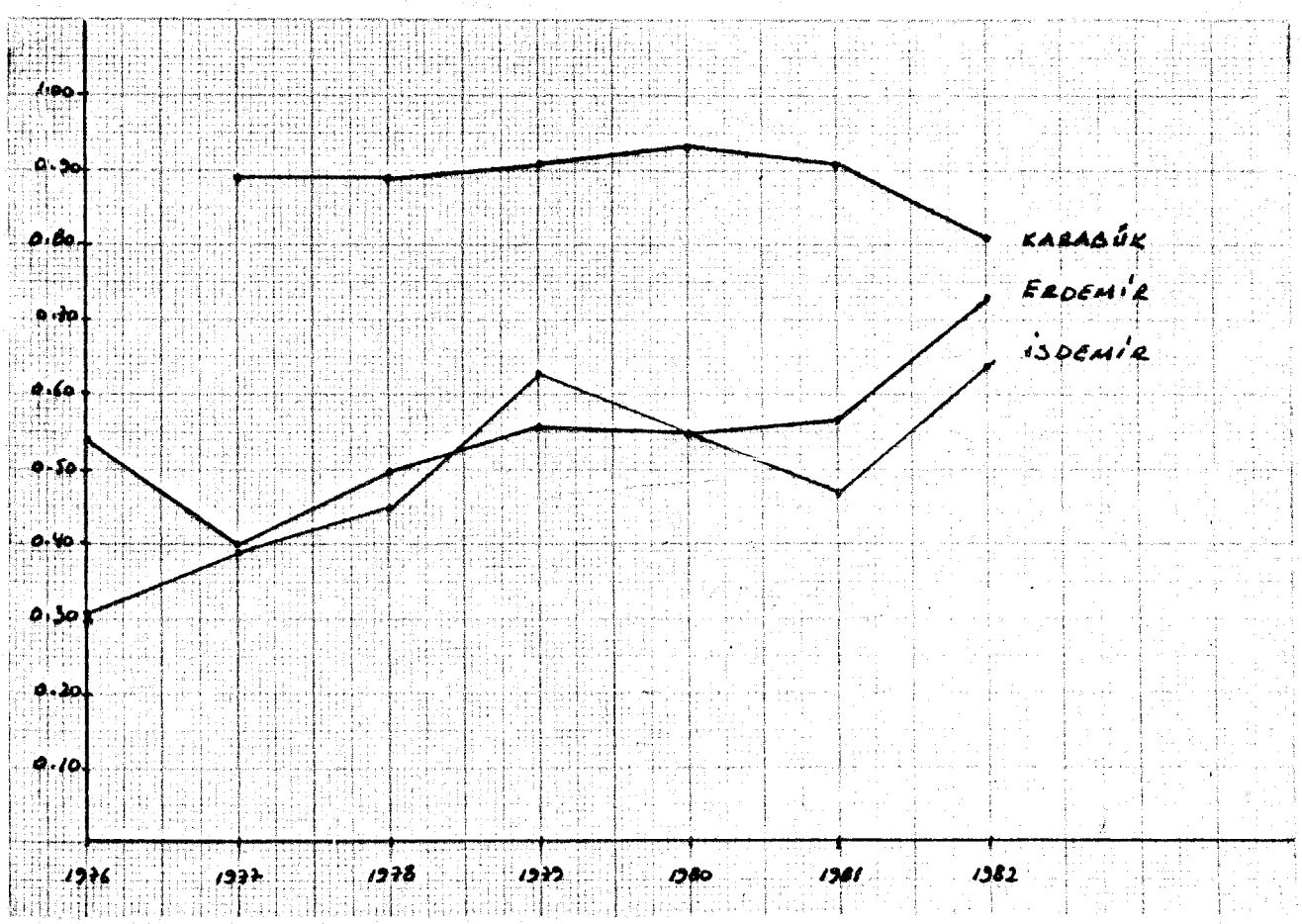
The capacity utilization is not high in ERDEMİR Furnace but it shows a stable performance except for the sharp increase in 1982.The reason for the low capacity utilization in this production unit is that ERDEMİR imports an important amount of intermediate input and uses this in the following stages of production.The reason for the sharp increase in capacity utilization in 1982 is partly due to the increasing demand and partly due to the decrease in the import of intermediate products.

İSDEMİR Furnace on the other hand do not have a high capacity utilization either.The capacity utilization shows an unstable performance which is a general property of the whole production units within this complex.The low production level of the complex is another reason for the low capacity utilization in the furnace.

TABLE 12. PRODUCTIVITY OF THE PRODUCTION UNITS : (output/cap)

	1976	1977	1978	1979	1980	1981	1982
ERDEMİR	0.54	0.40	0.50	0.56	0.55	0.57	0.73
İSDEMİR	0.31	0.39	0.45	0.63	0.55	0.47	0.64
KARABÜK		0.89	0.89	0.91	0.93	0.91	0.81

FIGURE 7. PRODUCTIVITY OF THE PRODUCTION UNITS :



VII.3. PRODUCTIVITY IN STEEL PRODUCING UNIT :

VII.3.1. LABOR PRODUCTIVITY IN STEEL PRODUCING UNITS :

The labor productivity results of the steel producing units is given on tabl 13 and figure 8.

The effect of low employment level in ERDEMİR compared to the other two plants is seen once more.ERDEMİR Steel Producing Unit is more productive than the steel producing units in KARABÜK and İSDEMİR. The decreasing employment level and the increasing capacity utilization in the unit effects the labor productivity positively in the last three years.

KARABÜK Steel Producing Unit shows a stable performance in terms of labor productivity.The labor productivity does not increase in KARABÜK although the employment level decreases and this is probably due to the depreciation of this complex.

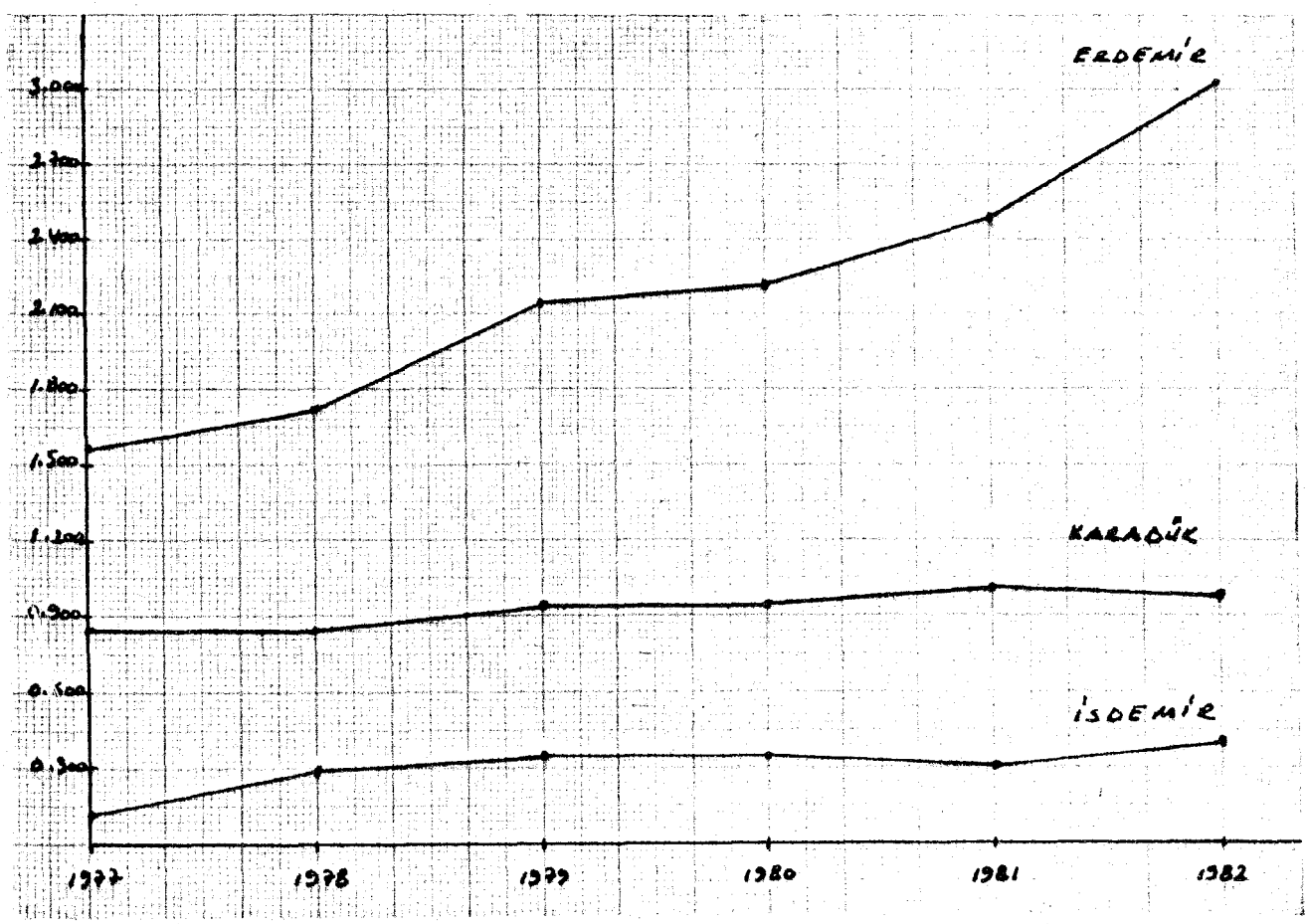
The overemployment in İSDEMİR Steel Producing Unit decreases the labor productivity to very low levels.This unit has 2/3 production capacity of ERDEMİR Steel Producing Unit but the employment level is 3 times higher than ERDEMİR Steel Producing Unit.

The general decrease in the employment level especially after 1980 has effected the labor productivity level of İSDEMİR Steel Producing Unit too.

TABLE 13. LABOR PRODUCTIVITY IN STEEL PRODUCING UNITS : (steel prodn. / workers)

	1977	1978	1979	1980	1981	1982
ERDEMİR	1.573	1.729	2.166	2.261	2.507	3.039
İSDEMİR	0.134	0.298	0.357	0.361	0.317	0.402
KARABÜK	0.842	0.853	0.943	0.948	1.025	0.998

FIGURE 8. LABOR PRODUCTIVITY IN STEEL PRODUCING UNITS :



VII.3.2.RAW MATERİAL PRODUCTIVITY IN STEEL PRODUCING UNITS:

The raw material productivity results of the steel producing units in the three plants are given on table 14 and figure 9.

The raw material productivity in ERDEMİR Steel Producing Unit is satisfactory and quite stable since the technology used is new.

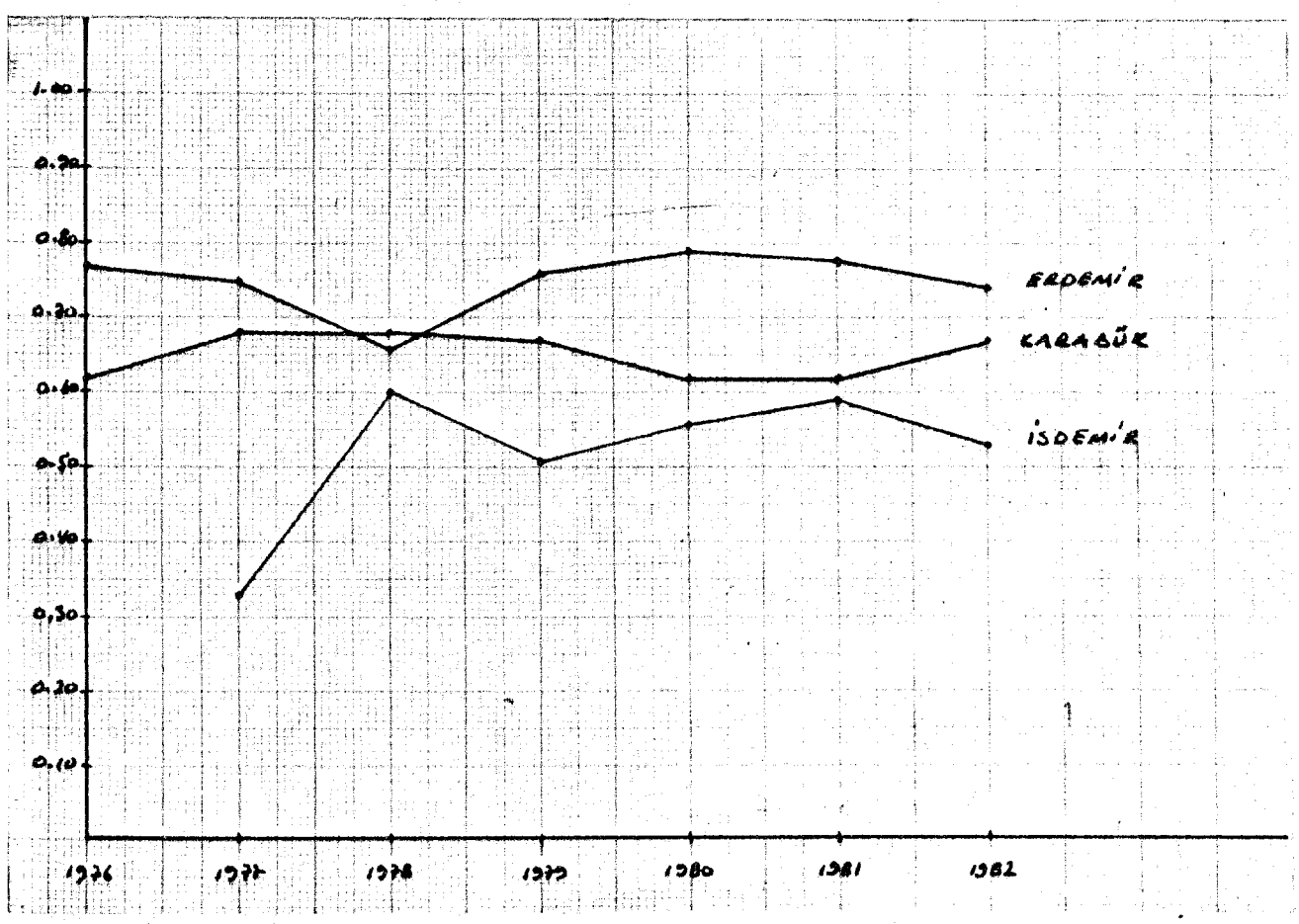
KARABÜK Steel Producing Unit shows a lower raw material p oductivity compared to ERDEMİR and the productivity level is not stable.The comparatively low level of productivity is basicly due to the old technology of KARABÜK Steel Producing Unit.This complex does not have continuous casting technology as ERDEMİR and İSDEMİR which saves time and energy.The unstability of the productivity level may be due to the depreciation of the complex in general.

The raw material productivity of İSDEMİR Steel Producing Unit on the other hand is low and unstable.The unstability comes from the nature of the complex since this is the youngest between the three.The low productivity is basicly due to the absence of the technology which casts the fluid iron into big molds and then sends these to the steel producing units.In İSDEMİR there is only the continuous casting system which sends the fluid iron directly to the steel producing unit and whenever there is an interruption in the system,the fluid iron sent to the steel producing unit is wasted.Such interruptions oftenly occur in İSDEMİR since the system has not settled yet.

TABLE 14. RAW MATERIAL PRODUCTIVITY IN STEEL PRODUCING UNITS : (STEEL PRODN. / PIG IRON INPUT)

	1976	1977	1978	1979	1980	1981	1982
ERDEMİR	0.77	0.75	0.66	0.76	0.79	0.78	0.74
İSDEMİR		0.33	0.60	0.51	0.56	0.59	0.53
KARABÜK	0.62	0.68	0.68	0.67	0.62	0.62	0.67

FIGURE 9. RAW MATERIAL PRODUCTIVITY IN STEEL PRODUCING UNITS :



VII.3.3. ENERGY PRODUCTIVITY IN STEEL PRODUCING UNITS :

Again, the relevant data about the energy consumptions of the steel producing units was available, so the energy productivities of these units could not be calculated.

VII.3.4. PRODUCTIVITY OF THE PRODUCTION UNITS :

The productivity levels of the steel producing units of the 3 complex is given on table 15 and figure 10.

KARABÜK Steel Producing Unit shows the highest capacity utilization with the advantage of its settled and stable structure. The slight decrease in the level of productivity starting from 1980 is partially due to the depreciation and mostly due to the decrease in the demand for long products.

ERDEMİR Steel Producing Unit shows an improvement in terms of capacity utilization. The sharp decrease in 1979 is due to the extention in the steel production capacity and starting from 1979 a continuous improvement is observed. The difference between the capacity utilizations of the furnace and the steel producing units of ERDEMİR is due to the disequilibrium between the capacities of these two units. This disequilibrium in the complex is critisized and it is proposed that the cost of this disequilibrium will be much higher at higher capacity utilization levels[22].

İSDEMİR Steel Producing Unit's production productivity on the other hand is very low compared with the other two. A gradual improvement is observed but this is not satisfactory. The sudden decrease in the productivity observed in 1981 is due to the increase in the interruptions in the system. The low demand level for long products also prevent further increase in the productivity level of İSDEMİR Steel Producing Unit.

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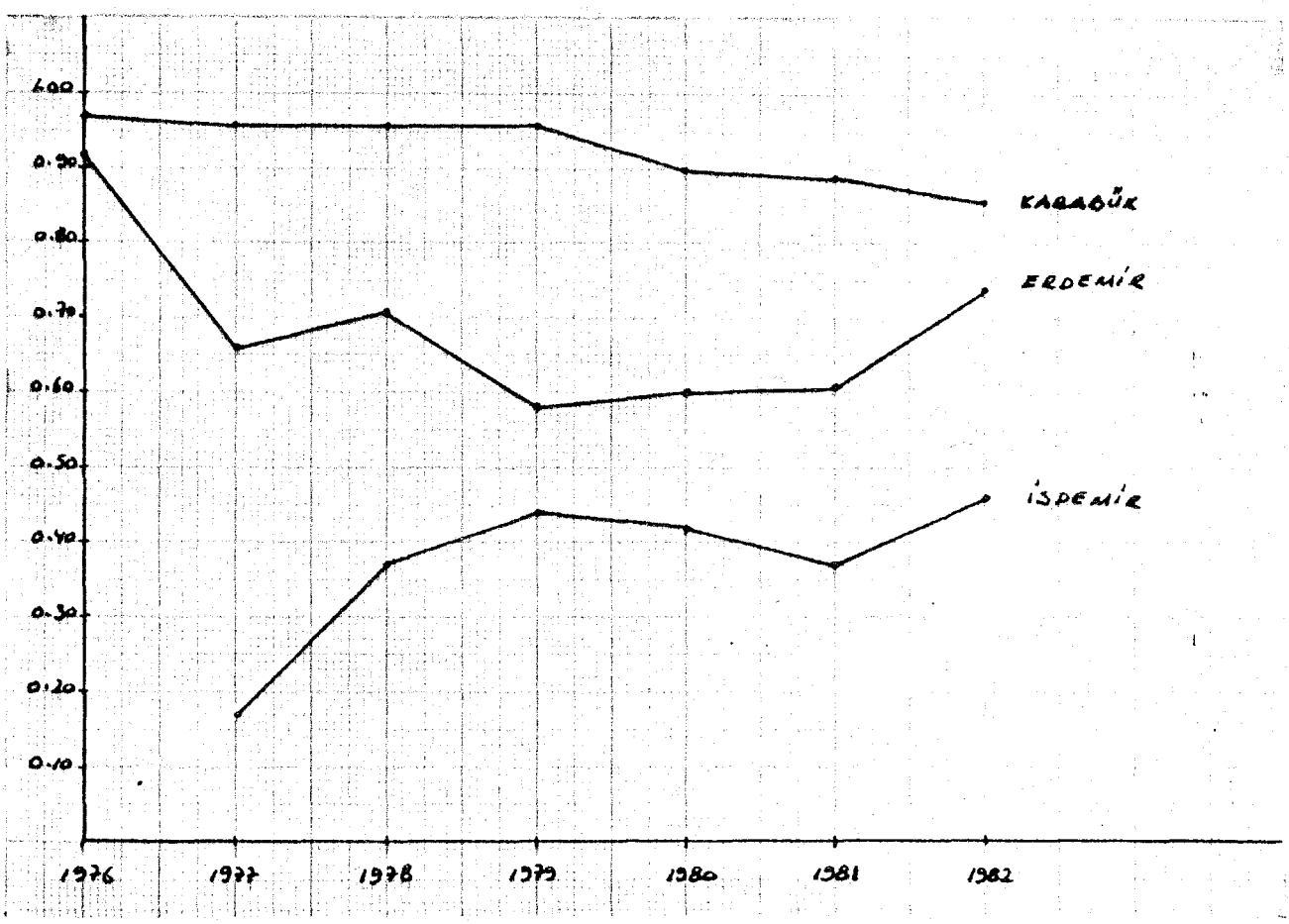
22) DPT, 1983 : 104-105

TABLE 15. PRODUCTINITY OF THE PRODUCTION UNITS : (output/cap)

	1976	1977	1978	1979	1980	1981	1982
ERDEMİR	0.92	0.66	0.71	0.58	0.60	0.61	0.74
İSDEMİR		0.17	0.37	0.44	0.42	0.37	0.46
KARABÜK	0.97	0.96	0.96	0.96	0.90	0.89	0.86

FIGURE 10. PRODUCTINITY OF THE PRODUCTION UNITS :



VII.4. PRODUCTIVITY IN THE ROLLING MILLS :

VII.4.1. LABOR PRODUCTIVITY IN THE ROLLING MILLS :

The labor productivity results of the rolling mills of the three iron and steel complexes are given on table 16 and figure 11.

ERDEMİR Rolling Mill shows the highest labor productivity as in the previous stages of production and this is again because of the low employment level compared to the other rolling mills.The high capacity utilization also contributes to the high labor productivity in ERDEMİR.

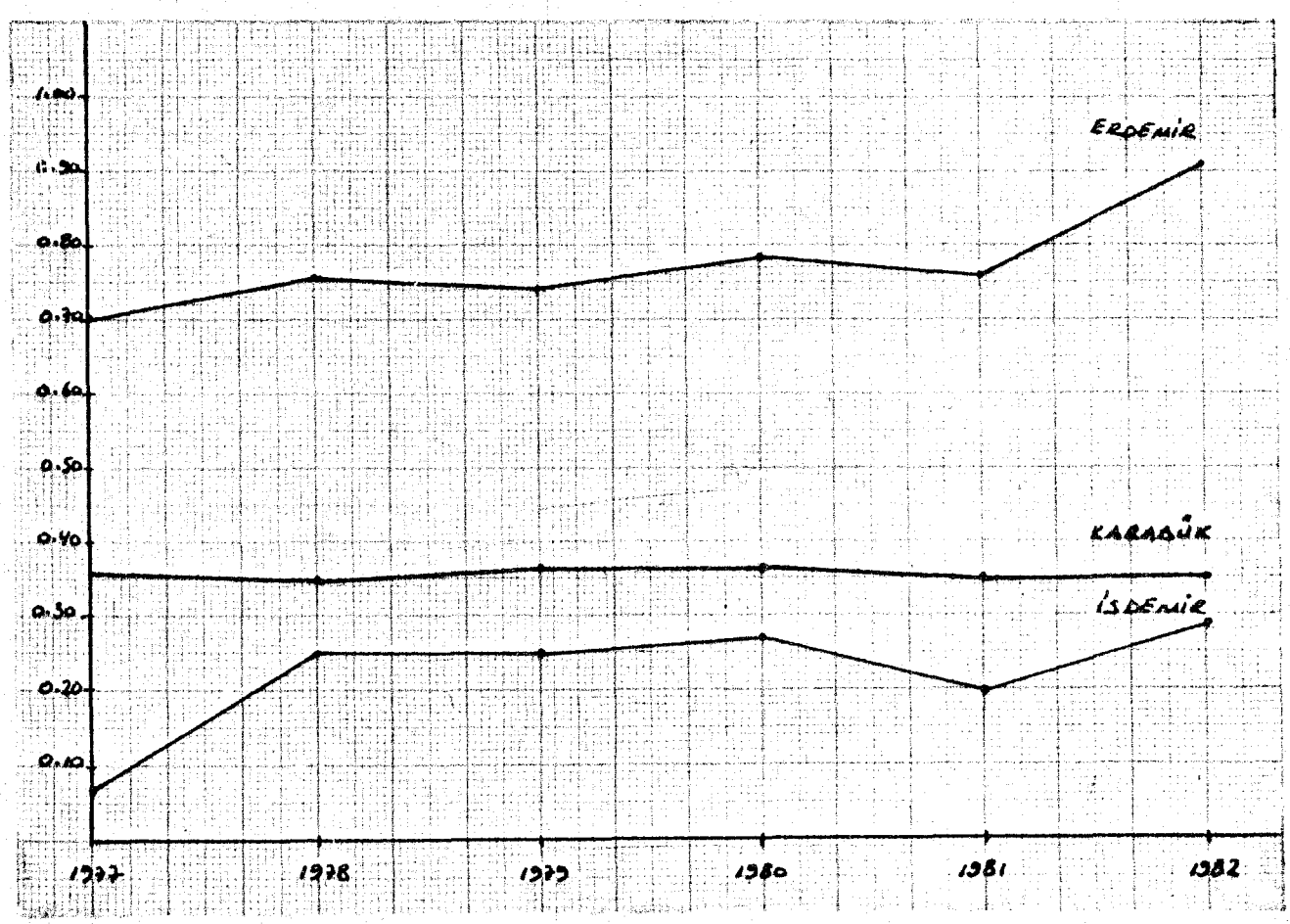
The labor productivity in KARABÜK Rolling Mill is quite low compared to ERDEMİR and this is mainly due to the differences between the technologies. KARABÜK uses old technology which is more labor intensive and this decreases the labor productivity in this production unit.

İSDEMİR Rolling Mill shows a very low productivity level compared to the others.The low productivity level is again due to the overemployment and due to the very low production level.The effect of sharp decrease in the production in the last three years cannot be observed from the results since the positive effect of the decrease in the employment level is more significant.

TABLE 16. LABOR PRODUCTIVITY IN THE ROLLING MILLS : (output / worker)

	1977	1978	1979	1980	1981	1982
ERDEMİR	0.704	0.762	0.743	0.785	0.763	0.909
İSDEMİR	0.066	0.251	0.248	0.271	0.197	0.288
KARABÜK	0.356	0.348	0.364	0.366	0.349	0.352

FIGURE 11. LABOR PRODUCTIVITY IN THE ROLLING MILLS :



VII.4.2. RAW MATERIAL PRODUCTIVITY IN ROLLING MILLS :

The raw material productivity results of the three rolling mills are on table 17 and figure 12.

The raw material productivity level in İSDEMİR Rolling Mill is satisfactorily high,although it seems to be unstable,The low performance in 1977 is because it was the first year of the production.The sharp decrease in 1981 is due to the interruptions in the production process, which amounted to very critical levels in this year.

KARABÜK Rolling Mill shows an equivalently high raw material productivity as İSDEMİR.But the raw materials bought from other complexes or imported which is not included in the calculations decreases the productivity level in this production unit.In other words the real raw material productivity of this unit is lower than the level seen on table 17.

ERDEMİR Rolling Mill on the other hand shows a high but unstable performance. The challenging performances in 1977 and 1978 are simply because of the high amounts of pig:rsteel ... imported and which is not included in the calculations since consistent data was not avilable.

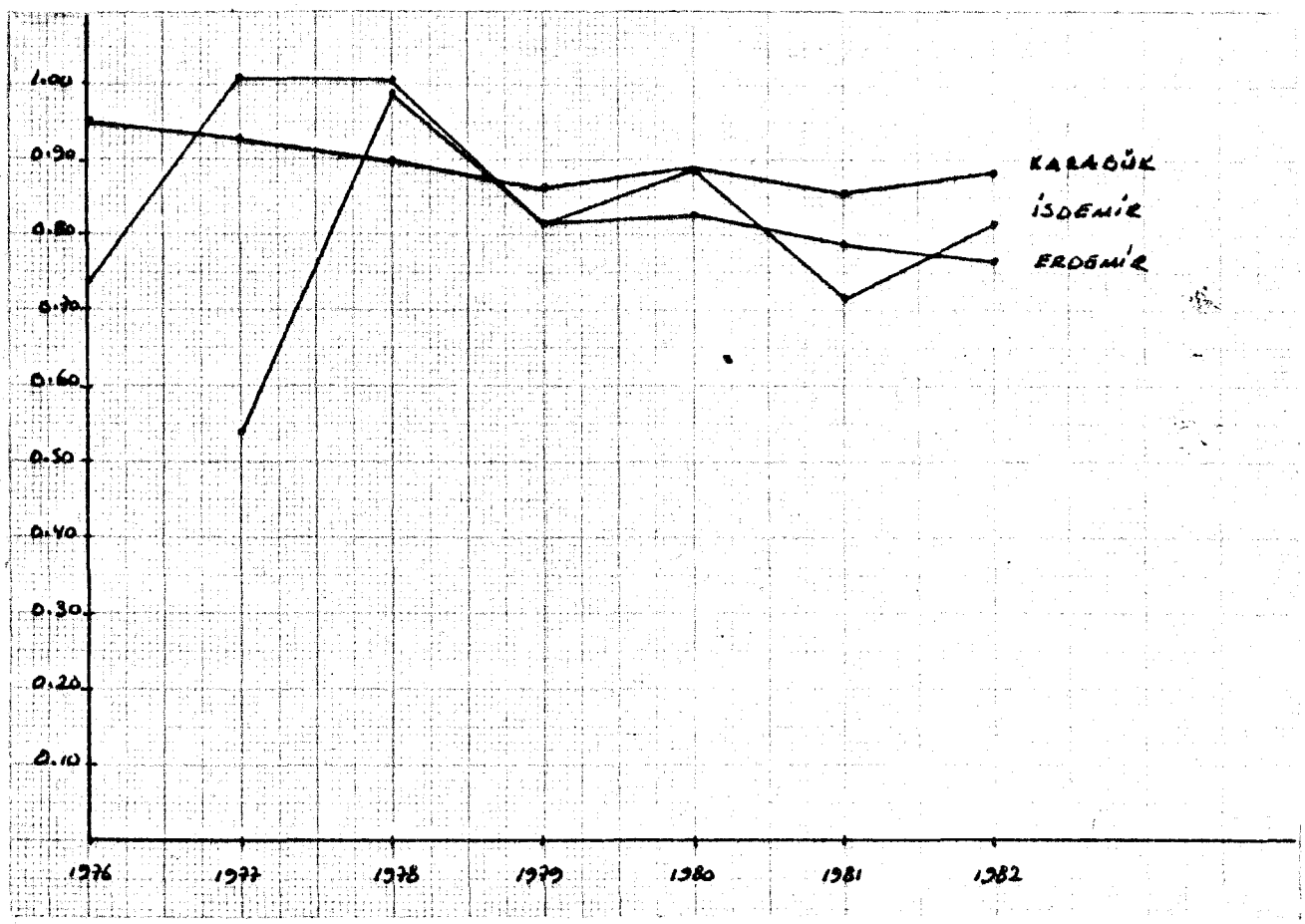
VII.4.3. ENERGY PRODUCTIVITY IN ROLLING MILLS :

The data about the energy consumptions of the three rolling mills was not available so the energy productivity levels of these production units could not be calculated either.

TABLE 17. RAW MATERIAL PRODUCTIVITY IN THE ROLLING MILLS : (Final product / pig steel)

	1976	1977	1978	1979	1980	1981	1982
ERDEMİR	0.736	1.073	1.053	0.821	0.832	0.789	0.772
İSDEMİR		0.544	0.991	0.819	0.890	0.718	0.823
KARABÜK	0.953	0.933	0.899	0.864	0.891	0.857	0.885

FIGURE 12. RAW MATERIAL PRODUCTIVITY IN THE ROLLING MILLS :



VII.4.4. PRODUCTIVITY OF THE PRODUCTION UNIT :

The productivity of the production unit results are given on table 18 and figure 13.

In calculating the productivity of the rolling mill a different procedure is followed since there are a number of different final products and production capacities corresponding to these.This makes it necessary to calculate capacity utilization levels for each of them.Instead of this each rolling mill is taken as a whole and a ratio of totalworked hours/total workable hours is calculated which also represents the capacity utilization collecting all the products under one unit successfully.

KARABÜK rolling mill has the highest productivity level and shows a stable performance.The high capacity utilization in KARABÜK is contradictory in fact since the demand for its products has decreased to a great extent,but by increasing exports KARABÜK has managed to keep its capacity utilization at high level.Also the comparatively low capacity of this complex minimizes the negative effects of such fluctuations in the market.

ERDEMİR shows a closely high productivity to KARABÜK but this is not satisfactory since there is excess demand for flat products which are only produced in ERDEMİR .

İSDEMİR Rolling Mill on the other hand shows a low and declining productivity porformance.The decline in the capacity utilization which has started in 1979 is basically due to the decrease in the demand for long products . It seems that this decline in the demand has showed its total effect on İSDEMİR only since KARABÜK is still working at high productivity levels. The decrease in the demand and thus in the production makes the problems of İSDEMİR even more crucial. It is calculated that the share of fixed costs in total costs will decrease by 53 percent if full capacity utilization is achieved.[23] This shows the real sources of the losses of this complex and also gives an idea about the importance of the productivity in these complexes.

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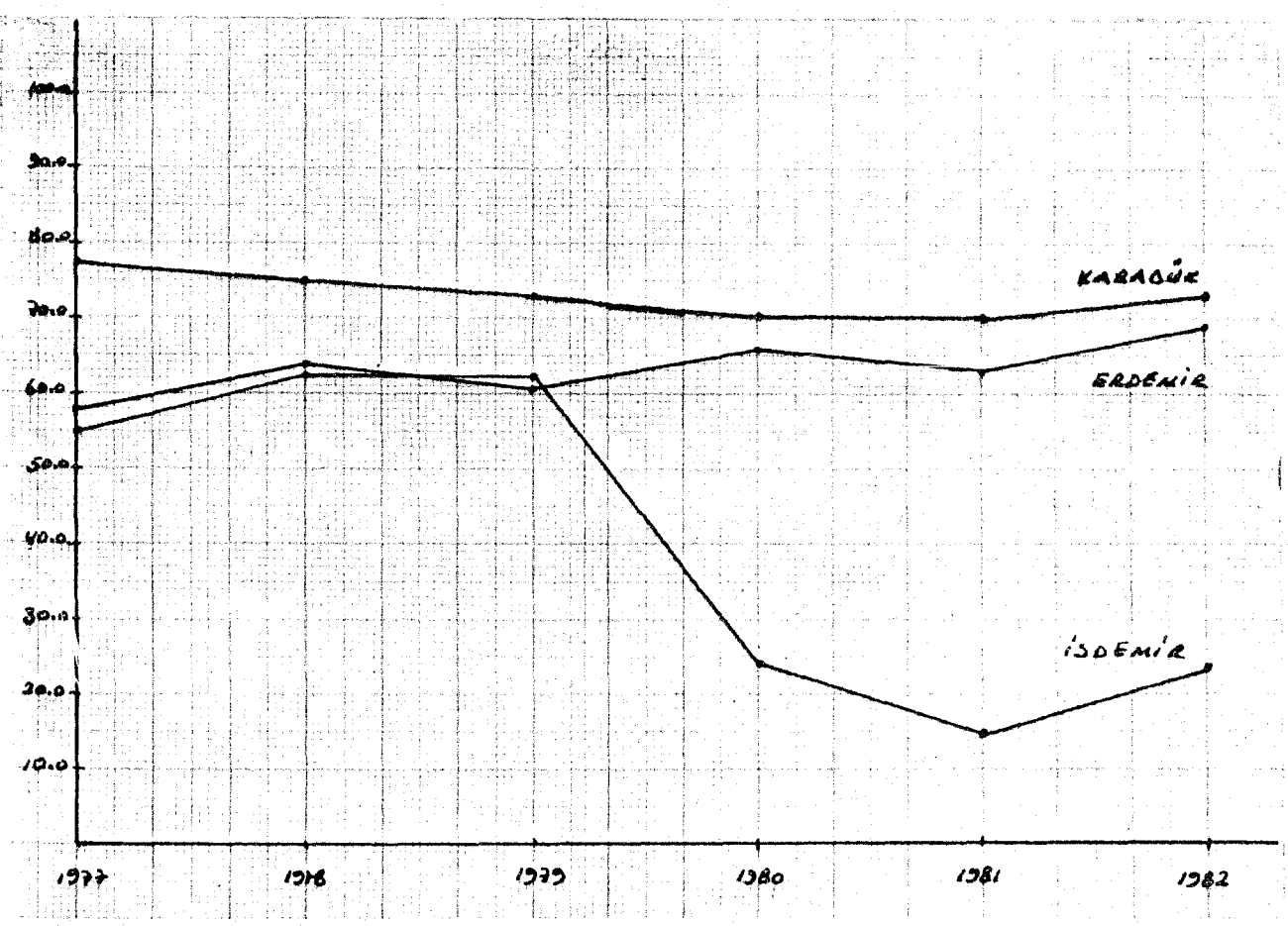
23) YÜKSEK DENETLEME KURULU,1981 : XII

TABLE 18. PRODUCTIVITY OF THE PRODUCTION UNITS : (total worked hr / total workable hr) (%)

	1977	1978	1979	1980	1981	1982
ERDEMİR	58.1	64.6	61.4	65.7	63.2	68.6
İSDEMİR	55.0	62.8	62.8	24.4	15.3	23.5
KARABÜK	77.5	75.2	72.8	70.2	70.2	72.9

FIGURE 13. PRODUCTIVITY OF THE PRODUCTION UNITS :



VIII. CONCLUSION :

Iron and steel industry is vitally important for developing countries since this industry plays an important role in industrialization of these countries.Iron and steel industry has strong forward and backward linkages with other sectors and thus it is highly senstive to the fluctuations in these sectors and the economy in general.

Iron and steel industry is also open to the fluctuations in the world economy.The economic crisis prevailing throughout the world since the beginning of 1970's has influenced this industry to a great extent.As a result of this crisis,the costs in the iron and steel industry have increased highly and demand decreased.These negative developments encouraged the cost decreasing activities in this sector.As a result of these activities new technologies are developed especially in the developed countries.

The costs in the developing countries are already high due improper organization and administration,lack of qualified workers and some other structural reasons and these countries are unable to create or apply new technology and thus they cannot decrease their production costs.Achieving maximum productivity with the given technology seems to be a short run and attainable target for these countries since they are also experiencing a lack of funds to make investment.

The situation in Turkey is similar to the other developing countries.In this study the productivity performances of the three iron and steel complexes in Turkey are measured using various criter and the results are compared.The major aim in this study was to

investigate the margins of improvement in each complex by comparing the results.Although specific calculations are not made and specific results are not obtained in this direction in this study,considerably important results are obtained concerning the productivity levels of these complexes which may be used in further analysis.

According to the results obtained the major difference between the three complexes in term of productivity is observed in the labor productivity.Overemployment in KARABÜK and especially in İSDEMİR is at critical levels and this may be attributed to the administrative status of these two complexes.ERDEMİR on the other hand has got the authority to follow an independant administrative policy.As a result of this the labor productivity results are much higher in ERDEMİR compared to others.

ERDEMİR gives better and satisfactory results in general compared to the other two plants.The new technology together with stable and consistent administrative structure has an important role in this performance.In addition to these,high capacity utilization due to the high demand for flat products effects the performance and productivity levels positively in general.But still the productivity may be increased by removing the disequilibrium between the production units within the complex in terms of production capacity.

KARABÜK shows a stable performance in terms of productivity but the technology is quite old in this complex and the plant is highly depreciated and this also influences the productivity level. In addition to these,the decrease in the demand for long products shows a negative effect on the productivity level since the capacity utilization decreases.

İSDEMİR's productivity performances are quite low and highly

unstable, although the technology employed in this complex is new. The unstability in the administrative structure and political influences play an important role in these negative results. Another important factor which causes unstability is that the complex is quite new and it has not settled yet. Overemployment is the most important problem in this complex and a slight improvement is observed in this area in the recent years. The decrease in the demand for long products has influenced this complex highly and the capacity utilization has decreased to very low levels and thus the productivity level is influenced negatively.

It seems that Turkey has got an important opportunity to increase the production in this sector and to decrease the costs and to increase the productivity by motivating the given production capacity and technology. This opportunity will gain even more importance in near future since almost no investment is made in this sector in the last four years.

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