INTERNATIONAL RELOCATION OF STEEL PRODUCTION:

U.S.A. AND BRASIL

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U.S.A. AND BRASIL

by

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ABSTRACT

There has been a general shift in the location of steel production over the last 15 years away from developed countries towards developing countries. The shift is similar to those documented in other industries like cars and textiles, but the reasons for the shift are different partly because steel is not produced by multinational corporations.

This thesis examines part of the shift in steel production, specifically its decline in the United States and its expansion in Brasil. An analysis of changing class relationships around steel production over the most recent cycle of accumulation is conducted for each country. The importance of indigenous class forces in determining the course of industrial development is emphasised, in contrast with most of the radical literature on industrial development which considers third world growth to be externally imposed.

The thesis makes two major contributions to the literature. First a theory of international development which is consistent with realist-marxist principles is provided. This theory also integrates the economic and political branches of marxist theory through an analysis of competition, a subject relatively absent from most marxist analyses. Secondly, research at a concrete level is conducted which illustrates the strengths and usefulness of the realist-marxist theory. By analysing an industry (steel) that in its institutional organisation and

physical structure is different from other industries that have been examined empirically, different kinds of social relationships are found to be important in determining the pattern of international development. An explanation of the shift in steel production is provided therefore which also demonstrates practically the realist argument that causes of industrial development are both abstract and specific: specific to places, times and branches of production. Most of the existing radical literature on international development identifies only causes that are specific to certain cases.

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LIST OF ABREVIATIONS

AISI	American Iron and Steel Institute.
AID	Agency for International Development, U.S.
Acesita	Companhia Acos Especiais Itabira.
Acominas	Aco Minas Gerais, S.A.
ARENA	Alianca Nacional Renovadoria.
BOF	Basic oxygen furnace.
BOLSA	Bank of London and South America.
BNDE	Banco Nacional do Desenvolvimento Economica, Brasil.
CFEIM	Companhia Financiera de Exportaciones Industriales, Madrid.
Cimetal	Cimetal Siderugia S.A.
Cosigua	Companhia Siderurgica da Guanabara.
Cobrapi	Companhia Brasileira de Projetos Industriais.
Cosipa	Companhia Siderurgica Paulista.
CSN	Companhia Siderurgica Nacional.
Consider	Conselho de Nao-Ferrosos e de Siderurgica.
CVRD	Companhia Vale do Rio Doce.
CWPS	Council on Wage and Price Stability.
DIEESE	Departamento Intersindical de Estatistica e Estudos Socio-Economicos.
ECLA	Economic Commission for Latin America.
FINAME	Agencia Especial de Financiamento Industrial, Brasil.
FNM	Fabrica Nacional de Motores.

IBRD	International Bank for Reconstruction and Development. (World Bank)
IBS	Instituto Brasileiro de Siderugia.
ICM	Brasilian sales tax.
IDB/IADB	Inter-American Development Bank.
IISI	International Iron and Steel Institute.
IPA	Indice de Precos por Atacado (wholesale price index).
IPI	Brasilian value-added tax.
IFC	International Finance Corporation (affiliate of IBRD).
LIBOR	London Interbank Offering Rate.
MDB	Movimento Democratico Brasileiro.
ORTN	Obrigacoes Reajustareis do Tesarro Nacional (value of government bonds).
PCB	Partido Communista Brasileiro.
PSD	Partido Social-Democratic.
PSN	Plano Siderurgico Nacional (National Steel Plan).
PTB	Partido Trabalhista Brasilieiro.
SENAI	Servico Nacional de Aprendizado Industrial (National institute of industrial training).
Siderbras	Siderurgica Brasileira.
Siderama	Companhia Siderurgica da Amazonia.
TPEY	Tons per employee year.
UDN	Uniao Democratico Nacional.
Usiminas	Usinas Siderurgica da Bahia S.A.

CHAPTER 1

INTRODUCTION

Just over 150 million tons of raw steel was produced in the United States in 1973. By 1982 output had fallen to 74.5 million tons. Between 1973 and 1983 the labour force was cut from 509,000 to 243,000, and between 1982 and 1984 steel companies lost $5.8 billion (AISI statistical yearbook, various years). These figures demonstrate a recent crisis in the steel industry, a crisis which is nevertheless not atypical of other industries in the United States (Bluestone and Harrison, 1982).

However, rapid contraction is not characteristic of world steel production as a whole. Table 1.1 shows how the pattern of world steel output has changed over the last 12 years. While U.S. steel industry output shrank by 50 percent, world output (market economies only) fell by only 19 percent. Decline in U.S. steel output alone accounted for 74 percent of the decline in world output. In some already industrialised countries the decay presents a similarly gloomy picture (Britain being the most notable with a decline in output from 29.5 to 12.4 million tons of raw steel between 1973 and 1980), but in some developing countries steel output has expanded. For example in Brasil output has almost tripled from 7.9 million tons in 1973 to just over 20 million tons in 1984. The U.S. share of world output in steel fell from almost 28 percent in 1973 to only 17 percent in 1982, while the share supplied by developing countries grew from 7 percent to over 17 percent (see figure 1.1).

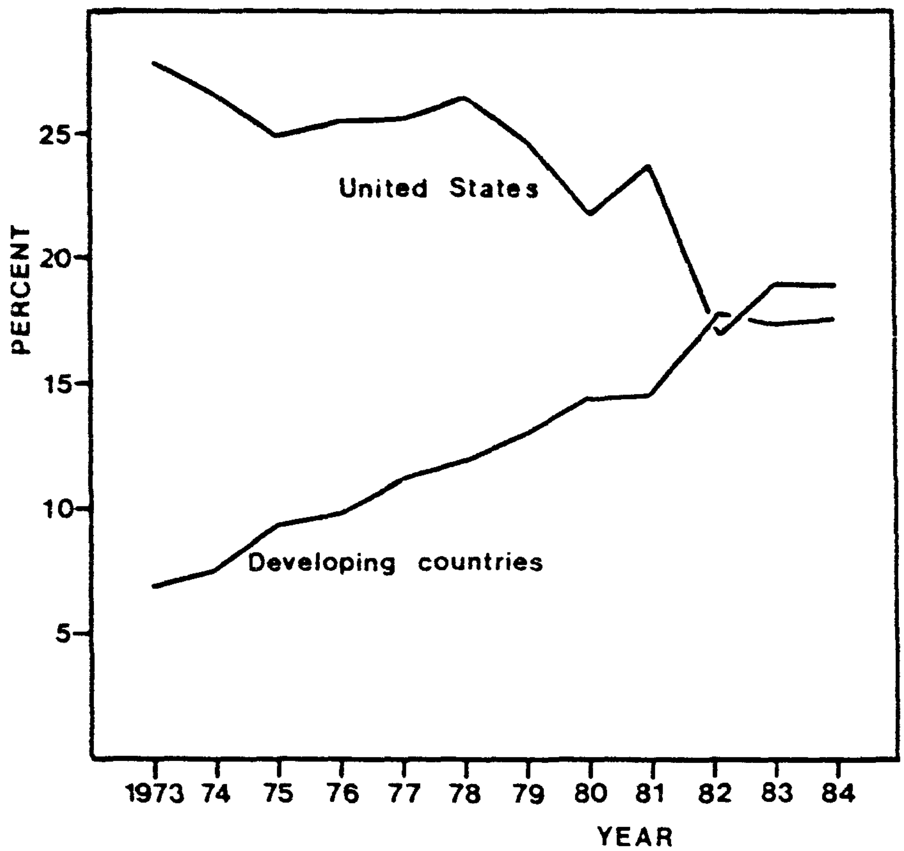
Table 1.1 Market world raw steel output, millions short tons.

	1973	1975	1977	1980	1982	1984
U.S.A. and Canada	165.5	131.0	140.4	129.4	87.5	108.6
Western Europe	197.7	170.8	171.1	178.1	158.6	172.9
Australia & NZ	8.7	8.9	8.3	8.6	7.3	7.2
Japan	131.5	112.8	112.9	122.8	109.7	116.4
Total Developed	503.5	423.5	432.6	438.9	363.2	405.0
Latin America	18.4	20.5	24.1	31.9	29.9	36.9
Africa	7.2	8.6	9.3	11.8	10.7	10.6
Middle East	1.5	1.2	1.5	3.0	3.2	4.0
Asia	10.8	13.5	19.4	27.0	32.1	34.9
Total Developing	37.8	43.8	54.3	73.7	75.9	86.4
Total Mkt Ec's	541.3	467.3	486.9	512.6	439.1	491.4

Source: American Iron and Steel Institute, Annual statistical report, various years.

So over the last twelve years the international steel industry has been in a state of stagnation. But this stagnation has been characterised by a notable shift in the location of production away from developed and towards developing countries. It is that shift which this

Figure 1.1 Percentage of world steel output,[1] U.S.A. and developing countries.



Source: Table 1.1
Note, 1: Market economies only.

thesis seeks to explain.

Two bodies of theory are used to inform this explanation. The first is that about the New International Division of Labour which has been used to explain the relocation of various industries towards the Third World, for example textiles (Frobel, Heinrich and Krey, 1980;

Elson, 1983), cars (Mericle and Kronish, 1984; Jenkins, 1984a) and semi-conductors (Ernst, 1981). Put very simply, most of these explanations emphasise the movement of production by multinational corporations as solutions to a profitability crisis in developed countries. Released from market locations by improvements in transport technology, they make use of cheap and politically disorganised labour markets in the developing countries.

But this body of theory makes some errors. While it is good at explaining changes in the location of industries that are organised by multinational corporations, it is less adept at understanding the shifts in location of those that are not. This is because it examines the capitalist class in only one of its forms: as multinational capital in the sphere of production. Furthermore it is the movement of relatively labour intensive industries that has been investigated. Industries dependent upon large supplies of low skilled labour, it is argued, have more to gain by using cheap labour sites than do other industries (Jensen-Butler, 1982).

In this context the steel industry is an interesting case to examine because it differs in some respects from industries which have gone through what appears to be a similar shift in location. Steel is not a labour intensive industry. Why then are places like Brasil and South Korea, where labour is cheap and (supposedly) easy to control, apparently such attractive places to produce steel? Nor is steel a sector that is organised by multinational corporations, as are other sectors that have been analysed. Relocation[1] in this case has been achieved through cooperation between some nationally based producers and international finance capital. But the interests of finance capitalists in the process of accumulation are quite different from those of productive capitalists, so their reasons for investing in steel and in particular places are different.

The second body of theory used in this thesis is that developed from a realist-marxist perspective to analyse changes in the regional location of industry (Massey and Meegan, 1982; Sayer, 1982; Lipietz, 1980; Walker, 1978). It is not the theory about regions in this literature that is useful because regional and international questions are different. But the theory developed by these analysts to examine spatial change in general as an outcome of class forces is preferable to that used in the literature about international changes. They make two important points. The first is that relations between classes appear in forms that are specific to different times and places. The second is that change is driven by the conflicts between these class factions and that it is concentrated in periods of crisis when the process of accumulation is ruptured (Aglietta, 1979).

Applied to analysis at an international scale this means that

[1] The term 'relocation' is only used in this thesis to infer a change in the location of production: it does mean that the industry has been physically moved. As the thesis shows, the shift in location of steel production is a result of decline in some locations and growth in others. Though there are some links between these events they are not as clear as in the case of multinational corporations that move production to more favourable locations.

the multinational corporation is only one form in which international relocation is achieved. Conflicts between classes (inter-capitalist competition and class struggle) grouped into a variety of forms or configurations in different countries influence the changing pattern of industrial location on a world scale. These country-specific forms tend relatively to be ignored by theory about the New International Division of Labour and by the empirical analysis of location shifts in sectors organised by multinational corporations. One result is the view that the pattern of development is imposed on Third World countries from the outside.

The empirical analysis which constitutes the body of the thesis is designed in accordance with the theory about changes in location developed in the regional literature. First it is expected that the class forms whose contemporary break-down has ruptured the process of accumulation, originated as solutions to the previous crisis. Therefore the last fifty years of development in steel is examined because this covers the duration of the most recent cycle of accumulation. Second, because steel is a different case, not organised by multinational capital, class forces specific to individual nations play a particularly important role in its development. This means in turn that the development of steel is itself specific to different countries: the links between locations are relatively weak because the industry has not been moved by a single concern that has decided upon a new and preferable location. So the analysis of its development must also be specific to different countries.

Though the cause of steel decline (or expansion) includes elements that are specific to countries therefore, its appearance (falling output, lost employment) is common to many. In other words we should not expect the pattern of decline to reveal its cause. At the beginning of this chapter the crisis in steel was described in its most observable form, as a decline in output. On this basis certain countries are grouped together in table 1.1 to illustrate a general shift to developing countries. But there are discrepancies. While steel output has declined in Britain and the U.S.A., it has grown in Italy. Steel growth is dramatic in Brasil and South Korea, but negligible in some other developing countries, such as the Philippines. So steel is not declining in developed countries just because they are developed, nor growing in developing countries just because they are developing. Furthermore the class formations around steel production are different in countries where the pattern of decline is similar. In Britain the steel industry has at times since 1945 been publicly owned, but in the United States it is not. So the empirical pattern of steel decline does not necessarily correspond to its cause.[2]

In order fully to explain the apparent shift in steel production from developed to developing nations as described in figure 1.1 and table 1.1 it would therefore be necessary to examine the history of that development in a large number of countries: probably in the U.S.A., Britain, France, Germany, Italy, Japan, Brasil and South Korea at

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[2] The principles of realist science upon which such a claim can be made are presented in chapter 2.

least. This task is beyond the scope of this thesis. Analysis is limited instead to the United States and Brasil, and a complete explanation of changes in the world pattern of steel production is therefore not attempted.

One result of looking only at the U.S.A. and Brasil is that the thesis itself takes on a division that reflects the relative separateness of the processes determining steel development in the two countries. Chapters 4 and 5 explain the decline of steel in the U.S.A., chapters 6 through 9 its growth in Brasil. Both analyses examine crisis because, as argued in chapter 2, this is necessary to understanding the forces of change. Decline in the U.S. is shown to be linked to the expansion of steel production in other countries, but not to Brasil in particular. A full explanation of decline in the U.S.A. would therefore be best complemented by an analysis of steel expansion in Japan. But the thesis is not intended simply to provide an explanation of steel decline in the U.S.: rather it is entended to explain the contemporary shift of steel production towards certain third world countries, and understanding steel decline in the U.S. is one part of this task. Brasil was chosen as the second case study therefore not in order to add to the explanation of steel decline in the United States, but to shed light on the international development literature. The aim is to find out why steel, a non-multinational and relatively capital intensive industry, has grown so dramatically in this developing country, not (as it turns out) as a cause of decline in the U.S. but in contrast to it. The understanding of steel growth in Brasil does not add <u>very</u> much to our understanding of decline in the United States, but it is not intended to. Instead it shows what were the particular forces that caused the growth of steel production in one developing country.

Chapter 2 illuminates the theoretical strengths of the regional literature. It then examines the international literature critically in the light of the realist-marxist claims made by regional analysts. In particular it distinguishes the theoretical concept of competition from its various empirical forms, and sets down a framework for analysis which captures this distinction and which is used in the empirical analysis in chapters 4 through 9.

Chapter 3 defines steel as a use-value:[3] as a sector which is distinct from others because of its products' qualities. It also explains why it is important to distinguish between sectors of production, and in what ways the use-value of a product may effect the formation of class relations in its production.

Chapters 4 and 5 analyse the development of steel in the U.S.A. They identify the forms of competition and labour relations that developed in the industry in the 1930s and 1940s, and show how the emergence of a new form of competition in the early 1960s was invited by these relations. The unsuited structure of the industry to this new form of competition lay at the root of its decline and profitability

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[3] The use-value of a commodity refers to its physical qualities as opposed to its price (exchange-value) and its labour content (labour-value).

crisis in the 1980s.

Chapters 6 through 9 analyse the development of the steel industry in Brasil. Built not by multinationals but by indigenous state and foreign finance capital (chapter 6), the motivation for its construction was not profit generation. For example Brasil is not a particularly cheap place to produce steel, despite its cheap labour, partly because the need to use foreign finance expanded capital costs (chapter 7). Instead the decision to expand industry in general (chapter 8) and the steel industry in particular (chapter 9) has emerged from broader class conflicts within Brasil itself.

The thesis provides separate analyses of steel development in the U.S.A. and in Brasil over the last 50 years. The kinds of causes involved in the changing world pattern of steel production are identified, but we would expect their actual forms to be different in other countries. It also serves to illustrate how an analysis of relocation at an international scale should be conducted, so that it is consistent with the theory developed by regional analysts to explain changes in location generally. As a result some conclusions can be drawn about weaknesses in some of the current literature on international development.

CHAPTER 2

A REALIST THEORY OF INTERNATIONAL DEVELOPMENT

Marxist explanations of international development can be traced from theories of colonialism and imperialism, through those about the dependent nature of third world development and the New International Division of Labour, to those which emphasise the role of indigenous classes in developing countries. That these theories have themselves developed in sequence indicates the methodological problem which it is one aim of this chapter to uncover: that they all contain specific elements which identify them with particular periods of capitalist development. The various brands of Marxist theory of international development correspond to stages in capitalist development and fail to explain why and how these stages evolve.

Marxist theory is very complex. It includes a range of central propositions about the nature of causal mechanisms in capitalism, the labour theory of value, crisis theory, the state, the three spheres of value analysis, circuits of capital and the relationship between economics, politics and ideology. The development of theory about these propositions is well documented elsewhere. (See for example Harvey, 1982; Mandel, 1971; Mandel and Freeman, 1984; Shaikh, 1977; Wright, 1979.) But many crucial theoretical propositions are left out of international analyses. The purpose of this chapter then is to review critically the attempts at explaining development at an international scale, drawing out their mistakes in method, and their theoretical omissions. The later sections of the chapter show how these omissions might be incorporated in a consistently realist-Marxist approach to questions of international change in industrial location.

Section 2.1 reviews the realist method of analysing spatial change that has been developed in the regional literature. Sections 2.2 and 2.3 provide a realist critique of the two main bodies of international development literature; 1) traditional world views in Marxist theory (Lenin, 1975; Luxemburg, 1976), and their revival during the 1960s in the guise of dependency theory (Wallerstein, 1975; Frank, 1969; Emmanuel, 1972), and 2) more recent theory about multinational corporations and the New International Division of Labour. The first focuses on exchange at the relative exclusion of an analysis of production processes (Laclau, 1979). The second, while focusing on production, becomes pre-occupied with class struggle and the form it takes in contemporary global capitalism, and thus virtually ignores strategies induced by competition over issues other than relations with labour. Both bodies of theory therefore omit some of the contradictions which are central to a Marxist understanding of capitalist accumulation.

Competition is discussed in detail in section 2.4. It is made clear in this discussion that capital is a class divided into factions, but that the form which competition takes is historically and spatially specific. It is important to understand the form of competitive relationships and how they evolve if we are to explain industrial development in given periods, so some of these forms are discussed in section 2.5.

In section 2.6 the work of Warren (1980) and Jenkins (1984b) is considered. They provide less specific and therefore more realist approaches to international development than the earlier literature. Jenkins is able to show how the dynamics of world development alter as the relationships between different class factions change (see also Corbridge, 1986). Finally section 2.7 ties together the realist criticisms of dependency theory and the New International Division of Labour with the discussion of competition into a framework which guides the empirical analysis of steel that follows.

2.1 Realist method in regional analysis

This section reviews some of the Marxist literature about regional industrial development in which a realist conception of the relation between cause and outcome has directed empirical work and the interpretation of empirical events. There are theoretical and methodological strengths in the regional literature which are missing from the so-called Marxist literature on international industrial development. This review draws out these strengths first to criticise the international literature and secondly to provide a consistent means of explaining industrial changes at an international scale (in chapters 4 through 9).

2.1.1 Structures and specificity

Causal structures operate in temporally and spatially specific conditions to give rise to a variety of events. This means that unless a closed system can be constructed (one in which the conditions are known) so that the outcomes of a given causal structure are always the same, it is not possible to identify structures through empirical regularities. So events are distinct from their structural causes. (See Bhaskar, 1975, 1979; Keat and Urry, 1982; and in geography, Williams, 1981; Chouinard et al., 1984; and Sayer, 1982.)

Marxist theory argues that capitalist competition and class struggle are the causal structures of a capitalist mode of production. (Mandel, 1971, describes the material basis for these abstractions.) The relationship between capitalists is one of competition for the realisation of surplus created in production, and between capitalists and workers is one of struggle over the value created by labour. These relationships are logically necessary because the existence of one category implies the existence of the other, and vice-versa (Sayer, 1982). Identifying causal structures as necessary relationships avoids the mistakes of confounding cause and outcome (laws are not empirical regularities) and of presuming that structures are merely the mind constructs of theorists when they are real causes.

The causal structures of capitalism are transcendental, at least in societies where a capitalist mode of production has become generalised. But they give rise to a variety of phenomena, depending on the conditions (or conjunctures) in which they operate, and upon their interaction with other structures (physical and social) that are not the focus of the analyst's investigation. Providing an explanation for a single event therefore involves a two stage process. First is the identification of a causal structure that is central to the understanding of the particular research problem. Second, some of the conditions surrounding the event to be explained must be described.

The second stage (the identification of conditions) implies the definition of two components. First the analysis must be given historical content, for even though the structures of capitalist society are transcendental, the progression of events that are influenced by the operation of those structures through human agency has the effect of constantly altering the configuration of conditions. Secondly the analysis must be given spatial content, because conditions are specific not only to times but also to places.

Two threads of analysis can therefore be identified in the regional literature on industrial development. First it draws on literature about the forms of class relations and how these change through time. Secondly it shows how the forces of capitalist accumulation can lead to a variety of uses of space (uneven development).

2.1.2 Time in social analysis

History is socially structured. Crisis theory, for example, maintains that breakdown is a built-in part of capitalist accumulation (Sutcliffe, 1977) whether as a result of a falling rate of profit, a squeeze on profits by rising wages, or crisis in consumption resulting from over production. (For critical reviews of crisis theories see Shaikh, 1978 and Van Parijs, 1980.) The common conclusion of all these theories is that accumulation is cyclical, passing through successive periods of decline, restructuring of the form of class relations in production, renewed growth and accumulation, and then rupture and decline once more. Periods of prosperity contain the seeds of breakdown: for example high employment may increase the political power of labour, while the build up of fixed capital and labour-saving technology progressively undermines the basis for profit (as the organic composition of capital rises). In turn, periods of crisis, characterised by high unemployment, undermine the political power of labour and destroy fixed capital through plant closures, thus facilitating the restructuring of production for renewed accumulation.

So the history of accumulation in capitalist societies is divided into cycles: cycles which have been shown empirically to last for approximately forty years (Gordon et al., 1982; Mandel, 1978). But each cycle of accumulation is different in the form of its appearance from those which precede it. The forms of social relations in production (Burawoy, 1979) the forms of competition (Gibson and Horvath, 1983) or the forms of accumulation (Aglietta, 1979) that characterise cycles are commonly used to identify successive periods in capitalist development because it is these that are restructured during crises.[1] Taylorism, Fordism and neo-Fordism (or bureaucratic consensus) (Friedman, 1977) for example, are categories which have been used to describe forms of labour relations predominant during successive cycles. Taylorism refers to the control of labour via "scientific" methods of management, such as time-in-motion regulation through piece-work methods of payment. Fordism refers to a method of labour control through technology which itself fixes the rate of work, as in the case of conveyor belt assembly for cars introduced by Henry Ford (Friedman, 1977; Gartman, 1979). Neo-Fordist methods of labour control depend on job classification schemes, promotion ladders, collective bargaining and union regulation of work. Neo-Fordism is characterised as a less direct form of control than Taylorism and Fordism, depending more upon consensus (Friedman, 1977). Similarly the terms competitive, monopoly and global capitalism refer to periods in which the general form of competition is different (Gibson and Horvath, 1983; Trachte and Ross, 1985). Sometimes

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[1] Section 2.7 examines some problems with these characterisations which result from their empirical content.

the forms of competition and of struggle are combined to characterise a particular period, so for example according to Braverman (1975) the period of monopoly capitalism, that gave individual capitalists control over the pricing of commodities in the market, itself corresponds to a particular form of relations between management and labour.

Each of these period-specific categories imply far more than just a form of relations in production or of competition. They also characterise the form of changes in consumption, the "articulation between the process of production and the mode of consumption" (Aglietta, 1979, p117) and the form of the state (Jessop, 1982).

Two crucial methodological points are central to this literature. First it is possible to divide time theoretically. Fordism, Taylorism and monopoly capitalism are categories which try to capture the manifestation of the inherent cycles in capitalist production. These periods are not defined by the intervals of available data. Second, each period of accumulation contains the conditions of its own destruction and its evolution to another form or period of accumulation. So for example, the problems that arose from Taylorist and Fordist forms of labour relations, both direct methods of control (Friedman, 1977, pp6-7), provided the conditions for a reaction from labour which threatened the smooth continuation of accumulation. Bureaucratic consensus characterises a method of control which was developed specifically to overcome these contradictions by taking struggle off the shop floor and on to the bargaining table. Removing confrontation from the point of production smooths out plant operation and introduces a system of job classification that is policed by both management and labour. Such developments did not change the fundamental relation between the classes, but did restructure the form that struggle took in order to allow, at least for the time being, renewed accumulation.

The contradictory nature of change encourages the view that history is evolutionary (Banaji, 1977; Engels, 1947; Foot et. al., forthcoming). If the form of class relations is one of the characteristics that describes a conjuncture, then the events that are determined by the causal mechanisms are specific to that situation: causal mechanisms create different events in different historical periods. Also those events themselves, such as the intensification and generalisation of direct forms of labour control, alter the form of labour relations, and thus lead to the emergence of a new conjuncture. Events are caused by structures, by conditions that are period specific and by the course of history, since the form that events take in one period is determined by conditions constructed by previous events.

2.1.3 The evolution of spatial form

Much of the literature about the historical development of forms of production and consumption relations (Friedman, 1977, Edwards, 1979, Gordon et al., 1982, Burawoy, 1979, Aglietta, 1979), pays little attention to space (Sayer, 1984, p132). While their empirical work refers to particular places (for example Burawoy refers to Chicago, and Aglietta to the United States), the use of space in the restructuring of class relations is virtually ignored. Yet the use of space is commonly a central issue in competition and struggle between the classes. Just as competition and struggle take different forms <u>and</u> evolve, so too are the forms of spatial differentiation sequential causes of break-down in accumulation and solutions to crises.

One form of spatial organisation may provide the conditions for a new form. For example the spatial concentration of industry adopted by capitalists to reduce the costs of transporting their inputs and outputs by locating close to markets or input sources facilitates control and reproduction of labour and assists the expansion of new forms of consumption (Harvey, 1977; Webber, 1982). But it also contributes to the development of types of struggle that are disfunctional for accumulation. The demands of workers and their political power in agglomerated regions may prompt capitalists to decentralise production to an area with a non-unionised labour market. The use of location in new ways is therefore an outcome of conflict between classes in the particular spatial configuration of a previous period. One situation in time and space defines the conditions in which the mechanisms operate to produce a new situation.

The observation of these processes in France during the 1970s, has led Lipietz (1980) to define regions by the contemporary spatial forms of accumulation. Central regions, in particular Paris, correspond to "the stage of large-scale industry" and are the site of concentrations of financial capital and technological innovation; ex-centres, such as Lyons and Lille, are those in which old, traditional industries have declined and been replaced by new, skilled manufacturing industries. The remainder of France constitutes mainly an agricultural periphery with small unskilled or resource industries (1980, p69). Each of these regions is delimited, not by legal-political or administrative divisions, but "on the basis of the concrete analysis of modes of production and their articulation" (1980, p65).

Furthermore, each region exhibits changes in the form of accumulation. This is most pronounced in ex-centres, as shown by analyses of similar regions in Britain. Williamson (1982) for example has described the use to which the local class structure has been put in the restructuring of production on Merseyside. The female labour force, conditioned by the concentration of traditionally male-orientated industry in the area, has proved particularly suitable for use in certain kinds of electronics assembly operations. Similarly in South Wales, disunited and unemployed miners and steelworkers have willingly accepted new forms of labour relations in production brought in by multinational electronics branch plants (Morgan and Sayer, 1984). (See also Massey's, 1983, work that compares changes in South Wales, an ex-centre, with those in Cornwall, a peripheral or predominantly agricultural region.)

So the restructuring of space is one way in which class relations can be restructured and any analysis of the spatial restructuring of industry, like this thesis, must also be an analysis of class restructuring (Massey, 1983). But the restructuring of class relations does not always involve a direct re-use of space. While the forms of industrial production and class relations are spatially specific, so too are the forms of changes in them. Some of these changes make no direct use of space. Many of the competitive strategies of capitalists are, for example, aimed at improving the quality of output with technology that may directly affect neither the labour process nor the location of production (Sayer, 1985). Massey and Meegan (1982), while conducting an analysis of regional industrial change in Britain therefore emphasise the importance of changes in situ. An ignorance of competitive strategies between capitalists can lead to the overemphasis of the spatial concentration or decentralisation of production as a method of restructuring the relations between capital and labour. This is a weakness which also characterises much of the international development literature.

2.1.4 Determinacy and specificity

This review of the Marxist literature on regional industrial development implies a method of explaining events that does not ascribe an over-deterministic status to abstract causal structures, but that does not rob specific appearances of their transcendental determinants. To explain is to view the operation of causal mechanisms in specific conditions. Two things are then required: an understanding of causal mechanisms in their abstract, though real existence (which involves the development of theory through arguments of logic) and a description of the conditions in which these mechanisms operate. Conditions are definable only in relation to time and space, so explanation necessarily involves the consideration of historical and spatial change. But conditions are altered by events. Spatial and temporal form are therefore evolutionary, and event outcomes change in response to the altered conditions in which mechanisms operate. It is also necessary therefore for analysis to identify the links between event sequences. The resulting explanation of events "avoids the over generality and thus potential empirical falseness of abstract, logical arguments, as well as the over particularity and lack of determinacy which characterises analyses conducted solely at a level of appearances" (Foot et al., forthcoming, p16; see also Jessop, 1982, p73).

A realist notion of determination is not synonymous with pre-determination. The global form of capitalist competition for example is not a necessary outcome of monopoly capitalism. But neither did that form of competition emerge from the uncoordinated or purpose-less actions of individual actors. It grew rather from the actions of people constrained or limited by the social forces and material conditions of the period (Wright, 1979).

Contemporary Marxist work on regional industrial development has made good use of a realist approach to causation in the development of theory and the execution of empirical work. But the literature about development at an international scale has not. The following sections review the international literature in the light of realist regional work. Their object is to clarify the methodology and theory that provide the basis for understanding the international development of steel, as well as the design of the empirical work, which together form the subject matter of chapters 4 through 9.

2.2 Imperialism and dependency

The traditional or developmentalist Marxist view of development in third world countries is that each should follow the pattern previously experienced in developed ones. This view derives from an evolutionary view of history that divides development of modes of production into sequential stages: slavery, feudalism, capitalism and socialism (Wallerstein, 1975, p15).

However, the developmentalist view does not imply that all countries should be at the same stage of development at the same time, so the question is raised about the relationship between countries in a capitalist stage of development and those still dominated by feudal modes of production. In one form or another examination of this relationship has dominated Marxist theories of world development, though it is often couched in terms of the relationship between the developed centre and the underdeveloped periphery of a unified capitalist world system.

2.2.1 Imperialism as a stage of development

For Lenin (1975), writing in the early 1900s when colonialism was at its height, the question was of central importance (O'Connor, 1970, p107). Lenin, Hobson (1965) and Luxemburg (1976) wrote variations on a theme that saw colonialism and imperialism as synonymous with stages of competitive and monopoly capitalism. The period of colonialism was dominated by free trade mostly in raw materials from still feudal countries to those where resources were required for capitalist manufacture. Imperialism on the other hand was a period dominated by direct financial investment of predominantly European capital with the prospect of producing and transferring surplus back to those countries. The international expansion of capital was necessary it was argued, either to solve the profitability crisis of the central capitalist states (a higher rate of profit could be earned on capital invested abroad: Dobb, 1972, p231), or in order to solve the consumption crisis (by opening up new foreign markets: Luxemburg, 1976), depending upon the individual writer's theory of crisis.

Lenin's portrayal of imperialism as the highest, that is the final, stage of capitalism, has since been impugned. International capitalist development has changed considerably since then, most notably with the growth of direct productive investment in branch plant and multinational corporations. Furthermore as the period of imperialism intensified the developmentalist view that third world countries should still progress along the feudalist - capitalist - socialist sequence was increasingly questioned.

Two primary objections to the developmentalist view were raised in the 1960s. The first is that it is illogical to insist "that the various historical modes of extracting a surplus must each, necessarily occur in all countries and follow in a specific order" (Wallerstein, 1975, p15). As argued in section 2.1, the course of history is not predetermined because individual actions and local events can change it. A Realist or materialist "conception of history need not necessarily prescribe a of set universal periodisations"(Habib, 1973, quoted in Wallerstein, 1975). The second objection is an empirical one. To accept imperialism as the pioneer of capitalism (Warren, 1980), as developmentalists must do, ignores the variety of forms that development takes. India for example maintains its caste system and is still not classified as newly industrialising, despite the pioneering attentions of British colonial capital a century ago (Lipietz, 1982). If the stages approach accurately predicts the course of development, why has capitalism not developed in India, why was Russia the first revolutionary socialist country and not Britain or Germany, why are conditions in many third world countries getting worse not better, and why did capitalism develop out of imperialism in the United States but not in Latin America (Wallerstein, 1975; Lipietz, 1982)?

2.2.2 Imperialism as a lever of dependency

Writers who are critical of the developmentalist approach argued alternatively that imperialism is a barrier to development. Far from being a stage in capitalist development, imperialism represents a method by which the countries of the centre dominate the economies of the periphery. Making use of cheap resources and transferring surplus to the centre solves crises in developed countries but also bars accumulation and development in the periphery. This "dependency theory" is represented in a variety of guises: the world economy of Immanual Wallerstein (1975), the theory of unequal exchange developed by Arghiri Emmanuel (1972) and the pure dependency view of Andre Gunder Frank (1969).

While the three brands of dependency theory differ, they do exhibit some common themes. First they reject the notion of a dual structure in developing economies, one in which capitalist and pre-capitalist (usually some form of feudal) structures co-exist. Instead the world is viewed as a whole system, in which capitalism is the dominant mode of production and into which all sectors are integrated. According to both Frank (1969) and Wallerstein (1975) this has been the case since the 16th century, and "it follows from such a premise that national states are <u>not</u> societies that have separate, parallel histories, but parts of a whole reflecting that whole", so that, "to the extent that stages exist, they exist for the system as a whole" (Wallerstein, 1975, p16). The stage of capitalism implies development of the centre and an imposed dependence of the underdeveloped periphery.

Secondly dependency theories focus on the transfer of surplus value from periphery to the centre. Theory of unequal exchange through trade is the most explicit on this score. Commodities are traded at prices which favour developed countries, effecting a transfer of surplus away from third world economies. Foreign aid policies (through the activities of development bank capital) transfer surplus in the same direction via the circuit of finance capital, as well as providing a means of political leverage over state policy in the periphery (Hayter, 1971). Thus development is not only for the purpose of supplying surplus to central economies: rather the pattern of development itself (the types of commodities produced and the methods used in production) is dictated by the needs and requirements of the centre. "The dependent nature of its [the third world's] insertion into the capitalist world market is the cause of its underdevelopment" (Laclau, 1979, p19).

The third claim of dependency theory, sometimes explicit, at others implicit, is that the relationship between nations is primary in determining international development patterns. Frank is explicit in referring to exploitation which "appears within nations no less than between them" (1969, p227). The centre exploits the periphery as necessarily as capital exploits labour, and this is why the periphery is caught in a dominated or dependent mode of development. Frank calls this 'underdevelopment' in distinction from 'development' because the periphery is blocked by inter-nation relations of exploitation.

Dependency theory is not consistent with the realist-Marxist propositions reviewed in section 2.1. First no realist nor materialist argument proposes that exploitative relationships between one nation and another are necessary. Inter-nation exploitation is an empirical relationship identified by measuring the geographical flow of surplus from one place to another. It is therefore a specific not a necessary relationship, and as such obscures the essence of surplus flows as transfers between capitalists. As the restructuring of the relationship between capitalists, and between them and labour, alters the configuration of space, so the apparent relationship between nations changes as the flows of surplus between countries are altered. Indeed as capital becomes increasingly internationalised it loses that national identity that gave the appearance of correspondence between capitalist and national interest (Foot, 1983; Sayer, 1985). The spatial relationship identified by dependency theorists was too specific. Class interests and restructuring have changed it.

Secondly the work of dependency theorists concentrates upon the period of capitalist development characterised by monopoly capitalism and the imperialist transfer of surplus to the centre, partly because they are pre-occupied with the sphere of exchange (Laclau, 1979). This pre-occupation is epitomised in the work of Emmanuel (1972) which traces patterns of development resulting from unequal exchange. Therefore the true relations of exploitation, that are rooted in production, are not analysed sufficiently and as forces of change they are ignored. Changes in the use of space, such as the development of productive capital at an international scale, and the indigenous development of accumulation in developing countries, are consequently obscured.

Thirdly by concentrating on surplus transfer, dependency theory denies the distinction between modes of production that are defined by relations of material production not relations of exchange. Because they define the world economy according to the mode of exchange, both Frank (1969) and Wallerstein (1975) presume that the entire world economy is capitalist:[2] the apparent domination of the capitalist mode of production (through exchange) is sufficient reason to interpret all production as capitalist (1969). But exploitation through exchange is a thing common to most modes of production and, according to Frank, to the relationship between nations. Feudalism by contrast he regards as a closed or subsistence economy, so its lack of exchange relations of exploitation distinguishes it from capitalism (Laclau, 1979, p22). As Laclau suggests, such a definition implies that slaves in a Roman latifundium are workers in a capitalist system. This ignorance of the relations of <u>production</u>, which are central to understanding a mode of production, means that there is no conception of change in history, which, as emphasised in section 2.1, is necessary if explanation is to

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[2] Modes of production particular to each country are not easily defined. Capitalist production may be generalised in the United States, but this does not deny that both capitalist and domestic modes of production exist. Capitalist structures may dominate, but some events may be directly influenced by structures rooted in material production in the home (Barrett, 1980). A problem for empirical analysis is to reconcile the fact that while modes of production are not, "deducible by a relation of 'virtual identity' from the given forms of the exploitation of labour" (Banaji, 1977, p6), nevertheless a properly abstracted mode of production may be useful for explaining events caused by more than the structures that it defines.

be provided. It is this lack of historical content that prompts Browett (1980) to write about the "cul-de-sac of the dependency paradigm".

Finally the empirical focus of much of dependency theory is Latin America, and it was developed to explain the apparent form of development there that exhibited many of the typical characteristics of underdevelopment (Wallerstein, 1975, p16) and to explain why growth was not following the developmentalist path. Latin American experience and the political need for a theory that supported the fundamental political action of the left against the interests of international capital, encouraged adoption of a body of theory that corresponds to those appearances. But it is not capable of explaining any divergence from these conditions of development because it focuses on specific relations in relative isolation of abstract determining structures.

These weaknesses in dependency theory, as well as alterations in the form of international class relations, have encouraged the development of theory about multi-national corporations and the New International Division of Labour. This theory focuses more upon changes in the sphere of production and the use of space to restructure the form of relations in production. But as the following section argues, it lacks a well developed theory of competition.

2.3 The new international division of labour and multinational capital

The international movement of productive capital is distinguished from that of finance and commodity capital. It refers to the establishment of branch plants in other countries by multinational corporations based in a parent, usually developed country. Such movements expanded in the post-war period: they signify a new form of intercapitalist competition which is commonly identified as the defining characteristic of late (Mandel, 1978) or global capitalism (Gibson and Horvath, 1983). Direct investment abroad by firms based in the U.S.A. for example, expanded from $11.8 billion in 1950 to $94 billion in 1972 (Palloix, 1977, p6).

2.3.1 The theory about multinational firms

The increased mobility of productive capital is commonly viewed in conjunction with an increased mobility of commodities: the result of new methods of transport which cheapen the cost of moving them. Improved communication systems make it possible to coordinate production at a world scale. These facilitating factors (Walker and Storper, 1981) release large corporations from input or market locations, so that the importance of the characteristics of other inputs, in particular labour and government policy, is accentuated.

The unit by which the international expansion of productive capital is analysed is typically the multinational corporation, the institution responsible for its movement. This is most obvious in the work of Stephen Hymer (1979) who claims that the pattern of international development corresponds to the hierarchical organisation of the multinational corporation itself. The apex of technical innovation and managerial control is in the central countries, while routine production occurs in the low skill, low wage countries of the periphery; hence the emergence of a New International Division of Labour. Barnet and Muller (1975) produce a similar analysis of development that focuses on the power of the multinational corporation in general. Frobel, Heinrichs and Kreye (1980) conduct an empirical analysis of the internationalisation of the German textiles industry by global corporations.

There are significant differences between the theory of New International Division of Labour and dependency theory. First Hymer and others try to examine the use of space, in a way not dissimilar from that developed in the regional literature. The focus on productive capital means that the forms of class struggle on the shop floor, and the control of labour, are seen as relations that are restructured through relocation. The movement of production to developing countries where labour is both cheap and disorganised can lower the cost of wages, improve capitalist control of the labour process (which usually implies a more direct method of control), and reduce the cost of providing safety and other facilities to workers. Empirical analyses of the development of particular industries as multinational branch plants therefore tend to focus on the cheapness of wages, long hours and short vacations, poor working conditions and rapid rates of labour turnover in the periphery (Jenkins, 1984b). See for example work on the Latin American car industry by Mericle and Kronish (1984), and Humphrey (1982), and on the use of female labour in the international textiles (Elson, 1983) and other industries (Humphrey, 1983).

Secondly the international expansion of multinational corporations is interpreted in this literature as both a cause of and a solution to crises in the centre. In dependency theory it is viewed only as a solution. In so far as job loss and unemployment is the result of capital flight to cheap labour markets (Bluestone and Harrison, 1982), the crisis of the 1970s and 1980s is the result. On the other hand relocation of production is a solution to profitability crises in two ways. First the use of less organised labour allows an increase in the creation of relative surplus value as Frobel et al. (1982, p4) attest. Secondly the increased unemployment caused in developed countries by this off-shore production creates a climate which is suitable for the restructuring of labour relations there too: recently, developed countries have exhibited a decline in real wage growth, decrease in unionisation of workers (Peet, 1983b) and increased use of quality circles, profit sharing and job security measures in exchange for concessions by labour (Morgan and Sayer, 1984; Capelli, 1984). So in contrast to dependency theory, the growth of accumulation in developing countries is held by the theory of the New International Division of Labour to be a form of restructuring coincident with the crisis in accumulation in developing countries.

The strengths of theory of the New International Division of Labour lie in its focus on the development of class relations (as opposed to spatial relations) as the structural causes of changes in location, and its incorporation of historical change through analysis of crises and the restructuring of conditions for renewed accumulation. Jenkins' (1984b) characterisation of such work as exchange orientated, because it emphasises the search by capital for preferable labour "markets", is ill founded, for the theory of the New International Division of Labour explicitly analyses space as a use-value employed in the restructuring of the relations in "production". While there are of course borderline cases (for example Frobel et al 1980, p24-25 emphasise the importance of the realisation of value over the relations of its production, 1980, p24-25), those studies that focus on multinational corporations in general cannot rightly be categorised in the same manner as the classical dependency or exchange orientated theories.

The conclusion of the two bodies of literature is however quite similar. Both dependency theory and theory about multinational branch plant location in developing countries imply that the pattern of development is determined by the interests of multinational capital, and therefore imposed upon developing economies without consideration of the pattern of development that would best suit the needs of people there. This is especially obvious in the pressure that multinationals can bring to bear on regional and national governments to give concessions (on taxes and tariffs for example) and in strengthening their control over labour in order to create an attractive investment climate (Cohen, 1981). Frank (1980) suggests that the military governments in Latin America emerged during the 1960s and 1970s largely as a result of this pressure by multinationals and because of direct and indirect pressure (through development bank lending) from the governments of developed countries (Hayter, 1971; Chomsky and Herman, 1979). Barnet and Muller (1975, pp152-184) point to the financial, technical and ideological domination of developing countries by global corporations. (See also Ledogar, 1975.) To this extent development is still dependent upon and determined by the interests of the centre, or in the case of theory about multinational corporations, determined by the interests of the capitalists of the centre.

There remain inadequacies in the theory of the New International Division of Labour as a theory of world development. Three will be dealt with here. The first is a matter of empirical inconsistency. There simply is not as much investment in developing countries as we might expect if the 'labour factor' (the quality and cost of labour markets) is so important. Second is the limited conception of competition. Capital appears in the institutional form of the multinational firm, not as a <u>class</u> divided by competition over the exploitation of labour. Third is the pre-occupation with the circuit of productive capital at the relative exclusion of the circuit of finance capital. Yet the conflicting interests of these two factions of capital in developing countries are quite distinct.

The empirical objection to emphasis on the 'labour factor' is examined in the following sub-section. An examination of competition follows in a separate section because it is of more general relevance to the analysis of development. After years of neglect, theory about the structure of competition as a necessary relation in capitalist production and its impact on the forms of accumulation is only now coming to the fore in political economic discussions (Bryan, 1985). This question is given detailed attention in section 2.4, and then some of the forms in which competition appears, one of which is between financial and productive capitalists, and how they are relevant to the international development of industry since the war are discussed in section 2.5.

2.3.2 The 'labour factor'

While the restructuring of space is one way in which the form of class conflicts can be altered, it is by no means the only one. Many geographers and development economists, perhaps anxious to underline the importance of space which is omitted from many social, political and economic works, tend relatively to ignore the other forms that restructuring can take (Sayer, 1985). The result is explanations of industrial restructuring that exaggerate the use of re-location as a solution to crises in accumulation.

This is true both of the international and the regional literature. Peet (1983b) typifies the approach by mapping what he calls 'class struggle' by state in the U.S., (really just the characteristics of regional labour markets) and then correlating regional shifts in industry with those characteristics. Regions with large numbers of hours lost to strike action and high percentages of the work force in union membership are those in which the rate of industrial growth is least. This information is not necessarily wrong and can be backed up with numerous case studies of firms that have moved expressly for these reasons (Bluestone and Harrison, 1982; Perry and Watkins, 1977; Massey and Meegan, 1982).[3] Those industries most dependent upon labour, those with a low technical composition of capital, and those in old regions with old capital and old forms of labour control, have most to gain from such moves, and some evidence from Denmark suggests that they move the most (Jensen-Butler, 1982).

Much of the theory of the New International Division of Labour rests on this proposition. It is most clearly demonstrated in the work of Frobel, Heinrichs and Kreye (1980) and Barnet and Muller (1975), and in references to the search for cheap labour sites as "frenzied capital movement (that) leads to a new decentralised pattern of production, involving de-industrialisation in abandoned regions" (Peet, 1983b, p118). Ross (1983) for example produces data about comparative, international, unit wage rates "designed to show the critical role of

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[3] Presented in this manner however it suggests a theory of industrial location which is not unlike traditional Weberian models of optimisation according to minimised transport costs; only now modern methods for transport of material inputs and products release management from market and material input locations to go in search of suitable non-material inputs: that is often unskilled, preferably disorganised and always cheap labour. Weberian analyses are useful for revealing the individual location choices of firms, but in this case a complete analysis of all costs should be completed, not just of the costs of labour.

low wages in directing the NIDL" (Corbridge, 1986, p61).

Some industries and companies do relocate to take advantage of preferable labour markets, decentralising industry away from the old industrial centres. But firm movements of this kind are not that common. According to Birch (1979) (see Bluestone and Harrison, 1982), while the sunbelt displayed a net job increase almost three times that of the frostbelt in the U.S. between 1969 and 1976, nevertheless as proportions of total jobs created the net figures are very small. While the sunbelt gained a net 6.6 million jobs in this period, over 20.7 million were created in the frostbelt. This hardly indicates a region rocked by 'frenzied' capital flight to more preferable labour markets. There are other significant in-situ changes in industrial structure (Massey and Meegan, 1982). Meanwhile, "plant closings are not confined to the old industrial 'Frostbelt'; they occur in large numbers in every region of the country and as such they are a national phenomenon" (Bluestone and Harrison, 1982, p31).

This seems to imply that job loss as a whole in the U.S. might be explained by shift in location to developing countries. Yet here the picture is much the same. The shift of capital to developing countries is not nearly as pronounced as the "labour factor" argument might lead us to expect. The transfer of capital is still far greater between developed countries than it is between developed and developing countries (Jenkins, 1984b, p35; Grahl, 1983; p130). Direct investment by majority U.S. owned firms abroad between 1977 and 1984 totalled $293 billion (current), of which 72.4% was in developed countries (from, U.S. Department of Commerce, Survey of current business, March 1984, p33). Even these figures may overestimate direct investment in developing countries because they take no account of the huge amounts of foreign investment in the U.S.A. itself. These totalled $67 billion (current eurodollars) between 1981 and 1984. During those years foreign direct investment in the U.S., U.K., West Germany, France and Italy totalled $92 billion (current eaurodollars) compared with only $15 billion (16%) in Brasil, Argentina, the Philippines, Korea, Mexico and Chile (IMF, Balance of payments yearbook, 1985). For example multinational branch plant location is also focused in some old industrial regions as well as newly developing ones, for example in South Wales (Morgan and Sayer, 1984). So studies on the New International Division of Labour "fail to come to terms with the fact that most foreign direct investment is located within the most advanced regions and countries by exaggerating the significance of labour-intensive production and cheap labour locations and underestimating capital intensive and high skill intensive activity and the consequent need for market locations" (Sayer, 1985, p17).

While the importance of the 'labour factor' is not denied, it is true that a pre-occupation with labour markets has exaggerated its emphasis in some empirical work. As Massey and Meegan (1982) make plain, the restructuring of production and class to overcome obstacles to accumulation does not necessarily involve the use or re-use of space: it may take place in situ. Productivity increases in old centres can negate the unit labour advantage held by developing countries (Bettelheim, 1972; Corbridge, 1986, p62), or relocation can be a response to the growth of new markets. In the first case a little relocation may be enough to disunite workers in old regions sufficiently for them to accept alternative forms of restructuring. In the second case the quality of the labour market may be relatively unimportant. (Both cases are illustrated in the work on steel which follows.) Nor need restructuring necessarily involve greater capitalist control over labour: indeed changes in the structure of production to improve competitiveness may reduce the degree of labour control (Sayer, 1985).

It is argued in the following section that analyses that fail to appreciate aspects of restructuring other than the increasing use and control of cheap labour do so partly because they treat "capital" not as a class characterised by competition, but as an institutionalised homogeneous entity that struggles with labour.

2.4 Competition

The concept of competition has received little attention in Marxist theory. Even though Marx characterised competition as "nothing other than the inner nature of capital" (1973, p414), the term has often been regarded as a given that underlies laws about the falling or equalising rate of profit (without working out how such movements come about as outcomes of competition) or that is eliminated by the development of monopoly capitalism. As Bryan has recently argued, "the term 'monopoly' has (too frequently) been used simply as a synonym for large companies and 'competition' understood as a veil which disguises exploitation" (1985, p72), (a veil because the competitive formation of prices disguises the fact that value is created by labour). But these categories are now receiving more attention in Marxist discourse (see Semmler, 1982; Sherman, 1983; Wheelock, 1983; Weeks, 1981; and Farjoun and Machover, 1983).

It is important to note that the discussion that follows is conducted at an abstract level. It is an attempt to define the real relationship between capitalists and does not imply that this relationship always manifests itself in the same way at an empirical level. Section 2.5 discusses some of the forms in which competition appears. Often partnerships can be struck between productive and finance capitalists, or between producers in a given sector of production, but these do not destroy the necessary relationship between capitalists which is one of contest over the appropriation of surplus value.

Capitalists produce distinguishable use values and so are classified into sectors of production; the use-values are produced by different techniques so that the amount of surplus value produced per unit of capital advanced in each branch is different. Overall, sectors with a low organic composition of capital produce large amounts of surplus. However, this surplus is not necessarily realised by the capitalists in whose sectors it is produced. If it was then the rate of profit[1] in low organic composition of capital sectors would be high. But in general capital is attracted to high profit sectors, expanding production and thus bringing down the unit price of the use-value and depressing the rate of profit there.[2]

The result is a redistribution of the surplus amongst capitalists (Shaikh, 1981, p190). Each sector produces a certain surplus that is the difference between the amount of labour time performed there and the value of that labour power. Nevertheless that surplus may be realised by other capitalists as prices deviate from values. The entry of new capital into a sector reduces the surplus realised by capitalists already operating there because it depresses the price at which they can sell their output. So there is competition between capitalists in different sectors: those in low profit sectors try to enter high profit sectors.

Within sectors capitalists operating with an above average technique do better than the others, because they need to buy fewer inputs for a given quality of output. Unit costs are reduced by adoption of new technique, (or else the quality of the product is changed) yet all capitalists in the sector sell the same commodity at

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[1] "Profit" is used in this discussion as an exchange-value category, defined in prices as revenue minus cost. The rate of profit is therefore net revenue divided by cost. Thus profit is the money form in which surplus is realised.

[2] Webber (forthcoming) has shown that contrary to the common assumption, the flow of capital between sectors does not necssarily lead to a pure equalisation in the rate of profit.

the market price, so the rate of profit is higher for the more efficient producers. Once again surplus is not necessarily realised by the capitalist in whose enterprise it is produced.

Competition between and within sectors is linked, because as capital penetrates high profit sectors it expands production at the most efficient technique.

> ...The invasion of capital into a branch of industry with a high rate of profit revolutionises the productive forces there. This creates a stratification of capitals in each industry and unequal profit rates within the industry, as the more efficient capitals capture a larger share of the surplus value realised as profit in that industry. Thus, the process of the (movement towards the) equalisation of the rate of profit among industries is also the process of uneven development and stratification within industries (Weeks, 1981, p171; my addition in parentheses).

These two types of competition lead to contradictory movements in the rate of profit. Competition between sectors causes capital to move towards high profit sectors and enforces a general equalisation in the rate of profit. This social force of inter-sectoral competition lies at the centre of Marx's theory of price formation and the transformation from value to price (Shaikh, 1977). However, as Farjoun and Machover (1983) have argued, a state of equalised rates of profit is not only never realised, but cannot be reached in the presence of competition. This is because it ignores within sector competition that forces developments in techniques of production and divergence in the rate of profit. Individual productive improvements within a sector increase profits for the capitalist who adopts them, but they also attract external investments that depress profits again (Wheelock, 1983, 23-24). As we shall see in the following section, the control of production across an entire sector through monopoly can therefore offer a great advantage in inter-sector competition and yield sustained high rates of profit to the monopoly capitalist (Bryan, 1985).

Competition also produces contradictions for capitalists between strategies in competition and those in struggles with labour. This is because there are two contradictory sources of profit. The first is within the firm where capital struggles with labour to increase the production of absolute or relative surplus value (Marx, 1967a, p315). The other is in the market place where successful competition with other capitalists permits not only the realisation of surplus created within the firm, but also appropriation of additional surplus that has been created elsewhere. The first of these concerns a struggle with labour over issues such as the length of the working day (the creation of absolute surplus value) and those about the overall cost of labour - the amount of time worked for the capitalist each day (or the creation of relative surplus value). These are changes in the work place aimed at improving the production of surplus. The second constitutes competition with other capitalists over the distribution of the available surplus. More surplus can be obtained in this way by reducing costs, increasing the rate of turnover, changing the quality of the product or improving the reliability of supply.

Sometimes strategies of competition and struggle coincide. For example attempts to reduce the cost of labour or to increase the intensity of work improve the appropriation of value from elsewhere and increase the production of surplus value in the factory. But competition can induce capitalists to contradict the strategies appropriate to the struggle with labour. Attempts to reduce the costs of labour may reduce the quality of work and product or the reliability of supply if labour relations are strained. Technical change designed to improve the quality of output or rate of turnover may increase the potential for the disruption of production by workers.

Thus it is misleading to consider the development of capitalism as if it is defined only by class struggle. Although some analyses identify the different forms of labour relations that have corresponded to different forms of competition, the strategies adopted by capitalists are generally presumed to be those stimulated by the struggle with labour (for example Braverman, 1975). But many competitive strategies contradict capitalists' objectives in their relations with labour. This is why capitalists "may sometimes replace a labour process over which it has great control by one over which it has less control, if the new process is the only existing way of producing a new commodity for which market prospects are better than for its predecessor. Technology... can create rather than solve problems of control" (Sayer, 1985, pp9-10). Hence the confusion that results from concentration on the 'labour factor'.

Competition then may itself encourage some changes in the structure of production that are not directly the outcomes of class struggle, or may have side effects that do not enhance the position of capitalists in that struggle. However, just as the forms of struggle are specific to certain periods, so too are forms of competition. If understanding spatial restructuring means understanding class restructuring therefore, analysis not only of restructuring of the labour relations is required, but also of the form of competition, or of the capital relations.

2.5 Some forms of competition

A classification of capitalist development in to three stages is common in the literature: the stages of competitive, monopoly and global capitalism (Gibson and Horvath, 1983). These correspond to periods of colonialism (the mobility of commodity capital), imperialism (mobility of finance capital) and late capitalism (the mobility of productive capital and the development of the New International Division of Labour) (Mandel, 1978; Palloix, 1977) in terms of their influence on the form of international development.

The following two sub-sections consider two aspects of competition that are implied by these classifications. First monopoly is examined as a means of maintaining high levels of surplus appropriation. Secondly the division of capital into factions or circuits of commodity, finance and production, and the different forms that this division has taken at an international scale are considered.

2.5.1 Monopoly capital

For Marx the increasing concentration of capital was a necessary trend in capitalism (for example, 1969a, p579). It has been taken by some writers that this trend fundamentally alters capitalism. Baran and Sweezy (1968) argue that the trends towards centralisation and concentration of capital result in companies so large that they are able to regulate market prices and eliminate competition altogether (Bottomore, 1983, p340). They also contend that smooth accumulation without crises is facilitated by privileged pricing, while Sweezy (1970) denies the operation of the law of value in the era of monopoly capitalism. As such monopoly capitalism for them lies "at the very centre of the analytical effort" (1968, p6) because it represents a fundamental alteration in the laws of capitalism. This is a very different conclusion from Marx's argument about the trend towards concentration that carries with it no such threat to the law of value.

There is no reason to suppose that monopoly has such devastating implications as Baran and Sweezy suggest. There are two reasons for this. First the strategies that achieve monopoly (scale, concentration and control of market share) are quite different from and are undermined by the object of monopoly (privileged pricing). Secondly monopoly does not create new value, it is only a means of redistributing it. These two objections are considered in turn.

We know that competition is carried to individual capitalists as capital penetrates their sector, or by technical advances of competitors within the sector. Monopoly can be defined therefore as the creation of barriers to the entry of capital to a given sector, which also implies the control of the market for a particular use-value over competitors within the sector (otherwise entry could be gained through these competitors). Barriers are usually created by achieving sufficient concentration within an industry that no other producer is able to capture a significant share of the market. The monopoly producer can now charge privileged prices. However this means that the rate of profit in that sector is raised, strengthening the incentive for capital to enter from other sectors. The barriers to entry therefore have to be strengthened in order to maintain monopoly, which itself implies the continuation of competitive strategies normally conducted within a sector in the absence of monopoly. This is why Baran and Sweezy argue that under monopoly "price competition, which was the principle form of competition under competitive capitalism, has been replaced by a system of administered pricing. Yet... firms in the monopoly era continue to develop techniques of cost reduction, by differentiating products, and by advertising... Competition does not disappear in the monopoly era; rather it takes different forms" (Trachte and Ross, 1985, p189; Baran and Sweezy, 1968, p71).

Monopoly therefore, far from destroying competition, merely suspends its operation over prices and intensifies it over other issues. The blocking of capital movement into a high profit sector intensifies competition over the issues around which the barriers were constructed. This means that the kinds of competitive strategy adopted within sectors which reduce the production of surplus, like the replacement of labour with capital, must still be used in a monopoly sector to maintain the barriers to entry.

Secondly, monopoly does not destroy the unity between the three spheres of value (Harvey, 1982, chapter 1; Shaikh, 1981). Surplus value is only created in production, not in the sphere of exchange: no additional value is created through the artificial maintenance of profit rates above the average rate of profit. Monopoly pricing only obtains surplus profit from alternative sources.

The increased incentive for capital to enter monopoly sectors therefore, is not just the result of high profits in monopoly sectors but also of low profits in non-monopoly sectors which result from the loss of surplus. The only way in which capitalists can create more relative surplus value is by increasing the rate of surplus value. Yet this does not tend to happen in monopoly sectors. Both Braverman (1975) and O'Connor (1973) have identified a trend towards the development of privileged labour groups in monopoly sectors. High wages are paid in attempts to purchase labour peace and maintain product supply. This practice does not undermine profits within the monopoly sector so long as privileged prices can be charged, but it does reduce the overall production of surplus, and the fall in surplus production contributes to an overall reduction in the rate of profit that is manifested in the non-monopoly sectors. Furthermore the payment of high wages further weakens the barriers to entry because potential competitors can now undermine monopoly producers by making use of alternative, cheaper labour markets.

As we shall see in chapter 4 this is what happened in the United States steel industry. Up until 1959 a rigid oligopolistic pricing policy was maintained, and associated with this form of competition was a long period of capital widening with little or no technical advance and rapidly escalating wage rates. Steel producers adopted privileged pricing, but they neglected the adoption of competitive strategies required to maintain the barriers to entry. Increasing competition from abroad, where technical improvements were made and labour was cheap, undermined the monopoly position of the U.S. steel companies in their own market and the pricing system collapsed. The form of competition was transformed from monopoly to global.

Neither of Baran and Sweezy's claims, that monopoly capital eliminates competition and crises and that it negates the law of value, are valid. As Wheelock (1983, p30) argues, through the successful execution of a monopoly strategy, competition only appears to destroy itself. Monopoly competition is merely a form of competition which, through the elimination of competition over prices increases the need to adopt competitive strategies over other issues. This is why Peet suggests that 'monopoly capitalism' is a category "invented to describe", because it only captures a particular form of competition, not the relation of competition itself (1983b, p116).

2.5.2 Global competition and interest bearing capital

So far the discussion of competition has only considered divisions between productive capitalists. The circuits of finance and commodity capital contain particular kinds of sectors that are not involved in the production of absolute and relative surplus value. Capitalists in these sectors depend for their profit entirely upon surplus appropriation from productive capitalists. Conflicts between finance and productive capitalists lead to new forms of development which are generally ignored by the literature on the New International Division of Labour because it focuses on multinational corporations.

The relationship between industrial and finance capitalists is a complementary one under certain circumstances. The credit system for example allows payment by installment on the inputs to commodities that require long production periods, thus facilitating an accelerated rate of turnover. It is also needed to circulate large units of fixed capital such as dams, power stations and blast-furnaces that can be purchased on credit. "Capitalists investing in the present can borrow at interest from capitalists who are saving with an eye to future expansion or replacement" (Harvey, 1982, p265). Such interdependencies lead Hilferding to presume a unity of purpose between industrial, commercial and bank capital (1981). "Since industrialists derive competitive advantages (particularly with respect to scale operation) from access to bank capital, they must increasingly look to external sources of loan capital" (Harvey, 1982, p290).

However, this complementary relationship is not one of unity. Since competitive advantage can be obtained through access to bank capital, so industrial capitalists compete for that access. Yet they thereby commit themselves to donate some of their surplus to the finance capitalist. The transactions of interest bearing capital do not produce value and the finance capitalist therefore depends upon interest for profit, which is a direct deduction from surplus created in production.

The objectives of finance capitalists are quite different from those of productive capitalists. Industrialists must cut costs, capture markets and control labour or maintain monopoly in their battles with competitors. The objective for finance capitalists is to maintain a balance between liquidity and solvency (Scammell, 1983). As the supply of money grows it must be lent quickly to earn interest, reducing liquidity, but this implies lending increasingly to less reliable borrowers. If too much money is lent or it is not repaid, then solvency is lost.

Generally it is presumed that finance capital is lent to those sectors where the profit rate is highest, so that money capital plays a part in effecting moves towards the equalisation of the rate of profit (Harvey, 1982). Those industrial capitalists who are most successful can attract the investment required to make further changes in technology or location. However, because of the need to maintain solvency, lending is not necessarily made to the most profitable producers. Indeed it is often high profit makers who do not need to borrow money.

Furthermore the future level of profitability is not usually assured in the borrowing company, especially when long term investments are being made, and guarantees on repayment sometimes given by the state mean that money is lent to a variety of sectors independently of their profit potential.

At a national level the state is generally closely involved with finance capital. It establishes a legal framework for money transactions, controls the degree of centralisation of money wealth, and conducts monetary strategies that affect inflation (Harvey, 1982, p321). The central bank, which is a fully integrated part of the state apparatus, has significant power over the quality of national currency, and the state often affects the investment (through the national bank) decisions of international financiers by providing guarantees on loans made to nationally based or nationalised industrial capital. The last of these has been particularly common in developing countries anxious to induce the growth of industries in which industrial capital is not willing to involve itself, or which, for politically nationalist reasons, are deemed unsuitable for direct foreign control. Other nationally specific factors impinging on investment decisions include the perceived stability of national governments (see Chomsky and Herman's (1979) evidence about reduced loans to socialist regimes in Latin America; also Hayter, 1971), as well as varying attitudes of national stock-markets towards acceptable debt-equity ratios (for example the difference in this respect between Japan and the United States (FTC, 1977; Allen, 1981)).

So finance capital does not necessarily flow towards the sectors or firms where the rate of profit is highest, but towards those from which repayment is most likely. Under certain circumstances these two may coincide, but they need not. For example when petro-dollars flooded the European and American banks in the early 1970s there were "too many lenders chasing too few borrowers" (Sampson, 1982, p16). Under such circumstances credit worthy developing countries were actively pressed by the banks to borrow more money. "The banks now regarded about twenty (developing countries) as credit-worthy, and thus promising new customers. They could lend the OPEC deposits.. (and) they could earn higher profits because, as a general rule, the poorer the country the higher the interest and charges. In four years between 1972 and 1976 all the big banks rapidly increased the proportion of profits from abroad' (Sampson, 1982, 141, my addition in parentheses).

Chapter 8 shows how development in Brasil was facilitated by heavy foreign borrowing that allowed capital accumulation by domestic classes. Development in this instance is not imposed by finance capitalists but is the result, at first, of a partnership between international finance and Brasilian productive capital. The inherent conflict between finance capitalists dependent on surplus appropriation and productive capitalists who must donate it emerges between these participants later.

The understanding of development through conflict between these branches of capital leads to two conclusions that differ significantly from those of the New International Division of Labour literature. First, development is not imposed from the outside. Instead it is the result of partnerships and conflicts between different branches of national and international capital. Second, development may progress for reasons other than exploitation of cheap labour markets. Since finance may move to third world locations for reasons more allied with the interests of local classes there expressed through their influence on state policy, the presence of cheap labour may be less important than it is to multinational corporate capital.

2.6 National class interests

Theories of the New International Division of Labour tend to ignore capital as a class in competition and focus on the specific relations between workers and transnational corporations. They therefore over-emphasise the importance of the labour factor, and omit from analysis other divisions within the capitalist class, such as finance capital. They also pay little attention to branches of capital that are not organised internationally. It is to gain advantage over other firms, as well as over labour, that some corporations strive to internationalise their production. Multinationals must still compete therefore with non-multinational firms and struggle with locally or nationally organised groups of workers, both in developed countries and in developing countries where they locate their branch plants. Investigation should turn therefore towards a broader class analysis which examines the variety of competitive interests within the capitalist class as well as the forms of class struggle, in different national locations.

> In locating the dynamic which leads to the new international division of labour in trends in accumulation at the centre, these authors deny any independent dynamic within the Third World. Policies to promote exports or to attract capital for instance are seen as a result of the needs of capital at the centre, rather than as an outcome of local class struggle... The neglect of these (local) aspects gives a highly one-dimensional picture of the new international division of labour which tends to identify it with certain branches which have relocated to free production zones where cheap labour is the major consideration (Jenkins, 1984b, p34)

Conflicts between national and international class groups usually involve the state. The state is caught in a contradictory position in these conflicts. It can be called upon to protect the interests of those groups within its own jurisdiction, for example through tariff protection, exchange rate policies and price control, while pressure may also be brought by external forces to reduce taxes or tariffs to allow investment or imports. For example tariffs on steel imports to the U.S. protect the profits and jobs of steelmakers. But tariffs are opposed by steel consumers, (because they mean higher steel prices) and by international bankers who depend upon the export ability of developing countries for the repayment of loans (chapter 5). Issues such as this are resolved through conflict, not imposed by international capital as the New International Division of Labour theories imply.

The change in emphasis recommended by Jenkins is most evident in the work of Warren (1980). His book, Imperialism, Pioneer of Capitalism, returns to some of the classical stages or developmentalist view of development. This view claims that the dependency and New International Division of Labour theories have underestimated the extent of the development of capitalism in developing countries, over-emphasising the role of external forces. Instead Warren regards colonialism and imperialism (externally imposed forms of development) as precursors to the emergence of indigenous capital classes in Third World countries, and the development of the productive forces a necessary step towards socialism.

Warren's argument is good because it redirects attention towards the importance of indigenous class forces in developing countries. But the political purpose of the argument is to show that imperialism is a necessary step on the road to socialism.[3] The empirical evidence Warren supplies is comparative growth rates in GNP, improving welfare and growing manufacturing output in some developing countries, intended to show that imperialist development is producing real growth in the periphery and not just providing a flow of surplus to the centre countries. But this sort of advance is far from typical of the third world. According to Lipietz, Warren's work includes "a few

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[3] "A non-revolutionary aristocracy... has encouraged reactionary policies aimed at excluding foreign investment, thereby hampering the development of the productive forces and the working class" (Sender, 1980, xii). According to Warren a progressive socialist policy should encourage the development of these forces and growth of a working class which can fulfill its historical mission on the road to socialism, a strategy which is critical of the populist-nationalist, (Peronist or Nasserist) anti-foreign position taken by many on the left in developing countries (see chapter 8).

incredibly naive arguments" (1982, p52). The weakness in his argument is that it does not take account of the patterns of development specific to each country.

Nevertheless, Warren's emphasis on internal development forces points towards an alternative approach to understanding third world development. It is this that prompts Lipietz to admit that "since 'the living soul of Marxism is concrete analysis of a concrete situation' (Lenin), the priority task is to study the Third World countries as they are" (Lipietz, 1982, p48). It is this element of concrete analysis which is so lacking from the international development literature in the classical dependency tradition as well as that on the New International Division of Labour. The different patterns of development in Brasil, Chile, South Africa and Iran in the past twenty years do not permit such a rigid interpretation of history. It is necessary to analyse the configuration and influence of internal class forces, state policy and foreign interests separately in each case.

In this respect some Latin American political economy provides useful examples of analyses of development specific to each country. Cardoso and Faletto (1979), for example, credit foreign capital with a primary role in the dependent development of Brasil, Argentina and Mexico, yet are at pains to contrast the development of capitalism in each of these countries. While they do not deny the existence of dependence, nor do they accept its necessity. Rather they accept that the development of Latin American economies must take place within a world economy dominated by international forms of capital. "This being the case it is necessary to determine the way in which state, class and production are related in each... case of dependence" (Cardoso and Faletto, 1979, p173). Similarly analyses of growth in Brasil since the war by Evans (1979) and O'Donnell (1978) focus on the specific development of class relations within that country which take note of indigenous class forces and the state as well as the interests of foreign capital. (Other analyses of this type provide a basis for the examinatio of Brasilian development in chapter 8.)

2.7 Empirical analysis and mid-level abstractions

The empirical work in the following chapters is about steel production. This work is directed in such a way as to avoid the weaknesses in other international development literature identified by this chapter. That implies maintaining a distinction between theoretical propositions and empirical information as defined by a realist method of science.

Some recent attempts to make it easier for analysts to link empirical information with abstract causes have tried to identify a series of intermediate levels of abstraction (Sayer, 1979; Gibson and Horvath, 1983). In this section it is argued that over-use of these sub-levels can lead to the imposition of stereotyped interpretations on a variety of forms. Alternatively analysis should be conducted as far as possible by moving between levels that really exist, that is between our knowledge of concrete events and the logic of the causal mechanisms specific to a capitalist mode of production.

Gibson and Horvath (1983) have defined four levels of abstraction. Level I refers to laws that are transcendental. Level II refers to modes of production (with respect to capitalism this is the level of capital in general), and level IV refers to events at the level of social formations (in specific conditions). Level III abstractions are sub-modes of production (for example monopoly or global capitalism) in which relationships are supposed to take on characteristic forms specific to a particular period. Level III abstractions can link theory and concrete analysis (see also Sayer, 1979). But such a mixture of theory and form at the same level can also cause confusion because it must confront a contradiction between theory and concrete analysis.

At level II, that is theory at the level of necessity with respect to the mode of production, the basis for dividing capitalism into periods is crisis theory. The contradictions in the nature of accumulation lead to the cyclical breakdown and rebuilding of class relations. At level II each cycle is the same, but at level III each cycle in development is different from the earlier ones as the form of relations evolves. These changes are characterised in the literature by various terms such as Fordism, Taylorism, competitive and global capitalism, imperialism and the development of a New International Division of Labour. But all these categories are essentially derived from empirical analysis. If they are not handled carefully they can become little more than stereotypes which, "freeze, and then present as universal, relationships which are contingent and historically specific" (Sayer, 1985, p17). In other words it can be useful to use these categories to describe, but misleading to present them as universal, even over a period of say fifty years. This mistake is noticeable in studies that characterise the period of global capitalism by the movement of productive capital and so analyse development as if it were imposed by multinational firms. Really the variety of empirical forms does not fit a stereotype so easily as this.

The contradictory position of mid-level abstractions can be illustrated by considering the conceptual movement (in the mind of the analyst) from level IV to level III and the reverse. The movement from level IV to III involves the empirical identification of characteristics that define periods. Most authors may agree that the present period is one of global capitalism, and labour relations are characterised by more consensus than in the era of monopoly capitalism, yet there is a noticeable lack of willingness to identify the date when this era began. This may be because the global expansion of productive capital and the most recent cycle of accumulation do not correspond. Mandel (1978, p131-2) and Gordon, Edwards and Reich (1982, p9, p37) agree that the most recent upswing began during or immediately after world war II, but this does not coincide with a noticeable expansion in the internationalisation of capital which is concentrated some twenty to thirty years later (in the mid-1960s to 1970s). So the empirical and theoretical definitions of this most recent cycle do not coincide. This raises the question: Is the emergence of international competition a response to the crisis of the 1930s, or was it merely an attempt to stave off the crisis which we are now experiencing? When does the era of global capitalism begin? Does it correspond to a cycle of accumulation from trough to trough, say about 1940 to 1980, or does it begin at the crest of the cycle, say in 1960? While crises can be identified by plotting the progression of statistical indicators such as profitability and unemployment (as Mandel and Gordon et al. attempt to do) this does not imply that each form of class relationship need correspond to its own wave.

The form of class relations can change therefore outside periods of crisis. High levels of crisis theory, at level II, point directly to changes in the composition of capital and rate of exploitation brought about by the destruction of fixed capital and high unemployment during crises (that create the conditions for renewed accumulation through the elevation of the rate of exploitation and the adoption of new techniques (Foot et. al., forthcoming). These restructurings take various forms. But they may not take shape in an identifiable form until they become consolidated well into the cycle of accumulation. In the case of the expansion of accumulation at a global scale, the conditions for restructuring of capitalist relations in this direction did not become fully developed until the war-torn economies of Europe and Japan had been repaired, and the technological advances in transport and communications had become sufficiently established to allow production to be coordinated internationally. Immediate post-war restructuring focussed more upon the establishment of new technology on the heels of the vast devalorisation of fixed capital during the crisis of the thirties and the physical destruction in Europe and Japan, than on internationalising production.

Describing epochs in capitalist development by generalised forms of class relations can constrict empirical work (conceptual movement from level III to level IV). The characterisation of the present cycle as one of global accumulation has encouraged the focus upon the actions of multi-national corporations at the exclusion of other aspects of the restructuring of class relations. But a level III abstraction should not deny the possibility, even the likelihood, of a variety of concrete situations. O'Connor (1973) and Braverman (1975) for example describe the relationship between labour and monopoly capital as if they never vary. The pricing power of monopoly capitalists allows them to pay labour higher wages than those who work for capitalists who must maintain price competitiveness, while skill levels are reduced as jobs are standardised. The creation of a dual labour market by elevating monopoly workers to a privileged status allows for consensus forms of labour control in those industries. Yet as we shall see in chapter 4, developments in the U.S. steel industry after the war were almost completely the reverse of O'Connor's scenario. Monopoly pricing collapsed in 1959 in the face of imports of competitively priced steel. Wages in the steel industry continued to grow, at first because of the political strength of the union, and later because the industry offered wage concessions for improved reliability of output and a no-strike clause.

Different sectors may exhibit quite different forms of restructuring (Massey and Meegan, 1982). The epochs characterised as Taylorism and Fordism need not find all sectors employing such methods of labour control. Similarly these categories have been developed through historical analyses in the developed economies of Europe and North America. However, in the analysis of class relations in developing countries the forms of labour control may be, as for example in Brasil, closely tied to direct regulation and intervention by the state (Quartim, 1971), and quite different from methods of control developed during the same epoch on the shop floors or at the bargaining tables of the industrial centre.

These examples of concrete divergence from level III abstractions reveal how those abstractions or types may be misleading. While there are sound realist arguments to support the existence of levels I, II and IV, level III is an invention by the analyst for use in interpreting empirical information. As such it is useful for characterising concrete forms of relationships, but when applied to a period as a sub-mode of production it can impose regularity on what is really a diverse concrete reality. Most of the international literature reviewed in this chapter has made the error of focusing on the characteristic form of a sub-mode of production, and therefore overlooked the variety of changing concrete relationships that contribute to development.

The work that follows attempts to avoid the errors identified by this chapter in the international development literature. This implies using mid-level abstractions only to describe concrete forms of social relations. They are not used to imply that in the specific countries and sector analysed these forms should necessarily correspond to the characteristics of the most recent sub-mode of production. The analysis of the steel industry takes account of indigenous class forces: international capital forces are viewed as interests which conflict with nationally based classes. In each situation the relative dominance of external forces changes, so there are periods in which a pure dependency view of development in Brasil, for example the late 1950s and the mid-1960s, is accurate. In the 1940s, the early 1960s and the late 1970s however external forces were less influential. The empirical work in this thesis provides explanation by identifying these <u>changes</u> and the links between them (how seeds of a new situation are contained within the old). Analysis is conducted by identifying specific forms and tracing how the operation of causal mechanisms in these conditions leads to new outcomes. So the conceptual transfer between the abstract and the empirical matches as closely as possible the reality of the relationship between cause and outcome.

CHAPTER 3

STEEL AS A USE-VALUE

3.1 The concept of use-value

Classes conflict in capitalism over the production of labour-value, which forms the basis for the value of labour power and surplus-value, and around the realisation of that value in its money form as exchange-value. Wages and profit are the price forms of the value of labour power and of surplus-value respectively. But the production and realisation of labour-value itself are also embodied in a material form. So the production of labour-value is also the production of use-values: things which are of use. Capitalists compete over the exploitation of labour and over the distribution of surplus, but this competition is also structured around the production and sale of use-values. Similarly labour works for wages only because money can be exchanged for useful things.

The sphere of use-value has often been ignored in Marxist analysis (Harvey, 1982), yet its inclusion is necessary to the understanding of a number of basic Marxist concepts. For example the unity of the three spheres of value is central to the exercise of transforming values to prices. This is because corresponding value and price ratios, such as the rate of surplus value and the rate of profit, are not equal except under exceptional circumstances.[1] Their correspondence is due to the identical use-value bundles which the sums of profit and surplus-value represent (Shaikh, 1981). Without the sphere of use-value, comparisons between value and price categories are meaningless.

Competition is another Marxist concept which can only be understood in relation to use-value. As explained in section 2.4, the division of capitalists into competing groups and factions is based upon their involvement in the production of different use-values. So the introduction of a new technique is aimed at improving competitiveness (because it improves control over labour, speeds up production or improves product quality) over other capitalists producing either the same commodity or a substitute. Similarly, labour relations are centred around conflicts over production processes peculiar to the manufacture of particular kinds of use-values. Continuous production, typical of Fordist methods of labour control, are best suited to assembly processes and are therefore more typically found in consumer rather than producer goods industries.

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[1] When the organic composition of capital, the rate of exploitation and the rate of turnover in all sectors are equal.

In order to understand the class conflicts which have led to changes in steel production it is therefore necessary to know the properties of steel as a use-value. For example the handling of hot metal means that steel production is a relatively dangerous exercise, so safety at work can be a major issue in local labour relations. It also makes steel production vulnerable to unpredictable work stoppages, for if the insides of furnaces and casters are allowed to cool the start-up procedure is a lengthy one. Sudden shut-down of a blast furnace for only a few hours can result in days of lost production. The undesired but unavoidable output of pollutants can make health an issue of conflict between management and workers and the wider effects of pollution an issue between management and state.

This chapter reviews some of those properties of steel and some of the basic technology available for steel production that have influenced and distinguished the subjects of class conflict in that industry from the conflict in others. So for example the most effective method of speeding turnover in steel production has been the use of a chemical reaction which produces heat more quickly, a matter involving technical change. By contrast the increase of turnover in automobile assembly depends on the speed of work, a matter involving intensification and conflict over control of the labour process. These differences affect the pattern of labour struggles in the two industries (Ong, 1983). Information about types of technology is proffered here rather than during the historical account which follows in chapters 4 to 9. Information about steel products and the technology of steel production is presented in sections about each of the three stages in the integrated steel making process: production of iron, the production of molten steel, and its casting and rolling into finished products. Finally the position of steel as a use-value in the market is considered. The intensity of inter-industry linkages with steel makes the industry a prime target for government intervention in price control and development policy.

3.2 The integrated steel process

The central process in steel making is oxidation[2]. This lowers carbon levels in iron metal to less than 2% (Russell and Vaughan, 1976; U.S. International Trade Commission, 1982). (Small amounts of silicon, manganese and phosphorus are also removed.) Carbon steel is stronger and less brittle than iron. Because of its flexibility carbon steel can be rolled from castings into a variety of shaped finished products, whereas iron can only be cast into shaped moulds. Ninety percent of steel produced in the U.S. in 1976 was carbon steel, the remainder being stainless and alloy (UNIDO, 1978). This thesis considers only the carbon or basic steel producing sector.

The production of steel therefore involves three main stages. These are: the reduction of iron metal from iron ore for further heating

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[2] Oxidation means combining compounds with oxygen. Carbon, for example, oxidizes as carbon monoxide.

into steel; the making of steel by oxidising carbon from iron; and the rolling of steel castings into finished shapes. A plant which combines these stages on the same site is called an integrated steel mill. Plants which only conduct parts of the process are semi or non-integrated mills.

3.2.1 The production of iron

The conventional method for producing or reducing[3] iron metal is in a blast furnace using iron ore, coke as fuel and fluxes. The carbon monoxide gas from burning coke reduces iron ore to iron, while acids from ores combine with lime in limestone fluxes to produce a slag which floats on top of the molten iron. Charcoal can be used as a substitute for coke, but only in small blast furnaces as it cannot support the same quantity of burden (Baer, 1969). The regulation of the quantities of inputs to the blast furnace, depending upon their chemical constitution, determines the metallurgical character of the molten iron output. This should be approximately 94% iron, 3.5% carbon, 1% manganese, 1% silicon, and with small amounts of phosphorus, chromium, copper, nickel, tin and molybdenum (Russell and Vaughan, 1976, p87). Outputs from the blast furnace are molten pig iron, slag and gases (gases that are commonly used in the operation of the blast furnace itself and in other parts of the plant, particularly in ingot soaking pits or slab re-heating furnaces).

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[3] Reduction is the opposite of oxidation. It involves the separation of compounds from oxygen, in this case of iron from the oxygen with which it is combined in iron ore.

Coke, which is 90% carbon and 10% ash and sulphur, is usually produced on site in coke oven batteries which heat coal in the absence of air. Bye-products of coke production include benzene, light oil, sulphur, tar, phenol, ammonia, acid sludge, sulphur dioxide and hydrogen sulphide. Some of these bye-products may be recovered and sold, depending upon recovery costs and market prices, and much of the gas is mixed with blast furnace gas and similarly used. If they are not recovered, these products become either air or water borne pollutants (Russell and Vaughan, 1976, p37).

Sintering[4] and pelletising are methods of preparing iron ore for charging to the blast furnace developed industrially during the 1950s and 1960s respectively. They make possible the use of ore fines, thus increasing the efficient use of mined ores; the use of lower quality ores which are mined in smaller lumps; a more precise control of the chemical constitution of the blast furnace burden which affects the quality of the pig iron and the content of the slag; and they yield significant reductions in the tonnage of coke and burden used per ton of pig iron produced. Reductions in coke rates (tons of coke input per ton of coke output) at the Dillingen and Volklingen works in West Germany in 1962 were achieved from 1.2 for unprepared ores to about 0.65 for 100% sinter, and a corresponding burden (total material input) reduction from 3.5 to 2.2 tons per ton of iron output (United Nations, 1966). A low

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[4] Sintering is a process that agglomerates iron ore with coke and limestone.

coke rate is especially important in countries where coal is expensive. Coke rates in Brasilian coke-based blast furnaces averaged 0.49 from 1977 to 1982 (Editora Tama Ltda, 1985, p66), compared with 0.45 and 0.57 in Japan and the U.S. respectively (Barnett and Schorsch, 1983, p156).

A new alternative method for the production of iron suitable for steel production is direct reduction. Usually oil or gas is used to reduce ore to sponge iron which can be refined to steel in electric arc furnaces. These are being developed especially in developing countries where coal has to be imported but indigenous oil and gas is plentiful and where scrap (the alternative charge for electric steel furnaces) is scarce.

3.2.2 The production of steel

Until 1960 most steel was produced in open hearth furnaces. In this process shallow baths of molten pig iron and scrap are heated, primarily by burning fuel oil and plant produced gases. A normal charge of scrap is 50%, though it is possible to use entirely cold metal. However, from 1960 the Basic Oxygen Process began to replace the open hearth as the main method of steel production in integrated steel mills. Oxygen is blown at very high speeds directly into the pig iron and scrap charge through an oxygen lance. The supply of oxygen produces the chemical reaction required to oxidise unwanted carbon and other elements, all the initial heat coming from the molten iron. This method reduces the time taken to convert each charge to steel considerably, though the charge of scrap is now limited to 30%.

The first basic oxygen furnace (BOF) was introduced in Austria in 1952, but adoption at an industrial scale was limited before 1960 (Barnett and Schorsch, 1983). Originally heat times were reduced from nine or ten hours for an open hearth furnace to about 45 minutes for a basic oxygen converter (U.S. Department of Labour, 1975). Furthermore about one fifth of the labour was required for the same output of steel with the new method, largely semi-skilled operators on BOFs, the open hearth needing many unskilled workers for physical jobs (1975, p25).

These improvements were reduced in significance subsequently by the increased use of lances in open hearth furnaces to blow oxygen on to the surface of the steel bath, reducing heat rates to about three hours. However, increases in oil prices in the 1970s and the cost of installing pollution control equipment on open hearths (Office of Technology Assessment, 1980) shortened the lives of open hearth furnaces in developed steel industries. Most integrated steel capacity installed since 1960 uses BOF technology (see section 4.4).

Electric furnaces deliver an electric charge through graphite electrodes to produce steel from scrap or from directly-reduced sponge iron. Minimum heat times of one hour have been achieved when additional oxygen blowing is utilised (33 Metal Producing, January 1977). Their main advantage is that with the use of scrap the production of coke, sinter and pig iron is unnecessary, thus greatly reducing capital and input costs. So mills using scrap in electric steel making furnaces are termed non-integrated or minimills. Barnett and Schorsch (1983, p194) estimate that the capital costs of installing integrated steel mill capacity in the U.S. to produce wire rod (scale of 1 million tons) in 1981 were $800 per ton, but only $286 for minimills.

With greatly reduced input costs, minimills provide significant competition with integrated steel producers (minimills took over 16% of the U.S. market in 1980), though they are limited by scrap supply and the quality of steel produced. Scrap carries impurities (called tramps) such as copper and tin which in combination with sulphur cause surface defects in flat rolled products. This thesis focuses upon integrated steel production because it is this branch of the steel industry which has declined most significantly in the U.S., and has expanded most significantly in Brasil, and because it is this international shift in steel industry location, rather than technical change per se, that is being examined. Technical characteristics of minimills give them local or regional advantages in location, benefits that are not altered at an international scale. Minimill issues are considered in more detail however in section 5.1.

3.2.3 Casting and rolling finished products

Casting and rolling are the processes in which steel is given shape. They therefore create product differentiation.

Until the late 1950s most casting was in ingot moulds. These are stripped after cooling and the ingots reheated in soaking pits to an even temperature before rolling. They are rolled into slabs, or blooms (circular cross section) and billets (square or oblong cross section but smaller than slabs), depending upon the final product desired. These shapes are then cooled and inspected for defects, re-heated and rolled into a variety of finished products ranging from plates, sheets and flat rolled coils, to bars, rails, structural shapes or beams, rods, and wire. Pipes are usually made from rolled steel strip, and nails from steel wire.

In the early 1960s, continuous casting began to replace ingot pouring as the most effective method of steel casting. In this process molten steel is poured into a vertical, bottomless mould which oscillates to prevent the cooling liquid from sticking to its sides. The continuous slab, bloom or billet is then drawn out horizontally and cut into desired lengths.

Continuous casting cuts out the stages of ingot casting, stripping, soaking and rolling. The result is an increased rate of turnover, improved yield and product quality, and reduced labour requirements. The department of labour (1975) estimates that labour hours involved in ingot casting and primary rolling may be reduced from 0.52 to 0.28 per ton of steel slab with continuous casting installation.

Steel is lost at various stages in casting and rolling processes, mostly due to scarfing (removal of scale from reheated ingots and semi-finished shapes), loss during pouring, the removal or cropping of the uneven ends of rolled products, and rejection of poor quality output. Continuous casting reduces loss from all of these stages. Yield of semi-finished products as a proportion of raw steel produced is increased from 83.6% to as much as 95%[5] by continuous replacement of ingot casting (33 Metal Producing, December 1977, p37). Energy requirements are also reduced from 350,000 Kcal/million tons to 100,000 Kcal/mt.

Continuous casters have been combined most commonly with steel making shops using the Basic Oxygen Process. This is partly because the two technologies became available at an industrial scale at about the same time, and where continuous casters were installed the improvement was combined with a new steel plant in the same building. It is also less easy to maintain a smooth flow of steel at the correct temperature for continuous casting from open hearth furnaces which discharge large amounts of metal at wider time intervals than BOFs. Syncronising steel flow from the furnace to the caster is critical in maintaining yield benefits (33 Metal Producing, Dec 1977, p38). However continuous casters are used extensively in combination with electric furnaces and are an integral part of low capital, low labour and high yield minimill techniques. But in these combinations they are almost exclusively used

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5 95% yield can be attained when the breaks in casting are kept to a minimum. This means keeping a continuous flow of metal through the casting mould for as many ladles of steel as possible.

in bloom and billet production because the quality of steel smelted from scrap is not sufficient for the production of flat-rolled sheets and coils.

A variety of divisions of steel products into groups can be devised. UNIDO (1978) defines seven classes and their percentage shares of the U.S. market in 1976: Sheets and strip, 50%; structural shapes and plates, 17%; bars and tool steel, 14%; pipe and tubing, 7%; tin mill products, 7%; wire and nails, 3%; rails and accessories, 2%. Sheets, strip, plates, pipe and tin mill products are flat steel commodities, the others are non-flats. (The U.S. International Trade Commission, 1982, defines nine groups of steel products.)

A distinction can be made between flat and non-flat products on the basis of technology used as well as their more complex distinctions in the market. Equipment for flat rolling is far more expensive than for non-flat rolling. A three million ton integrated plant in the U.S. in 1981 for the making of cold rolled sheet would have cost $1,250 per ton of annual capacity, compared with only $640 per ton for a plant of the same capacity producing wire rod (estimates by Barnett and Schorsch, 1983, p194). Crandall (1981) estimates that the cost of rolling mills, including a hot strip mill, pickling and oiling lines, plate mill, cold reduction mill, tinning and galvanising lines, makes up 54% of the cost of a fully integrated plant making cold rolled steel (p77; his estimates from Temple, Barker and Sloane Inc., 1977).

Minimum scale of efficient production depends upon the type of rolling operations practiced within a particular mill. For a plant producing flat rolled products minimum efficient capacity is about 4 million tons. This is determined a) by the efficient size of contemporary flat rolling technology, b) by the imbalance between different parts of a plant (for example between efficient blast furnace size and rolling capacity) below this scale, and c) because multiple furnace availability is desirable during periods of furnace renovation and re-lining, which in the case of blast furnaces can take some months (Barnett and Schorsch, 1983; Baer, 1969). (Minimum efficient scale for integrated non-flat production is about 3 million tons.) This means that the capital costs of building a new integrated steel plant from scratch are very high. Judging by Barnett and Schorsch's (1983) estimates for steel mill capital costs, a new integrated plant for cold-rolled-sheet production with a capacity of 4 million tons in the U.S. in 1981 would have cost U.S. $4.82 billion. This has added to the need for state assistance in steel industry growth in many developing countries.

The distinction between flat and non-flat products is illustrative of more particular divisions within the steel market. Because the procedure for making alternative steel products varies after the casting stage, or in the case of continuous casting after the steel making stage, and because of the specific uses for different steel products, competition between steel producers is fragmented around particular product types. Nevertheless, although some integrated steel plants produce a wide variety of products, there is an increasing competitive division, at least in the U.S., between flat and non-flat producers. The suitability of minimill techniques for producing non-flats, and the huge capital savings which result from cutting out the production of pig iron, have yielded vast cost advantages to non-integrated producers in these product lines. Also the minimum efficient scale of minimill technology is about 750,000 tons, compared with 3 million for equivalent integrated production. Capacity utilisation levels have a greater impact on costs than economies of scale for integrated plants of efficient scale (Barnett and Schorsch, 1983, p192), so minimills are less vulnerable to demand fluctuations than integrated mills. For these reasons integrated producers in the U.S. have been forced out of non-flat markets and are concentrating on improving the efficiency and quality of flat production. Technical change in non-flat production and specialisation and rationalisation in flat production are some forms of restructuring focused upon in chapter 5.

3.3 Steel and the market

In the U.S. in 1947 steel was the highest ranked industry by forward linkage (see Baer, 1965, p139, and Rasmussen, 1956). In absolute terms steel's linkages were twice as strong as the second ranked industry. Backward linkages ranked fifth, but steel still ranked first in combined linkage intensity. End uses in the U.S. in 1976 included construction, 42%, transport equipment, 32%, durable goods (such as stoves and refrigerators) 17%, and containers, 9% (UNIDO, 1978). This linkage quality of steel has two major implications for the development of the industry.

First, because of the potential impact of changes in steel prices and steel supply on other parts of the economy, it is an industry upon which state policy has been especially focused. Whether through attempts to control inflation rates or to stimulate economy wide growth through multipliers, steel industries have often been the target of price controls and heavy government subsidy or direct involvement. This is less true of industries with weaker linkages through which government action has less effect. This quality of steel has influenced its development in different ways in the U.S. and Brasil.

Second, because certain industries which use steel have also declined, and there have been technological developments in providing substitute materials, the growth in demand for steel products has not kept pace with the growth in GNP in many developed countries. Figure 3.1 illustrates the observed relationship between steel consumption and GNP, which shows increased consumption at moderate GNP levels when infrastructural investments are high. U.S. steel consumption reached a peak in 1973 when it was 82% higher than in 1961, but consumption in 1982 was only 13.5% above the 1961 level, a growth rate of just under 0.6% per annum (see figure 3.2).

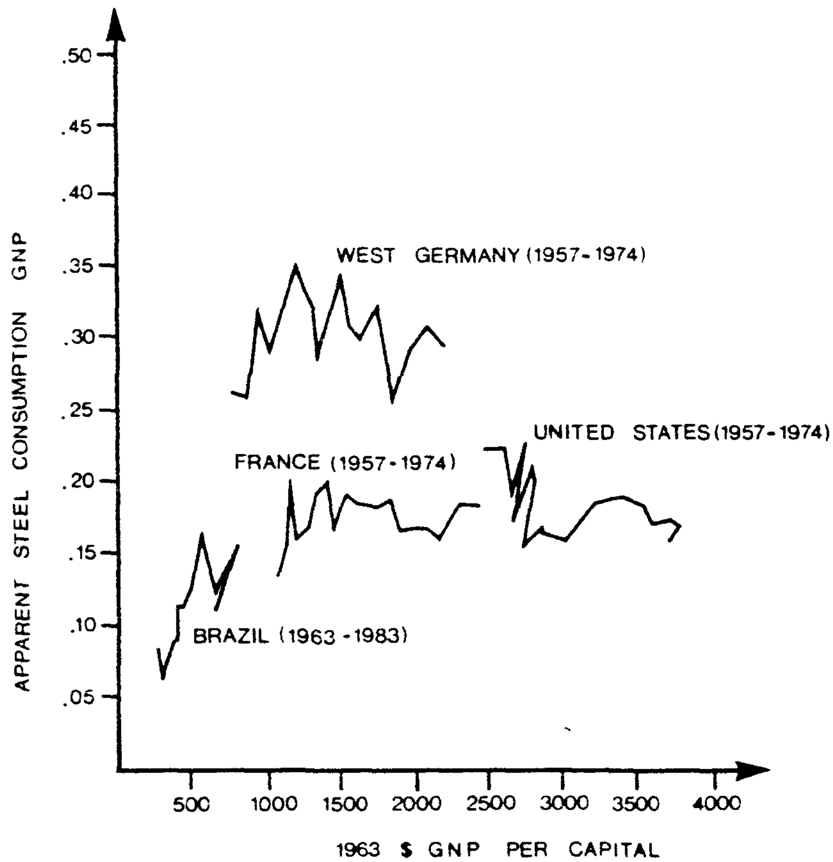
Reductions in relative investment levels in infrastructure, such as bridges, ports, railways and power stations, the increased use of pre-stressed concrete (Greer, 1977), and reduced weight with increased scale of steel using products have cut into steel demand. Table 3.1 details some weight reductions in metal inputs to machines and equipment resulting from increases in unit capacity. There has also been development of either cheaper or lighter substitutes for steel. Between 1960 and 1977 the share of aluminium and plastics in the average European car rose from 40kg to 80kg, and may double again by 1990 (United Nations, 1984, p83). Between 1973 and 1983, steel and cast iron materials fell from 81.1 to 76% of the weight of a car, while in the U.S. average car weight fell from 1,800kg in 1970 to 1,397kg in 1980,

Table 3.1 Reduction of metal inputs into machines and equipment resulting from increases in unit capacity

Type of Machinery and Equipment	Increase in Maximum Capacity From	To	Percent Metal Reduction
Blast furnaces (m^3)	2,700	5,000	15
Plate mills (million tons capacity)	6	10	7
Converters (tons capacity)	250	350	20
Power generators (MW)	500	1,200	12
Turbo generators (MW)	800	1,000	18
Heavy duty motor vehicles (tons)	40	100	11

Source: United Nations, Economic Commission for Europe, 1984.

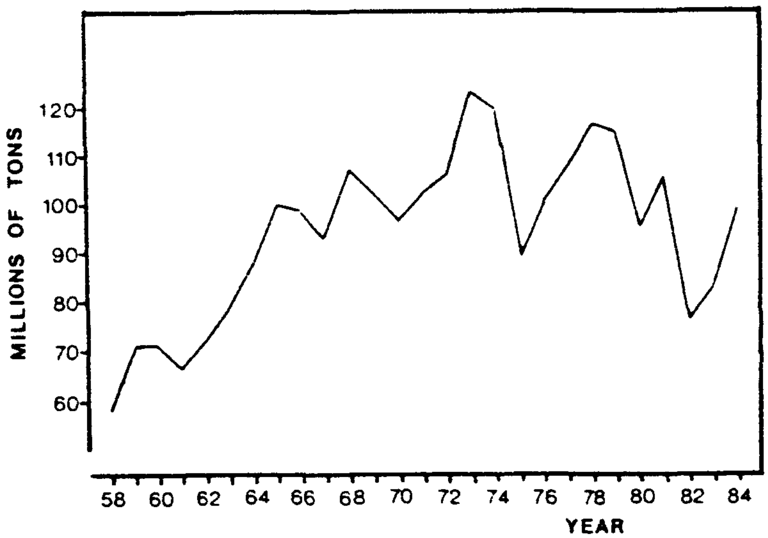
Figure 3.1 Steel intensity by country



Sources: International Iron and Steel Institute (IISI), Steel intensity statistical yearbook, various years; United Nations, Demographic Yearbook, various years; International Monetary Fund, International Financial Statistics, various years; IBS, Statistical yearbook, various years.

and is projected at 925 kg for 1985 (United Nations, 1984, p84; see also Iron Age, Nov 1, 1985).

Figure 3.2 Apparent U.S. steel mill products consumption, millions of short tons.



Source: AISI, Annual Statistical Report, 1967, 1977, 1984.
Note: (Consumption = total shipments - exports + imports.)

3.4 Summary

This chapter has identified some of the use-value characteristics of steel that have influenced the form of conflicts over the industry's development as well as some of the technology alternatives available for use in steel production. The unchanging characteristics of steel itself however cannot explain both its expansion and decline at different times. Things do not act, so they do not constitute forces of change. What does change is the way steel and other commodities are produced and used, and it is these changes that alter linkage patterns.

Forms of competition, struggle and state policy are "determined" by the evolution of class conflicts, but within the steel industry they are also "influenced" by characteristics peculiar to that use-value. The use of different technologies is also an issue of competition and struggle. The following six chapters therefore examine the history of these conflicts in the steel industry, and how they and the conditions for accumulation have changed. The result however is an explanation which is quite specific to steel production because of the influence of its particular use-value characteristics.

CHAPTER 4

U.S. STEEL IN DECLINE

Figures demonstrating the decline in demand for and production of steel in the U.S only describe the industry's crisis. This chapter attempts to explain that crisis by tracing the evolution of the relationship between capitalists and workers in the industry, sometimes through institutions like the government and the steelworkers union, and how this evolution influenced the decline of the industry. Unlike previous accounts of parts of this history (Stone, 1974; Betheil, 1978) it is argued that the development of this relationship cannot be properly understood without also knowing about the changing form of competition between capitalists within the steel industry, and between them and capitalists in other industries.

The new form of competition which emerged in the 1960s was based upon a division of capital in the sector of steel between different national territories; competition was internationalised. In steel this happened in quite a different way from most other industries. None of the U.S. companies expanded their own steel production abroad, though they did diversify their interests into other production sectors. But despite a lack of direct foreign investment a new pattern of production emerged in the 1960s, the industry growing efficiently and with relatively cheap labour in Europe and especially in Japan, and in the 1970s in developing countries like Brasil and Korea.

Two developments caused U.S. steel to decline: first new competitive sources abroad, and second the pattern of development of the industry in the U.S., which made it vulnerable to them. To explain the decline of steel in the U.S. we must therefore account both for the inefficient pattern of its own development, as well as the reasons for the growth of steel production in other countries. The forces at work in this case take a different form from those involved in the direct relocation of the production of some other commodities, but the end result is similar: plant closures and unemployment.

The task of this chapter is to deal with the first of these two parts in the explanation by tracing the changing social forces in steel production in the U.S.. It is shown why it was that the conditions for accumulation prior to 1960, such as the method of labour control and the type of technology, that were suited to a protected industry, at first made the industry vulnerable to external competition, and then became the conditions for decline under the altered form of competition. Chapter 5 goes on to examine a variety of restructuring strategies adopted in the 1980s including plant closures and technical changes which led to job loss: the appearances of the crisis.

4.1 The emergence of Taylorist labour control and monopoly

Both the forms of competition and labour relations in the steel industry in the 1950s found their roots in the events of the 1890s. Alterations which occurred in that decade as the American economy emerged from the crisis of the 1880s created forms of class relationships that would remain intact until the late 1930s, and the new form of labour relations that arose with unionisation of the work force in 1937 sprung directly from the contradictions in those earlier forms.

In the 1880s work in the U.S. steel mills was organised by unionised craftsmen (hired by the owners) who hired additional unskilled helpers with their own earnings. Craftsmen's income was based upon negotiated tonnage rates on a sliding scale dependent upon the changing price of billets, so they and the owners therefore shared not only the control of working practices, but also the profits from production. "The men and the firm were practically in partnership, increased profits to the latter meaning increased earnings to the former" (Burgoyne, 1979, pp17-18).

The combination of an expanding market and the availability of new types of technology together encouraged the owners to try to change this method of labour control. New markets began to open up when the economy emerged from the crisis of the 1880s (Mandel, 1978). Certain technological advances provided a means by which production could be expanded, but they also placed pressure upon the owner-craftsman relationship. For example, the scale of blast furnaces could be increased only if the burden was charged by conveyor, as it was physically impossible to perform the task by hand. But opposition to such changes from craftsmen, who saw their skilled and privileged positions as sub-hirers threatened, prevented the adoption of these new techniques. With new markets opening up and exports expanding, "employers had no way to speed up the workers, nor could they introduce new machinery that eliminated or redefined jobs" (Stone, 1974, p120).

Thus, in order to insure competitiveness abroad, as well as an improved production of surplus value, the owners found it necessary to alter their relationship with the craftsmen. This change was initiated in 1892 at the Homestead works of the Carnegie Corporation, location of the strongest lodge of the craftsmen's Amalgamated Association, when the company locked out the work force and demanded that it should operate without a union (Stone, 1974, p121). The result was a bloody, four-month conflict involving over three hundred deaths both of striking workers and police, the use of strike breakers, and the eventual intervention of the government on the side of the company. Non-unionised work quickly spread to other firms, and the installation of new technology (larger blast furnaces, overhead cranes and rising and falling tables in the rolling mills) was rapid. Tonnage rates earned by craftsmen declined by between 63 and 72 percent depending on job type between 1892 and 1908 (Stone, 1974, p126), thus yielding great improvements in the production of relative surplus-value, as well as wresting control over the work process from the workers.

The initiation of new methods at Carnegie also helped that company to gain the competitive strength to create a monopoly in the U.S. industry. In 1901 the U.S. Steel Corporation was formed from mergers with the Carnegie corporation (Stone, 1974) and produced some 80%[1] of U.S. steel supply. Although its share declined over the years, to 42% in 1925 (Stigler, 1968) and 33% by 1953 (Metal Bulletin, 1957), the company had established itself as the industry price leader. Mancke (1968) for example demonstrates the immunity of steel prices to fluctuations in capacity utilisation during the 1950s, an indication that no competitive pressure between steel producers was exerted on prices, even during periods of relatively slack demand.

Nevertheless, though the locus of labour control had been shifted, a new method of control was required to replace the shop floor organisation originally exercised by working craftsmen. This was found in the management techniques proposed by Frederick Taylor, who began his career in a steel plant. Piece rate methods of payment, job ladders, and the use of trained foremen to oversee work and make promotion decisions, contributed to the re-division of a work force homogenised by de-skilling, and an internal labour market which imposed discipline on workers competing for personal advancement (Stone, 1974; Friedman, 1977;

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[1] Stigler, 1968, puts the 1901 share at only 66%.

Edwards, 1979).

According to Stone, these methods of control changed little even until 1970, but as will be shown later this is far from true. They did remain predominantly unaltered however after 1947. Meanwhile the labour process, characterised by what Friedman (1979) calls a "direct form of control", was never peaceful. Industrial action in the form of sabotage, slow downs and strikes, characterised much of U.S. manufacturing, though it afflicted the steel industry in particular. The strike of 1919 involved 300,000 workers for three and a half months, the main issue being union recognition. But the owners were not keen to return to a unionised work force, and the strike was eventually strangled by anti-union sentiment spread in the press, military intervention, arrests and the use of strike breakers (Brody, 1970), and by shifting production to nonstriking plants (Edwards, 1979, p50).

4.2 Development of a bureaucratic form of labour control

Between 1937 and 1947, as the industry emerged from the crisis of the 1930s, this direct Taylorist form of labour control was changed. In 1937 a contract was signed between the Steel Workers Organising Committee and the U.S. Steel Corporation (Bernstein, 1970) and culminated in the strike settlements of 1947 which gave workers, through the institution of the United Steelworkers of America, a direct say in the running of plants. There were two main reasons for the change in management-labour relations, both springing from barriers to accumulation which had arisen during the crisis of the 1930s, and both outcomes of the form of class relationships which had become established through the early decades of the 1900s. The first was an effort by workers to organise in resistance to Taylorist forms of control (Edwards, 1979). The second was an effort by management to consolidate an oligopolistic form of competition by equalising wage rates across the industry.

Widespread industrial action, typified by the steel strike of 1919, was a unified worker response to long hours and low wages, but "the harsh and arbitrary discipline of hierarchical control was of equal importance and directly contributed to the workers' determination to strike" (Edwards, 1979, p58). Roosevelt's "New Deal", aimed at resolving these conflicts and other more general social schisms that were accentuated during the depression, included a new statement of workers rights to organise in the 1933 Industrial Reconstruction Act. Steel companies introduced Employee Representation Committees (company unions) in an attempt to stave off this government endorsement of unionisation, but these were soon revealed to the work force as obstructions to an increase in their own influence over production. The steel industry became the main target of the Committee for Industrial Organisation (founded in 1935) for independent worker unionisation, because of its central position in the economy and its history of industrial action (USWA, 1974).

Steelworkers continued to work a 60 hour week during the 1920s while the average in manufacturing was 55 hours (Greer, 1977, p69), so the issues in 1937 were simple: union recognition, a $5 a day wage, and a 40 hour working week (USWA, 1974).[2] From agreements in 1946 and 1947, however, there began to emerge a pattern of labour-management relations more akin to what Friedman (1979) calls "responsible autonomy", a less direct method of labour control. Agreements were based upon the establishment of procedures for negotiation of contracts, the Cooperative Wage Study Programme that was designed to eliminate wage inequities and improve job evaluation (Ong, 1983), and a clause (2B) that protected local working conditions except in the case of technology change (something the industry did not engage in heavily until after 1960) and established an arbitration procedure for the settlement of disputes over local issues.

But it would not be correct to attribute these changes merely to increased worker resistance and organisation, and to alterations in state policy which they helped to induce. The second force for change came from the interests of capital, which were not so disturbed by developments in 1946 and 1947 as is sometimes supposed. Stone (1974, p152) suggests that the U.S Steel Corporation had merely become antiquated and archaic in its management policy and therefore less willing to resist workers action. (Fortune, 1936, and Bethell, 1978, also adopt this commonly held view that U.S. Steel management had become lazy and

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2 The agreement made with U.S. Steel in 1937 quickly spread across the whole industry, though not without extensive resistence from other companies. These included one of the plants at Republic Steel where, in May 1937 occured the infamous Memorial Day masacre in which police fired into marching strikers, killing ten and wounding thirty.

out of touch with efficient business practice.) But this interpretation identifies only a behavioural characteristic of management, not the structural forces which influenced it. There were three of these.

First the monopoly power of U.S. Steel had been eroded by 1937, its share of the market declining significantly, partly under anti-trust pressure from the government (Edwards, 1979). The Cooperative Wage Study Programme established more equal wage rates across the industry, which made it easier for the U.S. Steel Corporation to enforce prices (Ulman, 1962), thus easing the transition from monopoly to oligopoly.[3] Wage costs were an especially important issue for competitors while there were no new technologies on the horizon, so evening them out helped U.S. Steel to avoid being undercut by American competitors. The prospect of remaining un-unionised and therefore more competitive than U.S. Steel may have been at the root of the resistance to unionisation from the other companies.

Of course the increase in wages and reduction of the working week reduced the production both of absolute and relative surplus-value. But this did not matter to steel management so long as prices could be increased along with costs, independently of fluctuations in demand and supply, thus allowing the appropriation of surplus from other sources in order to maintain profits. Price increases on steel products

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[3] Oligopoly is presumed here to require cooperation between producers and a recognised industry leader, whereas the greater concentration in monopoly allows one company to suppress competition over prices, production quality and production efficiency within the sector.

averaged $7.35 a ton in 1955, $8.50 in 1956, $6.00 in 1957 and $4.50 in 1958, which "well exceeded any increases in costs, thus widening the profit margin and raising the return on investment" (Blair, 1972, p642). As early as August 1957 the Senate Antitrust Sub-committee began hearings on "administered prices in the steel industry". So the new form of labour relations in the late 1940s, though a result of labour's increased organisation, also enhanced the industry's ability to enforce oligopolistic prices: far from threatening profit realisation the new form of labour relations enhanced it.

Secondly, the strikes and other disruptions of production which characterised the period before the second world war did nothing to improve the quality or reliability of product supply, and they interrupted the production and realisation of surplus value. A solution which promised more peaceful relations with labour would reduce these interruptions.[4]

Finally, although clause 2B represented a significant loss of control by owners over <u>changes</u> in the speed and intensity of work, the emergence of union power did not represent a threat to control as such. Indeed as Stone (1974) argues, the union through its endorsement of the Cooperative Wage Study Programme and the precise criteria established

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[4] If this was a conscious strategy by management it did not prove to be very successful. The union held an increasingly powerful position as profits remained high. General steel strikes followed of 42 days in 1949, 55 and 3 days in 1952, and 34 days in 1956 (AISI, Annual Statistical Report, 1984). Management resisted wage hikes, but these strikes generally succeeded in winning labour substantial benefits (see figure 4.1).

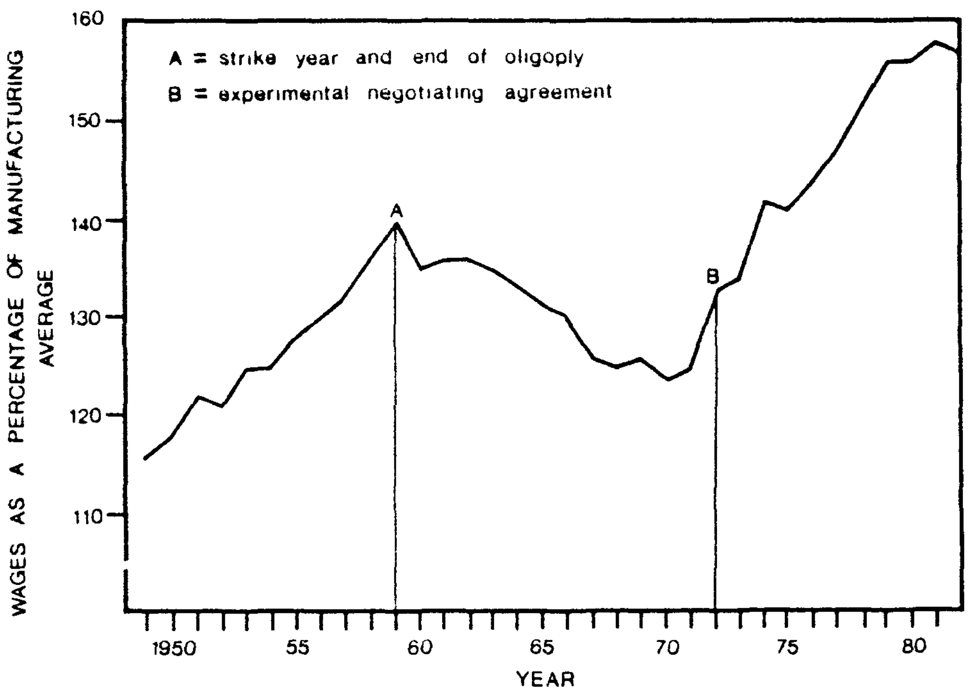
therein for evaluating and grading specific job descriptions, merely institutionalised the form of labour control already established. The union in effect recognised the competition between workers on different scales, established procedures for advancement based on seniority, and ensured that workers performed the jobs they were supposed to. It therefore became a means through which management could control worker discipline (Edwards, 1979; Betheil, 1978; Herling, 1972).

The new form of relations with workers therefore provided certain advantages to owners as well as to labour. The disadvantages, such as loss of control over wage increases and over changes in the intensity of work, were unimportant so long as high prices could be passed on to steel consumers.

4.3 Increasing wages and restrictions on productivity

After 1947, with the increased power of workers united across the industry by the steelworkers union, and with the industry's capacity to pass on increased costs to consumers, the level of wages escalated steadily (see figure 4.1). Higher wages were not simply hand outs by the companies: they were fought for during a series of strikes, but these generally yielded significant gains for workers. In 1956, after a four week strike, the companies agreed to pay over a three year contract what they had offered to pay in five (Herling, 1972). By 1959 average hourly earnings were $3.08, or 39% above the manufacturing average. In 1953 they had been only 20% above the manufacturing average (Bureau of Labor Statistics, Supplement to wages and earnings, various years).

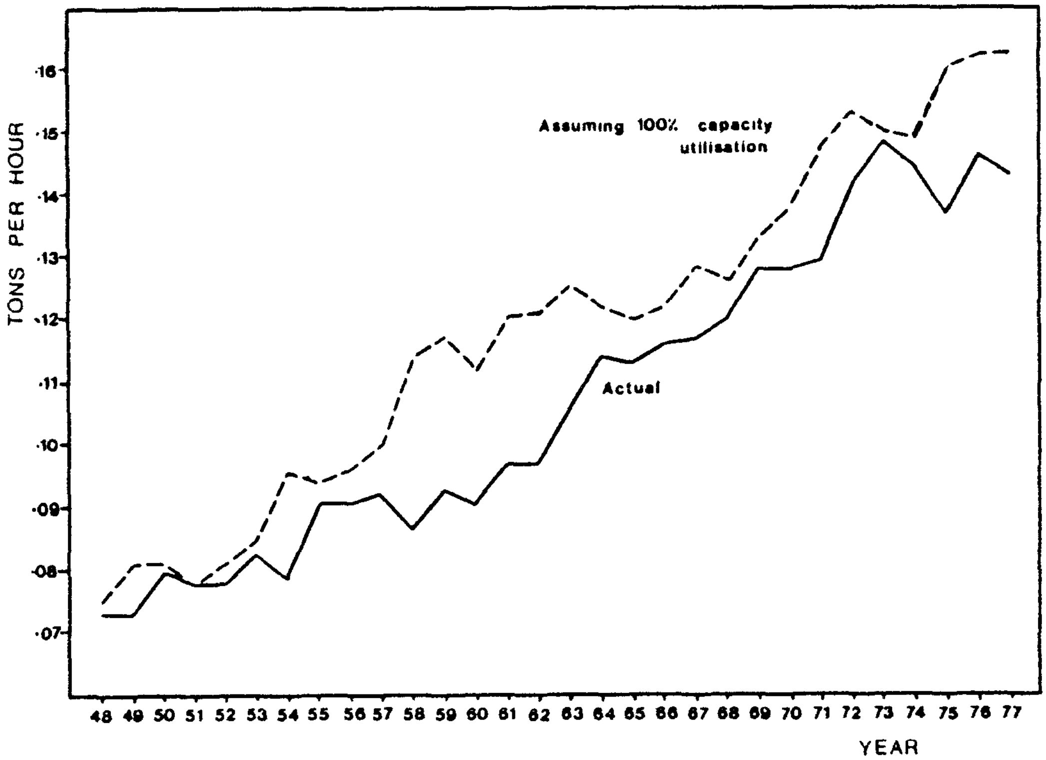
Figure 4.1 Steel wages as a percentage of the average manufacturing wage, U.S., 1949 - 1982.



Source: Bureau of Labor Statistics, Supplement to employment and earnings, various years.

Isolating the impact of different factors upon productivity is not easy (Ong, 1983, p257). Apart from labour management relations there is the effect of work stoppages, labour saving technology, increases in scale, and capacity utilisation. Figure 4.2 illustrates observed productivity changes. An estimate of the impact of capacity utilisation is also included which presumes that labour use is reduced

Figure 4.2 Productivity in the U.S. steel industry, tons output per hour of labour, 1948 - 1977.



Sources: Computed from; Barnett, 1977; American Iron and Steel Institute, Annual statistical report, various years.

by 5.7% for each 10% reduction in operating rate.[5] This shows for example that the apparent stagnation in productivity increase from 1957

[5] Labour productivity improves with capacity utilisation unless employment levels fluctuate in proportion to capacity changes. Barnett (1977), has estimated that between 1956 and 1975 for each 10% reduction in capacity utilisation, there was a 5.68% reduction in employment. However, this is not a static relationship. It depends, amongst other things, upon labour agreements and technology, which change historically. This figure for the U.S. is relatively low compared with that for Canada (7.82%).

to 1962 was probably due to low utilisation rates during those years. Isolating the effects of technical and scale improvements is not easy, partly because there is usually a lag associated with their adoption while labour becomes familiar with new processes.

Analysis of productivity is therefore limited here to the examination of technical changes and labour-management relations over the issue of work intensity. From this we can conclude that productivity improvements during the 1950s were probably limited to those resulting from scale increases, because there was not much technical change, and labour resisted changes in work practice.

In the 1950s the combination of (first) monopolist and (then) oligopolist forms of competition, the general lack of innovation in steel producing technology from the 1890s until 1960, and an expanding market, encouraged the expansion of capacity but with existing technology. Raw steel capacity expanded from just under 100 million tons in 1950 to 126 million in 1955 (AISI, Annual Statistical Report, 1955). Much of the investment went to expand the scale of open hearth furnaces. Between 1951 and 1960 open hearth capacity rose from 90.4 million to 125.9 million short tons, though the number of furnaces fell from 910 to 874 (Barnett and Schorsch, 1983, p28).

Whether due to government encouragement to expand capacity in the early 1950s, pressure on capacity in 1951 during the Korean War[6], or overestimates of future demand growth, the expansion of the 1950s was far greater than subsequent consumption increases required (Barnett and Schorsch, 1983, pp22-23).[7] Steel consumption in the U.S. hardly grew during the 1950s so that capacity utilisation rates fell from a high in 1951 of 101% to 63% in 1958. But it may also be presumed that this "mistake" was excused by the ability to maintain profit levels through price increases which off-set inefficiency.[8]

There is also evidence that organised labour not only induced wage increases, but, through clause 2B, consistently frustrated the attempts of companies to intensify production with existing technology[9]. For example, one arbitration ruling in 1959 favoured a union

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[6] Production exceeded capacity in 1951, but has never done so since.

[7] An alternative to expansion of steel capacity in the U.S. at this time might have been to invest in steel production abroad. For example in 1939 the U.S. Steel corporation received a request from the Brasilian government to participate in building a fully integrated steel mill in that country, but the company was not interested. Some of the reasons for this are to be found in Brasil (chapter 9). But maintaining barriers to entry to a sector can also imply construction of barriers to exit (Sherman, 1983). There was little point in the U.S. Steel Corporation adopting strategies that might themselves undermine the secure market protection it enjoyed, or taking risks abroad when profits could be expanded by producing more at home.

[8] The ability to maintain profits in the 1950s can be compared with the inability to do so when demand fell in the 1980s (chapter 5).

[9] Steel, unlike the auto industry for example in which designs must change rapidly in a competitive market and machinery and work patterns along with them, is not a sector where work must be repeatedly reorganised, especially under monopoly conditions. The restrictions which clause 2B placed on job flexibility could never have been accepted in auto factories (Ong, 1983).

claim to keep seven members in some U.S. Steel work crews, even though during the preceding two years the crew had worked successfully with only five members. Such rulings were based not on what was possible, but upon a "literal interpretation of the clause. The agreement froze inefficient war-time practices which had been designed to maximise production without regard to efficiency, ...(and) allowed workers to maintain the same practices so long as the underlying conditions persisted" (Ong, 1983, p72-73, my addition in parentheses). Packard's (1977) account of working conditions at the U.S. Steel's plant at Gary (Indiana) also refers to the large amount of idle time permitted by established jobs and work loads. Over 50% of working hours were spent not working.[10] When the clause was agreed in 1947 U.S. Steel, it seems, was more concerned with eliminating wage inequities, and less with the erosion of its power to oversee work rule changes (Stieber, 1959).

So steelworkers became a privileged or primary labour segment within the work force with high wages, a cost of living agreement which kept wages rising faster than productivity, and protection against a rapid decline in labour demand through clause 2B. This was certainly related to their position in a core monopoly industry (O'Connor, 1973, 22-23). Without competition in the steel market and with established oligopolistic pricing, the steel industry was able to realise high profits despite expensive labour. Extra surplus could be extracted from

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[10] It should be noted that in the rolling mills where Packard was working many workers are involved in maintenance, work which is contingent upon the frequency of breakdowns.

steel-using sectors simply by passing on wage increases in the form of higher prices.

It should be noted however that this was not a necessary outcome. As Jones has recently pointed out, a "relation between industrial structure and labour force segmentation, linking the primary labour segment to the monopoly core of industry and the secondary segment to the competitive periphery" is too simple (Jones, 1983, p24). Different combinations of forces may intervene in specific circumstances to produce a variety of outcomes. So the increased power of labour in the steel industry was facilitated by the competitive structure of the industry, but also caused by the CIO's concentration on steel as a central sector of the economy, the actual organisation of worker power, and the suitability of production techniques for restructuring the flexibility of work practices.

4.4 New threats to the entry barrier

During the 1950s the steel industry was in a secure competitive position, with a form of labour relations which in some ways helped to strengthen its oligopolistic structure. In 1950 49.5% of the world's market economy raw steel was produced in the U.S. (estimated from AISI, Annual Statistical Report, 1955), and U.S. integrated steel mills were the biggest and most technologically advanced in the world (see Barnett and Schorsch, 1983, pp16-19, for comparative measures of scale and technology between the U.S., Japan and Europe in the 1950s). The large domestic market had permitted American firms to scale their operations efficiently (average plant capacity was more than twice that of any other country in 1954), an advantage that was unattainable by other producers so long as their markets remained small or were limited by high transport costs and national boundaries. The European and Japanese economies were still recovering from the destruction of the 1939-45 period (Japan and West Germany between them produced only 3.4 million short tons of steel in 1946 compared with 96.8 million in the U.S.), while the U.S. industry enjoyed the opportunities for expansion provided by World War II and later the Korean War. Imports of steel mill products in 1954 amounted to 788 thousand tons, just 1.3% of apparent consumption, and hardly a competitive threat.

By 1959 however the secure competitive position of the U.S. industry began to falter. In the late 1950s and early 1960s the basic oxygen furnace and continuous casting, the two major technological developments of the century, became generally available to steel makers. The first of these specifically rendered uncompetitive the open hearth capacity in which so much money had been sunk in the previous decade. So the U.S. steel industry in the 1960s was already capitalised with outdated and as yet undevalorised machinery, which it could not afford to write off, while the economies of Europe and Japan were now in a position to invest more heavily in new steel making equipment. The market in Japan grew at a rate of 9.8% a year between 1950 and 1981, and steel output at a rate of 15.4% in the 1960s (Crandall, 1981), much of this growth making use of the newly available technology. Figure 4.3 and table 4.1 illustrate the relatively slow adoption of modern technology in the U.S., compared with Japan, Europe and Brasil.

Table 4.1: Percentage of production by process by country.

Year	U.S.A.	Japan	EEC	Brasil
	Basic Oxygen and Electric Furnace			
1960	11.8	32.0	11.5	36.6[a]
1965	27.9	75.3	31.5	53.6[b]
1970	63.5	95.9	57.7	57.1[c]
1975	81.0	98.9	82.6	68.2
1981	88.8	100.0	98.6	92.6

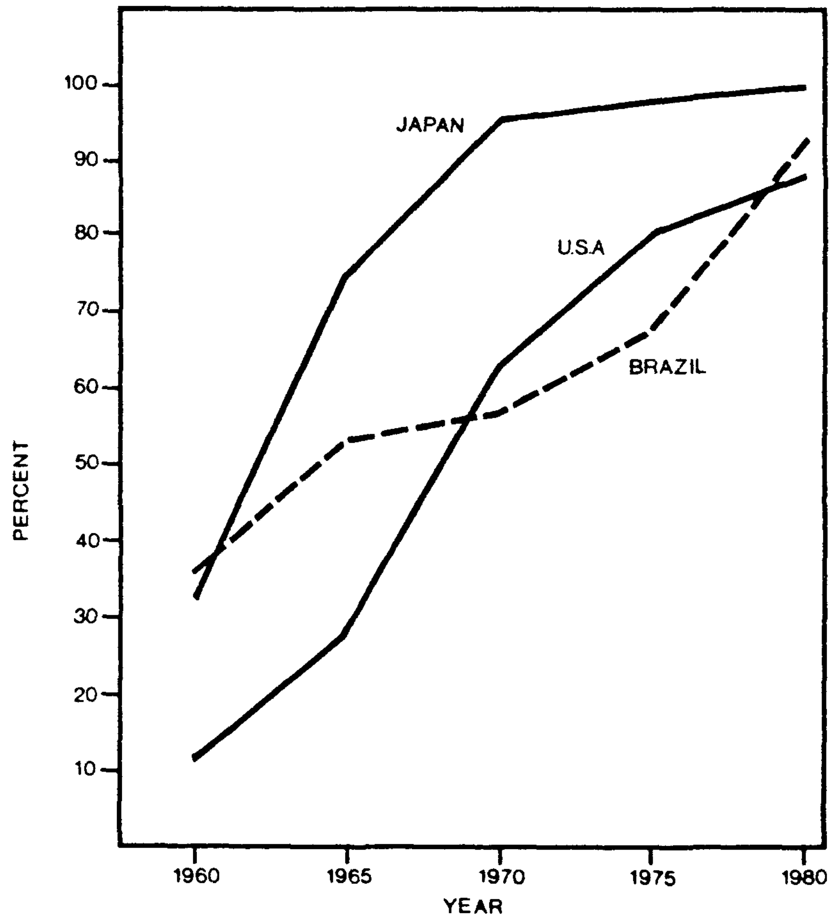
[a] 1963 [b] 1966 [c] 1969

Year	U.S.A.	Japan	EEC	Brasil
	Continuous Casting			
1971	4.8	11.2	4.8	2.2
1976	10.5	35.0	20.1	12.2
1981	21.1	70.7	45.1	37.3

Sources: Barnett and Schorsch, 1983; Editora Tama Ltda, 1985.

Once it had been decided to switch to the BOF in the U.S., this technique was adopted quite quickly, expanding from 17.4 to 48.1 percent of steel production in the second half of the 1960s. But the U.S. has been much slower in its adoption of continuous casting. Also in the late 1950s shipping improvements began to open up cheap sources of iron ore in Australia and Brasil, as well as foreign markets, to producers in Japan (see chapter 3). Wages in Japan were one fifth of those in the U.S. in 1964 (Barnett, 1977) so that the new labour saving techniques

Figure 4.3 Percentage of steel production by process by country; BOF and Electric furnace, Japan, U.S.A. and Brasil.



Source: Table 4.1.

were far more important for U.S. than for Japanese producers (paradoxically, the techniques which they did not have).

Although the U.S. still possessed some material cost advantages over European and Japanese producers, especially in the cost of domestic coal and iron ore, the combined effect of improved technology, reduced shipping costs of imports, and the low cost of labour in these countries gave them an overall cost advantage in the early 1960s. A number of independent studies confirm this conclusion (FTC, 1977; Council on Wage and Price Stability, 1977; Barnett and Schorsch, 1983; Crandall, 1981). (See table 4.2 and figure 4.4.)

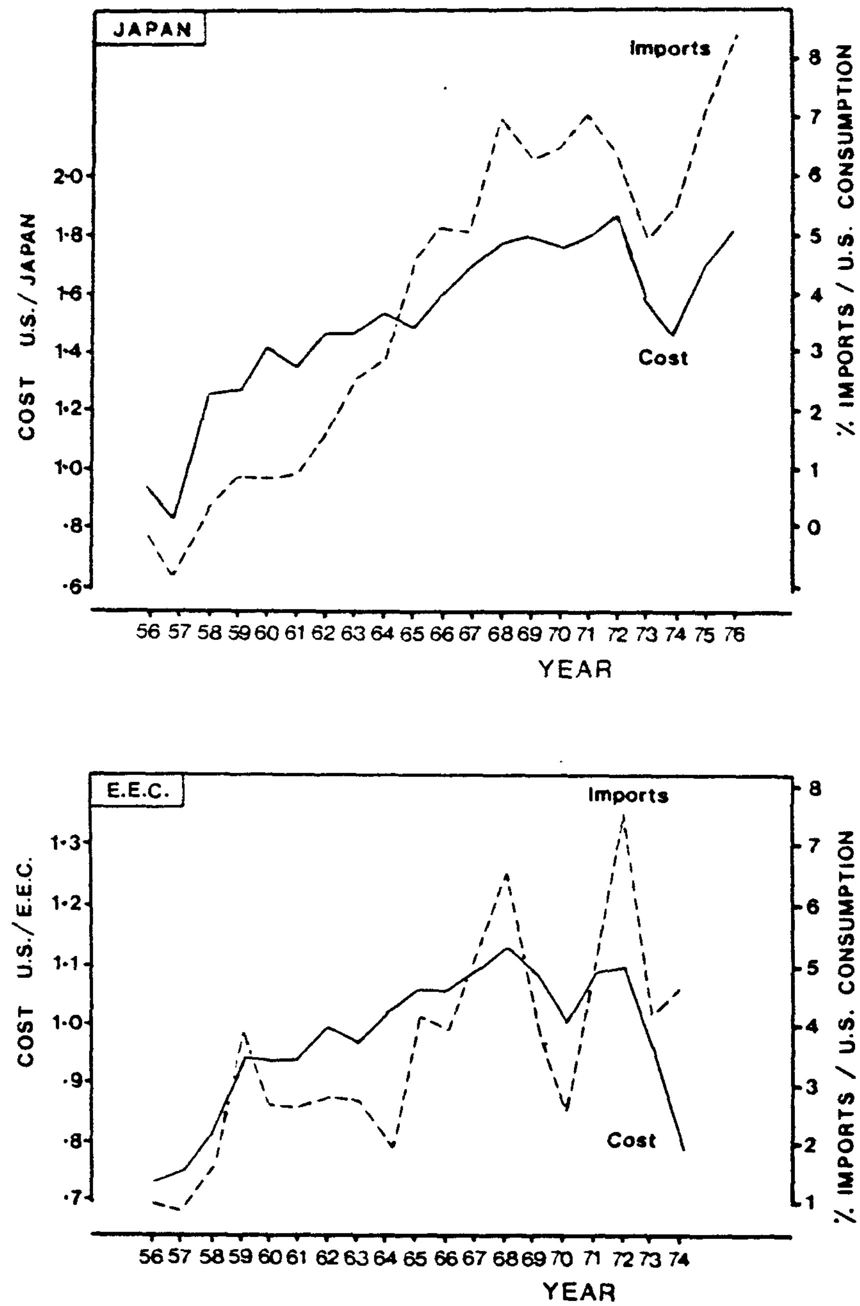
Table 4.2 Estimated operating cost: Cold rolled sheet, Japan vs U.S. 1964 $/ton

Inputs	U.S.	Japan
Labour	44	17
Iron Ore	17	22
Purchased scrap	7	3
Coal	8	14
Other energy	15	16
Other	26	30
Total	117	102

Source: Reproduced from Barnett and Schorsch, 1983, p64.
Note: "Other" includes Rolls, Refractories, Fluxes, etc.

There are many components in any cost equation which are not considered here. For example, technical efficiency is not only important in the intensification of labour, but also in the use of materials. The adoption of sintering techniques reduced coal consumption during the 1950s, but the reduction of coke rates had a greater impact on the cost of steel production in Japan where the cost of coal is greater than in the U.S.. These issues are considered in more detail in chapter 7 with respect to the cost of steel production in Brasil.

Figure 4.4 Relative unit costs and import penetration, Japan and EEC.



Source: Reproduced from, Federal Trade Commission, 1977.
Note: All steel products, variable costs only, including delivery and tariff to the U.S.

Nevertheless it is questionable whether, had it not been characterised by oligopoly during the 1950s, the U.S. industry would have remained as uncompetitive as it did. The difference in labour costs was responsible for more than the entire variable cost difference between the U.S. and Japan in 1964 (table 4.2). But if wage increases during the 1950s had been held at their 1949 proportion of average manufacturing wage (figure 4.1)[11], the U.S. wage bill would have been $37 per ton instead of $44. Without clause 2B this figure could have been reduced further by work intensification. Although BOF technology was not available during the period of capital widening, nevertheless a more conservative expansion of capacity during the 1950s would have allowed an easier switch to the more efficient technique in subsequent years, making further savings in labour. In addition, neither the FTC nor Barnett and Schorsch include fixed costs in their estimates for 1960. Estimates for later years show that these are commonly higher in Japan, partly because of a heavy reliance on debt financing for capital expansion. As figure 4.4 suggests, the cost advantage to European importers once transport and tariffs were added was not great, so foreign penetration of the market from this location would not have been so easy in the 1960s had growth in the U.S. taken a competitive course in the 1950s. As it was in 1960 (figure 4.5) imports began to penetrate the U.S. market sufficiently to undermine oligopolistic pricing.

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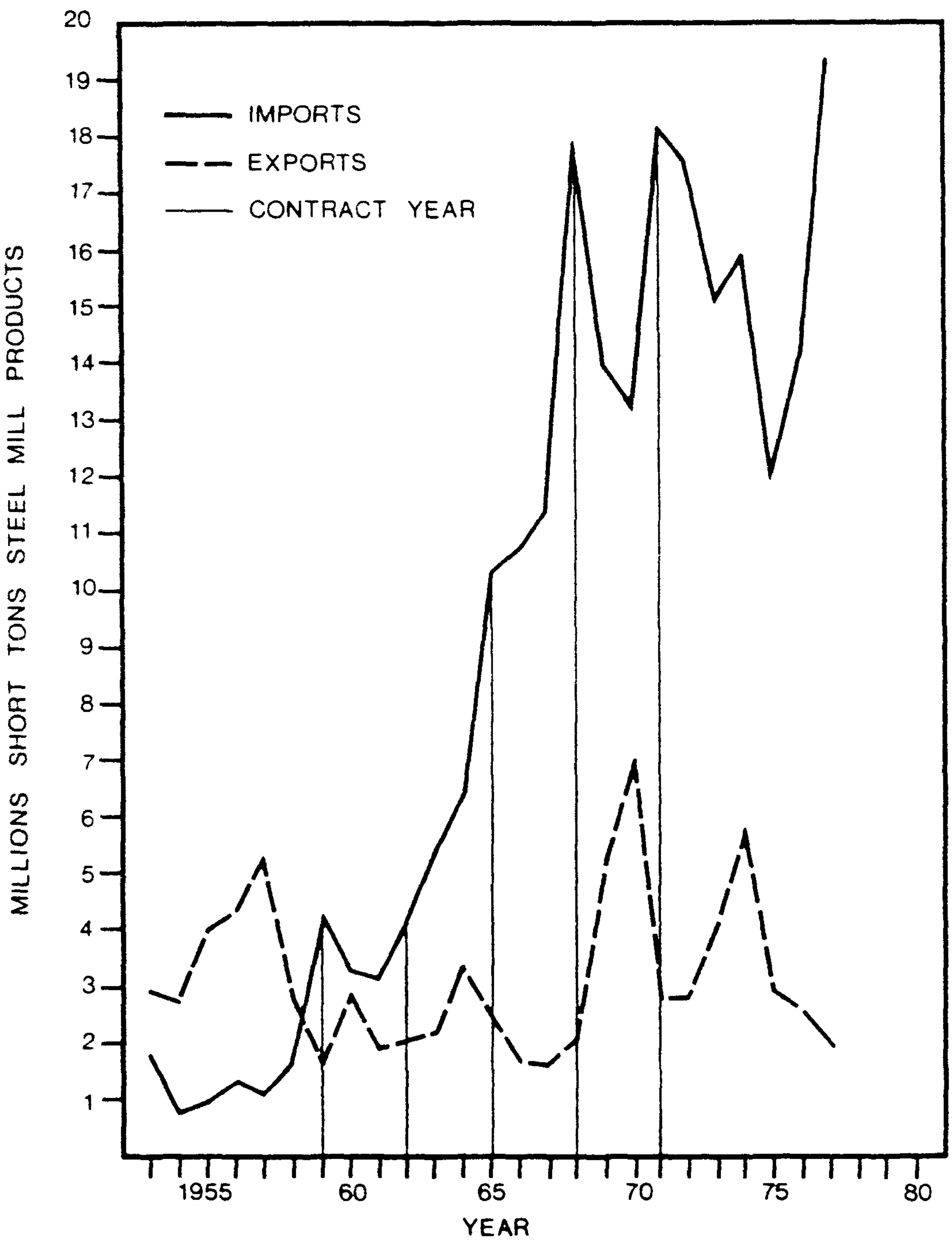
[11] 116% instead of 133%, or 15% lower.

Figure 4.5 U.S. imports and exports of steel mill products, 1953 - 1977.



Source: American Iron and Steel Institute, Statistical Yearbook, various years.

4.5 The collapse of oligopoly

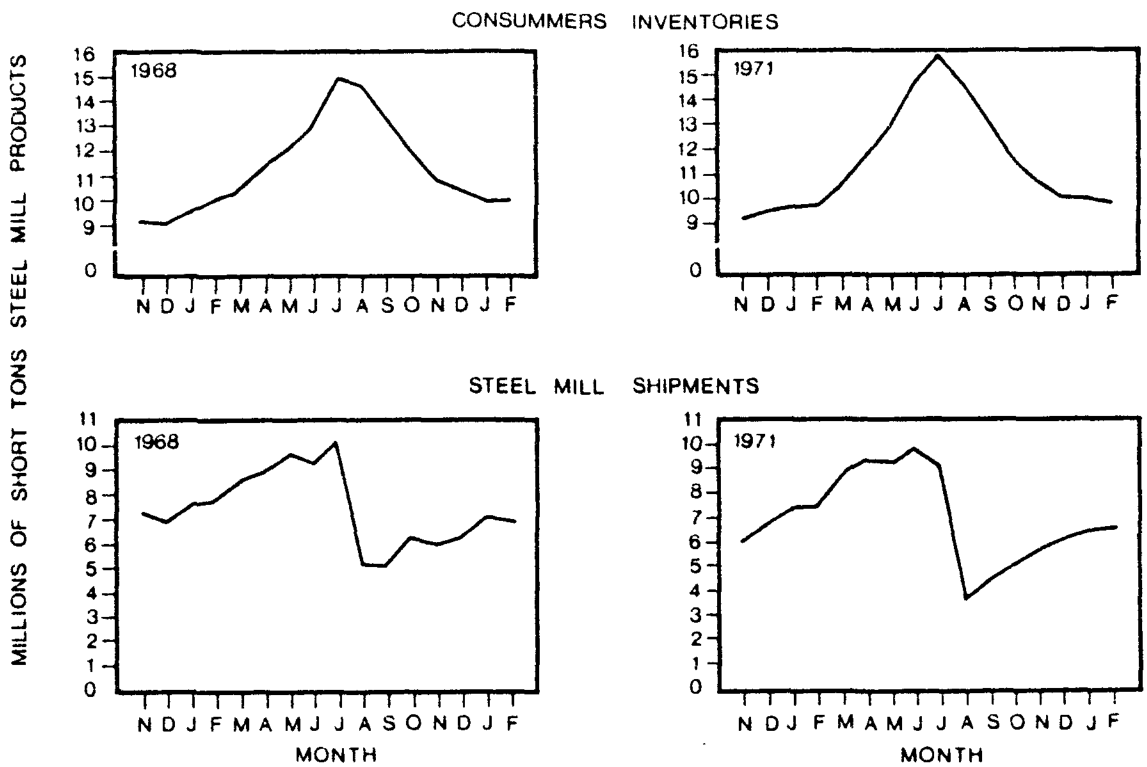
By the late 1950s therefore, with the growth of foreign competition, new disadvantages for capitalists of a consensus form of labour control began to emerge (Adelman, 1961). There was also pressure from the government against rising prices, pressure that expressed the increased intensity of competition between a monopolised steel industry and capitalists in other sectors to whom price increases were passed on.

In 1959 the twelve largest companies formed a committee through which they presented demands to the Union. These included greater freedom to increase work intensity and the flexibility to re-schedule jobs (Ong, 1983, p83). The aim was to re-establish a link between wages and productivity by cutting the cost of living increment and altering clause 2B. The result of this confrontation instigated by the companies was a 116 day strike lasting until mid-December, when the Taft-Hartly injunction forced a return to work at old contract rates for eighty days during a period of government arbitration (Herling, 1972, p68; Stieber, 1980). Clause 2B remained intact, though the creation of joint union and management study committees proved later to be a vehicle for effecting some of the desired work process changes. But wages rose by an average of only 3.7% over the three year contract period, compared with 8% after the 1956 agreement (Herling, 1972, p68; Betheil, 1978, p6).

The disruption in supply caused by the strike did have a dramatic affect on the market however, for it intensified the image of uncertainty of supply that had been acquired by American steel. Added to the emerging cost advantage of foreign producers, this encouraged steel purchasers to turn abroad for supplies during the strike. Many maintained these sources. (Imports climbed above exports in 1960, and have remained there ever since.) Furthermore as the dates of the subsequent three-yearly contract negotiations approached, so steel purchasers built up stocks, partly from foreign suppliers. Figure 4.5 shows how imports rose in three-yearly peaks which corresponded to the dates scheduled for contract negotiations. Figure 4.6 shows the shipments made by steel producers and the stock records of steel purchasers during periods leading up to contract expiration in August 1968 and 1971. In both years settlements were reached without strike action.

The immediate effect in 1960 of alternative sourcing was the collapse of oligopolistic pricing. When demand for steel products at listed prices failed, discounts were offered by many U.S. companies. For example, the Federal Trade Commission (1977) identified substantial accumulation of inventories by steel purchasers in early 1968 while Florida and the Great Lakes regions were experiencing heavy import competition. "Armco Steel, Inland Steel and Jones and Laughlin officially denied making selective price cuts to meet foreign competition; however, some purchasers said that Jones and Laughlin salesmen were offering to meet U.S. Steel's prices which were down to the import level" (FTC, 1977, p176). After a contract was signed without a strike,

Figure 4.6 Steel consumers' inventories and steel makers' shipments around contract negotiation dates: August 1968 and 1971.



Source: Department of Commerce, Survey of current business, various years.

and buyers started to run down inventories, even the advertised prices of certain products were slashed. Bethlehem reduced its list price on hot rolled sheet by 22%.

Pressure from the government on steel prices also continued into the 1960s. The Kennedy administration introduced steel price guideposts in 1962 and was directly involved in contract bargaining that linked these price restrictions to conservative wage increases. But pressure from the state was applied to both sides in the bargaining process. U.S. Steel followed the contract settlement with price increases above the guideposts, which provoked a major confrontation between it and the government. Antitrust investigation was threatened and defense contracts promised to firms which did not follow U.S. Steel's price lead. Whether because of these pressures or the new competitive structure of the market, the price increases did not stick and were rolled back less than a week after they were announced (Greer, 1977, p60; Barnett and Schorsch, 1983, p237; FTC, 1977, p253).

These government pressures on steel wages and prices directly favoured neither capital nor labour in the steel industry itself, but they were a response to the inflationary effects of monopoly pricing and the above average wages which were seen as a major cause. It also threatened the entry barrier erected by capitalists in that sector. That barrier had intensified the competition over rising steel prices between steel companies and producers in steel consuming sectors, and it threatened smooth accumulation by its inflationary effects.

Various studies provide more general evidence of a change in pricing practices in 1959. Mancke (1968) showed that capacity utilisation rates did not affect steel prices before 1959. But, "starting in 1959 and not earlier, the steel companies could now raise prices only when demand was relatively high and pressing capacity" (Mancke, 1968, p154). Multiple regressions showed that apart from costs, low capacity utilisation was the main negative determinant of price after 1959. As capacity utilisation fell, so prices were restricted despite the positive effect of costs. The government price guideposts and the level of imports were of less statistical significant than costs, though this does not deny the role played by these two forces in destroying oligopolistic resistance to the impact of demand fluctuations. Bailey (1962) showed that if price changes in steel had been the same as the average of manufactured goods, then the wholesale price index would have increased more slowly during the 1947-58 period, but more quickly from 1959 to 1974. Post- 1960 prices for steel products showed some cyclical trends in line with business cycles, but this was not the case prior to 1960 (Stigler and Kindahl, 1970). Crandall (1981) reviews a wider range of literature on this subject.

Some studies are less conclusive than those cited above. But most evidence points towards a dramatic change in the form of price competition around 1960 from oligopolistic to competitive. Forced to reduce prices under pressure from foreign entry, from the government and from steel-using capitalists in other sectors, the U.S. steel firms were now forced to turn to more efficient business strategies.

4.6 Investment and labour relations under the new form of competition

The capital widening investment of the 1950s was never intended to improve competitiveness because it did not need to. As foreign firms entered the U.S. market, however, the technological inefficiency of domestic producers was exposed. Furthermore the form of labour relations developed through the 1950s, which had offered some advantages to an industry characterised by oligopoly, particularly to the industry leader, was quite unsuited to a competitive market. So the technical and social relations of production constructed under oligopolistic conditions for accumulation were also those which intensified the U.S. industry's vulnerability to competition. The following two sub-sections examine attempts to overcome these two obstacles during the 1960s.

4.6.1 Investment in new technology

The wave of investment during the 1950s expanded capacity, but as the rate of growth in demand fell off and capacity utilisation rates began to fall (see table 4.3), so the need for these kinds of investment declined. The decline in growth rates of steel purchases from domestic producers was the result of 1) import penetration and 2) a decline in the use of steel in comparison with the growth in GNP because of the decline of steel using industries generally, and the development of substitute materials (see chapter 3). The price of steel rose two and a half times faster than that of concrete in the decade 1948-1957 (Greer, 1977, p61). Investment fell to a low in 1962 (figure 4.7).

By this time however the technological backwardness of the industry had become apparent, and the BOF as a method of steelmaking was proving itself (Adams and Dirlam, 1966). From 1964 onwards steel produ-

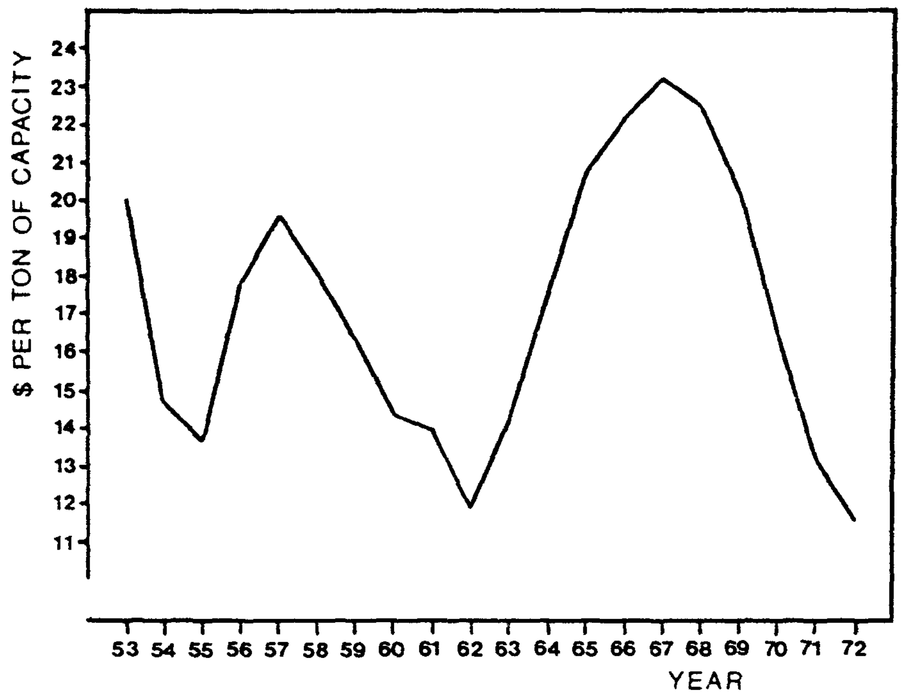
Table 4.3 U.S. steel industry capacity utilisation, and investment, 1951 - 1977.

Year	Capacity Millions tons	Utilisation Rate	Gross investment $/ton installed capacity
1951	104	101	n/a
1952	109	86	26.7
1953	117	95	18.7
1954	124	71	10.7
1955	126	93	11.9
1956	130	89	16.7
1957	133	85	24.0
1958	136	63	18.2
1959	140	67	11.9
1960	143	70	18.9
1961	144	68	12.0
1962	145	68	11.1
1963	146	75	12.5
1964	147	86	18.9
1965	148	89	21.2
1966	149	90	22.0
1967	151	85	23.4
1968	152	86	23.8
1969	153	92	20.3
1970	154	86	16.4
1971	155	78	12.8
1972	156	85	10.2
1973	157	96	11.7
1974	157	93	15.5
1975	157	76	20.2
1976	158	81	19.3
1977	160	78	15.7

Sources: Barnett, 1977; IMF, International financial statistics, various years; AISI, Annual Statistical report, various years.

cers embarked upon an ambitious investment programme, but this time to improve technology. Gross investment never fell below $20 (1975 $U.S.) per ton of installed capacity between 1965 and 1969, (a level it has since reached only in 1975) during which time capacity expanded by only about 3%.

Figure 4.7 U.S. steel industry gross fixed capital investment, 1975 dollars per short ton of capacity, 3 year moving average.



Source: Table 4.3.

Adoption of BOF technology might have been quicker in the early 1960s, but at this time total BOF costs exceeded open hearth variable costs (Adams and Dirlam, 1966). It only made sense therefore to adopt BOFs as additions to capacity, not as replacements of still workable open hearths. If all the new BOF and electric steel equipment added between 1960 and 1966 was used at full capacity, then some 37 million tons of this type of capacity was added (table 4.4). Total capacity in this period expanded by only 6 million tons (table 4.3), implying that 31 million tons of open hearth capacity was abandoned. It is presumed that most of this open hearth capacity was abandoned because it was old and needed significant capital expenditure.

Table 4.4 Steel production by furnace type, U.S.

Year	Open Hearth	BOF	Electric
1960	86,368	3,346	8,379
1961	84,502	3,967	8,664
1962	82,957	5,553	9,013
1963	88,834	8,544	10,920
1964	98,098	15,442	12,678
1965	94,193	22,879	13,804
1966	85,025	33,928	14,870
1967	70,690	41,434	15,089
1968	65,863	48,812	16,814
1969	60,894	60,236	20,132
1970	48,022	63,330	20,162
1971	35,559	63,943	20,941
1972	34,936	74,584	23,721
1973	39,780	83,260	27,759

Source: AISI, Annual Statistical Report, 1967, 1977.

Therefore the cost of abandoning working open hearth capacity was a major barrier to the adoption of the BOF in the early 1960s. The Federal Trade Commission (1977, p489) provides some evidence to show that the adoption rate of BOFs in the U.S. was faster than in most other countries, but the measure they use is a ratio of new BOF capacity with total capacity change. These ratios are high for the U.S. because after 1960 there was so little new capacity added. Other estimates show much slower rates of BOF adoption for the U.S. than for Japan where capacity was being expanded rather than replaced.

Schumpeter's assumption that monopoly firms are good innovators

(Caves, 1964) is not born out in this case. Without the need to introduce, and therefore research into, new innovations, the large steel firms were content not to upset the oligopolistic structure which was their basis for profitability. Hence they were slow to adopt BOFs during the 1950s when capacity was being expanded. It was the smaller steel firms that adopted the BOF first (Adams and Dirlam, 1966). By the 1960s however, when the error had been made, the advantage of BOF adoption was reduced because of the need to replace instead of expand capacity.

The climate for these investments was one of declining profits.[1] Through the 1960s the steel industry was the least profitable of all the major manufacturing groups (Greer, 1977, p79), a complete reversal from the 1940s and 1950s. The data in table 4.5 show how quoted profit rates in the U.S. Steel Corporation fell after 1960 independently of capacity utilisation rates (Blair, 1972). Along with evidence by Mancke and others about pricing behaviour, it is reasonable to conclude that the loss of oligopolistic pricing was responsible for the dramatic fall in profits (see also figure 4.8). The fall in profit rates required an increase in the use of external financing for the heavy investment of the sixties, which was needed to restore competitiveness. Debt equity ratios rose from 24% in 1960 to 38% in 1970 (Barnett and Schorsch, 1983, p53).

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[1] Investments were encouraged slightly by new taxation laws in 1964 (Business Week, 1964; Hall and Jorgenson, 1967, Dept of the Treasury, 1968), which allowed a 7% deduction on the value of capital investments.

Table 4.5 Profit rates and operating rates.

Year	U.S. Steel Return on net Worth	Steel Industry Operating Rate
1955	14.8	93
1956	12.8	89
1957	14.3	85
1958	9.7	63
1959	8.0	67
1960	9.2	70
1961	5.7	68
1962	4.9	68
1963	6.0	75
1964	6.8	86
1965	7.6	89
1966	7.2	90
1967	5.3	85
1968	7.7	86

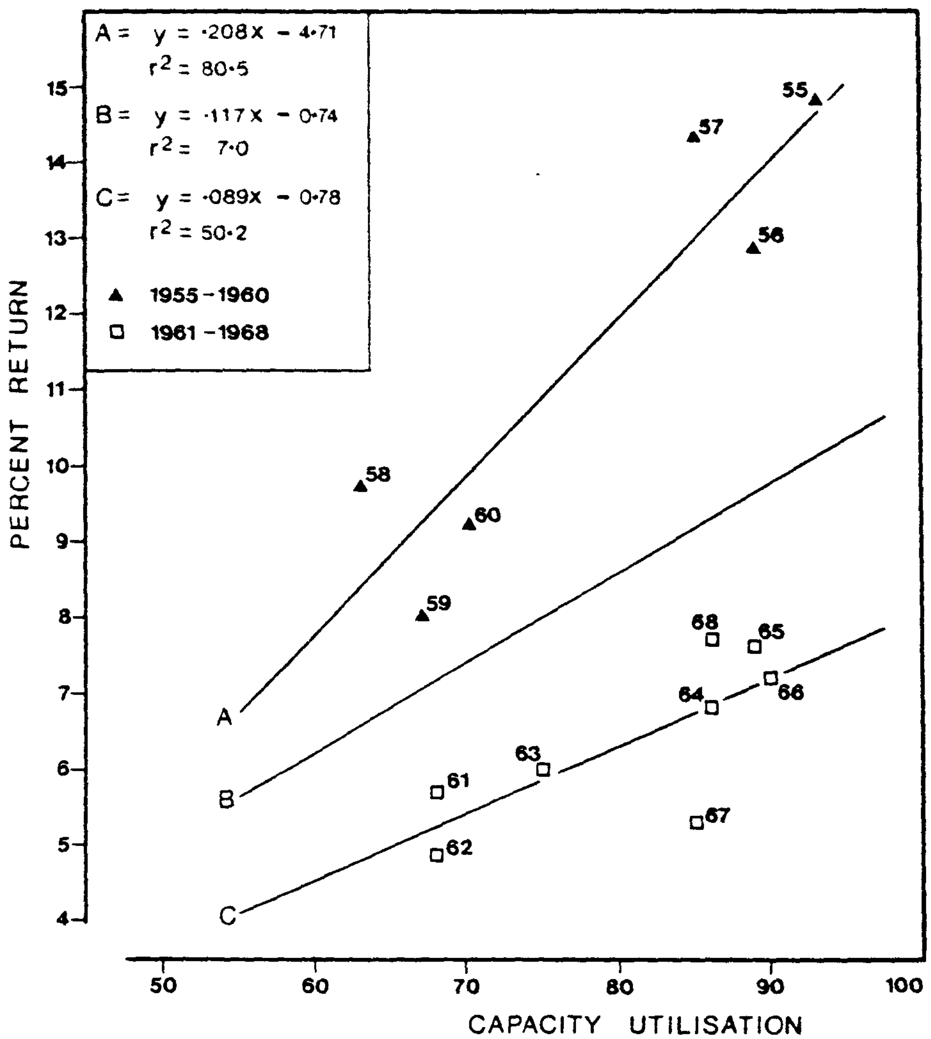
Sources: Blair, 1972, p642; table 4.3.

With depressed profits and rising debt equity ratios however, investments at levels of $20 per ton of capacity could not be maintained indefinitely. The incentive to continue heavy investment diminished too, as profits remained stagnant, and imports continued to grow into the early 1970s. The desired impact of BOF installation failed to show up in the companies' profit statements.

4.6.2 Strengthening the capital-labour alliance

The altered form of competition also placed pressure on the steel companies to improve labour efficiency and reliability of supply,

Figure 4.8 Profits and operating rates, U.S. Steel, 1956 - 1968.



Source: Table 4.5.

though they could not risk the disruption which another major confrontation with the union would cause. But now the union too was becoming concerned about the increased penetration of imports and its effect on the cyclical fluctuation of employment rates around the contract dates and on employment levels in general. This mutual threat of imports steadily brought union and management together through the 1960s.

Direct involvement of the government in the 1962 settlement had already helped to establish a pattern of management-union bargaining which differed substantially from that conducted in the 50s. Instead of formulating demands in the union's Wage Policy Committee and setting deadlines for contract renewal, thereby making use of the workers' bargaining power, settlements in 1962 and 1965 were achieved by the Human Relations Committee (a joint relations committee involving both management and union personnel which was set up as a consequence of the 1959 arbitration) and then passed on to the Wage Policy Committee for ratification (Betheil, 1978, p9).

The result was a continued check on wages (see figure 4.9a) as well as concessions on work practices which had been controlled by clause 2B. The clause was not rescinded, but its interpretation was relaxed. Real wages rose on average by 22.7c/hr[2] per year between 1952 and 1959, but by only 0.9c/hr per year between 1959 and 1970. With steady productivity improvements from 1960 to 1964 (figure 4.2 and 4.9b), partly due to labour intensification and partly due to capacity utilisation increases, the cost of wages per ton of raw steel output[3]

[2] In 1973 $U.S.

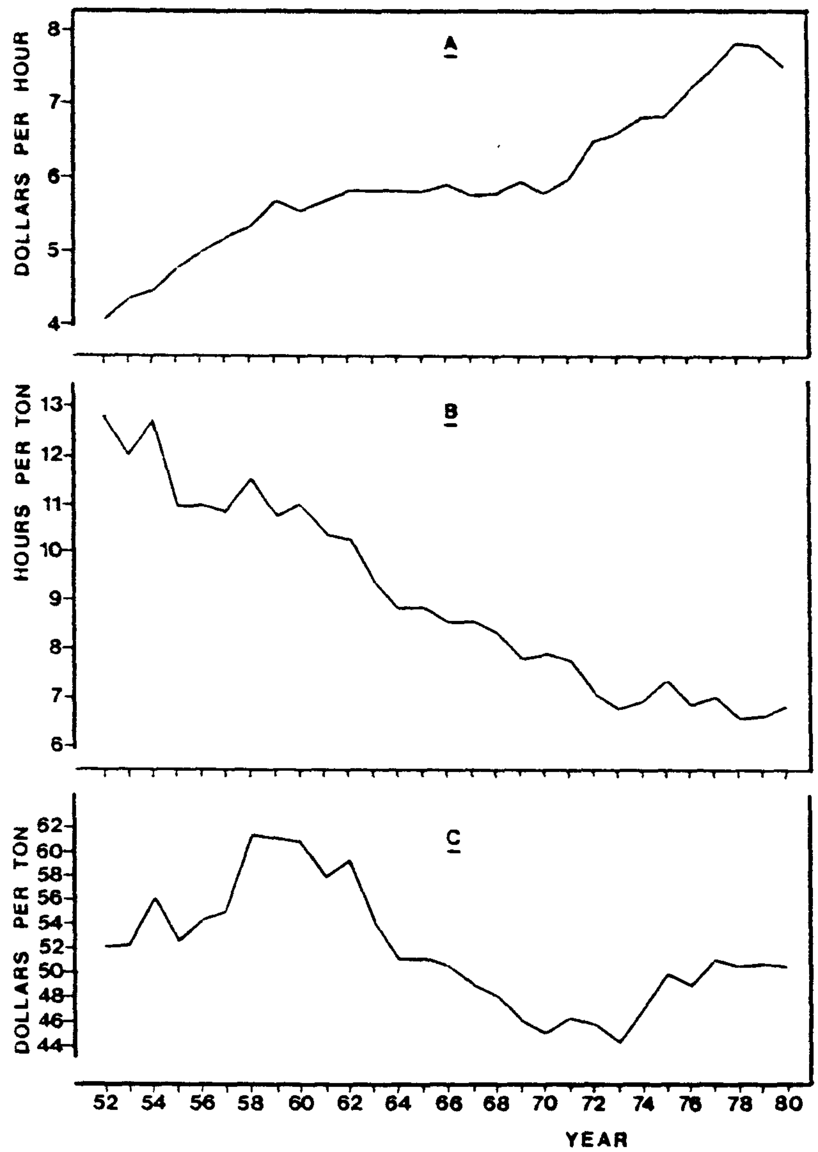
[3] The cost of labour series in table 5.9 does not present the total labour cost of producing a ton of raw steel, but is the cost of all labour used in the industry (including those in casting, rolling and finishing operations) as a proportion of raw steel output.

fell considerably (figure 4.9c). (See also table 4.6.) So the stable wage - increasing productivity environment which the owners had wanted before 1959, but which they now required with the increased competition from abroad, was quite quickly achieved in the early 1960s.

It would not be correct to infer that workers were united on this issue, for the union did not unequivocally represent the interests of the work force. The lack of rank and file influence over union decisions made within the Human Relations Committee became the subject of political struggle within the union in 1965. I.W. Abel won the presidency of the union over McDonald in that year on a platform that promised the resurrection of negotiating power. In the long run, however, this personality change, despite the apparent political forces behind it, did not alter the outcomes of union management settlements. The pattern of wage stagnation and productivity improvement continuing unabated throughout the 1960s. A further challenge to the union - management consensus in the 1969 union elections gave Abel a narrow victory after an apathetic turn out, while the 1968 agreement (which yielded none of the benefits promised in the fighting words of the 1965 election) was met with numerous strikes over local issues (Herling, 1972).

There are two possible interpretations of the move towards consensus. The first is to view the union as a tool of management policy, for it had become, "increasingly incorporated within capital becoming an aspect of it rather than an instrument of the steel workers"

Figure 4.9 a: Average hourly wages, U.S. steel, in 1973 dollars.
b: Productivity, hours per ton of raw steel output.
c: Cost of wages per short ton output, 1973 dollars.



Source: Table 4.6.

Table 4.6 Real wages, productivity and labour cost. U.S., 1952-1980

Year	Average Hourly Wage 1973 $	Hours Per ton of Raw Steel	Cost of Labour 1973 $ per ton
1952	4.08	12.8	52.2
1953	4.36	12.0	52.3
1954	4.44	12.7	56.4
1955	4.78	11.0	52.6
1956	4.98	11.0	54.5
1957	5.19	10.8	54.9
1958	5.33	11.5	61.3
1959	5.67	10.8	60.9
1960	5.53	11.0	60.6
1961	5.64	10.3	57.8
1962	5.80	10.3	59.4
1963	5.81	9.4	54.4
1964	5.80	8.8	50.9
1965	5.80	8.8	51.1
1966	5.88	8.6	50.5
1967	5.76	8.5	49.1
1968	5.78	8.4	48.1
1969	5.91	7.8	46.0
1970	5.77	7.8	45.2
1971	5.99	7.7	46.3
1972	6.47	7.1	45.7
1973	6.57	6.8	44.5
1974	6.79	6.9	47.2
1975	6.78	7.3	49.7
1976	7.14	6.9	48.9
1977	7.40	7.0	51.1
1978	7.76	6.5	50.5
1979	7.71	6.6	50.6
1980	7.44	6.8	50.4

Sources: From IMF, International financial statistics, various years; Bureau of Labour Statistics, Supplement to employment and earnings; AISI, Annual statistical report, various years.

(Betheil, 1978, p10). Like Edwards' concept of bureaucratic control, this sees a move away from hierarchical and technical (Taylorist and Fordist) methods of control which "relied almost exclusively on negative sanctions" towards a bureaucratised set of work rules sanctioned by the union which enhanced control "not only directly by compelling behaviour but indirectly by legitimising employer-imposed work procedures" (1979, p142, p109).

But these interpretations come from views of the labour process which tend to ignore the influence of competitive forces within the capitalist class, and consequently how these may yield new divisions between groups of workers. Strategies consciously used by management to divide the work force within the firm, whether through racial differences (see Packard, 1977, for examples of the use of this tactic in steel) or competition for promotion, have been emphasised. But the competitive divisions between groups of capitalists also place pressures on the immediate interests (Wright, 1979) of workers affiliated to those groups. As the altered form of competition in steel production became more evident in the early 1960s therefore, so the pressure was increased on workers in that sector in the U.S. to cooperate with management in their own industry in order to improve competitiveness.

While wage increases had been checked and productivity improved during the 1960s, the fluctuations of purchases, stocks and imports around contract dates continued, and indeed intensified in 1968. The union held out this year to demonstrate bargaining power to its membership, so the contract was not signed until two days before the strike deadline. The effect on employment lay off was dramatic (see figure 4.10).

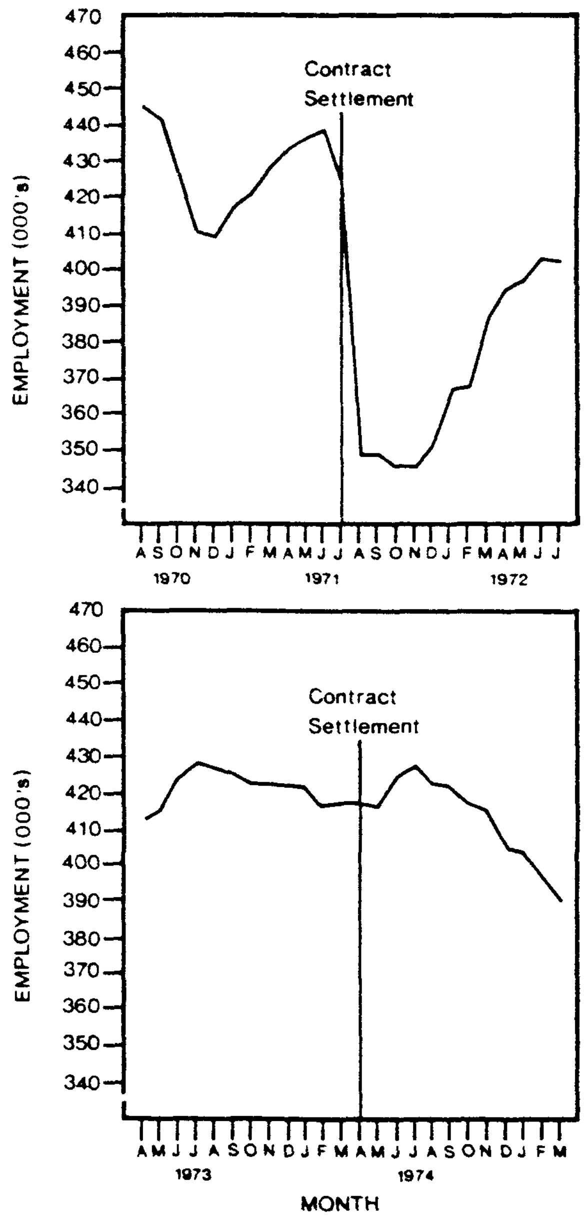
In 1973 an attempt to smooth out employment levels and capacity utilisation, and to improve the reliability of U.S. steel supply was made in the signing by union and companies of the Experimental Negotiating Agreement. In terms of the joint approach to productivity established in the Human Relations Committee, this agreement changed little (Betheil, 1978). It was intended, however, as a public statement: the union conceded a no-strike clause over national level issues in order to restore confidence in reliability of supply. But significant wage increases were granted by the companies in return, to compensate rank and file members for giving up their main weapon in pressure bargaining. From 1973 on, the contract-induced fluctuations in shipments were eliminated[4], as the reliability of supply was re-established (figure 4.10), but rapid growth in wages cut further into the industry's cost competitiveness. Between 1971 and 1978 wages increased by 24c/hr per year (see figure 4.9).

4.7 Conclusion

By 1973 the steel companies appeared to have lost both the battles of the 1960s. Heavy investment in new technology had not been sufficient to maintain parity with producers in other countries who were expanding rather than replacing capacity. Profits remained low as debt ratios escalated. Wages were kept in check, but even this advance

[4] This may also have been influenced by the introduction of voluntary trade restraint agreements. See section 5.1.4.

Figure 4.10 U.S. steel industry employment by month, 1971 and 1974.



Sources: Bureau of Labor Statistics, <u>Supplement to employment and earnings</u>, various years; USWA, 1975.

was conceded in 1972 in order to improve reliability of supply and to eliminate costly fluctuations in production rates around contract dates. Productivity improved, but not enough. While unit labour costs in actual dollars rose by 105% between 1964 and 1975 in the U.S., they rose by 160% in Japan. But whereas U.S. output per hour increased by 17.5% during that period, it rose by 166% in Japan (Council on Wage and Price Stability, 1977). Imports reached a high of 18 million tons in 1971, over 17% of the U.S. market.

Failure to restructure the relations of production sufficiently in the 1960s condemned the industry to major upheavals in the years that followed. In 1973 and 1974 demand increased and some government protection from imports was afforded, but as the 1970s progressed, alternative and more radical strategies than those of the 1960s were adopted. When demand collapsed in the 1980s the industry was not competitively structured to protect itself, profits became negative. Chapter 5 examines the restructuring of the industry that underlay the appearance of its decline.

CHAPTER 5

CRISIS AND RESTRUCTURING

1973 and 1974 were good years for steel production. There was a boom in world steel demand and production levels reached new highs, while the collapse of the Bretton Woods agreement and subsequent devaluation of the U.S. dollar in 1974 improved the cost competitiveness of the industry (see figure 5.4). Imports fell in 1974 to 13.5% of U.S. steel consumption. However this short lived revival did nothing to change the structure of the industry which continued to show symptoms of decline.

By the 1980s the industry lost completely its ability to accumulate capital, whether by a failure to appropriate it from elsewhere, or to generate surplus itself. Table 5.1 gives quoted after-tax-profits (losses) of selected companies from 1981 through 1985. It was the fall in profits (illustrated by these figures despite the inclusion of earnings from non-steel subsidiaries) that has stimulated strategies of restructuring.

Table 5.1 Earnings[1] of major U.S. Steel companies, millions of dollars, 1981 - 1985.

	1981	1982	1983	1984	1985
Seven (six) largest integrated companies:					
U.S.Steel[2]	1077	-361	-1161	493	409
LTV	386	-155	-181	-378	-724
Bethlehem	211	-1469	-164	-113	-196
Armco	295	-345	-163	-295	55
Inland	57	-119	-117	-41	-178
National	86	-463	-162	21	-88
Republic[3]	190	-239			
Sub-total	2302	-3151	-1948	-313	-722
Some other integrated mills:					
Wheeling-Pittsburgh	60	-59	-54	n/a	-303
Weirton[4]				61	61
Interlake	47	6	23	37	n/a
CF+I	39	-24	-94	-28	-3
Some minimills:					
Cyclops	21	-12	-2	18	26
Nucor	n/a	n/a	28	45	58
Carpenter	7	-1	16	33	25
Lukens	11	1	-14	5	-4
Copperweld	n/a	n/a	-24	n/a	-8
Florida	-3	-2	-5	7	8
Laclede	4	-18	5	7	5

Sources: Iron Age, May 2, 1983, p32; May 3, 1985, p35; December 6, 1985, p16; May 2, 1986, p19.

Notes: 1 Operating profit less tax, depreciation and interest.

2 Earnings are for all operations. U.S.Steel in 1982 had income of $1.2 billion from Marathon Oil, but incurred $911 million in interest charges on its purchase. Total steel corporation net income in 1982 was -$3,155 million, steel sector net income -$3,384 million. But in 1983 and 1984 non-steel operations had a negative impact on income, -$372 million and -$105 million respectively.

3 LTV and Republic merged in 1982.

4 National sold its Weirton plant to the work force when it merged with Nippon in 1984, and Weirton became a separate company.

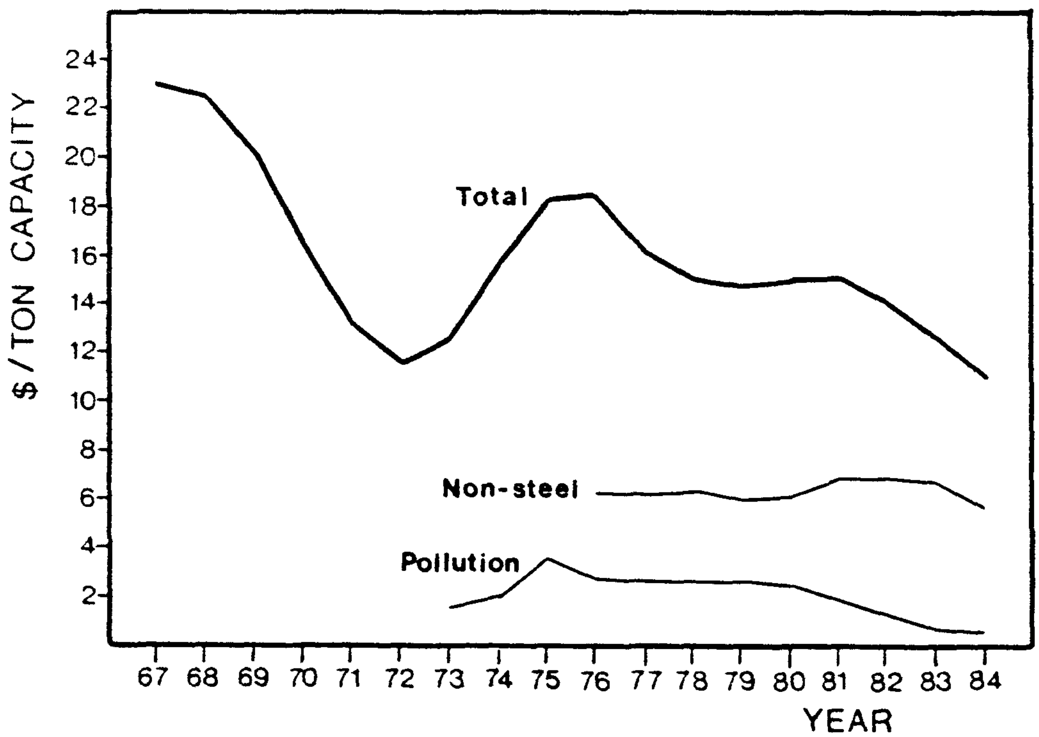
It was after 1975, but especially as the crisis of the early 1980s intensified, that class relations around steel production began to change. This chapter analyses those changes. As concrete events they comprise plant closures, technical changes, alterations in product quality and market range, and diversification of investment. But together they also constitute changes in the form of class relationships. Constricted by conditions in 1975 and by their own class position, management in the industry now had to adopt these new strategies in order to improve competitiveness. Attempts were also made to reduce wages, reorganise work and alter labour negotiation procedures. The extraction of more surplus from their own workers was one solution tried by owners to the loss of their ability to extract it from other capitalists.

The chapter begins by detailing some of the new competitive strategies adopted in the late 1970s and early 1980s. Diversification out of steel (section 5.1) was an attempt to channel capital into more profitable sectors of production. Together with expenditure to satisfy new pollution control requirements, diversification meant that less money was invested in integrated steel production. Expansion of minimill production intensified the competitive squeeze on integrated producers' markets (section 5.2) and by 1982, as capacity utilisation fell below 50%, the integrated companies were forced to close many facilities (section 5.3). Section 5.4 examines the effect that the resultant decline in employment had on struggles with labour in the industry and how this made it easier for capital to restructure labour relations to suit the new forms of competition. While conflict between the classes was dominant, labour was forced to accept its identity of interest with the competitive fortunes of the sector, illustrated for example by the cooperation between workers and management in lobbying the government for import protection (section 5.5). Finally some recent technical changes and mergers are examined (section 5.6). These herald the emergence of a modern, capital intensive integrated steel sector with a narrow product line, as well as increasing foreign penetration of the sector, not this time in the circuit of commodity capital, but in the financial and productive spheres.

5.1 Diversification and pollution control

Investments by steel producers showed an increase in the early 1970s over the late 1960s, but they were still well below the levels required to return the industry to cost or quality competitiveness. The highest real level of capital expenditure on plant and equipment was reached in 1975, equivalent to $4.7 billion (1980 dollars), but it was estimated in 1980 by the AISI that in order to reduce replacement cycles from 35-40 years to 25 years, the industry needed to invest $7 billion (1980 dollars) per year (AISI, 1980). The average age of equipment at that time was 17.5 years. Yet investment after 1975 fell again (figure 5.1). Furthermore, an increasing proportion of that dwindling investment went not to the installation of new technology, but to non-steel operations and to expenditures on pollution control.

Figure 5.1 Gross investment, steel, non-steel and pollution control, U.S., 1975 dollars, three year moving average, 1967-1984.



Source: Table 5.2

5.1.1 Diversification

Profits from steel production continued to fall in the 1970s. Return on sales was 5.3% between 1960 and 1969, 4.1% between 1970 and 1976, and only 1.6% between 1977 and 1979. Internal capital generation through the 1970s averaged only $2.47 billion (current) a year in the entire industry (U.S. Government Accounting Office, 1981). Yet in the early part of the decade the companies had continued to pay high dividends, on average 43% of after-tax profits (above the manufacturing average) at a time when heavy investment in technological and pollution equipment was required. "Some Wall Street analysts saw this as a strategy for buying time - holding investors' confidence - while management developed a plan for diversifying into new fields[1]. In the late 70s the entire industry, of course, did just that, shifting capital into cement, petrochemicals, coal, natural gas, nuclear power plant components, containers and packaging, and real estate" (Bluestone and Harrison, 1982, p285). Forty six cents of every dollar the U.S. Steel corporation invested in capital went to its non-steel segment in 1979 (p41). For the industry as a whole it was 23 cents in 1979, but by 1982 it was 47.8, and by 1984 51 cents (estimated from AISI, Annual Statistical Report, 1984).

Diversification has been concentrated within a few corporations. The most dramatic example of this capital shift out of the sector was U.S. steel's purchase of Marathon Oil in January 1982 for $6 billion. At the same time the company announced the closure of 14 steel mills and the subsequent loss of 13,000 jobs, a move which yielded $850 million in tax credits which was used as the down payment on the Marathon Oil purchase (Bluestone and Harrison, 1982, p6, p158). As late as 1975 74% of steel companies' total sales were in steel, and compared with other industries steel was relatively less diversified (FTC,

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[1] In the late 50s market value of stocks was 160% of book value. In 1959 they began to fall until they were less than 50% of book value by 1971. Republic's stocks were 26% of book value in 1979 (U.S. Government Accounting Office, 1981).

1977). But by 1982 this situation had changed: as a proportion of property, plant and equipment, only 45% of the U.S. Steel corporation was involved in the production of steel (U.S. Steel Company Report, 1982).

Inland and Bethlehem are less committed to diversification. In 1976 74% of Armco's assets were in steel. By 1981 they were down to 50%, and the 1981 annual report put the target at 36% for 1985. Armco also has assets in 26 foreign countries, but its only foreign concern in steel is a small electric mill in Mexico City (Hogan, 1984). National became a major producer of aluminium in 1968 with investment in Southwire Corporation, but steel remains its major concern despite the closure or sale of half its steel making capacity between 1981 and 1984. The company made a bid to take over Grumman in 1981 which failed.

5.1.2 Pollution control

Diversification has been a conscious restructuring strategy of steel management designed to reduce competitive pressure within its own sector and to put capital to work in more profitable branches of industry. Pollution controls by contrast are an expense imposed by state legislation[2], primarily introduced in the Clean Air Act and the Federal Water Pollution Control Act, which reduces productive investment in steel. Environmental expenditures from 1951 to the end of 1978 totalled

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[2] In this case not to effect a transfer of surplus from some other sectors, but as a non-productive expenditure.

$6 billion (1978 dollars) (AISI, 1980), $3 billion in the six years 1973 to 1978, and a further $1.6 billion in the following four years (AISI, Annual Statistical Report, 1985) (table 5.2).

Table 5.2 Steel company capital expenditure, total, non-steel segment and pollution control, U.S., 1975 millions dollars.

Year	Environmental	Non-Steel	Total
1973	263	n/a	1,841
1974	328	n/a	2,437
1975	581	n/a	3,179
1976	459	n/a	3,052
1977	471	n/a	2,516
1978	374	n/a	2,117
1979	489	574	2,486
1980	351	478	2,298
1981	305	626	2,124
1982	154	1,203	2,517
1983	81	728	1,775
1984	76	688	1,345

Sources: AISI, Annual Statistical Report, 1984; Office of Technology Assessment, 1980; IMF, International Financial Statistics, 1985 (Capital goods deflator).

Note: For the years 1976,7 and 8, the environmental expenditure series from AISI and OTA overlap, but do not match. The AISI series has been used for these years.

Despite these investment levels some 45% of steel facilities did not comply with air pollution control regulations in March 1980 (Office of Technology Assessment, 1980, p333), and some companies have been fined for breaking regulations. For example in 1979, Wheeling Pittsburgh made an out of court settlement amounting to $4 million in fines and a commitment to spend $84 million on pollution control in the following three years. The company's after tax-profit in 1979 was $19 million (Iron and Steel International, 1979, p123.) This illustrates steelmakers' resistance to pollution control, and they have repeatedly argued that EPA targets are determined entirely by social considerations but ignore their economic feasibility (see for example AISI, 1980, pp69-71).

As Bluestone and Harrison (1982) argue, it is difficult to support this position when dividend payments were so high in the early 1970s. Nevertheless pollution controls, complied with or not, certainly intensified an already serious cash-flow problem. Pressure from other sectors and environmental groups through pollution controls are not themselves responsible for reduced competitiveness of U.S. industry, for expenditures on environmental control in Japan (where newer technology reduces the relative cost of control at comparable limits) have been greater both absolutely and as a proportion of total capital investment. Pollution control cost however have reduced the capacity for the U.S. integrated industry to recover competitiveness through productive investment, though it is not possible to say how much of this money would have been directed towards new steel technology, and how much to other sectors of industry or in dividends.

5.2 Minimill competition

Another form of competition has emerged within the domestic steel sector itself. Minimills use electric furnaces with continuous bloom or billet casters which offer considerable cost advantages in non-flat product lines. Miller (1984) estimates labour cost per tonne of steel shipped at $75-$100 at minimills and $195-$295 at integrated plants, though Barnett and Schorsch's estimate of $144 per ton at integrated mills ($158 per tonne) in 1981 is significantly lower. Employee hours per ton (EHPT) for wire rod production in a minimill of efficient scale (1 million tons) is estimated at 1.9, but 3.55 in an equivalent integrated mill (4 million tons) (Barnett and Schorsch, 1983, p194). In January 1984 MacSteel's new minimill in Arkansas was planned for production of 280,000 tons of bars with 240 workers, or 1,160 tons per employee year, which is almost twice as high as the most productive major plant in the world in 1983 (table 9.6). Capital costs in 1978 dollars ranged from $154 to $320 per tonne for a minimill and $965 to $1,500 for an integrated plant (Office of Technology Assessment, 1980), or $286 for a minimill and $625 for an integrated mill (Barnett and Schorsch, 1983, p194).

The use of local, non-unionised labour forces has been commonly stressed in the literature (Miller, 1984; Barnett and Schorsch, 1983, p93) as an advantage exploitable by minimills to allow greater flexibility, and their general location in the sun-belt states where union activity is less concentrated (Peet, 1983) would support this view. However in 1979 only 25% of minimill capacity was unorganised, while 68% was organised as locals of the USWA (USWA, 1979). MacSteel was struck for ten weeks in 1981 (Iron Age, 1984, January 16th, p125). (Appendix A lists minimills in operation in 1979, their location and union status.) Really it is the relatively small capacity, narrow product range and input requirements (scrap and electricity) that give minimills the option of locating near local markets.

As a result of these advantages (in capital costs, labour costs and material and energy inputs) the minimill sector has steadily expanded. Miller estimates that 10 minimills in 1960 took 2% of the U.S. steel market, but by the end of 1983 50 mills took between 15 and 18% with a capacity of 15.4 million tons. Appendix A lists 60 plants in 1979 with a capacity of 16.8 million tons. Furthermore the specialised product line minimills means that they have penetrated particular sections of the U.S. market. According to Barnett and Schorsch (1983), in 1981 minimills accounted for 54% of wire rod (3 million tons), 32% of structural shapes (4.6 million tons), 36% of hot rolled bar (6.6 million tons), 93% of bar sized light shapes (1.1 million tons) and 74% of concrete reinforcing bars (4.4 million tons), though this puts output well above Miller's estimated capacity for 1983. Expansion in these lines has been at the expense not only of integrated mills, but also of imports. In 1967 wire rods, wire and wire products, bars, tool steel, structural shapes and piling, comprised 41% of steel imports (4.7 million tons) compared with 28% of domestic shipments. By 1981 these types of steel accounted for only 23% of imports (still 4.7 million tons) compared with 27% of domestic production (from AISI, annual statistical report, 1967, 1981). So not only were imports expanding, but their expansion was entirely in steel product lines in which integrated mills were being forced to concentrate.

The result of minimill competition has been a far greater loss of domestic market share by integrated producers than data for the entire U.S. industry suggests. With 26% imports, and given an 18% minimill market share, integrated producers supplied only 56% of the U.S. market in 1984, compared with about 95% in 1960.

5.3 Restructuring labour relations

Wages continued to rise after the signing of the ENA in 1972, until by 1980 they were 59% above the manufacturing average (Bureau of Labour Statistics, Supplement to Wages and Earnings, 1982)[3]. Although complaints were made about their uncompetitive level, nevertheless the ENA continued to work in other ways. Falling imports in 1973 and 1974, though primarily the result of dollar devaluation, seemed to confirm the benefits of guaranteed industrial peace. But the worsening financial problems of the industry after 1974, the sharp decline in investment, competition from mini-mills and once more rising imports brought the ENA under pressure in the early 1980s.

In 1980 employment fell to its lowest level since before the war, while imports in 1981 took their highest ever share of the domestic market at 19%. By 1983 steel employment had fallen to 53% of its 1979

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[3] Some other sources put this figure at 77%. See for example the U.S. Committee on Ways and Means (1974). Iron Age (February 16, 1983, p23) puts hourly labour cost (wages plus benefits) at 84% above manufacturing average in 1982.

level. The barrier against leaving a sector may not be that great for any individual worker[4]. However the exit of capital from a branch of industry threatens workers' political power if they are organised in sector specific unions. The union, as well as the workers themselves, was directly threatened by disinvestment from steel. By 1980 therefore, union leadership was actively encouraging steel investment in new technology as an alternative to diversification (Ong, 1983, p181). Although technical change also threatens jobs, this alternative was seen as one which would improve job security for those who remained, a common concern in many industries in the 1980s (Capelli, 1984).

Massey and Meegan (1982) list three causes of job loss: labour saving technical change, locational job loss, and rationalisation. Labour saving technical change is considered in detail in section 5.5. Locational loss in the sense that Massey and Meegan intend it, that is the loss of employment in one place due to the shift of production to new locations, is evident in U.S. steel only indirectly through import penetration. But the most visible form in the early 1980s was through rationalisation: plant closure and capacity reductions.

5.3.1 Rationalisation

Table 5.3 summarises plant closures since 1977 which together

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[4] This depends upon a variety of specific conditions, such as the state of local job markets. Bluestone and Harrison consider some of the hardships experienced by steel and other workers after losing their jobs in the late 1970s (1982).

account for a reduction in crude steel capacity of 36.5 million tons. It is not an exhaustive list, but it does include the major closures.[5] U.S. Steel alone reduced its crude steel capacity from 34 million tons in 1981 to 26.2 million tons in 1984 (Iron Age, September 17, 1984, p54B1). The closures which that company announced on December 27, 1983 meant the loss of 15,436 jobs, though over 10,000 of these were already on lay-off (Iron Age, January 16, 1984, p49).

There have been few closures due to bankruptcy. Most have constituted major steel firms' attempts to rationalise their production, sometime in conjunction with diversification out of steel, to match new demand levels, competition from minimills in non-flat product lines, and to eliminate old technology, especially coke ovens and open hearth furnaces which require pollution control expenditure (Iron Age, November 5, 1984, p14). U.S. Steel has made an explicit move to concentrate its facilities on flats and tubes (Manion, 1983b; Fortune, April 6, 1981, p33).

Phoenix Steel, Youngstown Sheet and Tube, Wheeling Pittsburgh, Kaiser Steel, McLouth, Guterl Steel, and Hunt Steel have all filed for bankruptcy since 1977 (Iron Age, 7th June, 1985, p51). Youngstown Sheet & Tube was purchased by Jones & Laughlin, but some of its facilities,

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[5] Some of the reduction has been compensated for by installation of additonal electric furnace capacity, both in minimills and to supplement steel supply in integrated mills. Between 1977 and 1984 electric furnace raw steel output rose from 27.7 to 31.4 million tons, and from 22 to 34% of steel output.

Table 5.3 Plant closures in U.S. steel, 1977 - 1984.

Year	Company (and plant)	Equipment	Capacity[1]
1977	Bethlehem (Lackawanna)	Steel	2.0
	Bethlehem (Johnstown)	Steel	.6
1978	Youngstown Sheet & Tube (Jones & Laughlin from 1978)		
	(Indiana Harbor)	Steel	2.7
	(Campbell)	Steel	2.0
	(Brier Hill)	Complete	1.4
1979	U.S. Steel (Youngstown)	All except coke	1.7
	U.S. Steel (Fairfield)	Plate mill	.5
	U.S. Steel (Gary)	80" hot strip mill	3.0
1981	National (Great Lakes, Detroit)	Steel	3.0
1982	U.S. Steel (Fairfield)	Complete	3.0
	(Pending agreement with USWA, reopened in 1984.)		
	Armco (Houston)	Tube mill	.3
	Republic (Buffalo)	Complete	1.0
	McLouth (Trenton)	Steel	1.2
	CF&I (Pueblo)	Steel	1.3
	Northwestern (Sterling)	Billet mill	1.5
		Blooming mill	1.5
1983	U.S. Steel (South, Chicago)	Steel	4.0
	U.S. Steel (National Duquesne)	Steel	3.0
	U.S. Steel (Johnstown)	Complete	.1
	U.S. Steel (Cayuhoga)	Complete	.7
	U.S. Steel (Gary)	Rail mill	.7
	U.S. Steel (South, Chicago)	Rod mill	.7
	U.S. Steel (Fairless)	Rod mill	.5
	Bethlehem (Lackawanna)	Steel	2.8
	Bethlehem (Los Angeles)	Complete	.8
	Kaiser (Fontana)	Complete	2.8
	Armco (Kansas City)	Bar and wire mills	.4
	Bethlehem (Sparrows Point)	Wire and pipe mills	
	Florida Steel (Indiantown)	Complete	
	Northwestern (Sterling)	Rod mill	.4
	Phoenix Steel (Phoenixville)	Steel	.2
1984	LTV (Aliguippa)	Steel	3.0
	Armco (Houston)	Complete	1.5
	Babcock & Wilcox (Milwaukee)	Seamless tube	
	Bethlehem (Bethlehem)	18" structural	
	Northwestern (Sterling)	Structural	.4
1985	Inland	Steel, some finishing	1.5

Sources: Hogan, 1984; Iron Age, 17th September, 1984, p54B1; 7th January, 1985, p14.
Note 1 : Capacity, in millions of tons, of equipment withdrawn.

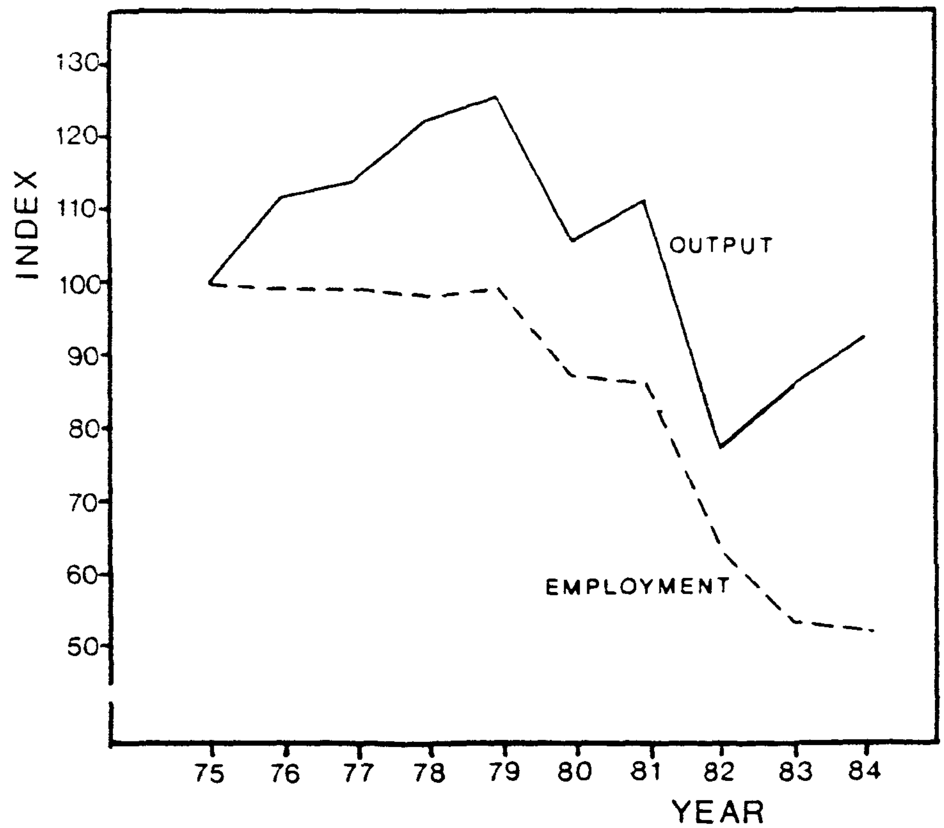
including all its steel making, were subsequently closed. Phoenix and McLouth were independently purchased and still operate. Kaiser Steel's Fontana works were subsequently purchased by Brasilian and Japanese concerns (see chapter 9) and its rolling mills reactivated. Guterl Steel was purchased by Allegheny Ludlum, and Hunt Steel by North Star Steel. Wheeling-Pittsburgh was on the brink of closure at the end of 1985.

5.3.2 The end of the ENA

Plant closures put the steel workers union on the defensive. Figure 5.2 shows how lay-offs began to cut into the labour force in 1980. The closures at Youngstown and Lackawanna especially had dramatised the precarious position of steel firms while labour costs continued to escalate. Cost of living adjustments increased wages by $1.97 in 1981 and 1982, and actual wages rose by 20% (AISI, yearbook).

In certain cases explicit pressure was placed on steelworkers to reduce wages and make other concessions. The complete closure at U.S. Steel's Fairfield, Alabama, plant in 1982 was made pending an agreement with the union on the restructuring of restrictive practices (Hogan, 1984). When it was reopened in 1984 the decision was made to install new continuous casters and a pipe mill there. But at South Works (Chicago), "where employees were unwilling to modify work rules, most operations are being terminated, and plans for a new rail mill have been killed" (Iron Age, January 16, 1984, p49). Allegheny Ludlum told

Figure 5.2 U.S. steel industry employment vs output, 1975 - 1984.



Source: AISI, Annual statistical report, 1981, 1984.

workers at its West Leechburg (Pa.) plant that modernisation would depend upon the union's acceptance of work rule and wage rate changes. The workers agreed (Iron Age, August 11, 1982, p11).

Other companies claiming near bankruptcy filed with the USWA for special concessionary agreements. In these instances the union investigated the financial position of the company concerned and then, depending on its findings, advised its locals whether to negotiate separate agreements. Companies involved include Allegheny Ludlum, Wheeling Pittsburgh, CF+I, McLouth, Penn-Dixie, Northwestern (the agreement was reached after a long strike), Phoenix, Interlake (Riverdale Plant), Jones and Laughlin (Hammond and Mahoning cold finishing bar plants), and Roblin Steel.[6] Most of these agreements were made in 1982. In the cases of Penn-Dixie, McLouth and Phoenix, the agreements were reached after the companies had filed for bankruptcy. Appendix B lists the main concessions contained in two such agreements, which are typical of the rest. Reductions in wages from levels set by the collective agreement of August 1980 ranged from $1.25 to $1.75 an hour, and Cost of Living Adjustments (COLA) increases were generally sacrificed along with reduced vacations and vacation pay. But some of these agreements also included profit sharing schemes as compensation for wage cuts, and the introduction of labour management participation teams as a method of improving job flexibility (see appendix B). Most of them also included commitments to use savings on wage concessions to invest in steel facilities, an attempt by workers to reduce divestment. There was no reason why they should make concessions so that management could invest elsewhere.

The United Steelworkers therefore entered negotiations with the group of coordinated companies in 1982 under very different conditions from those prevailing in 1980. Concessions had already been given to a number of steel firms. Wheeling-Pittsburgh and Allegheny Ludlum had

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[6] This information is from copies of the contracts between these companies and the USWA. Penn-Dixie Steel became the Joliet Bar Division of Continental Steel Corporation in 1982.

been members of the coordinated negotiating committee, but were ejected for bargaining separately with the union. The other major companies now looked for similar assistance, and they had massive operating losses to back up their claims that help was needed (table 5.2). The union was not in a strong position after the huge lay-offs in 1982 (figure 5.2) and with operating rates in the final quarter below 40% (Iron Age, February 16, 1983, p29). Furthermore with the new basis for negotiation and company pressure for a radically new agreement on wages, the ENA was finished. Car companies threatened in early 1983 that if no agreement was reached by March 1st they would begin placing orders abroad. The prospect of a return to pre-1971 fluctuations was not attractive to either labour or management.

The agreement negotiated between the USWA and the remaining 7 member companies of the collective committee[7] on March 1st, extended across the whole industry the concessions made to individual companies the previous year. Wages were cut by $1.25 for all wage scales. COLA was retained, but deleted from February 1, 1983 through July 31, 1984. There were also temporary reductions in vacation and holiday pay, and the Sunday premium was reduced from 50 to 25%. In return the companies raised by 50 cents their contribution to Supplementary Unemployment Benefits, and improved guaranteed payments to laid-off workers (Iron Age, March 16, 1983, p33; AISI, Yearbook).

The agreement was less explicit on the subject of work rules.

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[7] U.S. Steel, Bethlehem, LTV, Republic, National, Armco and Inland.

There is considerable vagueness as to what has happened and what will happen in the area of work rules. A contract provision calls for steps to reduce contracting out. In connection with this there is language dealing with the less restrictive trade and craft job classifications. A worker could go from electrical to mechanical work under certain conditions. The implementing of this concept is up to the local management and union people..." (Lynne Williams, president of the USWA, as quoted by Iron Age, 16th March, 1983, p36).

Nevertheless the conditions under which local negotiations over this issue would take place had changed. The original contract proposals in late 1982 had included a clause prohibiting plant closures for a year, but this was dropped from the final agreement. With plant closures a real threat, management had a powerful means of forcing through work rule changes they wanted, a strategy used effectively at Fairfield and South Works by U.S. Steel, and by Allegheny Ludlum. Along with management-labour participation teams the trend was towards increased in-plant flexibility and away from the rigid, foreman-union regulated job classification system established in 1947.[8]

The Agreement also stated that all savings on wage concessions were to be invested in steel operations. Such a committment is difficult to police, especially when net income remains negative. Recent technological investments may have been made quite independently of wage concessions. Union estimates of savings due to wage concessions were about 100% above those by the companies.

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[8] There is no in-plant analysis available to establish the degree to which these changes have been effective in improving flexibility on the shop-floor, or whether work rule changes have been achieved in general or in isolated cases.

5.3.3 Collapse of coordinated negotiating

Although the USWA had now lost some of its political strength, it is not true that capital had attained a position where it could force anything it wanted on labour. In particular it is the struggle with labour during the early 1980s (brought on by the need to restructure that relationship in the face of external and minimill competition as well as the ability to do so in new economic conditions), which has been made an issue of competition amongst the integrated mill operators themselves. Just as industry-wide bargaining was favoured during a period of oligopoly, so increased pressure to compete helped to undermine that form of bargaining.

Furthermore the change in the form of competition was only one contributory cause of the change in the form of struggle. The independent action of organised labour was also a cause. If it had not been for workers' resistance to change it would not have been necessary for capitalists to compete over the increased exploitation of labour.

There is evidence of intensified competition within the sector over a number of issues in the early 1980s. First was prices, because with exceptionally low demand, competition to maintain sales intensified. General Motors introduced a new bidding system for its purchase of steel (Iron Age, June 15, 1983, p23). There is no evidence available about pricing behaviour in the 1980s as detailed as that for the period around 1960, but real prices fell by 5% between 1981 and 1983 (from AISI, 1984 yearbook and IMF, International Financial Statistics, 1985) while chronically low utilisation increased costs. Second, the American Iron and Steel Institute, long the collective voice for the industry, began to lose some of its appeal. CF+I left the institute, while some new mini-companies, including Nucor and Chapparral, never joined. Third, strategies of merger were adopted by some companies, thereby raising opposition from others whose market position was threatened. (See section 5.6.) Fourth, some conflict arose over an increase in the purchase abroad of semi-finished steel by some integrated companies. In some cases it was cheaper to import slabs from abroad and close coke, iron and steel making equipment which was out of date and violated pollution regulations. Between 1980 and 1984 imports of ingots, blooms, slabs and billets rose 9.8 times, from 155,000 tons to 1.5 million. One example is the import of slabs from Tubarao, a new integrated plant in Brasil, for finishing at the renovated Fontana works of Kaiser Steel Corporation, now California Steel (see chapter 9). In 1983 U.S. Steel announced plans to close the steel making facilities at its Fairless works and import slabs from British Steel's Ravenscraig plant. Opposition came not only from the USWA who saw the move as a direct shift of jobs abroad, but from other steel companies anxious to prevent U.S.Steel from gaining a competitive edge in their input costs. Bethlehem and the USWA joined forces to condemn the proposal, especially on the grounds that it undermined the industry's lobbying position with the government for increased import protection. The plan eventually foundered.

Efforts to squeeze concessions from labour therefore took place in an environment of already increased competition within the integrated sector. In 1983 the issue was temporarily solved because even after the expulsion of Wheeling-Pittsburgh and Allegheny Ludlum from the joint committee, the collective agreement in March bestowed similar concessions across the industry. Since then however further concessions have been granted to other companies, including some branches of LTV, at Wheeling-Pittsburgh and to Bethlehem's Johnstown plant (Iron Age, June 7, 1985, p13).

The case of Wheeling-Pittsburgh has been most divisive. The company invested heavily in new equipment after 1982 (including $105 million on a new rail mill, $140 million on new continuous casters, and $135 million on environmental controls). Although this strengthened it technologically it became stretched financially with debts of over $500 million. In April 1985 the USWA rejected a restructuring plan and the company filed for bankruptcy. This did not mean an end to steel production, but it did present the opportunity to take certain exceptional measures. In July the original labour contract was voided by court order, and a new one, which cut total remuneration (wages plus benefits) from $21-40 to $17-50 an hour, was proposed. A 98 day strike followed after which the local union settled for a total of $18 an hour (Iron Age, October 4, 1985, p13; December 6, 1985, p16).

This and other recent concessions to companies outside the coordinated bargaining group have further undermined the competitiveness of those within it. The U.S. Steel Corporation for example has made it clear that it expects parity in the 1986 negotiations. "It's absolutely essential that United States Steel be labor rate competitive," said U.S. Steel Chairman, David M. Roderick (Iron Age, October 4, 1965, p13). Furthermore the settlement at Wheeling-Pittsburgh stands to cost other steel companies directly because most of the saving was achieved through elimination of the company's pension scheme. "...The Wheeling-Pittsburgh burden made it doubly certain the industry will be paying government more for pension insurance. This is a sore point with the large steel companies; they see themselves underwriting Wheeling-Pittsburgh's cost reduction" (Iron Age, December 6, 1985, p16).

But the Wheeling-Pittsburgh strike is indicative of labour's resistance to further erosion of its bargaining power. A Babcock & Wilcox proposal that made a modernisation programme contingent on wage reductions, similar that made earlier by Allegheny Ludlum and accepted by workers, was recently rejected. Through 1985 the union was explicit that concessions made in cases of bankruptcy were not applicable across the whole industry and that it maintained a policy which took wages out of the market to prevent a company from gaining an advantage by paying lower wages than competitors.

In August 1984 National Steel withdrew from the joint negotiating committee, and in June 1985 the remaining five members disbanded it altogether. So negotiations to renew contracts in 1986 will be conducted separately. For the companies, coordinated bargaining had become disfunctional, especially with the potential for achieving beneficial labour agreements individually. The USWA is still united nationally and may still be capable therefore of enforcing parity across most of the industry. But there is also political fragmentation within the steel union, and a trend towards increasing autonomy at a local level. This trend towards decentralisation has been influenced by the importance of recent decisions for the jobs of specific locals: groups of workers threatened by plant closure are unwilling to sacrifice their own jobs in the interests of maintaining a united front against pressure to reduce wages.

5.3.4 The new form of labour relations

It is normal to assume in Marxist analysis at an abstract level that increased unemployment (an expansion in the reserve army of labour) will cause a fall in wages. This conclusion is not weakened by an analysis of American steel in the 1980s. However that case does illustrate how labour's role is not inert as the abstract statement suggests. The increase in unemployment did not enforce a wage reduction, but it did represent a new condition which made it more difficult for workers to resist pressures both to cut compensation and to alter the form of control.

In steel these changes are still being acted out. Wages have been reduced and flexibility in job regulation increased. The changed form of competition within the integrated sector has intensified the pressure amongst capitalists to impose these changes, necessary if renewed accumulation is to be achieved. But they must be imposed through a struggle with labour, a struggle which itself intensifies competition.

5.4 Cooperative lobbying for protection

Although competition within the U.S. steel sector intensified and was intensified by the struggle with labour, both classes were still organised at a national level (as opposed to international). Resistance to foreign competition was an issue which still brought the two together. It has long been the contention of U.S. steel producers that foreign imports are dumped, their competition being unfair (Hogan, 1983). Most of the international cost analyses that compare the U.S.A. with other countries have aimed at answering this question (FTC, 1977; Council on Wage and Price Stability, 1977) and usually include sections on subsidies to foreign industry (AISI, 1980). The report of the International Trade Commission (1982) explicitly responded to petitions filed by seven major companies alleging that certain steel imports were being subsidised or deliberately sold in the U.S. below cost.

Cooperation between the companies and the union began in 1968 when joint pressure on the government brought voluntary restraint agreements with a number of steel producing countries, and was renewed with the Joint Conference on Imports and Productivity in 1972. In 1983 Bethlehem (representing the domestic steel industry) and the USWA submitted a joint petition for "import relief for the purpose of facilitating orderly adjustment to import competition" (USWA, 1983) to the International Trade Commission.

Despite this combined lobbying, tariff regulation has been intermittent and predominantly unsuccessful. The 1968 and 1971 voluntary trade agreements (Government Accounting Office, 1974) controlled steel by tonnage not price and therefore succeeded only in shifting import penetration to higher steel grades and specialty products. The 1977 Trigger Price Mechanism (Government Accounting Office, 1980) was intended to eliminate dumping practices by government-assisted steel industries abroad, but failed to do anything to stem the increasing flow either from low cost production locations or from places where it was difficult to prove dumping (almost everywhere). Later attempts to limit imports took the form of direct petitions such as those cited above, but the International Trade Commission found evidence of dumping in only 38 of 92 cases in 1982.

High imports and repeated petitions against dumping in 1984 (41 unfair trade cases were filed by steel companies in the first six months; Iron Age, July 2, 1984, p14) encouraged the negotiation by the government of new restraint agreements with foreign countries. Most of these were completed in November. Imports would be limited to 18.5% of the U.S. market: 6% from Europe, 6% from Japan, 2% from Canada, and 4.5% from the remaining countries, including Korea and Brasil (Iron Age, November 19, 1984, p5).

Once more these quotas have had little impact. A preliminary estimate of 1985 U.S. steel consumption is 95 million tons, with internal shipments of 70 million, down from 73.7 million in 1984 (Iron Age, March 7, 1986). Even assuming no exports, import penetration was 26%, about the same as 1984. Nor do the quotas discount the potential for increased imports if the competitiveness of U.S. product is not improved. The possibility of a steel strike in 1986 brought early warnings once more from steel consumers that hedge buying abroad would begin, quotas or no quotas, if an agreement was not reached by April 1 (Iron Age, February 21, 1986).[1]

The continued lack of effective market protection demonstrates a primary concern of the U.S. government to keep steel prices low for steel consumers. The policy of keeping the steel industry competitive rather than protected is illustrated by statements by Chairman Gibbons of the U.S. Congress Subcommittee on Trade in mid-1984 to a representative of the American Iron and Steel Institute during hearings over the bill to restrict steel imports:

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[1] The current labour contract runs out on August 31, 1986.

> Nobody is going to talk if we give you these quotas... They will just all be out there living it up for another 4 or 5 years... We won't just have steel wages 74 percent higher than the American industrial average, we will have 200% of the American industrial average if we let this go on. There won't be any jobs left for anybody else except a few people that had some jobs in the steel plants.

and about the protective approach of some European governments towards their steel industries:

> I don't want to model our society after their society. I look at all the inefficiencies they have got, and the high prices they have got and the way they live, and I prefer our system... Wherever it went, the U.S. capacity, it seems to me, was taken down by competitive pressures. European capacity was taken down by political decisions. I am not sure I would like to go that way,... (Committee on Ways and Means, 1984, p451-453).

This attitude is not just a reflection of American ideology to maintain competition in preference to protection. In other words that ideology is not independent of class relations. With steel consumers depending on cheap steel, and some steel exporting countries dependent upon their exports to earn dollars with which to pay their debts to American banks[2], there is considerable pressure from other productive and financial interests in the U.S. not to restrict import competition in steel. As <u>Iron Age</u> astutely observed, the government may be no more interested "in protecting the steel industry than [in protecting] banks who have big interests in underdeveloped countries." If developing countries default on their debts, "the U.S. government and the American taxpayer may end up looking down the barrel of another Continental Illinois Bank debacle. Now, this is what you call pressure"

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[2] 40% of Latin American export earnings went to loan payments and interest in 1983 (Iron Age, July 2nd, 1984, p24).

(Iron Age, November 19, 1984, p5). Competition from capitalists in other sectors of production has also intensified: from steel consumers trying to prevent steel producers from making monopoly profits as they used to, and which they might do again if protected, and from international bankers anxious that profits in production should be appreciated by their debtors in Third World countries. It is these competitive forces which make it difficult for the U.S. government to introduce effective steel protection, a position justified by the ideology of free competition.

5.5 Technical change

Aggregate figures for gross investment in steel have continued to decline into 1984 (figure 5.1, table 5.1). The AISI estimates 1984 gross investment in steel segment plant and equipment as $1.2 billion (current). Even with declining environmental control expenditures, this figure is well below the $7 billion a year deemed necessary by the AISI in 1980 to maintain the industry's competitiveness.

Such a low investment level is not surprising in an industry which had negative net income in 1982, 1983 and 1984, totalling $5.8 billion for the steel segment. Both the incentive to invest and the internal source of funds are low. Nevertheless some of that investment that has been made has been focused on technical changes as opposed to capital replacement or widening. Some of these technologies have been relatively less capital intensive (low capital cost per ton of steel), while technical restructuring has also been effected through selective capacity reductions. Other investments have aimed at product rationalisation.

5.5.1 New technologies

New investment in the 1980s has focused on continuous casting, electric furnaces, electro-galvanising, and computer controlled processes. Table 5.4 summarises the major structural investments in the integrated sector between 1982 and 1986.

During this period more than 27 million tons of continuous casting capacity have been added. In 1981 26 million tons (21.6%) of steel was continuously cast, and 36.6 million (39.6%) tons in 1984. With new casters starting production at Bethlehem, Inland, Continental Steel, and U.S. Steel in 1985 and 1986, this figure can be expected to rise to about 46 million tons (50% of 1984 output) in 1986. However, this is still well behind Japan where over 70% of steel was continuously cast in 1981.

The increase in the proportion of steel produced electrically is partly the result of abandoned capacity in integrated mills. But expansion has come not just in minimills. There were 48 million tons of electric furnace capacity at the end 1983. Between 1976 and 1984 13.5 million tons were added, 8 million in minimills and 5.5 million in

Table 5.4 Major technological additions, 1982-1986, U.S. steel industry.

Year	Company	Equipment (capacity)[1]	Cost[2]
1982	Armco (Butler)	Continuous caster (.4)	$51
	Inland (Indiana Harbour)	Slab caster (1.8)	
	National (Granite City)	Coke ovens	$50
	Northwestern (Sterling)	Billet casters (2.2)	$42
	U.S. Steel (Clairton)	Coke ovens	
1983	Armco (Ashland)	Bloom caster (.7)	$105
	Bethlehem (Burns Harbour)	Coke rehabilitation	$61
		Continuous heat treating	$60
	Bethlehem (Steelton)	Bloom caster	$85
	Inland (Indiana Harbour)	Continuous annealing line	$80
	LTV (Indiana Harbour)	2 slab casters (3.2)	$165
	LTV (Cleveland)	Slab caster (1.8)	$140
	LTV (Chicago)	Coke ovens	
	U.S. Steel (Lorain)	Bar caster	$145
	U.S Steel (Fairfield)	Bloom caster, seamless pipe	$750
	Wheeling (Steubenville)	Slab caster (2.4)	$110
	Wheeling (Manesson)	Bloom caster (.8)	$60
1984	Allegheny (Leechburg)	Annealing and Pickling lines	$15
	Babcock & Wilcox (Koppel)	Electric furnace, ladle refining, bloom caster.	$80
	Quanex (MacSteel)	Bar caster	$98
	U.S. Steel (Fairfield)	Slab caster	
1985	Continental Steel (Kokomo)	Billet caster (.65)	$21
	National (Great Lakes)	Slab caster (2.2)	$200
	Timken (Canton)	Greenfield minimill	$500
1986	Armco (Middletown)	Electrogalvanising (.2-.4)	$48
	Bethlehem (Sparrows point)	Slab and bloom caster (2.9)	$280
	Bethlehem (Burns Harbour)	Slab caster (2.2)	$260
	Bethlehem (Bethlehem)	Structural mill	$50
	Inland (Indiana Harbour)	Slab caster (2.2)	$200
	Inland (Walbridge)	Electrogalvanising (.4)	$80
	LTV (Cleveland)	Electrogalvanising (.5)	$125
	National (Great Lakes)	Electrogalvanising (.4)	$100
	U.S. Steel (Gary)	2 slab casters (3.2)	
	Wheeling-Pittsburgh	Galvanising	
	Rouge	Electrogalvanising (.6-.7) and slab caster	$150

Source: Iron Age: September 17, 1984, p33; July 16, 1984, p49; January 16, 1984, p60; February 6, 1984, p31; March 7, 1986, p11.

Notes: 1: Capacity in millions of tons.
2: Cost in millions of current dollars.

integrated plants. Increasingly, integrated mills have moved to the cost advantages in electric steel making as blast furnace, coke and open hearth (and some basic oxygen) capacity is withdrawn. Jones & Laughlin at its Pittsburgh works, and Bethlehem at Johnstown have closed the coke and steelmaking plants and replaced them with electric furnaces. Neither plant produces flats. There are also electric furnaces in use at Brackenridge (Allegheny), Butler, Baltimore and Kansas City (Armco), Bethlehem and Steelton (Bethlehem) and Pueblo (CF&I). Jones & Laughlin at Cleveland, National at Great Lakes (Detroit), U.S. Steel at Baytown, McLouth, and Rouge Steel all use electric furnaces in combination with integrated methods to make slab and sheet. The limitation is scrap quality because there must be fewer contaminants for flat products production (Iron Age, January 2, 1984, p108).

Both continuous casting and electric steel making have been introduced as cost reducing technical changes through increased capital and labour efficiency. (See chapter 3.) Futhermore they have been combined with plant rationalisation, so they are neither additions to capacity nor simple replacements of it. When the $7 billion estimate of required investment was made in 1980, this presumed a small capacity expansion and a continuation of integrated steel production. Instead capacity has been cut, from 154 million tons in 1982 to 135 million in 1984, while much of the new equipment has come in the post-steel making end of the plants. Coke, iron and steel making has generally been modernised through closure of old plant or electrification at greatly reduced capital cost instead of through replacement.

Although the labour savings from these changes are sizable, they have been made not only to achieve labour economies. Attempts to change work rules are strategies more directly aimed at improved labour productivity and control than are technical changes, though job structures can be altered when machinery is changed as well. Computers for example have been introduced in a variety of roles to automate machinery control, especially in blast furnaces, continuous casters and new hot rolling mills, but the benefits go beyond reduced labour requirements and technical control of the work process. Computer control improves efficiency of blast furnace operation to reduce material input and improve the quality of iron produced; it is a necessary adjunct to continuous caster operation, for example in the correct application of water cooling jets as steel emerges from the mould; and it is increasingly necessary in hot rolling mills to improve the specifications of sheet. The motor industry is demanding sheets of higher quality (regular width and thickness) which it has found are necessary for its new robotic feed systems (Iron Age, January 3, 1986, p53). Continuous casting has also had a significant impact on the quality of steel produced. Ford rejected 9% of the steel it received from U.S. producers in 1981, but by 1985 only 1.5%, the same as its rejection rate on Japanese steel (Iron Age, November 1, 1985, p37).

In rolling there has been a move towards expansion of galvanising capacity, especially electrogalvanising. Five units have been installed to begin production in 1986, all in response to demands from the car industry for corrosion resistant steel. Inland, LTV and Armco will produce EGS (electrogalvanised steel) for the General Motors' GM10 intermediate car to begin production in 1987. LTV will supply the GM25 compact which begins production in late 1986, and Armco will supply the GM33, high priced two door luxury car which begins production in 1987 (Iron Age, March 7, 1986, p11). So electrogalvanising has been a response to car industry requirements that complements quality improvements and the relative concentration on flat products by integrated producers. Changes at the finishing end have been made not so much to improve cost efficiency as to rationalise product lines and raise output quality.

This evidence supports Sayer's (1985) argument that technical change may have different objectives in different situations. This is because capitalists do not only struggle with labour over the production of surplus value, but compete with other capitalists over its appropriation. Different forms of struggle and competition encourage different kinds of technical changes. So during the 1950s the steel industry concentrated on capital widening. Altered competitive conditions, the need to alter relations with labour, improve product quality and reduce costs in the 1980s have encouraged capital deepening and narrowing.

5.5.2 Capital Financing

Investment has been low in dollars, but compared to cash flow and profits it has been high. Between 1975 and 1985 for example, Inland

Steel invested over $2 billion in two new continuous casters, an electrogalvanising line, a new blast furnace, two ladle metallurgy stations and an advanced continuous annealing line. Investment during that period was "three times net income and far more than total cash flow" (Iron Age, February 7, 1986, p45). Financing to maintain even the relatively low levels of investment in the 1980s has had to come increasingly from outside borrowing, and less from internal capital generation.

U.S. steel producers have traditionally maintained low levels of debt. Between 1970 and 1981 when the industry invested $30 billion, long term debt only increased by $2.2 billion. "At the start of 1982, debt represented only 30% of invested capital. This is in sharp contrast to the course followed by Japan's steel industry. The Japanese have borrowed heavily against expectations," producing "a capital structure with 80 to 90% debt" (Iron Age, February 20, 1984, p26). With negative cash flow ($391 million in 1982) this practice could not continue. Steel companies began to borrow for capital investment, especially abroad.

Financing has been obtained despite the lack of profitability in steel, usually by linking it to capital purchases. The continuous caster installations at Bethlehem and Inland have been 100% externally financed. $190 million came from Austrian banks to Bethlehem, the remaining $350 million from American ones. Wheeling-Pittsburgh's new casters were purchased with Mitsubishi financing (Iron Age, February 20, 1984, p27) and a further $150 million was borrowed with 90% federal government guarantees for a new rail mill at its Monessen plant (Iron Age, July 5, 1982, pMP-9). Mitsubishi was also involved in the $200 million casting programme at Inland. Most of this money has been obtained via links between financing corporations and equipment suppliers, and accordingly technology has been bought from abroad. LTV's slab caster at Indiana Harbor was supplied by Sumitomo Metal Industries Ltd. Wheeling- Pittsburgh's and Inland's casters came from Hitachi Zosen Corp., and Mannesmann Demag. LTV's slab caster at Cleveland came from Mannesmann Demag. Ohio River Steel Corporation obtained American, German and Saudi Arabian money for purchase of a 400,000 ton rolling mill. The mill was produced in Brasil under license from Schoemann-Siemag of Germany with a loan from the Banco do Brasil of $45 million (Iron Age, July 5, 1982, pMP-11).

Other innovative financing schemes have been used. Safe harbour leasing (U.S. tax reform 1981) allows the sale of tax depreciation rights to other corporations who then lease equipment back to steel producers. For example in November 1981 Wheeling-Pittsburgh transferred new equipment worth at least $100 million to BATUS, Inc., a British-owned holding company, for which BATUS paid a minimum of $25 million. More conventional leasing arrangements were used for new coke oven batteries at National's Granite City plant and U.S. Steel's Clairton, and for Inland's new annealing line, all through General Electric Credit Corporation. Bethlehem's new casters are built by an outside contractor who will then lease them. Payments by Bethlehem, with an upper ceiling, depend on tonnage produced, an arrangement which absolves the need for Bethlehem to obtain its own financing and guards against market down-turns. U.S. Steel's seamless pipe mill at Fairfield is leased from a nominal holding company, while financing was provided through oil company commitments to purchase the product (Iron Age, July 5, 1982, pMP-9; February 20, 1984, p27).

Finally some capital investment programmes have been achieved through joint ventures, especially in the rush to electrogalvanise. Rather than duplicate capacity, some companies have joined forces and shared costs. Alternatively they have sought foreign help. Inland's electrogalvanising line is a joint venture with Bethlehem and Pre-Finish Metals of Waldbridge, Ohio. Rouge Steel is building its line in cooperation with U.S. Steel. LTV owns 60% of its joint electrogalvanising venture with Sumitomo Metal Industries Ltd., and National is in partnership with Nippon Kokan (see the following section on mergers). Wheeling-Pittsburgh's hot-dip galvanising line presently under construction is half owned by Nisshin Steel Co.Ltd. Only Armco, with the smallest galvanising line, has risked development alone (Iron Age, February 20, 1984, p14; June 7, 1985, p29).

Once more, altered conditions of competition within the sector have forced steel producers to restructure their relationship with capitalists outside. Cooperation with financiers and equipment suppliers has been necessary to achieve new technical developments. In the future this will lead to an outflow of surplus in interest payments. It has also meant that the foreign penetration of the U.S. steel industry itself has extended beyond the circuit of commodity capital. Foreign finance and direct investment is beginning to enter the sector. This is also evident in some recent mergers.

5.5.3 Mergers and foreign entry

The steel industry in the U.S., unlike other sectors has not been one of increasing concentration. In the early 1900s U.S. Steel controlled over 60% of the sector, but since then concentration of the industry has steadily declined. This has happened as other integrated firms have expanded with the support of anti-trust laws, and in the 1970s as minimills took a greater share of the market. In 1942 the four largest steel companies accounted for 64.7% of steel product shipments, but only 52.8% in 1976 (FTC, 1977, p53). The only notable mergers between steel corporations were Wheeling's acquisition of Pittsburgh Steel in 1968, and National Steel's acquisition of Granite City Steel in 1971 (FTC, 1977, p58).[3]

The 1980s have seen some new mergers, not only by steel firms attempting to diversify capital from non-profit making steel (U.S. Steel and Marathon, LTV's efforts to merge with Grumman) but also between steel makers attempting to increase cash flow and to balance rational-

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[3] Youngstown Sheet and Tube and Jones & Laughlin were taken over by non-steel companies, Lykes Corporation in 1969 and Ling-Temco-Vought (LTV) in 1968 respectively. Youngstown was subsequently run down, and then taken over by LTV in 1978. LTV had to divest itself of Braniff Airways before being allowed to take over Jones & Laughlin.

ised capacity. The most notable was between LTV and Republic, announced in September 1983. The merger was originally rejected under anti-trust laws by the U.S. Justice Department, and attracted efforts by other competing steel companies (Cyclops and Wheeling-Pittsburgh) to have it blocked. But the merger was eventually approved in June 1984. Combined the two companies made 15.7% of industry shipments in 1983 (Iron Age, February 20, 1984, p35), but capacity was trimmed through 1984. The resources of each company have been pooled to yield a better balance between operations. Slabs continuously cast at Republic's Cleveland mill are now direct rolled[4] in the powerful hot strip mill in LTV's Cleveland plant, a procedure which allows both units to operate at full capacity and produce together a high quality product. Without the merger a new caster and new rolling mill would have been required to improve quality, thus duplicating capacity in a period of slack demand. Other savings from the merger include reductions in inventory, and during 1984 the administrative work force was cut by 1,800 (Iron Age, February 1, 1985, p43).

In January 1984 U.S. Steel unveiled plans to take over National Steel Corporation, a move designed to tie in with closures announced the month before. This acquisition attempt was quickly dropped in the face of U.S. anti-trust legislation, but would have joined the largest and the third largest companies in the country if it had gone through. At a smaller scale bankrupt companies Guterl Steel and Hunt Steel were acquired by Allegheny Ludlum and North Star Steel respectively.

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[4] Rolled direct from slab without pre-roughing and re-heating.

Other mergers however have not contributed to the concentration of the U.S. industry because they have involved foreign, mostly Japanese, interests. The Japanese especially have shown an intention and ability to expand steel production internationally, partly due to their relatively high profitability, their market power and the need to limit further expansion within Japan due to heavy spatial concentration and strict pollution regulations (see also chapter 9).

National, after the collapse of its proposed merger with U.S. Steel, sold 50% of its steel operations to Nippon Kokan. National Steel Corporation itself was re-named National Intergroup Inc., as it continued to diversify out of steel. The merger with Nippon has been an essential element in the success of National's $1.2 billion modernisation programme for 1985-1989. Nippon has improved the cash flow of the company and been instrumental in securing finance, for example from Marubeni and Mitsubishi for the installation of the new caster at Great Lakes. Rouge Steel was also bought by Nippon Kokan in 1982 (Iron Age, September 5, 1982, p17). With the agreement between Wheeling-Pittsburgh and Nisshin Steel Co. Ltd. to build a galvanising line together, Nisshin also bought 10% interest in the American company. An expansion of this interest is one possible solution to Wheeling-Pittsburgh's current bankruptcy. Kaiser Steel's Fontana works was partially renovated by Kawasaki and the Companhia Vale do Rio Doce of Brasil. U.S. Steel has recently entered joint operation and modernisation of its Pittsburgh, California plant with Pohang of South Korea (Iron Age, February 7, 1986, p68).

Although these foreign interventions affect a relatively minor proportion of the industry by capacity, they do represent a trend towards another significant alteration in the class structure of the sector. Mergers within the U.S. industry only provide opportunities to coordinate rationalisation programmes and obtain the necessary finance for expensive technical changes. Foreign interests represent the direct internationalisation of production in steel which has characterised other industries.

In the case of steel however it is not American but Japanese companies which are displaying success in elevating their competitive strategies to this new level. This is another indication of the susceptibility of U.S. steelmakers to competition from a variety of quarters after the events of the 1950s. But it also raises questions about the national identity of international capital. The introduction of capitals organised multinationally provides a new set of conflicts within industry as well as for U.S. national interests as a whole. Multinational interests are not closely linked to those capitals within the same sector that are still organised at a national level. Direct foreign entry in steel raises potential conflicts with other U.S. steel companies and the U.S. state over issues of international competition (for example over the import of slabs from Brasil for finishing by Kawasaki in California) as well as with its labour force which is also limited in its actions by national boundaries. These questions are dealt with further at the end of chapter 9.

5.6 The roots of decline

Chapters 4 and 5 have examined the history of steel development in the U.S. and how class forces have influenced the industry's decline. Only by restructuring the method of labour control were capitalists in the steel sector originally able to establish monopoly power in the market. Although the form of labour relations which emerged from the struggles of the 1930s and 1940s served to sustain oligopoly, in so doing it helped to produce the conditions for new forms of competition. Once inefficiency had been generalised under conditions which made exit difficult, increased competition came from four sources: 1) efficient steel producers abroad, 2) minimill operators within the U.S.A., 3) producers of steel substitutes, and 4) steel users and international bankers who switched their consumption abroad, or placed pressure on government to force price controls on steel producers or to deny effective import control. The result was a break down in oligopoly pricing and the loss of the ability to appropriate profit.

The 1960s was a period in which surplus was no longer gained from other sectors (though it may not have been lost either), while the ability of steelmakers to produce surplus themselves was increased as wages stabilised and productivity improved. By the 1980s as the production and availability of surplus in the economy as a whole declined, steel producers were in no position either to appropriate surplus from elsewhere, or to realise that produced in their own factories.[5]

These conclusions are derived from an analysis of class restructuring. They show for example how changes are rooted in production relations. Demand was low both in the 1950s and the 1980s. Though more severe than that in the late 1950s, the recent decline of demand induced a crisis which ruptured the ability of steel producers to accumulate because they could not tap alternative sources of profit as they had done 30 years before, nor expand exports to keep output high. Demand fluctuations themselves are therefore of relatively minor importance in explaining the profitability crisis, and hence the decline in capacity and employment, compared with the alteration in class relations over this period. The analysis also shows that understanding change through class struggle implies more than charting the level of wages and degree of organisation. Profits were high in the 1950s as wages escalated, but fell in the 1960s when wages were stabilised because of the altered form of competition. So the 'labour factor' on

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[5] A simple assessment of the competitive position of the industry can be obtained by using the regression equation of profits against capacity utilisation rates for the period before 1961 (figure 5.8) to predict 1982 profit rates. With 48.4% capacity utilisation in 1982 and pre-1961 competitive conditions, a rate of return on unit worth of 5.6% is expected. Actual profit rates in that year were negative. They were still negative in 1984 when utilisation was above 68%, a predicted profit of 9.5% before 1961. Even the profit rates of the 1960s were well above those of the 1980s for equivalent levels of capacity use. These equations of course are not good profit predictors. They assume profits are determined by a single variable, and their accuracy may be distorted at extreme capacity utilisation rates.

its own does not explain very much either. But understanding how and why the form of competition changed can only be done in conjunction with an analysis of the changing ability of capitalists to exercise control over labour's resistance. A class analysis therefore implies an analysis not only of struggle and competition, but also of the relation between them.

Of special relevance to this thesis is the development of an internationalised form of competition. The direct relocation of production abroad was never a strategy adopted by U.S. steel producers. Of all the major U.S. steel companies, none are multinationals (though Armco runs a small mill in Mexico and U.S. Steel has part ownership in two steel mills in Spain, FTC, 1977). But such a strategy would have been intended to increase the production of surplus value by U.S. steel companies instead of relying upon external appropriation as a source of profit, so it was not complementary to the form of competition in the 1950s. By the 1960s, when profits had fallen, all available investment funds were targeted for technical change in domestic mills.

So international space has not been consciously used by U.S. steel producers to increase profitability, and the location pattern of steel production was not altered by the actions of U.S. companies, though it changed nevertheless. As a result not only has labour been divided internationally, as it would also have been by multinational relocation, but so too has capital. And it is because capital is internationally divided in steel that the development of steel industries has been so specific to different countries. Changes in the geographic pattern of steel production have resulted from forces specific to different nations. That is why analysis of that development must also be specific to nations. Chapters 4 and 5 have focused on that history in the United States. The next four chapters turn to look at Brasilian steel.

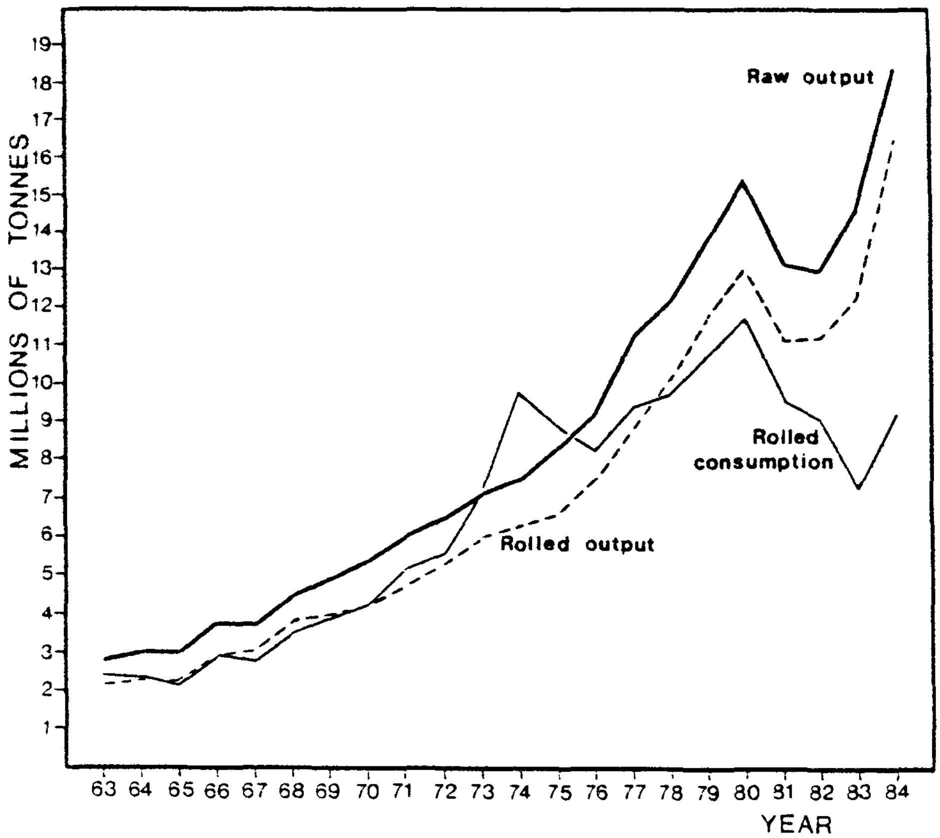
CHAPTER 6

BRASILIAN STEEL AND INTERNATIONAL FINANCE

Between 1967 and 1974 raw steel production doubled in Brasil from 3.7 to 7.4 million tonnes. By 1980 it had doubled again (see figure 6.1). Of all the major steel producing countries (market economies), with the exception only of South Korea, the rate of steel growth in Brasil was the fastest, (see table 6.1). In 1981 and 1982 output declined, but it grew again in 1983 and in 1984 to 18.4 million tonnes, almost 400% above 1967 output (IBS, Statistical Yearbook, 1985).

The analysis of Brasilian steel in the following four chapters focuses on the government-owned, coke-based, integrated segment of the industry. The reason for this is not that other mills are uncompetitive. The government controlled sector for example exports no greater proportion of total exports than its share of the domestic market (which was 68% of finished and semi-finished output in 1984). But the directly foreign owned sector is small both in terms of output (9% of raw steel

Figure 6.1 Brasilian steel output and consumption, 1963 - 1984, millions of tonnes.



Source: IBS, Statistical yearbook, various years.

output in 1984) and in scale of plant, and the technological differences between all the privately owned mills and the coke-based integrated sector distinguishes their development. Furthermore, it is government stimulated growth that has been responsible for the dramatic expansion of Brasilian steel production.

Table 6.1 Percentage change in raw steel production between 1967 and 1980, by country, millions of short tons.

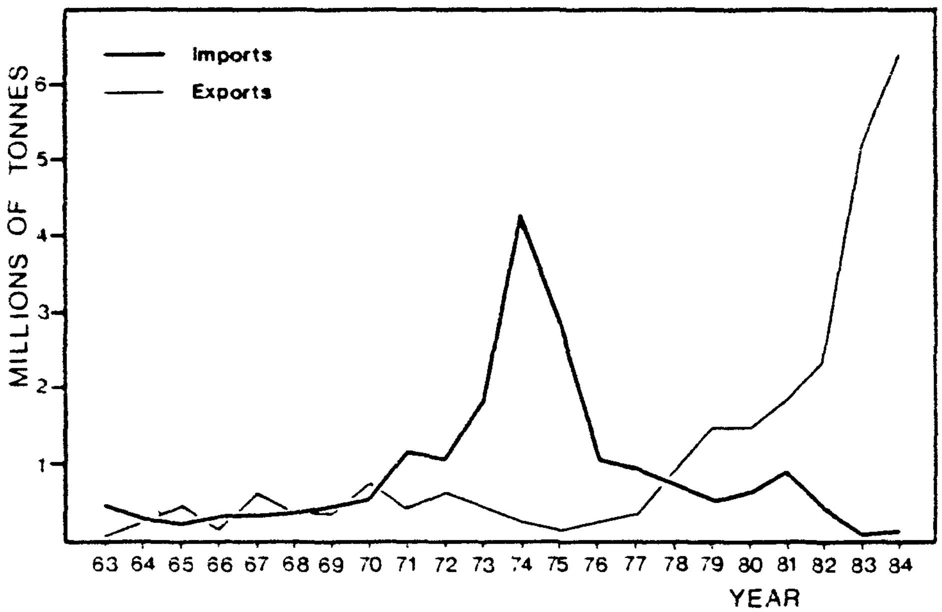
Country	1967 output	1980 output	% change
Japan	68.52	112.08	+64
United States	127.21	111.84	-12
West Germany	40.50	48.32	+19
Italy	17.52	29.21	+67
France	21.67	25.55	+18
Belgium	15.65	18.67	+19
Canada	9.69	17.53	+81
Brasil	3.92	16.88	+331
Spain	4.99	13.94	+179
United Kingdom	26.76	12.43	-54
India	7.40	11.88	+61
South Korea	.33	11.85	+3,514
South Africa	4.00	9.86	+147

Source: From AISI, Annual statistical report, various years.
Note: Includes all market economy countries with output over 10 million tons, and South Africa.

Figure 6.1 shows how expansion in output through the 1960s and first part of the 1970s kept pace with rapid growth in demand. At least in the government-owned sector of the industry, this is what it was designed to do, planned expansion coming in three stages between 1942 and 1974 (though the last of these has yet to be completed). In order to supply its domestic needs, both in quantity and product range, and to suit import substitution development policies, the Brasilian government found it necessary to develop a large, modern, flat products integrated steel industry which, with the completion of final expansion in 1986, will be responsible for over 70% of Brasilian production.

Brasil was not a major exporter of steel before 1983, nor did

Figure 6.2 Steel imports and exports, Brasil, 1963 - 1984, millions of tonnes.



Sources: IBS, Statistical Yearbook, various years.

the government originally intend that it should be. Exports expanded in the 1980s (figure 6.2) less by design than by default, so as to maintain operating rates as domestic demand fell and new capacity came on line, and to earn badly needed foreign currency.

The purpose of this chapter is to introduce the three that follow. First it describes the technological characteristics of the industry. Secondly, it details the ownership of steel making capacity in Brasil between private indigenous, state and foreign capital. Finally, it shows that most of the foreign interest has been in the form of international finance, not direct productive investment.

As argued in chapter 3, the interests of the faction of finance capital are different from those of productive capital. So although the steel industry was built with substantial foreign assistance, there was no requirement from abroad that Brasil should necessarily be one of the most profitable places to produce steel. All that was required was a guarantee from the government on repayment. That Brasil should be an especially profitable location (or else a large but protected market) would have been a prerequisite in the case of direct foreign investment. Furthermore the substantial government involvement suggests that domestic interests in the growth of the industry were partly political rather than purely economic.

Chapter 7 is therefore designed to show that despite cheap unit labour costs and iron ore in Brasil, there are other factors (low labour productivity and high capital costs) which bring into doubt its suitability as a cost effective location for steel production. Chapters 8 and 9 focus on the politics of development in Brasil. Chapter 8 examines the relationship between indigenous, state and foreign factions of capital (O'Donnell, 1978), and between them and labour. Workers have been consistently suppressed both by their lack of economic leverage in a society overflowing with surplus labour, and by divisive and rigorously enforced labour laws (Alves, 1985). Chapter 9 shows how these forces have influenced steel development in particular.

6.1 Production methods

The methods used for steel production in Brasil are diverse. In 1984 only 59% of steel mill products came from coke-based integrated mills producing more than one million tonnes. The remainder came frcm plants with capacities below one million tonnes, 18% from charcoal-based integrated mills, 21% from electric mills, and 2% from direct reduction (from IBS, Statistical yearbook, 1985). Nevertheless, most of the industry, particularly the government segment, can be considered technologically competitive with other countries. (See appendix C for a list of companies, their iron and steel making techniques and product outputs.)

There are four fully integrated coke-based plants in Brasil. Companhia Siderurgica Nacional (CSN), located about 100Km north west of Rio de Janeiro at Volta Redonda, has a rated capacity of 3.0 million tonnes; 7% of 1984 output was shapes, the remainder flat rolled. Usinas Siderurgicas de Minas Gerais (Usiminas), at Ipatinga in the iron ore mining region of the state of Minas Gerais, has a capacity of 3.5 million tonnes, all for flat steel production. Companhia Siderurgica Paulista (Cosipa) at Cubatao on the coast south east of Sao Paulo, also produces flat products only, with a raw steel capacity of 2.7 million tonnes.[1] Companhia Siderurgica de Tubarao (CST), which began production

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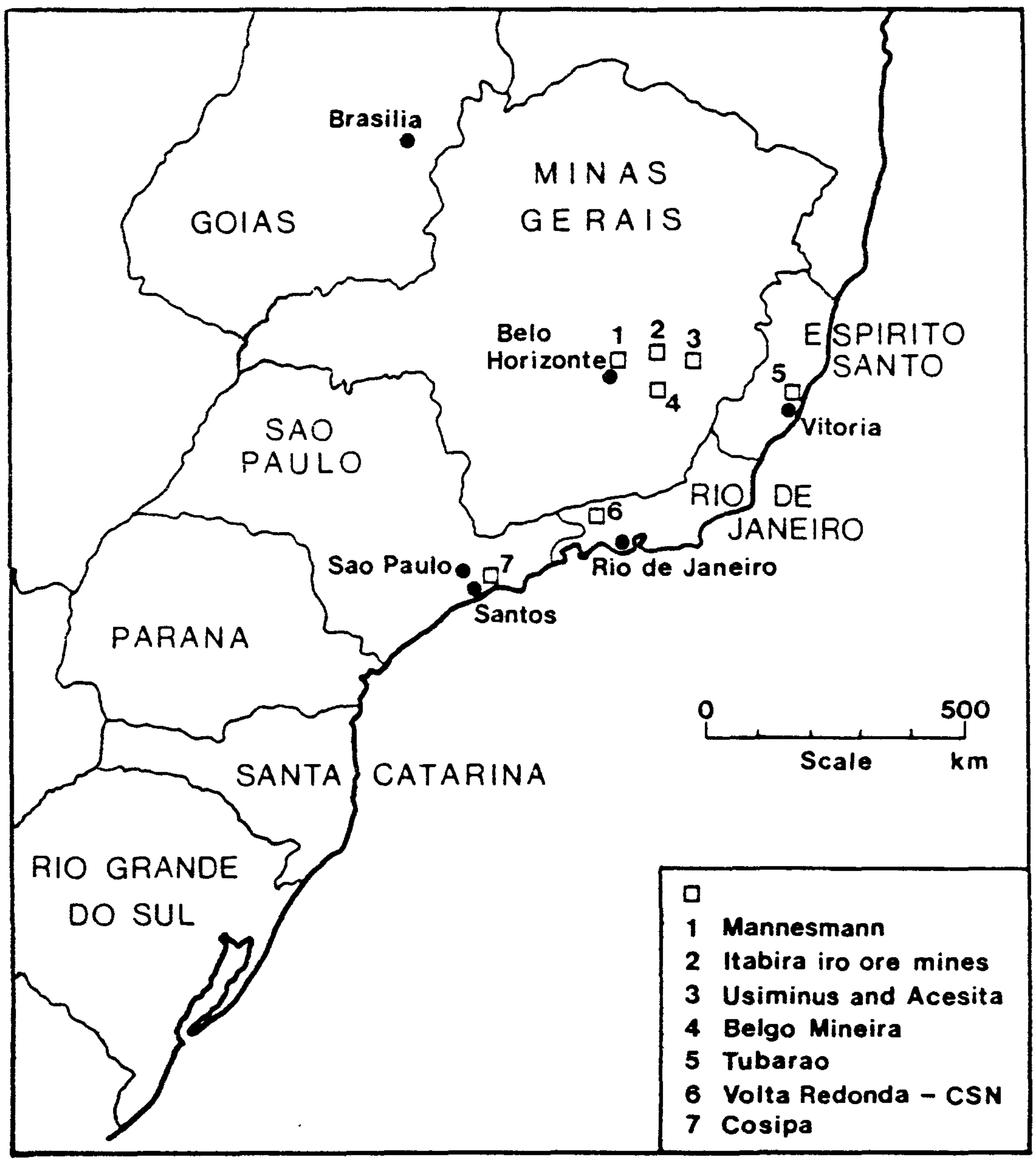
[1] Precise capcities are difficult to establish. For example Editora Tama Limitada, 1984, gives Cosipa's raw steel capacity as 2.3 million tons, while Cosipa company reports put the figure variously at 2.7 and 3 million tons. Part of the problem is associated with expansion of the capacity of existing machinery during the 1970s

in November 1983 at Vitoria (a port from which iron ore is exported), has a production capacity of 3 million tonnes of semi-finished steel slab. (Figure 6.3 maps Brasilian steel plant locations.)

Figure 6.3 Location of major Brasilian steel plants.



through speed up. See Dahlman, 1979, and discussion in chapter 9.

The nine charcoal-based integrated mills in Brasil would not be competitive in North America. Charcoal cannot support the same quantity of burden as coke, and blast furnaces are therefore small. But where coking coal (most of which is imported) and fixed capital are the most expensive inputs (see chapter 7), charcoal-based production can yield considerable benefits. The only coking coal in Brasil is high in sulphur (Baer, 1969), but there used to be an abundance of wood in the state of Minas Gerais close to rich iron ore resources, along with low wage agricultural labour for its collection and burning into charcoal. There are capital savings because coke ovens are not required. However, forest reserves in Minas Gerais have been depleted which, along with the limits on efficient scale of blast furnace operation, has meant that charcoal-based steel production has declined as a proportion of output. Responsible for 57% of pig iron production in 1962, charcoal mills only produced 36% in 1982 (Braga, 1984, p236); only 18% of raw steel in 1984 came from charcoal based mills (from IBS, Statistical yearbook, 1985).

Steel making in Brasil in 1984 was almost entirely by BOF and electric furnace (69.7% BOF, 25.9% electric: Editora Tama Ltda., 1984), open hearth production accounting for less than 5%. This partly reflects the relatively modern structure of the industry, most capacity being installed since 1960. But BOF capacity is also about half the capital cost of open hearth, an especially important factor in Brasilian technical choice. Scrap and fuel oil are relatively expensive in Brasil (chapter 7), but high quality iron ore is abundant (Brasil was the second largest market economy producer of iron ore in the world in 1983, behind Australia). These factors provide added technological advantage for BOF adoption over open hearth in Brasil. (See figure 4.3 and table 4.1 for comparative adoption rates between Brasil and other countries.) The disadvantage of relatively expensive scrap for electric steel making is overcome by capital cost savings and cheap, government subsidised, electricity. (See chapter 7 for a comprehensive analysis of costs in Brasilian steel production, and unit costs relative to those in the U.S.)

In 1983, 44.8% of steel production was continuously cast (Editora Tama Ltda., 1984), a rapid increase from 1975 when it was only 5.8%. In the four major flat producing mills (including CST which started production in November) the proportion in 1983 was only about 17% (estimated from Editora Tama Ltda, 1984; CSN Company report, 1983; Cebrap, 1982), though this will rise considerably with completion of recent projects at CSN, Cosipa and Usiminas.

6.2 Ownership

The technical division of steel production matches closely the division in ownership between private indigenous capital, private foreign capital, and state capital. Sixty-six percent of Brasil's 1983 steel making capacity was controlled by the government (Editora Tama Ltda., 1984), most of it through the state holding company Siderurgia

Brasileira (Siderbras) which was formed in 1973 to coordinate the state's increasing involvement in the industry (Teixeira, 1981, p110). The Siderbras companies include all four coke-based, flat-producing firms (and Acominas, yet to be completed), two semi-integrated electric steel companies, Cofavi and Siderurgica Mendes Junior (339,000 tonnes of raw steel output in 1984), one small charcoal-based company which is being run down, Cosim (41,000 tonnes) and two direct reduction mills, Usiba and Piratini (440,000 tonnes) (IBS, Statistical yearbook, 1985) (see appendix C). The small mills make a variety of non-flat products. One other charcoal based mill, Acesita (731,000 tonnes) is owned by the Banco do Brasil, but does not come under the jurisdiction of Siderbras (Abranches, 1978).

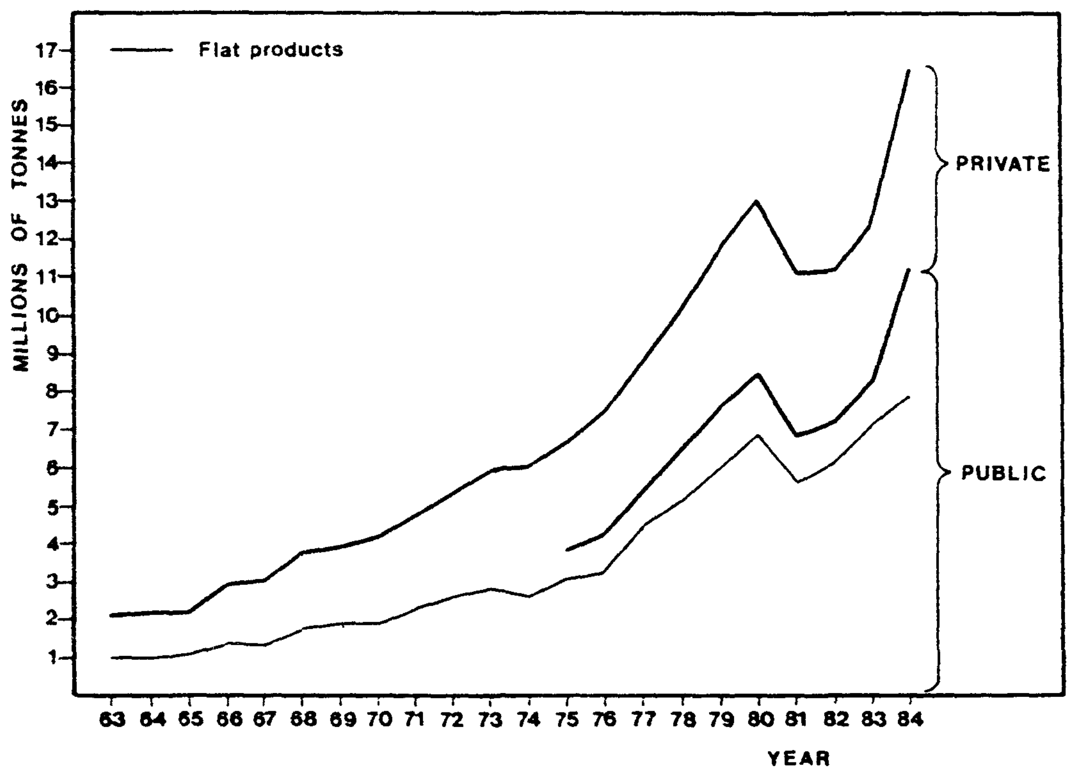
Although the majority of Siderbras ownership is held by the Federal and State governments, two plants, Usiminas and Tubarao (CST) are partly owned by foreign steel corporations. When formed in 1959, Usiminas was 40% owned by Nippon Usiminas Kabushiki Kaisha, a consortium of Japanese steel and engineering companies, though subsequently this share has fallen. CST is 51% government owned, and 24.5% owned each by Kawasaki Steel and Findsider (the Italian state steel holding company).

There are two directly foreign owned steel plants in Brasil; Companhia Siderurgica Belgo Mineira (842,000 tonnes), majority owned by Acieres Reunces de Burbach-Eich-Dudelange of Luxemburg, and Mannesmann (751,000 tonnes) which is a subsidiary of the German company. Both plants are charcoal-based, Belgo Mineira producing bars and wire, while Mannesmann is now Brasil's only maker of seamless tube. Between them, however, these two companies only accounted for 8% of Brasil's raw steel output in 1984. Thyssen of Germany has a minority holding in the equity of Cosigua, a company which uses Thyssen's Purofer method of direct reduction.

The remaining 32 steel plants (including Cosigua) are all privately owned by indigenous capital and produce only non-flat steel. Most of them are individual concerns, though the Gerdau Group controls six electric steel mills which together produced just over 1.5 million tonnes of raw steel in 1984, or 8% of total output. Together, indigenous privately owned steel firms produced 5.2 million tonnes of raw steel in 1984, or 28% of the total, with an average output of 163,000 tonnes per plant. None of them produced more than 782,000 tonnes in 1984, and all except Cosigua are electric or charcoal-based, non-flat producers.

This pattern of ownership has not changed significantly in the past twenty years. The government owned sector has always accounted for at least 50% of steel output (see figure 6.4). However, apart from 1981 and 1982 when capacity utilisation fell, the government sector has demonstrated a steady increase in participation, rising from 57% of finished and semi-finished output in 1976, to 68% in 1984. With the completion of the final stage of expansion (raising capacity in CSN to 4.6 million tonnes, at Cosipa and Usiminas to 3.5 million tonnes each, CST to 3 million tonnes, and completion of Acominas at 2 million tonnes, and Siderurgica Mendes Junior, a new electric steel mill to produce 720 thousand tonnes of wire rods and bars) Siderbras in 1986 promises to account for well over 70% of Brasilian production.

Figure 6.4 Finished and semi-finished steel production, by ownership, Brasil, 1963 - 1984.



Source: IBS, <u>Statistical yearbook</u>, various years.

6.3 Foreign finance

While foreign capital is only marginally involved in direct investment, its involvement in the provision of finance and technology is considerable. Funding for small private mills has come mostly from indigenous sources, though there are examples of private firms obtaining foreign loans (see appendix D). Those without recent expansion projects have relatively little debt capital (see table 6.2). However, large capital requirements for the construction of an integrated, flat-producing industry involves substantial debt financing, much of it from foreign financial institutions.

Table 6.2 Sample debt equity ratios, Private vs Public companies, Brasil

Private companies	1974	1976	1978	1980	1982	1983
Belgo Mineira	4.6	8.6	8.7	7.2	13.3	12.3
Dedini	5.2	2.8	6.1	40.0	22.3	18.8
Gerdau	38.3	51.7	43.9	30.9	40.7	43.3
Riograndense	23.9	29.2	28.4	22.1	36.3	27.5
Aconorte	28.8	20.2	26.2	14.1	19.9	39.8
Pains	35.7	15.7	10.9	3.6	0.8	9.6
Public companies						
CSN	35.5	48.0	54.3	60.3	50.8	42.0
Cosipa	50.2	63.9	59.5	63.4	53.8	47.3
Usiminas	51.7	65.9	65.2	72.4	74.9	52.1
Acesita	9.1	70.8	61.6	63.6	99.9	57.1

Source: Editora Tama Limitada, 1984.

Methods of financing public steel have changed as the scale of operations has increased. For example CSN was begun in 1942 with the help (for purchase of equipment and engineering assistance) of a loan of $20 million from the Export-Import Bank of America. The Federal Government contributed the equivalent of $25 million (Braga, 1984, p197; Teixeira, 1983, p72). Cosipa was inaugurated in 1953 with private interests of $50,000 which proved woefully inadequate. The state of Sao Paulo became directly involved, as well as the Federal Government through the Banco Nacional de Desenvolvimento Economico (BNDE - National Bank for Economic Development) which was founded in 1952. Foreign finance in the form of suppliers' credits was guaranteed by the national treasury (Braga, 1984, p199). Usiminas also began with local capital of $50,000, but quickly obtained technical support and 40% equity from Nippon Usiminas K.K., (the remaining 60% of capital came from BNDE, the state of Minas Gerais and CSN).

Government financing of the steel industry has subsequently been made almost entirely through BNDE, and by the Fundo de Financiamento para Aquisicao de Maquinas e Equipamentos Industriais (FINAME - Fund to finance the aquisition of industrial machinery and equipment) which was founded in 1965 and administered by BNDE. This has been either by direct equity involvement, or through loans to the companies or, since its formation in 1973, to the equity holding Siderbras. But involvement of government-run institutions does not necessarily mean that financial sources of these loans are domestic. BNDE and FINAME themselves acquire financial sources both internally and from abroad (BOLSA Review, January 1965, p6), though it is difficult to trace BNDE or FINAME loans made to the steel industry directly to foreign sources because the foreign and domestic funds obtained by these banks themselves are not usually targeted for use in specific industries (or if they are it is not known to the author). Appendix E provides a brief list of foreign loans made to BNDE, the Banco do Brasil, state and federal governments, which may have been used in part to finance steel expansion. It is only possible to conclude from the information available that loans from domestic sources are not necessarily loans of domestic capital.

Evidence of loans made directly by foreign financial institutions for steel expansion projects in Brasil is extensive. Appendix D provides a list of loans reported mainly by the Bank of London and South America, Review, and some other minor sources. (The list is not exhaustive.) All available information about financial sources, purposes and terms of loans is included. In addition appendix F lists all outstanding loans to CSN, Cosipa and Usiminas in 1984. For these three companies at the end of 1984, 42% of total debt was owed directly to foreign financial institutions. Appendix G gives details of one loan for $495 million made to Acominas in 1977 by an international consortium of banks.

Apart from providing evidence about the foreign sources of money for steel industry development, available information about loan purposes indicates that many were linked to the purchase of equipment from source countries. Some technical ability has been developed by the better established Brasilian companies, in particular CSN which created a subsidiary, Companhia Brasileira de Projetos Industriais (Cobrapi)[2], and Usiminas. Cobrapi handles most of the engineering and construction work for plant construction. Usiminas Mecanica is involved in machinery

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[2] In 1982 the stock of this company was transferred to Siderbras.

production. For example the company was contracted to supply three continuous casting units to Cosipa in 1976 as part of the stage III expansion project (BOLSA Review, September, 1976).

But the majority of equipment must still come from foreign sources. For example the Conselho de Nao-Ferrosos e de Siderurgia (Consider - council for non-ferrous and steel industries, a part of the ministry of trade and industry) estimated in 1965 that steel expansion projects up to 1970 would require the equivalent of $1.5 billion, 40% of which would be spent abroad. For the stage II expansion at Usiminas, 46% of total costs (estimated in 1972) were contracted abroad, but 76% of equipment was purchased abroad (Usiminas stage II appraisal, 1972, IBRD). IBRD (World Bank) loans went towards blast furnace, coke plant, BOF shop and continuous casting, slabbing, plate and hot and cold strip mills, equipment for water and energy systems, mobile equipment and rolling stock, all purchased abroad. The plate mill, new port facilities, steel plant, oxygen plant and blast furnace renovation for Cosipa's stage III expansion were all contracted abroad (Cosipa, Stage III progress report, April 1985). CSN's new hot rolling mill came from Mitsubishi in Japan at a 1976 cost of Yen19 billion. (See appendix D for further examples.)

6.4 The circuits of foreign interest

Although there is some direct involvement in the circuit of productive capital, the majority of foreign interest in Brasil's steel development has been in the circuits of commodity and finance capital. The expansion of markets for steel industry technology has provided an outlet for engineering firms in developed countries hit by declining demand from their own domestic industries. These outlets have been financed largely through the cooperation of the financial faction of capital, which nevertheless has its own interests. Profit has been extracted from Brasil by international banks in the form of rent (interest), an appropriation of surplus produced there under the control of indigenous and state capital in the productive circuit.

Development in Brasilian steel, however, was not "imposed" from the outside by the involvement of international finance. As shown in chapters 8 and 9, development is the result of a contradictory partnership between international and indigenous factions of the capitalist class. But the virtual exclusion of foreign capital from the productive circuit in Brasil's steel industry suggests either that it has been kept under nationalist control for ideological reasons (examined in chapter 9) or a lack of interest by the steel companies of developed countries in making direct investments there.

If it is true that foreign corporations were not that interested in Brasil as a location for steel production (evidence in chapter 9 suggests that they were not) then it is relevant to ask whether or not Brasil is a cost effective place for steel production. Chapter 7 attempts to answer this question. The purpose is also to investigate the entire cost equation of contemporary Brasilian steel production to see if the cheapness of labour might be as important a factor as some of the international development literature suggests it usually is (chapter 2). If the argument is to be made that the 'labour factor' is of primary importance in determining industrial growth in developing countries, then it is necessary also to examine the impact of other cost factors.

CHAPTER 7

THE COST OF STEEL PRODUCTION IN BRASIL

This chapter presents the results of a cost analysis of steel production in Brasil. Its object is not to show whether Brasil is a cheaper place to produce steel than the United States. As with other studies which attempt to provide an answer to this question, (mostly comparing the U.S. with Europe and Japan) either to show where the comparative advantage in steel production lies or to give evidence to support anti-dumping charges, the results of this one are inconclusive. The purpose of this analysis is rather to demonstrate that while the steel industry in Brasil enjoys cost advantages in its variable inputs, particularly labour and iron ore, there are nevertheless other cost components that act to its disadvantage. Especially the cost of fixed capital and the cost of financing expansion are high in Brasil, and increasingly so in the inflation-plagued and debt-ridden economy of the 1980's.

First a brief review of some other cost analyses in steel is provided, and some of the problems associated with reaching meaningful conclusions are identified. Because of technological differences, product mix and the distorting effect of inflation and exchange rate fluctuations, direct international cost comparisons are difficult to make. A cost analysis of steel production by the three coke-integrated plants producing flat products in Brasil for the period 1979-1984 is then presented.

Most cost analyses previously conducted are for single years only. The advantage of taking a six year period becomes evident when it is seen how violently the cost of steel production fluctuates from year to year as capacity utilisation alters and as, in the case of Brasil, high interest rates and the delay in completion of stage III expansion lead to rapid escalation in fixed costs. In 1981 the Brasilian economy began to exhibit symptoms of crisis. While this coincided with a general world crisis, problems particular to Brasil included a severe balance of payments deficit and foreign debt commitments which fuelled high rates of inflation (see chapter 8). Steel consumption fell in 1981, 1982 and 1983. As a result capacity utilisation fell in 1981, and only recovered in 1983 when a drive to export was initiated (see section 7.5).

Finally some comparisons are made with the costs of producing steel in the United States. These do not show conclusively that one or other location is cheaper, but they do indicate that under very different conditions for accumulation in the two countries the problems faced by producers are very different. While in Brasil there is the advantage over the U.S.A. of a cheap labour market, this alone is not sufficient to explain why a steel industry grew in Brasil.

7.1 Making cost comparisons

An analysis of production costs is not simply a comparison of the varying costs of inputs in two locations. The prices of inputs vary not only with location, but also with the scale of production, the technology used, the product output mix, the level of capacity utilisation and finished product yield, and the methods of depreciation applied and taxation enforced. It is difficult to separate the varying effects of these different components. This is particularly true when comparing the production costs in two different countries.

Even for selected input variables, price and quantity data may not be directly comparable. First, definitions of what comprises the steel industry vary between countries. For example, the edges of steel plate are finished at the mill in the U.S., but by users in Japan (FTC, 1977). In Brasil many spare parts are produced in on-plant foundries, but brought in from outside contractors in the United States.

Second, as detailed in chapter 3, steel is not an homogeneous product. Differences between carbon and specialty, flat and shape, wire or pipe, coated and un-coated, as well as size, quality and tolerance specifications, mean that the output of one plant is different from that of another. The input requirements vary with the product, some being more labour intensive than others. Production of flat rolled products requires heavy capital investment in rolling mill equipment, usually the most expensive capital item of any integrated steel mill. Unless differences in output mix can be controlled, cost comparisons lose much of their meaning, for although individual products may be comparable in the market, company or national input data are aggregated for their joint production (FTC, 1977). Even what is classified as specialty and carbon steel differs between Japan and the United States.

A third problem is the source of input supply. Different proportions of scrap and oxygen are produced on plant, while many companies, particularly in the United States, partly or completely own coal and iron ore companies. Internal sources of inputs may lead to an artificial reduction in apparent input costs (Council on Wages and Price Stability, 1977). Accurate comparisons of cost trends over time may still be made so long as the internally-sourced input remains a constant proportion of total costs, but an above average inflation of the market price of those inputs may further distort the relative cost of production between the two locations.

Fourth, differing technologies alter the input mix. So a greater reliance on the open-hearth process in the United States means more fuel oil and scrap inputs than in Brasil. These differences could be controlled by taking the quantities of inputs for the technology used in one country, and using the average prices of inputs from the other, so that the cost of producing a given product mix with a given technology can be estimated for two sets of input prices. However, such an exercise presumes that technology and product choices have been made in isolation of the particular conditions in different countries. Tax structures, pollution laws, the cost of labour and skill availability, cost of iron ore versus scrap, and available methods of financing may encourage the adoption of particular technology types that may be quite unsuited to another country (for example charcoal based iron reduction in Brasil).

Finally there are the problems of inflation and fluctuating exchange rates, problems that afflict this study in particular. Inflation rates in Brasil over the period covered by the analysis range from 50 to over 200 percent per annum. Under conditions of hyperinflation the amplitude of price fluctuations is heightened. For example a static money price over six months represents a decline in real price of 50% when the rate of inflation is over 200%. Wages in the Brasilian steel industry were increased every six months until early 1985 when labour action attempted to bring a change to three monthly alterations. Under such circumstances it is important to use average data on prices. Spot prices are misleading if they refer to moments immediately before or after price rises.

Furthermore there is a variety of inflation rates, the differences between which become important when the rate of inflation is high. The wholesale price index and the value of government bonds (Obrigacoes Reajustareis do Tesarro Nacional, ORTN) which is used to reflate the value of fixed assets in Brasil, vary considerably.

Comparing price fluctuations internationally becomes additionally difficult because the short term rate of currency exchange is not only influenced by country-specific inflation rates, but also by trends of confidence in the national moneys of the two countries. Table 7.1 and figure 7.1 show the deviation of the wholesale price index (Indice de Precos por Atacado, IPA), the consumer price index and the value of government bonds from the exchange rate of the cruzeiro against the U.S. dollar (the latter reduced to 1979 dollars and fixed at 100). The effect of these variations on cost analyses are dramatic. As will be seen, the results for Brasil demonstrate a very close relationship between the cost per unit output of production and capacity utilisation when expressed in U.S. dollars, but this is not the case when costs are expressed in cruzeiros deflated against the wholesale price index. Therefore the relative cost of steel production in Brasil and the U.S. is significantly determined by the general economic and political events that influence the rate of currency exchange. This further obscures the influence of productivity, technology, capacity utilisation and unit cost changes.

For the six reasons listed above the error in the analysis which follows is potentially large. No estimate of the error size is

Table 7.1: Brasilian inflation indexes against the U.S. Dollar. (All rates yearly averages.)

	A	B	C	D	E
Year	Cz/$U.S.[a]	Cz/$U.S.	CPI[a]	ORTN[b]	IPA[c]
1979	100	100	100	100	100
1980	161	100	113.5	95.4	127.9
1981	280	100	134.2	94.3	153.6
1982	513	100	145.0	99.4	160.8
1983	1606	100	112.1	72.8	137.8
1984	4936	100	108.2	69.3	150.7

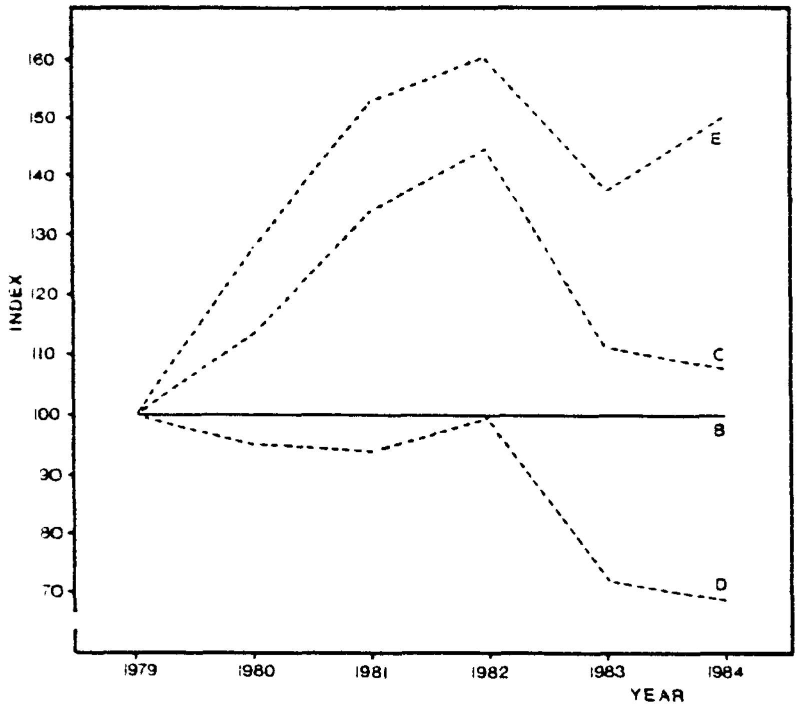
Notes: A = Index of the cruzeiro exchange rate with the U.S. dollar, the dollar deflated by U.S. GNP deflator, 1979 = 100
B = the cruzeiro exchange rate with the dollar / A x .001
C = Brasil consumer price index, 1979 = 100, / A x .001
D = ORTN, 1979 = 100 / A x .001
E = Brasil wholesale price index, 1979 = 100, / A x .001

Sources: a: IMF, International Financial Statistics, various years.
b: Economia Brasileira, 1984.
c: Instituto Brasileiro de Siderurgia, Indices de Precos dos Productos Siderurgicos, 1985.

made. Unless the results show a wide margin of difference between countries over a number of years therefore it would not be legitimate to conclude that one location is cheaper than the other. Other studies of the cost structure of the U.S. and Brasilian steel industries have encountered a similar problem (section 7.2).[1] The aim of this analysis however is to provide a quantitative estimate of the cost of labour and other inputs in Brasil in order to shed light on the relevance of the

[1] It may also be presumed that companies making location decisions would be unable to predict comparative costs with reasonable accuracy, especially due to exchange rate fluctuations, and would require a wide margin of measured cost advantage in Brasil to encourage direct investment there.

Figure 7.1 Brasilian inflation indexes Vs. deflated U.S. dollar.



Notes: B, C, D and E as table 7.1.

'labour factor' to steel location there.

7.2 Some other cost analyses, U.S. and Brasil

Several studies have been made of costs in the U.S. industry in comparison with those in Japan and Europe, either to illuminate the competitive problems experienced by the industry since 1960, or to investigate the validity of anti-dumping charges brought by U.S. companies against steel imports. Few cover more than one year however, and their differing methodologies prohibit conclusions about long term relative cost trends.

Three major studies were produced in late 1977, by Pifer Marshall and Merrill (1977) for the American Iron and Steel Institute, by the U.S. Federal Trade Commission (1977), and by the Council on Wage and Price Stability (1977). The difficulties involved in making international comparisons are well illustrated by these studies. The FTC for example measures only 70% of variable costs in the U.S. and ignores fixed capital costs altogether because of lack of data availability (without supplying evidence they claim that 70% of variable costs was equivalent to 60% of total costs: FTC, 1977, p.96). Implicit in these omissions is the assumption that none of the omitted factors influence cost differences between the two countries, and that the relative costs of excluded inputs do not differ significantly between the compared countries. Pifer, Marshall and Merrill (1977) base their study upon preliminary estimates by the FTC and makes similar omissions. Both studies produce cost composites from data on the quantities of variable inputs consumed in each country in 1976 and from yearly average prices of inputs. No attempt is made to distinguish the cost of producing different steel products (except in the analysis of Europe), nor to control for technology or capacity utilisation differences. The authors conclude that "little imagination is needed to identify the likelihood of numerous possible distortions in this study's relative cost measures, both at points in time and as indicators of trends over time" (FTC, 1977, p101).

As the Council on Wage and Price Stability (1977, p51) points out, analyses of this sort manage only to estimate average historical costs rather than long-run incremental costs. This means that they tend more to reflect conditions of production at particular times, such as the current mix of technology, capacity utilisation, the age of fixed capital and degree of vertical integration in the industry, rather than the general cost advantages which one industry location enjoys over the other. According to the Council on Wage and Price Stability, an incremental cost analysis should use input coefficients based on the newest technology; input prices should be based on arms length transactions (owned raw materials should be priced at domestic market levels); and capital charges should reflect today's cost of capital and today's price of capital equipment in the home country. The first and third are not easy conditions to meet. In the case of the U.S., operating coefficients and capital costs for modern technology are not readily available. There have been no greenfield plants built since Bethlehem's Burns Harbour in the mid-1960s. The Council on Wage and Price Stability (1977, p58) only manages to satisfy its second condition therefore, taking input coefficients from average technology and capital charges from accounting statements. Once again no attempt is made to distinguish between product types or capacity utilisation.

The study by Barnett and Schorsch (1983), which compares costs in the U.S. with Japan, makes significant improvements over these studies. All raw materials costs are included, based on average prices. Variations in capacity utilisation are accounted for by calculating costs at normal operating rates, defined as the average utilisation rate between 1977 and 1981, though this means that costs for the U.S. apply to a rate of 80%, compared with only 65% for Japan. It was assumed that raw materials costs per unit of output vary little with changes in utilisation, but that labour costs are 25% fixed (1983, p314). The data refer to cold rolled sheet only. This analysis is the most comprehensive and up-to-date cost comparison of the United States and Japanese industries available, though it refers only to one year, 1981.

There exist several studies of the Brasilian industry. Some include only a portion of costs, or compare only unit input prices (not total input costs) and they all refer to only one year.

Baer (1969) compares his own cost estimates based on information obtained directly from firms with those made by the Economic Commission for Latin America (La Economia Siderurgica de America Latina, 1966) for CSN[2]. Baer's data for particular firms allows the separate grouping of coke and charcoal based integrated plants, and comparison of the former with the ECLA estimates for CSN. Most of the variable costs are based on spot unit prices from a variety of sources, multiplied by

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[2] One of the three major governemnt owned coke integrated flat product producers.

direct quantity inputs, broken down into flat and non-flat product groups. The estimate of capital charges is admitted by Baer to be inexact. It assumes a life of 20 years for plant and equipment, and 50 years for permanent installations. Baer uses a depreciation rate of 4% a year on investments, but raises this arbitrarily to 15% to account for the weight of interest and amortisation in Latin America (1969, p176). The ECLA estimate of CSN, however, demonstrates a capital cost per unit of output between two and three times greater than Baer's. This is partly because the ECLA estimate is for 1963, when capacity utilisation was lower than for Baer's 1964 estimate, but must also reflect the heavy investment levels at CSN, the high proportion of external debt financing and the high capital intensity of the company's product mix.

The high cost of fixed capital in Brasil is confirmed by the reports, cited by Baer (1969), of Booz, Allen and Hamilton International (1966) and in Estado de Sao Paulo (1967). Comparisons with the U.S. suggest that for cold-rolled flat products Brasilian firms possess a cost advantage in variable operations, but also that financial depreciation costs and taxes are so great as to leave some doubt where the overall cost advantage lies. Some of these results are reproduced in table 7.2. While the methods of analysis and general results differ too greatly to allow the conclusion that steel production is cheaper in one or other of the countries, nevertheless evidence that capital costs are higher in Brasil is incontrovertible.

Table 7.2 Cost estimates, Brasil vs United States. U.S.dollars/tonne

Costs	Flat Products Brasil 1965[b]	1967[c] Usiminas	U.S.A.
Variable	79	89.9	105.9
Fixed	36	20.3	8.6
Interest	11	40.6	1.3
Taxes	--	22.9	14.9
TOTAL	126[a]	173.7	130.7

Note : a: Profit as a % of sales for Brasil -5, for U.S +6.7[d]
Sources: b: Booz, Allen and Hamilton International, 1966.
c: Estado de Sao Paulo, July 1967.
d: Fortune, July 15, 1966.

Teixeira (1981) also argues that fixed costs, interest and taxes are higher in Brasil than in the U.S. or Japan. However, he is only able to provide evidence about these categories for 1965 to compare with his analysis of variable costs for 1976. He supplies insufficient detail for us to know how comparable are his estimates for different countries, and the U.S. data on variable costs is from FTC (1977) and therefore makes no attempt to separate groups of output products. For Brasil there is no distinction between costs for coke, charcoal and non-integrated steel production.

In 1982 Siderbras commissioned a cost analysis from Themag Engenharia Ltda., a consulting company in Rio de Janeiro, to provide a model for the co-ordination of production between the companies in the group. Competition between the various companies had, from the point of view of the Siderbras management, been destructive during the late

1970s. For example in 1979 when Cosipa needed plates, CSN refused to sell them its surplus. Cosipa imported plates while CSN re-melted theirs. The Themag investigation was supposed to provide the base data and model for the future co-ordination of production so as to avoid similar conflicts in the future. The data in this report were withheld from the author as confidential.

Upon its completion in January 1984, the Themag report was immediately abandoned because of the dubious quality of the base cost data. Themag repeatedly challenged the costs reported by companies anxious to appear in a favourable light with their rivals in the group, while differences in accounting procedure made many of the data incomparable. The study took almost two years to complete, yet the data collected were considered useless. Of course the Themag study had a very specialised purpose which required greater detail than does this chapter, but the problems they encountered illustrate well the difficulties involved in making meaningful cost comparisons, even with apparently unlimited access to data.

7.3 Cost analysis of the Brasilian steel industry

Coated rolled flats and structural shapes made up 34% of CSN's finished and semi-finished product in 1984 (Relatorio de Atividades de Companhia Siderurgica Nacional, 1984), but apart from this virtually all the finished output of the three major coke-integrated plants in the

Siderbras group (CSN, Cosipa and Usiminas) is non-coated hot and cold-rolled flats (sheets, coils and plates).

Analysing costs for the Siderbras companies alone yields three advantages. First, the product mix is narrow, concentrated mainly in cold-rolled sheets and plate. Secondly the technology used in the three plants is similar, and the investment history in expansion stages towards a balanced capacity is the same. Finally it is relatively easy to obtain detailed data about a variety of cost components from company and technical reports, reports on expansion stages, and information obtained directly from management personnel. These data are supplemented by general statistics about the Brasilian industry as a whole published by the Instituto Brasiliero de Siderurgia (IBS) and the Consider and other general sources.

7.3.1 Method

The method used is similar to that employed by Barnett and Schorsch (1983) and provides a cost analysis of the production of cold-rolled sheet roughly comparable to that produced by them for the U.S. industry in 1981. Average market prices are taken for all material and energy inputs, excluding iron ore for which average prices are not available. The cost of iron ore is extrapolated from prices available for December 1977 and September 1983 and with the use of the wholesale price index. It is not known, however, at what intervals price increases in iron ore are staged, so these estimates include a high potential error (for example if the unit price obtained for September 1983 came immediately before or after a price increase). (See appendix H for details of calculations used to obtain costs of material and energy inputs.)

Data on wages were obtained from three sources: DIEESE[3], IBS and direct from CSN. The DIEESE data report monthly wages from a number of companies in 1980, 1982 and 1984, and the data from CSN give monthly wages through 1984 and the first half of 1985. Neither are sufficiently complete to provide a basis for estimating yearly labour cost for the three companies over the period required. However, they do provide useful confirmation that the IBS yearly labour cost data that cover the entire industry approximate to the costs at the three integrated companies.

The DIEESE data show that wage rates vary widely between companies. This is partly because of regional differences in living costs (Baer, 1965) and partly because labour is organised by government-run unions which are regionally divided (see chapter 8). Also the rate of inflation is so high that six-monthly wage increases can result in a doubling of the wage bill in consecutive months (see figure 7.3), but these increases do not happen on the same date for every company. Table 7.3 shows a sample of discrepancies between companies. The data suggest however that there is no obvious difference between wages in public and

[3] DIEESE is Departamento Intersindical de Estatistica e Estudos Socio-Economicos, or Interunion Department of Statistical Studies, a union funded research group in Sao Paulo.

private companies.

The 1984 DIEESE data are for March and give a monthly average wage of CR$ 491,000 at Cosipa, the highest for any of the companies for which they supply wage information. Data obtained directly from CSN show that the total wage bill for this month was the lowest during the year, (though the size of the labour force that month was above average) with an average wage of CR$ 530,788 (see figure 7.3). For December the monthly average wage was CR$ 1,595,672, and the average wage for the year was CR$ 9,600,815 (a monthly average of CR$ 800,068).[4] So the CSN data show that average monthly wages over the year are more than twice those at Cosipa in March.

Table 7.3 Wages at public and private companies, monthly average salaries, March, CR$ 1000's.

Public companies	1980	1984	Private companies	1980	1984
Usiminas	15.9	358.8	Acesita	18.6	418.9
Piratini	10.6	251.7	Belgo Mineira	19.2	354.2
Cosipa	23.5	491.6	Cimetal	10.4	--
Usiba	--	225.5	Acos Anlanguera	15.7	--
Cosim	9.3	--	Mannesmann	11.7	--

Source: DIEESE

The DIEESE data are not useful in providing cost data in the form of total yearly labour costs, but they do help to reconcile the

[4] This includes management and administrative staff, whereas the DIEESE data for Cosipa refers only to labour in operations.

data from CSN with IBS averages for the whole industry. The average yearly wage across the industry according to IBS was CR$ 8,191,938, 15% below the figure obtained directly from CSN. DIEESE do not report wages at CSN. These were below wages at Cosipa in 1984 because parity with the Sao Paulo company was a strike-demand in 1984 (see appendix L), but data above suggests that the difference must have been minimal.[5] According to DIEESE, Usiminas wages in March were 73% of those at Cosipa. The IBS data therefore provide a reasonable compromise. Yearly labour costs are obtained by multiplying average yearly wage and welfare payments per employee by the total average yearly labour force of the three companies. Details are supplied in Appendix I.

The calculation of the cost of fixed capital input presents the greatest problem. In past studies (for example Council on Wage and Price Stability, 1977, and Barnett and Schorsch, 1983) the cost of depreciation is estimated as that given in accounting reports. This is book depreciation as opposed to real depreciation, the latter representing the application of fixed capital costs over the effective life of the plant or machinery in question. Book depreciation can be very rapid if government regulation allows it and if the application of depreciation against profits can yield a tax benefit to the company. (OECD, 1975, reviews international variations in tax depreciation laws.)

Neither in the United States nor in Brasil have laws allowed

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[5] The wage for March was CR$ 491,000 at Cosipa, CR$ 530,788 at CSN, but the CSN figure includes management staff.

for the rapid depreciation of fixed capital in the steel industry. In the U.S. the minimum period for depreciation was 18 years until 1981, when it was brought more in line with Canadian (two years) and British (one year) practice (Barnett and Schorsch, 1983, p246). In Brasil depreciation, according to company law No. 6404/76, is allowed on buildings at a maximum annual rate of 4% (straight line depreciation over 25 years), on machinery and equipment at 10%, and on vehicles at 20%. Exceptions can be made if the useful life of equipment is less than the allowance. If two eight hour shifts are used on the plant, then the depreciation rate can be multiplied by 1.5, and by 2 if there are three eight hour shifts.

According to accountants at Cosipa, until 1980 a variety of depreciation practices were used by different steel companies within the Siderbras group. For example while Cosipa used a 30 year period and an increasing and then decreasing depreciation curve (beginning and ending at 1% with a high of 6.66%), Usiminas depreciated all its equipment by the straight line method over 8 years. In 1980 however, Siderbras standardised depreciation methods, so that a straight line on all equipment is used over 15 years. Auxiliary maintenance equipment, refractories and deferred operating expenses (which include administration costs and interest during construction) are depreciated over 10 years, the last of these from the date of equipment start-up.

Depreciation records in company reports therefore distribute fixed capital costs over approximately 15 years. This is probably too short a period. The CST feasibility study, for example, estimates the life of equipment at 18 years, while the pre-1980 method used at Cosipa suggests that capital there was expected to last for at least 30 years. Nevertheless it is normal in cost analyses to take book values, while a 15 year depreciation period in Brasil means that the depreciation rate used is roughly comparable with that used by Barnett and Schorsch (1983). The implications of using this method for the cost analysis, and an alternative calculation, are considered in section 7.5 (see appendix J for details of depreciation calculations).

Finance costs and taxes are applied to the cost analysis as recorded in company reports. Taxes are an important cost input to location decisions because they are a common means of attracting local industrial development, and also figure in attempts by developing countries to attract foreign investment (Cohen, 1982). The effect of including taxes is also considered in section 7.5.

Both taxes and finance costs are deductions from surplus in Marxist accounting, not part of capital advanced. While taxes are a deduction specific to location and determined by the formation of government policy (questions examined further in chapters 8 and 9), finance costs are a function of the degree of external lending used to acquire fixed capital, the amortisation schedule and the vintage of loans, as well as prevailing interest rates. The implications of the links between these costs, development policy and the vintage of capital are considered further in section 7.5. For now they are included as costs.

Taxes in Brasil are primarily sales, value added and corporate income taxes. Sales tax (ICM) varies regionally and by year. In the south-east region in 1982 this was 16% on domestic sales, 13% on exports. Value added tax (IPI) varies according to the product, but it is exempt on exports, and subject to exemptions of between 50% and 80% on the value added by imported machinery which is not available in Brasil. Furthermore, 95% of payments of value added tax made by major steel companies can be deposited, under decree law 1547/77, in special accounts with the Banco do Brasil (up to certain limits which are re-valued against the ORTN). These accounts may then be invested in the expansion of existing or new steel plant.

Taxes are recorded in company reports as sales and value added tax. Corporate income tax (fixed at 30% in Brasil) is recorded as a deferred debit when companies record a pre-tax loss, which they usually did.[6] These have not been included as income against cost in the present analysis. An unknown proportion of recorded tax payments are on value added and were probably deposited in accounts for future investment. These cannot be counted as a cost of production. (Appendix K reviews some of the tax concessions available to exporters.)

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[6] Profits before income tax were recorded by Usiminas in 1980, 1981 and 1984, by CSN in 1980, and by Cosipa in 1984. In all other years from 1979 to 1984 a pre-tax loss was reported. (Company reports.)

7.3.2 Unit costs of variable inputs

Brasil enjoys a considerable cost advantage over the United States in most variable inputs, particularly labour, iron ore and electricity. The only variable inputs that present a cost problem to Brasil are coal and refractories, which are mostly imported, and scrap. However, the cost disadvantage in these variables is not great. Table 7.4 compares the actual unit prices in U.S. dollars of five major inputs from 1977 to 1984. Together in 1981 they made up 72% of variable cost inputs to the three major Brasilian steel companies.

Figure 7.2 illustrates Brasilian unit costs as a proportion of U.S. costs. Labour, electricity and iron ore, all priced in Brasil under varying forms of government control, show a significant and increasing cost advantage to Brasil. Inputs the costs of which move in line with the cruzeiro, particularly those controlled by the government (as most of the internally sourced variable inputs to the steel industry are) become relatively cheaper in 1983 and 1984. This is partly due to a rise in the dollar in 1983 against the cruzeiro, which depresses cruzeiro prices when they are expressed in dollars. But it is also caused by delays in repricing government controlled inputs. This is especially true in the case of labour, which until 1985 was granted six-monthly wage increases. As the rate of inflation accelerates, the gap between money and real wages immediately prior to stepped wage increases widens. Figure 7.3 illustrates the stepped pattern of wage increases. This accounts for the sudden decline in labour costs in 1983 and 1984.

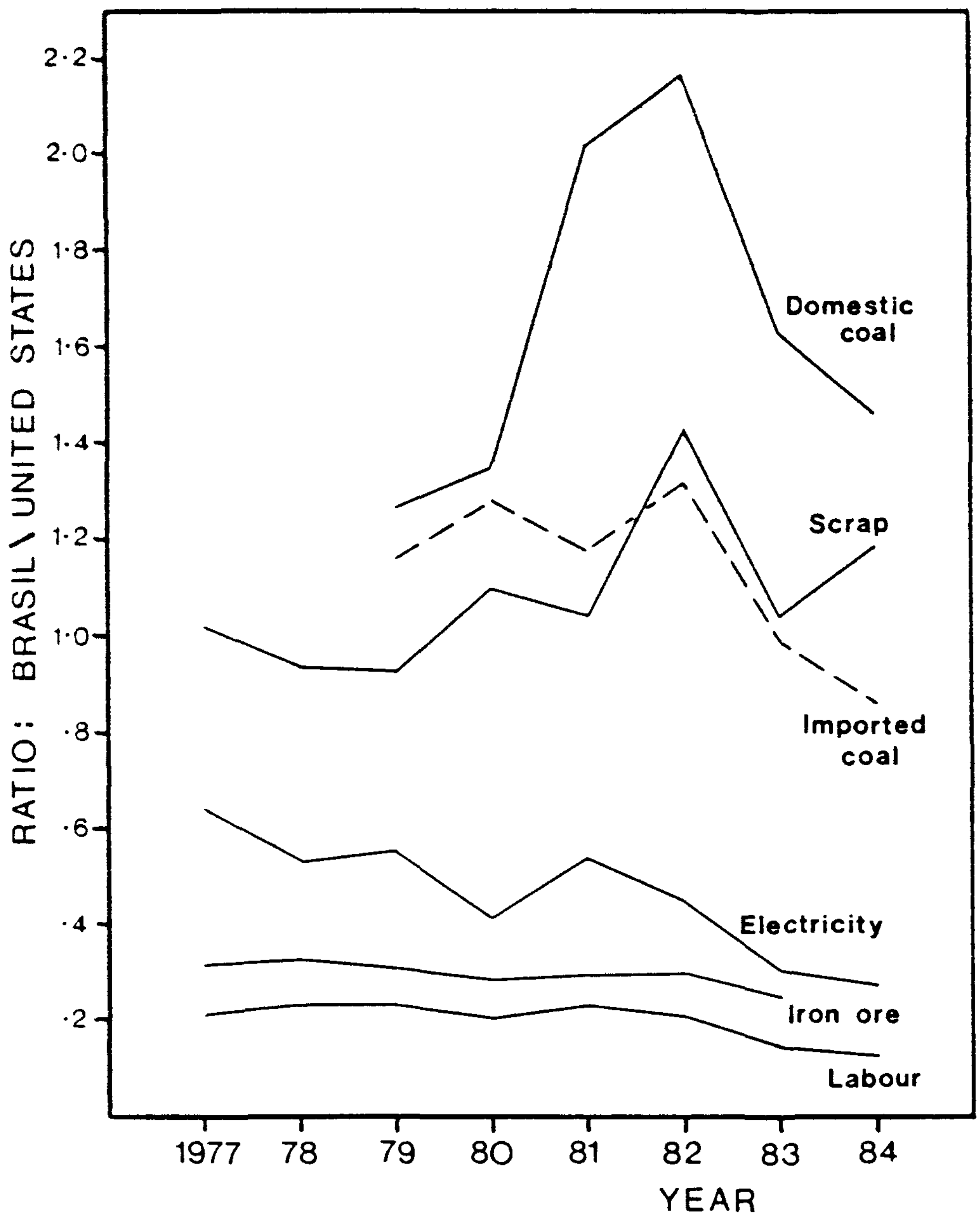
Table 7.4 Price of inputs, yearly average prices per unit in U.S. dollars, U.S. and Brasil.

Year	LABOUR Cost per hour U.S.A.	LABOUR Cost per hour Brasil	ELECTRICITY Per MWH U.S.A.	ELECTRICITY Per MWH Brasil	SCRAP per tonne U.S.A.*	SCRAP per tonne Brasil	COAL per tonne U.S.A.	COAL per tonne Brasil Domes'	COAL per tonne Brasil Import	IRON ORE per tonne U.S.A.	IRON ORE per tonne Brasil
1977	13.04[a]	2.31[b]	32.09[c]	20.83[b]	55.99[c]	57.35[b]	42.75[d]	-	-	22.00[f]	7.02[g]
1978	14.30	3.29	34.62	18.26	73.84	69.34	47.29	-	-	23.00	7.47
1979	15.92	3.73	37.37	20.77	98.07	91.35	49.62	62.97[e]	57.66[e]	24.75	7.83
1980	18.45	3.74	43.72	18.02	92.17	100.80	51.32	69.62	65.35	28.75	8.27
1981	20.16	4.71	51.62	28.03	90.17	93.90	54.31	109.57	64.10	32.50	9.75
1982	23.78	4.97	57.86	25.90	61.51	87.80	58.34	126.41	77.11	32.00	9.72
1983	22.21	3.33	59.88	18.00	67.24	69.80	58.72	95.45	57.96	32.00	8.11
1984	21.30	2.74	62.37	17.17	81.69	96.90	59.79	87.35	51.39	-	8.51

Sources: a: American Iron and Steel Institute, Annual statistical report, various years.
b: Instituto Brasileiro de Siderurgia, Anuario Estatistico da Industria Siderurgica Brasileira, 1985.
c: U.S. Department of Commerce, Survey of current business, various years.
d: From d, and FTC (1977).
e: Relatorio de Atividades de CSN, 1984.
f: U.S. Bureau of Mines, Minerals Yearbook, various years.
g: From local industry expert, Teixeira (1981), and Instituo Brasileiro de Siderurgia, Indices de Precos dos Produtos Siderurgicos, 1985.
*: Price composite for 5 U.S. locations, No.1 heavy melting scrap.
Exchange rates are from IMF, Internation financial statistics, various years.

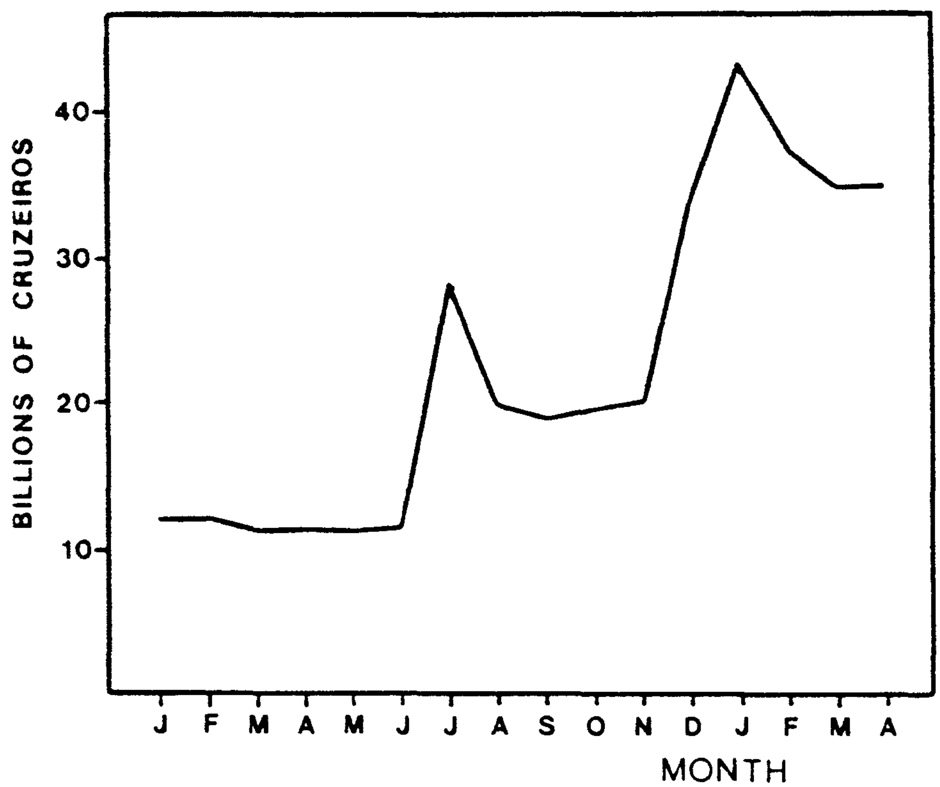
Iron ore produced in Brasil is sold cheaply to domestic steel companies (U.S.$ 7.65 per tonne in October 1983, while export prices ranged from U.S.$ 18.74 to U.S.$ 27.95 per tonne according to grade). Furthermore, the quality of Brasilian iron ore is higher than in the U.S. The iron content of primary reserves ranges from 58% to 66%, most of it nearer the upper limit (Baer, 1969, p31). Imports of ore to the United States from Brasil averaged 65% iron content in 1983, compared

Figure 7.2 Cost per unit of major inputs to Brasilian steel industry as a proportion of cost per unit of input to the U.S. steel industry.



Source: Table 7.4

Figure 7.3 Total monthly labour costs, CSN, 1984-1985, in CZ$ billions.



Source: Direct from CSN.

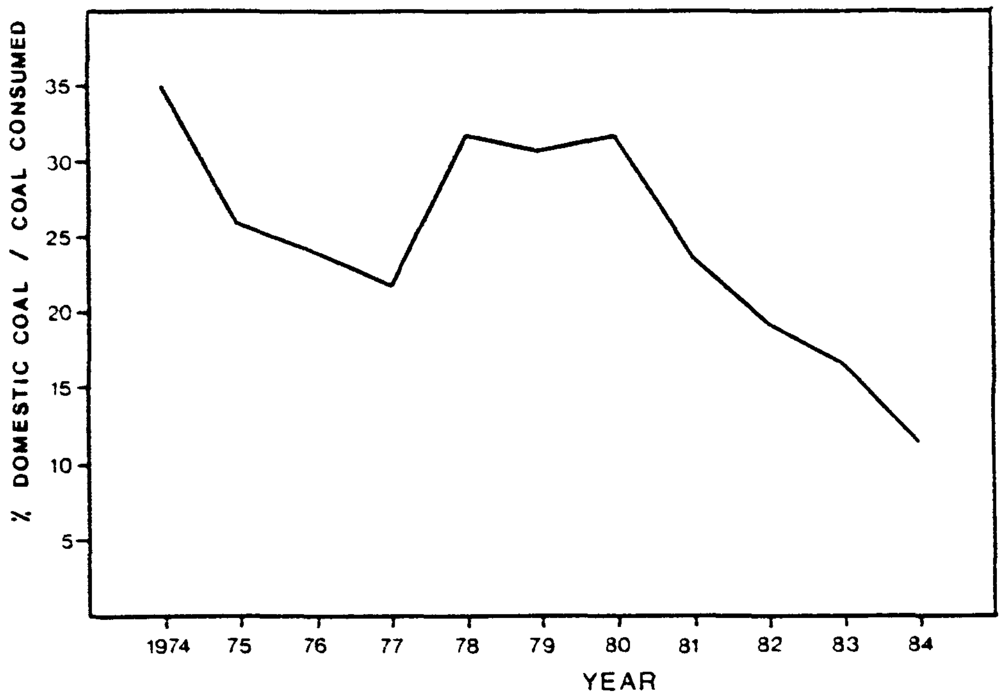
to an average of 61.8% for ore from North American sources (Department of the Interior, Minerals yearbook, 1983).

The data for both the Brasilian and U.S. series on iron ore are estimated: for Brasil from two spot prices that have been reflated against the wholesale price index: and for the U.S. from occasional marginal prices for Great Lakes Mesabi ore reported periodically in the Minerals Yearbook of the U.S. Bureau of Mines (Department of the Interior, Minerals yearbook, various years).

The only coking coal available in Brasil has a high ash content (about 18%) compared with American coal (4%) (Baer, 1969, p37). For this reason no more than 40% of domestic coal can be used in coke production for the steel industry (Junior, 1965). Government regulations stipulated until 1966 that this proportion should be used in order to protect employment in mining operations, but thereafter that the tonnage of domestic coal used should be maintained. Expansions in production may be effected with increases in the use of imported coal, while the proportion of domestic coal used may also be lowered by the proportion of steel products exported, one of many government incentives designed to encourage exports. For example, a company exporting half its steel output may cut its domestic coal consumption in half. As a result of these measures, domestic coal as a percentage of coal used in the Brasilian steel industry has fallen in the 1980's (see figure 7.4).

Data on the historical costs of domestic and imported coal do not show which is cheaper. Baer reports a price for coal at Usiminas of U.S.$22.05 for imported coal in 1965, U.S.$ 42.45 for domestic coal. Teixeira (1981), on the other hand, reports prices of U.S.$ 63.02 for imported and only U.S.$ 49.93 for domestic coal in 1977. Certainly, the price of coal in the U.S. rose rapidly during the 1970s, partly due to high wage settlements (Council on Wage and Price Stability, 1977), and

Figure 7.4 Consumption of domestic coal in the Brasilian steel industry as a proportion by tonnage of total coal consumed.



Source: IBS, Anuario Estatistico da Industria Siderurgica Brasileira, 1985.

this may be reflected in world market prices. In this analysis costs of coal are deduced from data given by CSN on the purchase price and tonnage of domestic and imported coal. These indicate similar prices for 1979 and 1980, but thereafter imported coal becomes significantly cheaper as the world price for coal declined in the mid-1980s. It should be noted that the price for domestic Brasilian coal is as reported by CSN which owns its own mines and washing facilities. The prices therefore include the cost of washing, a necessary procedure to lower the ash content on Brasilian coal, but may also contain an inflated cost element imposed for accounting purposes by the company.

Electricity is cheap in Brasil because of the availability of hydro-electric power. The government regulated price of electricity to the steel industry, when expressed in dollars, fell between 1977 and 1984, reaching a mere 17% of the price of electricity in the United States. As with other costs, however, the apparent fall in 1983 is partly the result of a rise in the U.S.$ against the cruzeiro at a rate much higher than inflation, and from the lag of many government controlled prices behind the rate of inflation resulting from delays in repricing.

7.3.3 Unit quantities of variable inputs

Average unit costs of inputs must be multiplied by the quantities of inputs used to obtain total input costs. Comparing the use of variable inputs in the Brasilian and U.S. industries is made difficult by data availability. Detailed input and output information is available in the statistical yearbooks of the IBS and AISI for the entire industries of both countries. But the technological, scale and output mix characteristics of the two industries are quite different. Information on many of these differences was covered in chapter 6.

Data are available for the three major integrated flat steel producers in Brasil, all of which are technologically (though not labour) efficient producers of steel. Inputs per tonne of crude steel output are listed in table 7.5 for the consolidated Brasilian and U.S. industries, as well as for one of the main Brasilian coke-integrated flat producers, CSN. It would not be wise to draw any major conclusions from this comparison for the scale, technological and output mix reasons given above. But the figures are useful when it comes to interpreting the overall cost analysis which follows, and those for the three Brasilian flat producing firms are used in that analysis (see figure 7.5).

In general, the decline in coal consumption in the U.S. can be attributed mainly to the increased use of electric steel making. CSN's consumption of coal appears to be high mainly because it is an integrated steel-making plant without electric furnaces, the latter being included in the aggregate figures for both the U.S. and Brasil. The consistently higher use of basic oxygen steel making in Brasil means a higher consumption of iron ore than in the U.S.. Again, CSN's iron ore use is high because it does not use electric furnaces. The increase in iron ore consumption from 1979 to 1981 reflects the closure of the open-hearth furnaces and opening of the third basic oxygen unit there. Likewise the use of scrap at CSN has fallen. The low use of scrap generally in Brasil makes up for the relatively high use of iron ore. The choice of BOF technology makes particular sense in Brasil where there is a relative cost advantage in iron ore but not in scrap. The growing use of electricity in the U.S. reflects the increasing proportion of electrically-produced steel in that country. No such change has occurred in Brasil. The relatively high use of electricity at CSN

Table 7.5 Units of input per tonne of raw steel output, U.S.A., Brasil and CSN.

Year	Tonnes Coking Coal U.S.	Brasil	CSN	Tonnes Iron Ore U.S.	Brasil	CSN	Tonnes Scrap U.S.	Brasil	CSN	KWH Electricity U.S.	Brasil	CSN	Tonnes Fuel Oil U.S.*	Brasil	CSN
1975	0.65	0.36	-	0.90	1.04	-	0.54	0.44	-	0.49	0.56	-	0.044	0.125	-
1976	0.60	0.42	-	0.93	1.03	-	0.53	0.46	-	0.48	0.62	-	0.044	0.113	-
1977	0.56	0.41	-	0.39	1.07	-	0.55	0.41	-	0.48	0.57	-	0.048	0.134	-
1978	0.47	0.37	-	0.39	1.06	-	0.56	0.43	-	0.47	0.57	-	0.049	0.097	-
1979	0.51	0.37	0.70	0.93	1.04	1.24	0.57	0.42	0.32	0.49	0.57	0.58	0.037	0.084	0.132
1980	0.52	0.40	0.65	0.90	1.03	1.34	0.60	0.42	0.31	0.52	0.56	0.57	0.022	0.066	0.084
1981	0.44	0.40	0.60	0.90	1.02	1.38	0.57	0.41	0.27	0.53	0.63	0.56	0.019	0.053	0.067
1982	0.45	0.41	0.76	0.38	1.06	1.41	0.59	0.39	0.24	0.61	0.65	0.69	0.014	0.046	0.077
1983	0.36	0.39	0.73	0.36	1.06	1.35	0.58	0.38	0.24	0.56	0.62	0.62	0.018	0.038	0.091
1984	0.39	0.45	-	0.34	1.12	-	0.57	0.34	-	0.68	0.59	-	0.012	0.032	-

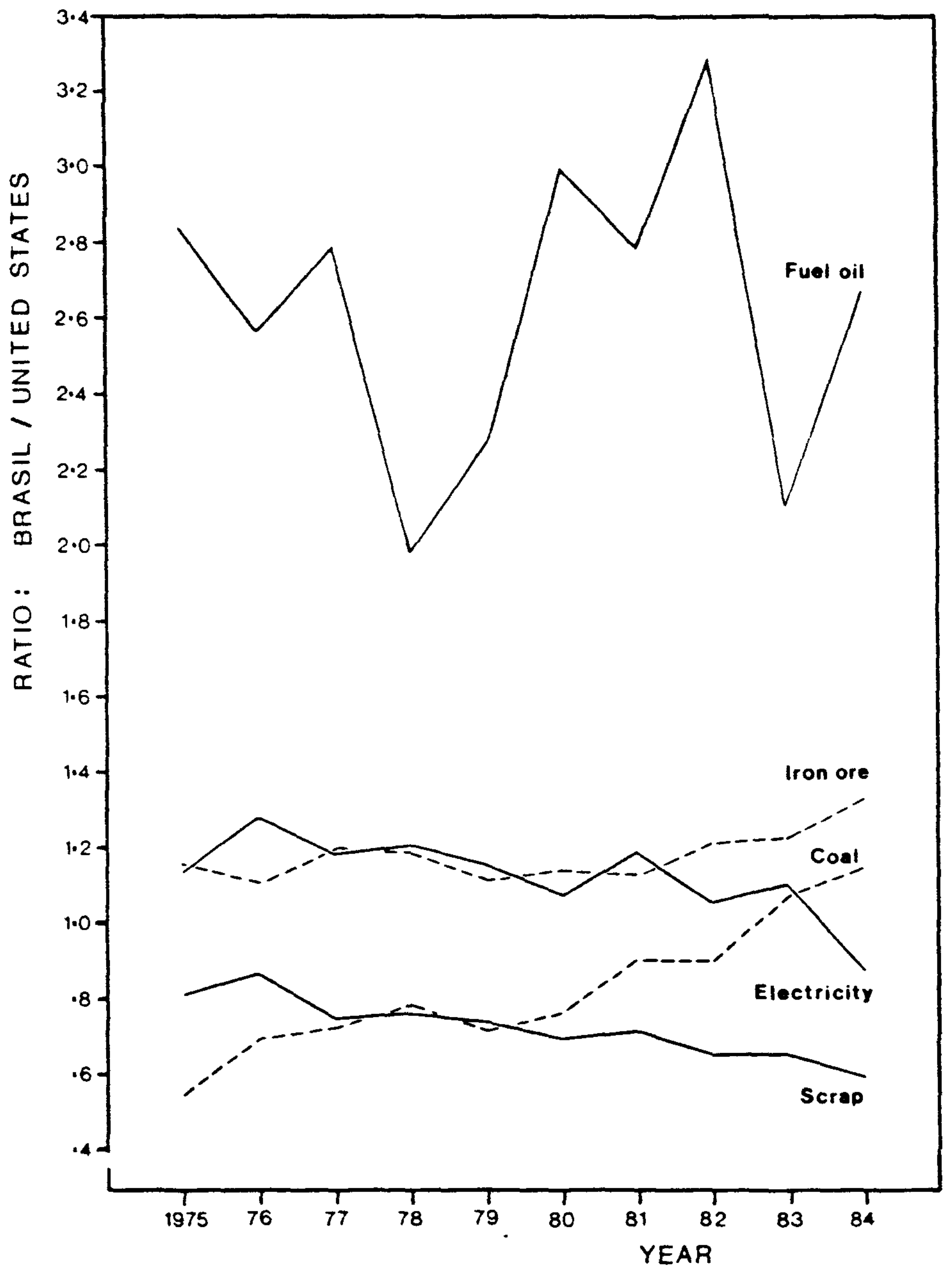
Sources: American Iron and Steel Institute, Annual statistical report, various years; Instituto Brasileiro de Siderurgia, Anuario Estatistico da Industria Siderurgica Brasileira, 1981, 1985; Companhia Siderurgica Nacional, Performance and prospects, 1984.

*: Converted from gallons according to ratios given in: Energy Information Administration, International Energy Annual, 1982, Washington D.C., September, 1983.

reflects the product mix and wide range of cold rolling and coating mills at the plant.

Transport costs to the companies are not high. Rail costs for example are subsidised by a heavy tax on gasoline. It has been estimated by industry experts at CST that costs per tonne of shipment by rail for 1981 averaged CR$410. On average some 7 million tonnes of material inputs were shipped annually (mostly by rail) to CSN, costing therefore approximately CR$2,870 million in transport costs. This does not include shipment by river which, in the case of CSN, is supplied by

Figure 7.5 Units of input per tonne of raw steel output Brasil, as a proportion of units per tonne of raw steel output U.S.



Source: Table 7.5

the company. Transport costs at the other two mills are probably less than at CSN. Both have superior locations, Cosipa on the coast, Usiminas in the iron mining region of Minas Gerais and on the railway which ships bulk iron ore to the coast at Vitoria returning with imported coal. A rough estimate puts combined transport costs for the three companies at CR$8,610 million for 1981, an additional 5.2% on pre-tax variable costs.

7.4 Results

Table 7.6 records total cost of inputs (including finance costs and taxes paid) in current cruzeiros. These figures must be converted to dollars and divided by finished output (short tons) in order to obtain a cost in U.S. dollars per short ton.

Most inputs are priced by annual averages or year end current totals. However, depreciation is calculated on total fixed capital revalued to December 31. In an economy with high inflation this means that depreciation at book value is artificially inflated against other costs which are priced over the year. To convert the values in table 7.6 to dollars therefore, all costs are divided by the average exchange rate for the year (IMF, International Financial Statistics, 1985), except depreciation, which is converted using the exchange rate for the end of the year. This yields a figure which represents the average cost of capital, not its cost at year end.

Table 7.6 Total cost of inputs, millions of current cruzeiros.

Input	1979	1980	1981	1982	1983	1984
Fuel Oil	1980	5291	10185	18225	66511	209001
Electricity	2279	4297	9670	16518	43765	142842
Coal, Imported	6110	14599	23437	58946	159445	539261
Domestic	2095	7321	14478	23607	55583	135934
Iron Ore	2338	5224	8891	16932	54702	183241
Fluxes	1197	2502	6759	18624	51533	155812
Fe Mn + Fe Si	771	1511	2581	5864	16179	50983
Manganese Ore	82	236	350	651	1721	5286
Purchased scrap	2709	6313	7447	13310	40932	181350
Refractories	2355	5257	8674	17542	56639	217932
Labour	11432	22765	50621	99010	207490	564273
Parts and Maint'c	5786	9999	21562	45084	174075	533269
Transport	2035	4436	8562	17384	48286	151798
Depreciation	7102	12398	35369	65837	186753	822580
Finance costs	7635	15782	47881	137217	411380	1235206
Taxes	10540	23471	41087	74504	159705	676590
TOTAL	66445	141402	297554	629255	1734699	5805358

Compiled from: IBS, Anuario Estatistico da Industria Siderurgica Brasileira, 1985, 1981; IBS, Indeces de Precos dos Productos Siderurgicos, 1985; Relatorio de Atividades Companhia Siderurgica Nacional, 1984, 1982, 1980; Companhia Siderurgica Nacional, Performance and prospects, 1984; Companhia Siderurgica Paulista, Financial Statements, 1984, 1982, 1980; Usinas Siderurgicas de Minas Gerais S.A., Relatorio da Administracao, 1984, 1983, 1981, 1980.

Output figures published by IBS provide questionable results for yield. Table 7.7 compares yield (finished output tonnage as a proportion of raw steel output) for the three companies, which ranges over the six year period from 83.5% to 92.7%. Compared with the United States, these figures are very high. The Council on Wage and Price Stability (1977) estimated U.S. yield at 75%, and quoted yield for Japan at 83%. This discrepancy cannot be accounted for simply by a greater use of continuous casters (which reduce the amount of internally produced scrap) or differences in product mix. So the CWPS presumed that the high yield in Japan was the result of a difference in accounting method, and calculated costs per ton of finished output in Japan assuming a 78% yield.

Table 7.7 Yield; CSN, Cosipa and Usiminas.

Year	(tonnes) Raw steel output	(tonnes) Finished output	Yield
1979	8,028,493	6,787,552	84.5%
1980	8,681,813	7,439,769	85.7%
1981	7,095,334	5,927,659	83.5%
1982	7,035,469	6,187,542	87.9%
1983	8,473,462	7,148,950	84.4%
1984	8,441,431	7,821,407	92.7%

Source: IBS, Statistical Yearbook, 1985.

An across the board reduction in yield is not applied initially to the analysis of Brasilian costs, though the apparently high yield should be noted when comparing the cost of steel production with the United States. The effect of a reduced yield is examined in section 7.4.2. However, the yields for 1982, and particularly 1984, are extremely high, so finished output for these years has been reduced, for the purpose of unit cost calculation, to 85% of raw steel output.

Table 7.8 shows final results of the cost analysis for six years quoted in current U.S. dollars per short ton of finished output. Ideally an independent comparative analysis of the U.S. industry would have been conducted. However, data are not readily available from individual flat-making companies in the U.S., while the aggregate data on costs provided by the AISI do not meet those of the IBS in Brasil. Furthermore the potential benefits of such an analysis are limited. An independent study of the U.S. might produce a different final cost from Barnett and Schorsch, but be no more reliable. There is no reason to believe that a different distribution of costs between variable and fixed costs would be obtained, because the method of calculation used by Barnett and Schorsch, judging by the detail they give, is similar to the method used in the present study. Their results are included in table 7.8 therefore as the best available comparison of cost and cost distri-

Table 7.8 Comparative production costs for cold rolled sheet: 1979-1984 Brasil, three integrated plants; U.S., integrated mills (U.S. dollars per short ton of finished product).

	Brasil[a]						U.S.[b]
	1979	1980	1981	1982	1983	1984	1981
Labour	56.8	52.8	83.4	83.8	45.7	38.7	144
Iron ore	11.6	12.1	14.6	14.3	12.1	12.6	63
Scrap	13.5	14.6	12.3	11.3	9.0	12.4	16
Coal	40.8	50.8	62.5	69.9	47.4	46.3	54
Other energy	21.3	22.2	32.8	29.4	24.3	24.1	54
Other	60.8	55.5	79.8	89.0	76.9	76.5	83
Total	204.6	208.0	285.3	297.7	217.9	210.7	414
Depreciation	22.4	23.1	42.5	39.6	24.1	33.1	18
Interest	38.1	36.6	78.9	116.1	90.7	84.7	7
TOTAL*	265.1	267.8	406.6	453.4	332.7	328.5	438
Including tax	317.4	322.2	474.3	516.4	367.9	374.9	445

Sources: a: Table 7.6. b: Barnett and Schorsch, (1983), p61.
*: May not add because of rounding.
Other includes: Parts and maintenance, manganese ore, fluxes, refractories, ferro manganese and ferro silicon alloys, and transport costs.

bution for the production of cold-rolled flat steel in the U.S. It is presumed that the output of the three companies in Brasil is representative of cold-rolled sheet. Capacity utilisation in the U.S. in 1981 for this sector of production was 80% (1983, p61). For the same year in Brasil in the three companies analysed it was 78.5% (Editora Tama Ltda., 1984; see table 7.9.)

At least in 1981 and 1982, when capacity utilisation was similar in both countries, the difference in the cost of steel production in Brasil and the U.S. was small. The comparability of these figures is discussed in section 7.4.2. More important, the results show that variable costs are far lower in Brasil, particularly labour, iron ore and energy. Yet despite the difference in average salary between Brasil and the U.S. (see figure 7.4), which in 1981 was about five times, the extra use of labour (see chapter 9) and the failure to reduce employment as the utilisation rate fell (see appendix I), raised the cost of labour per ton of output in Brasil in 1981 up to 58% of the cost in the United States. Although Brasil has a significant advantage over the United States in the unit cost of labour, this translates in to a relatively small advantage in cost per ton. Costs in Brasil in 1981 were only 13% lower than they would have been if the wage bill had been the same as that in the United States. This is an important conclusion because it shows how misleading data about unit labour costs might be if they were used to support an argument that steel production located in Brasil to take advantage of its labour market. Only a complete cost analysis can reveal this error.

There are also significant cost advantages on energy and iron ore which are supplied at subsidised prices. The cost of imported coal, and especially fixed costs cancel most of this advantage, at least in 1981 and 1982 when capacity utilisation in Brasil was at a level close to that in the United States in 1981. The meaning of the high figures for fixed costs is discussed in detail in section 7.5.

7.4.1 Capacity utilisation impacts on cost

There is a wide range of total pre-tax cost over the study period, from U.S.$ 265.1 in 1979 to U.S.$ 453.4 in 1982 (though the amplitude is less when expressed in constant 1981 dollars: $293 in 1980 to $435 in 1982, see table 7.9). At least part of this variation is an outcome of capacity utilisation. With the relatively high fixed costs experienced by the Brasilian industry this determinant of unit cost is especially important. So when demand and output fell in 1981 the unit cost of steel increased (see figure 7.6a).

The apparent relationship between capacity utilisation and costs when expressed in dollars is, however, somewhat misleading. When utilisation rates are compared with costs in constant cruzeiros the relationship is weaker (see figure 7.6b). Until 1982 the dollar and cruzeiro cost rise and fall in opposition to changes in capacity use. But in 1983 the rise in utilisation yields a more pronounced drop in dollar costs (29%) than in cruzeiros (11%). Costs in cruzeiros per tonne are compared with costs in real dollars per short ton in figure

7.6c. The reason for a less rapid fall in the cruzeiro cost of production in 1983 is the rise of the dollar exchange rate with the cruzeiro in that year (see figure 7.1). The costs of all variable inputs sourced in Brasil (labour is the best example) which increased with inflation, are greatly reduced when converted to dollars in that year.

Depreciation as a fixed cost was hardly affected by exchange rate fluctuations. The value of government bonds inflated close to the U.S. dollar until 1982 (see figure 7.1), and then in 1983 when it fell against the dollar decree law 2029/83 was passed allowing a company to "include the portion of the exchange losses on its foreign currency liabilities, which exceeded the change in the ORTN index relating both

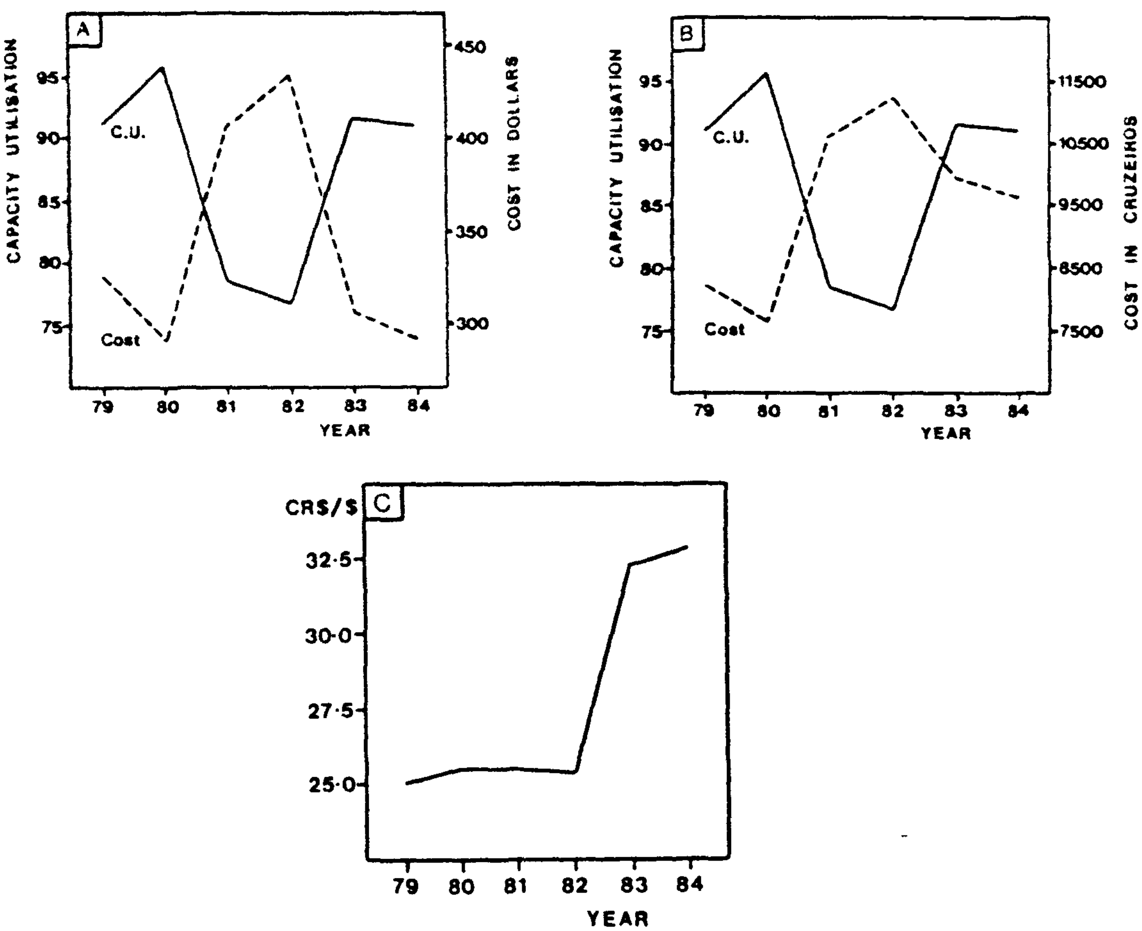
Table 7.9 Effects of exchange rate fluctuations on costs to the Brasilian industry.

Year	US$ per short[a] ton of output before tax	1981 US$ per[a] ton output before tax	Capacity[b] utilis-ation	Cost in 1979 CR$/ tonne[c]
1979	265	328	91.1	8236
1980	268	293	95.7	7680
1981	407	407	78.5	10606
1982	453	435	76.8	11239
1983	333	308	91.7	9957
1984	329	293	91.0	9612

Sources: a: Table 7.8
b: Editora Tama Ltda, Suma Siderurgica, 1984.
All currency conversions from IMF, International financial statistics, various years. Deflators from IBS, Indeces de Precos dos Productos Siderurgicos, 1985, and U.S. Department of Commerce, Survey of Current Business, various years.

Note: c: Before tax, and with yield reduced to 85% for 1982 and 1984, deflated by IPA.

Figure 7.6 a: Capacity utilisation vs costs in dollars
b: Capacity utilisation vs costs in cruzeiros
c: Costs in cruzeiros / costs in dollars



Source: Table 7.9

to operations and Stage III of the expansion, to property, plant and equipment for future depreciation" (Relatorio da Diretoria, Cosipa, 1983). Accordingly the property, plant and equipment of the three companies was revalued on December 31, by CR$993 billion, or about 13% above the ORTN allowance (inflation in the value of government bonds).

So most of the fluctuations in dollar depreciation costs are therefore independent of exchange rate changes.

Interest on most loans, local and foreign, is paid in foreign currency (see appendix F). Total interest payments rose rapidly until 1982, but then began to fall slightly in 1983 and 1984 (see table 7.10). Because the dollar rose in 1983, the effect of the fall in interest costs paid in dollars that year is lost when expressed in cruzeiros, and interest costs rose slightly as a proportion of total cost (against other costs which fluctuated just with cruzeiro inflation) despite the increased capacity utilisation. Conversely, however, it should be noted that the rising debt commitment in the early 1980s was not reflected in increasing costs of production as it might have been due to the general fall of the dollar against the cruzeiro in 1980 and 1981. Inputs priced in cruzeiros rose proportionately during this period, so that although finance costs rose by 109% in constant dollars

Table 7.10 Finance costs to the Brasilian Steel Industry. (Three companies.)

Year	Actual U.S.$ millions	1979 U.S.$ millions
1979	283	283
1980	299	264
1981	514	415
1982	764	592
1983	713	532
1984	668	479

Source: Table 7.8.

between 1979 and 1982, they only rose by 78% (from 14.4 to 25.6%) as a proportion of total costs, despite a fall in capacity utilisation.

A major determinant of the unit cost fluctuations therefore is capacity utilisation. However the reduction in dollar costs observed in Brasil in 1983 and 1984 is not as great as might be expected in response to the utilisation increases in those years because of the fall in the exchange rate. This fall also meant that variable costs declined as a proportion of total costs in 1983 despite an increase in capacity utilisation from 76.8% to 91.7% (see table 7.11).

7.4.2 The limits on a direct cost comparison

The effect of exchange rate fluctuations makes the comparison of international cost differentials additionally difficult. Comparison of the 1981 costs for Brasil and the U.S. (table 7.8) suggests a cost advantage to Brasil of $31.4 U.S. per short ton of finished cold-rolled sheet. However, the following qualifications must be made.

1) Evidence suggests that the addition of taxes would increase the 1981 total cost by $67.7 to $474.3 for Brasil, but by only $7.00 to $445 for the U.S., giving the latter an advantage of $29.

2) While capacity utilisation is important in determining the cost of steel production, exchange rate fluctuations also have a major impact. The apparent advantage to Brasil in 1983 is largely

a result of this distortion, the cruzeiro cost in that year not having fallen as dramatically as the dollar cost. Conversely the high costs in 1981 and 1982 are artificially inflated by the comparatively high cruzeiro dollar ratio. So the result of any international cost comparison is sensitive to volatile exchange rate and inflation discrepancies.

3) The dollar cost (in any one year) in Brasil is most relevant when the purpose of comparison is to determine if Brasil would have been a good off-shore location for steel production by U.S. companies. Barnett and Schorsch (1983) estimate an additional cost to the Japanese industry in 1981 of $65 per ton to enter the U.S. market, a result of transport cost and import duties. The entry cost to the U.S. market for steel produced in Brasil may be similar.

4) The Brasilian yield, at approximately 85%, is significantly higher than the 75% for the U.S. (CWPS, 1977). The CWPS arbitrarily reduced the yield for Japan to 78% to allow for accounting discrepancies. A reduction in Brasilian yield from 85% to 80% would increase costs by 6.25%.

5) Although an effort has been made to distinguish product mix in the present analysis, providing comparative costs for the production of cold-rolled sheet, nevertheless the mix of output, at least in the three Brasilian companies, is fairly broad. The

share of coated flat products at CSN for example was between 50% and 28% of rolled output from 1979 to 1983, shapes between 14.5% and 8%, though the other two companies produce only non-coated flats. It is not known what impact on costs these variations have.

6) Inevitably there are broad accounting differences between Brasil and the U.S. (even between Brasilian companies themselves) which limit the comparability of results.

7) Iron ore in Brasil is not only cheaper, but of a higher quality than in the U.S.. It is not known by how much this reduces the cost of production in Brasil.

8) The technology used in the three Brasilian plants is superior to that used in the U.S. steel industry as a whole in 1981. This might reduce relative variable costs in Brasil through reduced material input, but contribute to higher capital costs. No attempt is made to control for this discrepancy as an incremental as opposed to historical cost analysis would require.

Table 7.11 presents three alternative cost scenarios for Brasil which account for yield reductions, the inclusion of taxes, and cost of entry to the United States. It shows that it is not possible to conclude from this analysis that Brasil has a cost advantage over the U.S. in the production of steel.

Two further questions arise from these data. First, why is it, if there is no cost advantage to Brasil, that exports to the U.S. and elsewhere from that country have expanded? Second, if there is no obvious cost advantage to Brasil despite the cheapness of labour, a factor that much international theory emphasises to explain the relocation of production to developing countries, we must explain why capital costs are so relatively high. These two questions are examined in the final two sections of this chapter.

Table 7.11 Four different scenarios of costs for Brasil. 1981 U.S. dollars.

	Year	1	2	3	4
Brasil[a]	1979	265.1	317.4	335.2	387.7
	1980	267.8	322.2	345.3	404.8
	1981	406.6	474.3	495.1	560.1
	1982	453.4	516.4	548.8	616.5
	1983	332.7	367.9	388.1	458.4
	1984	328.5	374.9	398.4	471.5
U.S.[b]	1981	438.0	-	445.0*	-

Sources: a: Table 7.8.
b: Barnett and Schorsch, 1983.

Columns: 1: Costs as table 7.8.
2: 1, plus taxes.
3: 2, with yield reduced to 80%.
4: 3, with an additional $65 (1981) entrance to the U.S.
*: For U.S., column 1 plus taxes.

7.5 Brasilian exports and the relative prices of steel

The cost of producing steel in Brasil, when quoted in 1979 cruzeiros, rose over the period 1979 to 1984 from 8,236 to 9,612, or by 17% (the increase between 1980 and 1982 was 46%). But selling prices over that period have fallen. Despite government restrictions on the prices of a number of inputs, the steel industry was itself affected by price controls on its own output. Because of the high forward linkages of the steel industry (Baer, 1969), the price of steel is strictly controlled so as to depress inflation in steel-using sectors, as already evidenced by government intervention in the pricing policies of U.S. steel companies during the 1950's and 1960's (chapter 4). In May 1985 Brasilian government restrictions on steel prices took the form of a two month delay in the normal three monthly price hike, and a limit to 40% in that steel price increase in the face of a 200% inflation rate.

Table 7.12 and figure 7.7 illustrate how the relative market price of steel products in Brasil has declined from 1975 to 1984. When deflated against the IPA (the same index used to deflate the cost of producing rolled flats in the analysis above) the price of all steel products fell by 51% (compared with a 21% rise in costs). When converted to current U.S. dollars the Brasilian market price for steel fell by 24.5%, and by 46% in constant 1979 U.S. dollars.

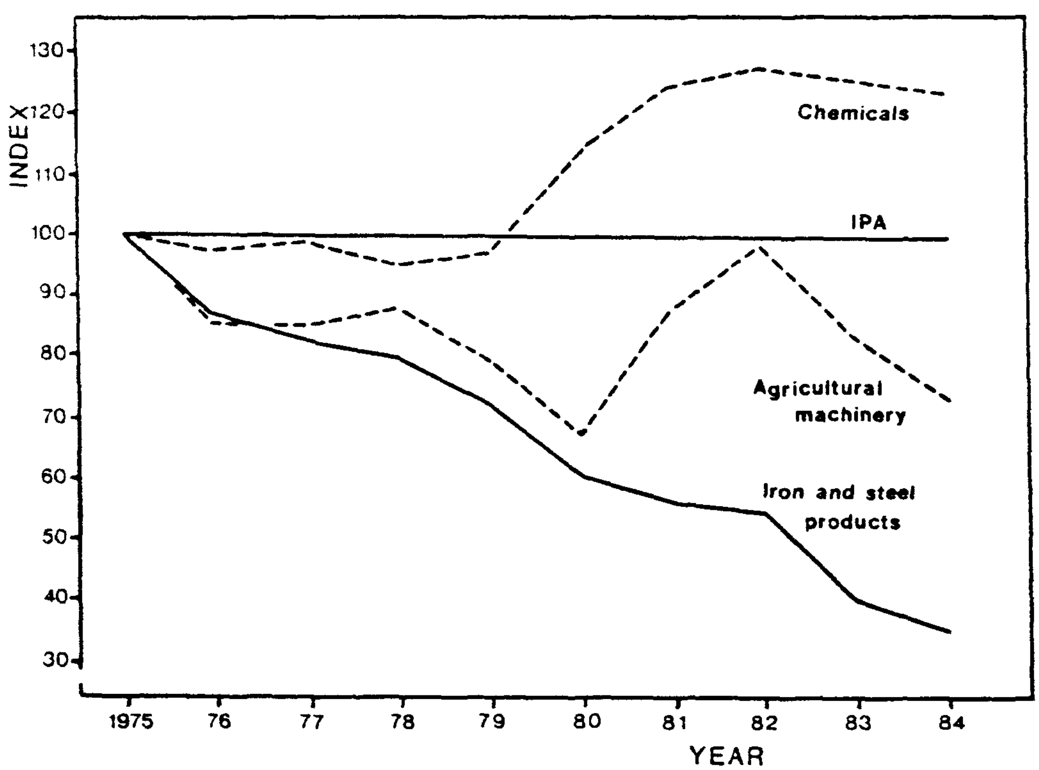
Data presented in table 7.13 suggests that despite this decline in Brasilian domestic prices for steel products, they did not sell much

Table 7.12 Price indexes of selected industrial products against the wholesale price index (IPA), Brasil, 1975-1984

Year	IPA	Iron and steel	Agricultural equipment	Industrial equipment	Motor vehicles	Chemi-cals
1975	100	100	100	100	100	100
1976	100	87	86	99	88	98
1977	100	83	85	104	87	99
1978	100	79	88	101	90	95
1979	100	73	79	93	83	97
1980	100	60	68	88	70	114
1981	100	57	88	102	81	125
1982	100	55	99	104	95	127
1983	100	40	83	93	78	125
1984	100	36	73	82	62	124

Source: IBS, Indeces de precos dos productos siderugicos, 1985.

Figure 7.7 Price indexes of selected industrial products



Source: Table 7.12

Table 7.13 Domestic and foreign steel prices. Current dollars per tonne.

Year	A	B	C	D	E	F	G
1979	13978	6128	519	227	303	191	448
1980	26560	11240	504	213	368	194	485
1981	54780	36290	588	389	367	266	543
1982	104130	50260	580	280	309	278	566
1983	243370	137945	422	239	238	201	587
1984	755340	484414	408	265	258	197	-

Sources: Relatorio de Atividades, CSN, 1983, 1984; U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook, various years; IBS, Statistical yearbook, 1985; and Table 7.8.

Columns: A: CSN domestic prices FOB, current cruzeiros per tonne.
B: CSN export prices FOB, current cruzeiros per tonne.
C: A in current dollars.
D: B in current dollars.
E: IBS, export prices FOB, current dollars per tonne.
F: Estimated marginal cost per tonne, from table 7.8.
G: U.S. domestic prices FOB, current dollars per tonne.

Note: These figures are not comparable. The domestic sales prices for Brasil are derived from CSN domestic sales (mostly rolled flats), quoted in cruzeiros and tonnes, and the export prices from CSN and from IBS. The IBS figures represent prices on a wider range of products. The U.S. domestic prices come from the U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook, a composite price for all steel products, including specialty steels.

more cheaply than steel in the United States, even as late as 1984. Nevertheless, exports were expanded in the early 1980s, rising from 21% of domestic production in 1982, to 41% in 1983 (table 7.14). But this expansion does not appear to have been a direct result of the relative fall in domestic prices (against those in the U.S. for example). The evidence available on prices suggests that the price per tonne obtained on exports remained much lower than the price obtained for domestic sales (table 7.13). This indicates that the export drive in 1983 was a conscious effort by steel companies in Brasil to increase capacity utilisation and to earn foreign exchange not necessarily an outcome of cost advantages and declining domestic prices.

An export strategy in an environment of falling demand is also encouraged by the low marginal cost of steel in Brasil, a result of high fixed to variable cost ratios. A rough estimate of marginal cost is provided by the figures for variable cost in table 7.8 (column F, table 7.13). Marginal costs are higher when capacity utilisation is low because the efficient use of variable inputs is reduced. However these estimates of marginal cost are consistently below those for the selling price of exports (columns D and E, table 7.13). In this case the effect of increased exports was a net increase in earnings, even though the selling price was below unit cost. Also the need for export earnings in foreign currency was magnified by escalating foreign debt and finance costs. For this reason the government offered significant incentives to encourage exports (see Appendix K).

Table 7.14 Domestic consumption and exports of rolled steel products, Brasil. Thousands of tonnes.

Year	Total Shipments Tonnes	Domestic cons' Tonnes	Domestic cons' %	Foreign sales Tonnes	Foreign sales %
1979	11,606	10,122	87	1,484	13
1980	12,575	11,077	88	1,498	12
1981	10,464	8,604	82	1,860	18
1982	10,944	8,598	79	2,346	21
1983	12,401	7,269	59	5,132	41
1984	15,536	9,147	59	6,389	41

Source: IBS, Statistical yearbook, 1985.

There are two reasons why export selling prices appear to be so low in comparison, for example, with prices in the U.S. First the CSN and IBS export prices do not include entry costs (transport and import duties), only income at the factory gate. Second it is normal for new exporters to price commodities competitively in order to win markets. In later years when lines of supply are established, prices can be moved towards the market rate. In Brasil's case it was necessary to establish export markets quickly as the activation of new capacity coincided with a decline in domestic demand. It should also be noted that the prices of CSN steel exports and U.S. selling prices in table 7.13 are not comparable (see the note in table 7.13). Also exports were expanded at this time to a variety of countries, and the domestic steel prices in the U.S. (column G, table 7.13) may not be representative of prices in other export countries. The U.S. was the largest importer of Brasilian steel in 1984 at 1.4 million tonnes, or 22% of Brasilian exports. Other major buyers included Argentina, Algeria, China and Japan.

Regardless of whether dumping by Brasil is practiced, or whether Brasil has a relative cost advantage over the U.S. (or other major steel producing countries) the pattern of domestic price decline, the collapse of the domestic market in Brasil, extremely low marginal costs and the need to earn foreign currency were enough to encourage a vast expansion of exports in 1983. An expansion in exports to the United States (or anywhere else) itself does not demonstrate that Brasil is a cheaper place to produce steel.

7.6 The cost of fixed capital

Table 7.8 shows that if there is no cost advantage to Brasil, it is because fixed costs are relatively high. Table 7.15 shows that the proportion of total costs due to interest and depreciation combined, rose from 22.35% in 1980 to 35.9% in 1984, two years in which capacity utilisation was similar. In 1981 fixed costs per ton of steel output were 4.86 times those in the United States. Why are fixed costs in Brasil so high? The next three subsections show how this is both because capital equipment costs more in Brasil, and because of its vintage, as well as the required use of external capital sources to realise such an ambitious expansion plan.

Table 7.15 Fixed costs as a percentage of total pre-tax costs, Brasil.

	1979	1980	1981	1982	1983	1984	U.S. 1981
Depreciation	8.5	8.6	10.5	8.7	7.2	10.1	4.1
Interest	14.4	13.7	19.4	25.6	27.3	25.8	1.6
Total	22.9	22.3	29.9	35.3	34.5	35.9	5.7

Source: From table 7.8.

7.6.1 The high cost of depreciation

The most obvious reason for the high costs of depreciation is that plant in Brasil is relatively new compared with that in the U.S.. Since depreciation has been included in the cost analysis (of both countries) at its book value, and this takes the life of capital to be about 15 years, then any capital still in use which is more than 15 years old will not appear as a cost. All the stage II and stage III expansion in Brasil has been formed in the past 15 years, but much of the U.S. steel capital equipment is much older (see chapter 4). This was especially true in 1981 before extensive plant closures (chapter 5).

An alternative calculation of Brasilian depreciation was made in an attempt to distribute capital cost evenly over the life-time of capital (and assuming a constant intensity of equipment use). Investment series for the three companies ideally required for this exercise are not available. However, annual capital formation for 1980 to 1984 can be deduced from figures for total accumulated fixed capital prior to depreciation for each year. Total accumulated fixed capital prior to depreciation at the end of 1979 is also known. It is possible therefore to begin depreciation on the known amounts of capital formed at the end of each year at an alternative rate. In this case the life of fixed capital is assumed to equal 30 years.

The period over which 1979 accumulated capital was invested was taken to be 1955-1979. The only investment before 1955 was in stage I of CSN, at that time about $250 million. However, this amount was not excluded from the 1979 total on the presumption that an amount at least equal to $250 million (1955 dollars) will have been discarded over the period up to 1979 as used capital no longer appearing on the books. The distribution of investment over the period 1955 to 1979 is immaterial so long as depreciation is on a straight line and all the capital is still being depreciated up to the end of 1984. Depreciation in 1979 is therefore simply one thirtieth of the total accumulated fixed capital on December 31. For subsequent years one thirtieth of the capital added in each year is included (see appendix J for details).

Table 7.16 compares the results of the 30 year calculation with the book value depreciation used in table 7.8. The new calculation shows a general reduction in depreciation cost below the book calculation,[1] but a more marked increase over the period, even between 1982 and 1983 when capacity utilisation increased. The general reduction reflects the longer life attributed to new, expensive capital. The increase over the period is because of increases in fixed capital without a corresponding increase in output. With a rolled output of up to 9 million tonnes by the three companies, unit costs of depreciation would be reduced by approximately 15% on their 1984 level. In subsequent years capital invested in the 1950s may no longer be counted as a cost (though it may still be used), but there are still substantial amounts of capital pertaining to stage III upon which depreciation has not yet begun. Fixed costs may rise beyond their 1984 level.

Nevertheless there are three reasons why the actual cost of fixed capital in Brasil has been higher than expected for the same formations had they been built in developed countries, and which would

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[1] Extensive evidence is provided in the remainder of this section which suggests that the book values available for total capital assets before accumulated depreciation are substantially lower than investment over the last 30 years. This means that the figures for depreciation in table 7.8 and 7.16 are underestimated.

Table 7.16 Depreciation calculated by two methods, Brasil, 1979 - 1984, in current U.S. dollars per short ton of finished output.

	1979	1980	1981	1982	1983	1984
Book depreciation	22.4	23.1	42.5	39.6	24.1	33.1
Over 30 years	15.6	17.3	29.5	33.8	34.9	37.1

Source: Appendix J; Table 7.8.
Note: See the footnote on the previous page.

therefore account for higher capital costs regardless of equipment vintage.

First, the construction of a steel industry in developing countries often requires heavy investment in infrastructure. Both CSN and Usiminas were built in previously unpopulated localities and required the construction of housing and other facilities for their work forces. The cost of stage I construction at Usiminas in the late 1950s and early 1960s was $385 million (approximately $642 per tonne of installed capacity), but $60 million of this (15.6%) was spent on the construction of a city (Baer, 1969, p29). The cost of infrastructure at Acominas has been estimated in 1982 at $400 million, some 10.8% of the total cost (excluding costs incurred during construction) (Acominas, Suplemental Information Memorandum, August 1982). But this total does not even include the cost of road and rail spurs from the plant, paid by Rede Ferroviaria Federal S.A. (Federal Railway Authority) and Departmento de Estradas de Rodagem - Minas Gerais respectively, and construction of a water reservoir and the construction of a new town to house 164,000 by

1985, including health, education, recreation and other facilities, to be paid for by the "relevant state and federal authorities" (Acominas, 1977, pp17-18).

Second, the construction of the three main mills, CSN, Cosipa and Usiminas, has taken place in phases which, until the completion of stage III, did not permit balanced production. At the end of stage I, both Usiminas and Cosipa had more rolling capacity (about 1.5 million tonnes) than steel-making capacity (about 600,000 and 400,000 tonnes respectively) (Baer, 1969, p31). After the addition of new blast furnaces and steel plant during stage II the opposite was true (Dahlman, 1979; Cebrap, 1982). As a result the investment in equipment throughout this period was excessive in relation to the output capacity installed.

Finally, delays in construction are expensive when finance is in the form of external debt instead of equity. (Costs during construction are recorded as deferred expenses, and then amortised over a ten-year period beginning when production is started.) The initial construction of Cosipa was delayed for example when poor soil conditions were encountered at the site (Baer, 1969; Teixeira, 1981) and the originally-estimated cost rose from about $200 million to at least $349 million, including $50 million in pre-operating expenses.

Construction of stage III expansion, though begun around 1976, was continually delayed at Cosipa, Acominas and CSN. For example, in the original plan of the Cosipa steel expansion project the completion of all installations was projected for the middle of 1979 (Cosipa, 1975, p12). In the 1979 report on the project to the IBRD/IDB however it was stated that building the quay for the new port had not begun, nor had the construction of the new number 5 coke oven battery, which was then scheduled for completion in July 1981. The contract for the renovation of number 2 blast furnace had just been issued. The imported portion of the BOF shop had not even left its country of origin, and the continuous casting equipment was approximately half manufactured. Most areas of the expansion project were then forecast for completion in 1980 or 1981.

Reasons cited for delays included the "inability to meet the heavy workload produced by the actions to meet heavy contracts" and a lack of required information. But the main reason given was lack of financial resources (Cosipa, 1979, p35). Projected cost of the expansion in 1975 was $1,446 million, but by 1979 it had risen to $2,040 million, of which 9.9% was due to interest costs during construction (Cosipa, 1975, p13; 1979, p51).

By the end of 1981 some 20% of the project was still incomplete, while "Cosipa management and Siderbras (were) endeavouring to obtain the necessary funds to complete stage III" (Cosipa, Directors' Report, 1982). In June 1985 both the port and the new steel making and continuous casting plant remained incomplete, though some construction was in progress.

Most of the costs resulting from construction delays are recorded as deferred costs incurred during construction which is a part of fixed capital assets. All other fixed capital assets are recorded as fixed property, plant and equipment. For Cosipa the percentage of fixed assets represented by deferred costs rose from 9.7% in 1979 to 22.4% in 1984. For CSN in 1984 deferred costs were 26.7% of total fixed assets prior to depreciation. At Acominas (a coke integrated plant designed to produce 2 million tonnes of structural steel products) the projected cost in 1977 was $3.04 billion, of which deferred cost accounted for 9.1% (Acominas, 1977). But by 1982 total cost was revised to $4.8 billion, deferred costs accounting for 20.8% (Acominas, 1982). Production still had not begun in 1985. At Usiminas on the other hand, where stage III expansion was completed in the early 1980's, deferred costs fell between 1979 and 1984 from 9.4% to 7.9%.

So because of increased needs for infrastructure, the imbalanced pattern of growth, and delays in construction, fixed costs in Brasil have been inflated. Providing capital-output ratios to support this evidence is not easy, and not very reliable. According to the FTC (1977), construction costs for an integrated flat-products mill in the late 1950s and early 1960s were approximately $350 per tonne of capacity in the U.S. and slightly under $200 for larger scale and less integrated Japanese plants. These compare with $642 for Usiminas and $872 for Cosipa (assuming initial raw steel output of 600,000 and 400,000 tonnes respectively, though their rolling capacities were higher than this). These do not represent accurate capital-output ratios, due to the scale of production and imbalance of the plant.

FTC (1977) also projected the final cost of building Sidor (Venezuela, flat products), Sicartsa (Mexico, non-flat), Tubarao (semi-finished slab only) and Sagunto (Spain, flat products) at $1000 per tonne, and Acominas at $900 per tonne. The final cost at Tubarao, which was finished on time, was $912 per tonne (Relatorio, CST, 1984). There are no finishing mills at this integrated plant, only ingot pouring and a slabbing mill with 3 million tonnes capacity. The infra-structure, including the new port at Vitoria which also ships iron ore exports, was provided by the government. But at Acominas the 1982 estimated investment to date of $4.8 billion gives a cost per tonne of capacity equal to $2,362, (an increase of 170% over the FTC estimate) very high for a mill producing labour intensive non-flat products. And the project still is not finished.

The 1984 company report from CSN gives an accumulated invest-ment for stage III of $3.7 billion for an increase in capacity of 2.1 million tonnes ($1,762 per tonne of additional capacity), again for an incomplete project and one for which most of the iron making capacity and infrastructure was already installed. Costs to December 31st, 1984 at Cosipa amounted to $2,573 million for an expansion of 1.2 million tonnes, or equal to $2,144 per tonne. Cosipa officials in June 1985 estimated final cost of the expansion project at $2,600 per tonne of capacity expansion, despite an assertion by Teixeira that "rolling equipment installed during stage II at Usiminas and Cosipa is being expanded to stage III goals with minor capital outlays" (1981, p185).

Compared with estimated costs for U.S. minimills in 1976 of $150 to $250 per tonne (depending on the variety of products offered) if based on scrap, and about $100 more if direct reduction is added, (FTC, 1977, p458), these estimates for stage III expansion are very high. Even compared with Barnett and Schorsch's estimates for capital costs at 1981 prices of new integrated plants in the U.S. (had any been built) of $1250 for a 3 million tonne mill making hot or cold rolled sheet, recent Brasilian capital costs are anything between 35% (CSN) and 100% (Cosipa and Acominas) higher.

According to company reports the total amount of accumulated capital, including deferred costs, was equal to CR$27,974 billion on December 31, 1984, (see appendix J) equivalent to $8.89 billion (1984 dollars). This appears to be low when compared with the information above. Over $6 billion (1984 dollars) alone had been spent on CSN and Cosipa stage III expansions by this time, while Siderbras investment between 1972 and 1984 amounted to $23.5 billion (1984 dollars). The figures for depreciation in this cost analysis may therefore be greatly underestimated.

It is possible however that a reasonably cheap steel industry could have been built in Brasil had the construction of stage III been completed on schedule in 1980 or 1981. While the need for infrastructure does add to the capital cost of a new mill in Brasil, there is no evidence to suggest that the equipment itself is more expensive, while the labour involved in construction is much cheaper than in the U.S.

Apart from the distortions of apparent capital output ratios by imbalances in the phases of expansion, the main reason for high capital costs has been the delay in project completion. Costs at CSN, Cosipa and Acominas have been far higher than at Usiminas and Tubarao where construction was completed relatively quickly.

Usiminas and Tubarao did not suffer so markedly from the problems of cash flow and inexperience, reported as the major obstacles in the 1979 Cosipa expansion report, probably because of substantial direct foreign involvement in the construction of each of these mills (see chapter 9). While Japanese ownership in Usiminas fell from 40% in the 1960s to only 5% in 1984, (Cebrap, 1982; Relatorio da Administracao, Usiminas, 1984), their involvement in construction, at least in the early stages of expansion, was considerable. Between 1957 and 1960 the management was jointly Japanese and Brasilian, with 530 engineers and foremen coming from Japan during that period (Cebrap, 1982).

The reasons for delay therefore, and at least some of the reasons for the high cost of capital, have more to do with the scale of the initial steel plan, the state of the economy in the 1980s, and possibly the relative lack of technical experience in what is still a relatively undeveloped country. By starting the construction of three separate mills in the late 1950s, and then two more in the mid 1970s, the Brasilian government committed itself to the development of at least 10 million tonnes of integrated steel capacity (later 15 million tonnes) if these plants were to reach efficient and balanced operating scales.

By 1981 however, with the collapse of domestic consumption, increasing interest rates and the upward spiral in international debt, these investments made less sense. A surplus of capacity emerged as it became increasingly difficult to obtain foreign loans for the completion of steel expansion projects, and so costs rose.

7.6.2 The high costs of finance capital

It is in part the size of total investment, and in part the proportion of this investment funded by external debt that is responsible for the high costs of finance to the industry. According to Consider (1984, 1981) total investment by Siderbras from 1972 to the end of 1984 amounted to $23.54 billion (1984 dollars) (see table 7.17 for yearly investments). Such a large investment commitment could not be supported by equity financing alone. So debt-equity ratios (the ratio of external debt to the sum of debt and equity capital) in the government steel sector in Brasil are much higher than in the U.S., though they still compare well with Japan. Teixeira (1981) estimates Brasilian debt ratios at over 40%, compared with an 80% average in Japan but only 25% in the U.S.. Chapter 5 explains why U.S. rates have risen recently. But the Siderbras integrated plants display above average debt ratios with (un-weighted) averages from 1978 to 1983 of 53.9% for CSN, 56.1% for Cosipa, and 67.9% for Usiminas (Editora Tama Ltda., 1985) (see table 7.2.)

Table 7.17 lists the total loans held by the three major companies from 1979 to 1984. Since most loans are held in foreign currency (even those with local lending sources) the fluctuations in cruzeiro exchange rates do not affect the indebtedness quoted in dollars. The trends displayed are therefore quite real, and they show a marked decline in debt at Usiminas where borrowing requirements for the completion of stage III ceased in the early 1980s. However, indebtedness at CSN remained high, while at Cosipa, where stage III is furthest from completion, the sum of external loans has continued to climb.

Table 7.17 Total debt, Brasil, three companies, U.S.$ billions.

Year	CSN	Cosipa	Usiminas	Total
1979	1.33	1.08	1.15	3.6
1980	1.59	1.26	1.15	4.0
1981	1.82	1.31	1.56	4.7
1982	1.89	1.40	1.42	4.7
1983	1.56	1.44	1.01	4.0
1984	1.76	1.64	.84	4.2

Source: Company reports, 1980 - 1984.

Interest rates charged on foreign loans from private banks to the Brasilian steel industry are above those charged in the United States. For example a loan of U.S.$ 495m for the construction of Acominas made in 1977 by an international consortium of banks quoted interest rates of $1^7/_8$%, 2% and $2^1/_8$% above LIBOR (London Interbank Offered Rate) for 5, 6 and 7 year portions of the loan respectively (see appendix G). (See chapter 6 for further evidence. See appendix F for a list of all loans outstanding and interest rates to CSN, Cosipa and Usiminas at the end of 1984.) This meant that the cost of money was notably higher in Brasil than in the United States. LIBOR-plus-2%, a common interest rate to Brasilian borrowers, was always at least 1.54 percentage points above the U.S. prime lending rate (the rate at which U.S. steel makers would borrow) between 1972 and 1984 (see table 7.18). Such elevations increase significantly the actual interest payable, especially when applied to debts as large as those carried by Siderbras companies. A rate of 10% on total loans of $1.4 billion at a plant like Cosipa with an output of 2.4 million tonnes yields a cost due to interest of $58.3 per tonne of output, but $70 per tonne if the rate is 12%. International interest rates peaked in 1981, but they were high

Table 7.18 Total investment, and total interest payments, Brasil, and LIBOR and U.S. prime lending rates.

Year	Total investment, Siderbras, U.S.$ millions[a]	Total interest paid, three co's, U.S.$ millions[c]	LIBOR + 2%[b]	U.S Prime[bd] lending rate
1972	383	-	8.00	4.83
1973	735	-	11.40	6.73
1974	1,598	-	12.84	8.98
1975	1,855	-	9.75	6.47
1976	1,418	-	8.15	5.92
1977	1,615	-	8.29	5.84
1978	2,902	-	11.08	7.24
1979	3,570	283	13.90	9.81
1980	2,955	299	15.91	11.73
1981	2,868	514	18.69	16.01
1982	1,945	764	15.60	13.46
1983	1,274	712	11.92	10.09
1984	423	668	13.29	11.75

Sources: a: Consider, Anuario Estatistico, 1984, 1981.
b: IMF, International Financial Statistics, 1985.
c: Company reports.
Note: d: These figures are deflated to account for the difference between the U.S. dollar and the euro-dollar to which LIBOR rates apply.

throughout the period 1979 to 1984, dipping only in 1983 (see table 7.18).

The combination of a high debt requirement, a continually growing need for money to complete stage III, and high interest rates through the early 1980s led to finance costs on Brasilian steel plants far in excess of those experienced in the U.S.. Once again, as with fixed capital, the crisis of the Brasilian and world economies, coinciding with the tail end of an overly ambitious expansion plan, contributed to the level and escalation of costs.

It is important also to note that interest in Marxist accounting is not a cost of production but a transfer of surplus. It represents an issue of competition therefore between productive capital in Brasilian steel and foreign financiers. This is a contest for surplus which has emerged from the initial cooperation between them: the Brasilian government needed foreign assistance to build a large steel industry, and international financiers were overloaded with liquid capital in the early to mid-1970s. Yet as argued in chapter 2, finance capital is less concerned with a cost efficient choice of location than multinational capital may be, lending to combinations of private and state capital that wish to develop industry for reasons other than profit. In this sense the high 'cost' of steel production is an outcome of the class alliance which was forged in order to develop the industry. These questions are considered in more detail in chapter 9.

7.7 Concluding remarks

The cost analysis in this chapter shows how inadequate it would be merely to provide evidence about the unit cost of labour (and its controllability), and perhaps also the worth of government incentives, and then conclude that these differences have led to the expansion of steel production in Brasil. It is not clear that cheap and controllable labour yields advantages to capitalists producing steel in Brasil, either in terms of costs or in the efficiency of production (though the reliability of supply might be greater). It is important not to jump to hasty conclusions about the importance of these 'labour factors' in determining relocation to developing countries without also examining the importance of others.

By contrast the analysis shows that fixed costs are high. However, the reasons for this are not all specific to Brasil. There are specific factors such as the need for infrastructure, the extra cost on loans to a developing country, and the lack of skilled labour, all of which do contribute to the high costs of capital. But together with these are the newness of capital, the scale of the project, decline in consumption and high interest rates, factors which result from the pattern of development rather than its location. It must be concluded that had such a project been adopted at the same time in the U.S., fixed costs would be high there too, though not so high as they are in Brasil.

The cost analysis does not show why such an ambitious pattern of development emerged in Brasil, but it is useful in suggesting further areas for investigation. For example it is known that exports in the early 1980s were facilitated by low marginal costs. But low marginal costs themselves were not only the result of cheap labour and local iron ore. Prices for energy, iron ore and transport are all subsidised by the government, and tax concessions on exports are extensive. So it is necessary to find out why government policy developed in this way in order to explain why exports grew. Also it is known that the unit cost of labour is very low, but that this is not carried over to the cost of labour per unit of output. To know the reason for this it is necessary to examine the form of labour relations and the characteristics of labour markets in Brasil. Finally the rapid growth of the industry (itself a major reason for the high cost of production) was heavily dependent on government policy and the availability of foreign finance, so it is necessary to investigate the political and economic interests involved in the decision to build. It is the task of the remaining two chapters in this thesis to investigate the class relations behind the development of steel, and how these conflicts have effected government policy.

CHAPTER 8

CLASS FRAGMENTATION AND THE AUTHORITARIAN STATE IN BRASILIAN DEVELOPMENT

Chapter 7 showed that even with very cheap labour and iron ore, Brasil may not be a cost efficient place to produce steel. Though steel companies in some developed nations have shown interest periodically in making direct investments in Brasil, chapter 9 will show that much of the encouragement for such investment came from Brasil itself. Furthermore this encouragement was predominantly unsuccessful, additional evidence that the steel corporations in Japan and the U.S. saw limited advantages to shifting production internationally. But Brasil developed a steel industry anyway, one which today rivals in scale and efficiency the steel industries of most developed countries.

This chapter examines the evolution of class forces which influenced Brasilian development policy from 1930 onwards. In particular it is intended to show when and to what extent foreign capital interests influenced the course of development in Brasil through their relationships with indigenous classes.[1] The chapter is divided into five historical sections: the end of land-based federalism, the introduction of the Estado Novo (new state), the increase in foreign involvement of the 1950s and crisis of the early 1960s, suppression under the military dictatorship since 1964, and the crisis of control after 1974. The conclusion is that the pattern of development is not externally imposed, as argued by a number of writers in the dependency tradition (Frank, 1969; Furtado, 1970) or by those who have examined development initiated by multinational corporations (Hymer, 1979; Barnet and Muller, 1975). The class history of development in Brasil is far more complex than this, and unfettered foreign involvement in the Brasilian economy has been limited to brief periods. Certain industries, including steel, were stimulated for internally defined reasons, neither just for the benefit of multinational profitability, nor because Brasil was an economicly efficient location for those kinds of production. By reviewing the development history of Brasil this chapter also defines the contexts in which state policy to expand the steel industry was formulated. It is necessary to understand the general forces behind development in Brasil before considering those particular to steel.

8.1 The collapse of federalism

In the early twentieth century Brasil was a supplier of

[1] This chapter relies heavily upon histories of Brasilian development provided by other writers, especially Quartim, 1971, Evans, 1979, Erickson, 1978, and Alves, 1985.

raw materials to the centres of capitalist production. Coffee, beef, cotton, tobacco, iron ore, hides, rubber and timber earned foreign currency for the purchase of manufactured imports. Brasil was responsible for 76% of the world's coffee trade in the first decade of the century (in the early 1960s coffee was still responsible for 55% of all Brasilian export earnings) (Leff, 1968, p78).

Until 1930 therefore political power was held by the agricultural fazendeiros of the southern states.[2] Slavery was abolished in Brasil in 1888, but despite the move to wage labour the fazendeiros relied on their control of federal policy (trade control, the maintenance of artificially low exchange rates in order to elevate cruzeiro earnings, or government purchase of excess produce to stabilise prices) for improving or maintaining their supply of surplus rather than on changes in production methods (Dean, 1969, pp4-5; Erickson, 1977, p12). The planters also enjoyed considerable autonomy, running their own state armies for example which they used to control peasantry in the country side (Leff, 1968, p23).

Two things combined in 1930 however to undermine the political power of the fazendeiros. First the growth of indigenously controlled industrial production, especially in Sao Paulo, produced an increasingly powerful capitalist class with political interests that were opposed to those of the landowners, and which were not accommodated under the

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[2] Minas Gerais and Sao Paulo were the centres of coffee production, Rio Grande du Sol of cattle ranching.

prevailing decentralised political structure. Between 1900 and 1920 industrial production per capita climbed almost 300% in Sao Paulo. Between 1920 and 1940 the number of industrial establishments there grew from 4,154 to 14,225, and the number of workers from 83,998 to 272,865 (Dean, 1969, p106, 117). Yet this growth was not encouraged by policies designed to favour the planters. Tariffs and taxes were exempt on the import of agricultural machinery and fertilisers, making it difficult for Sao Paulo industrialists to establish themselves in these markets. Cotton production fell off during the late 1920s so that textiles producers had to import cotton inflated by the low cruzeiro, and pay the tariff (Dean, 1969, pp130-133). The deliberately depressed exchange rate meant that imports of machinery for industrial expansion were very expensive, though it restricted import competition as well. The second, more specific impetus to political change came in 1929 with the collapse of international coffee prices. In 1934 the U.S. still consumed 55% of Brasil's coffee exports, but this represented only $51 million compared with $99 million in 1929 (Wirth, 1970, p19). This decline caused a crisis in the balance of payments and a weakening of the planters economic leverage.

Neither the growing industrial classes nor the fazendeiros therefore, who realised that a national solution to the balance of payments problem was necessary, provided much resistance to the revolution of 1930. The change, though effected militarily, was not in direct support of one of the ruling classes, nor in the interests of ruling class hegemony against a threat from the dominated classes. Vargas, himself a rancher from Rio Grande do Sul, maintained a populist platform, dependent not on one class or the other, but upon a broad base of support. This gave the new state an appearance of autonomy, but the 1930 solution was really a political compromise, appealing to a broad spectrum of interests (Quartim, 1971, p24).

From 1930 the government continued to support coffee prices by purchasing excess coffee supplies, which in 1937 amounted to 70% of the crop, but the exchange rate was increased in an attempt to improve foreign currency earnings. This had an indirect effect on industrial growth for it made imports of machinery cheaper, though it also reduced the price of imported consumer goods. There were no policies aimed at industrial expansion at this time. The significance of the change was political, for the new corporatist structure of government which Vargas began to establish could accommodate a greater variety of interests than the federalism of the Old Republic controlled by the fazendeiros.

8.2 Corporatism and the Estado Novo, 1930 - 1945

The populist solution to political diversity which emerged in the 1930s has typically been labelled corporatist (Erickson, 1977), a view that portrays the state as the central organ coordinating diverse parts of a political body, in favour of neither one part nor the other, but for the good of all. Such a view however assigns the state an impossible task, for it denies the necessity of conflict between social classes. While this necessity can be suppressed by consensus during certain periods, the state cannot eliminate conflicts between classes. The corporatist state is only one form that the state has taken in Brasil: a form that maintained stability through policies that gained support from various factions at different times. It therefore appeared to hold a relative autonomy that sustains its image as a corporative or populist body responsible for collective welfare.

8.2.1 Bureaucratic unionism

To maintain a corporatist or populist image it was necessary for Vargas to find a way in the 1930s of incorporating the interests of a growing working class. This need was important in determining the form of labour relations that would predominate in Brasil for the next fifty years. Significant efforts were made to improve the wages and conditions of workers whose demands had previously been met with military force similar to that used by the planters to control their labour forces. These improvements served to broaden the government's basis of legitimisation with the working class, but they were combined with the institutionalisation of labour relations, a move which pre-empted the revolutionary threat to urban industrial expansion. "All trade unions... were subordinated to the state, so that in return for decreed wage increases, capitalists both national and foreign received protection from the threat of a genuinely autonomous working-class movement" (Quartim, 1971, p24).[3] Whereas the pre-1930 period had been known as one of militant unionism therefore, a system of bureaucratic unionism followed (Erickson, 1977, p14).

The establishment of a corporatist state was formalised with the introduction of the Estado Novo (new state) in 1937, its institutions modelled on the Italian and Portuguese fascist constitutions. It banned political parties and institutionalised the mobilisation of the working class. The bureaucratic organisation of workers was therefore aimed not at preventing their political mobilisation but at providing control over it and securing its support for populism. Accordingly the Estado Novo focused on the supervision and control of industrial labour. The mobilisation of peasants was still adequately controlled by pre-revolutionary methods.

The Estado Novo established three state institutions for the regulation of labour relations; the sindicatos (or state run unions), the social security system and the labour courts. Sindicatos were limited to the municipal scale and are organised by industrial sector (for example the metalworkers of Sao Bernardo, a municipality of Sao Paulo). They were to deal with workplace grievances, wage demands and welfare services, but could only perform these functions if "officially recognised by the Ministry of Labour. Unrecognised or ad

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[3] This was a threat which had appeared very real in some of the communist inspired workers organisations under the Old Republic, and actively expressed in the Sao Paulo general strike of 1917. It appeared again in a communist inspired rebellion in 1935.

hoc workers organisations cannot legally use them or obtain the benefits conferred by recognition" (Erickson, 1977, p32), which makes it difficult for such organisations to establish credibility amongst workers. Conflicts between employers and employees were to be resolved through the labour courts, strike action without court approval being illegal. The social security system was designed to maintain social harmony, payments being made equally by employers, employees and the state.

Remaining in force ever since, these regulations, initiated in the 1930s and consolidated in the Estado Novo, have been used with various degrees of severity (Erickson, 1977). Only employees for example have been unable to avoid making social security payments, so they have been rather more divisive than cohesive. Anti-strike laws were not enforced in the early 1960s, but at other times the courts have been used along with military force, especially since 1964, to quell independent labour actions. Employees were protected against dismissal in 1937, but these regulations were withdrawn in 1967.

8.2.2 Industrial growth

The Estado Novo also signified the acceptance of industrialisation as the future course for the Brasilian economy. Its introduction in 1937 coincided with an economic crisis brought on by the continued stagnation in export prices and a rapid expansion of consumer imports because of inflated exchange rates. Imports in 1937 ran $85 million above their 1936 level, and "it followed that the country would have to begin to substitute domestic manufactures for foreign" (Dean, 1969, pp208-209). Furthermore the state would become directly involved "in order to supply the deficiencies of individual initiative and coordinate the factors of production so that conflicts may be avoided or resolved and a consideration of the interests of the Nation, represented by the State, may be introduced" (from the 1937 constitution, quoted in Dean, 1969, p210). The exchange rate was kept high while tariffs were placed on imports of consumer goods to encourage import substitution but relaxed on the necessary imports of industrial machinery.

Industrialisation through import substitution was also therefore a specifically nationalist policy of development designed to extract Brasil from its politically and economicly stifled position in the world market as a supplier of unprocessed materials to the imperial powers. As stated in the constitution the state was to assist in areas of the economy where local capital was unable to perform the task, and it became directly involved in enterprise itself. Individual state owned shipping lines were consolidated, a state controlled airline was formed, and the government took over administration of the ports. In 1938 the National Petroleum Council was formed (a predecessor of the state run petroleum company Petrobras) and Fabrica Nacional de Motores (FNM) and CSN soon followed (Evans, 1979, pp87-90). In some cases the formation of these companies was meant to exclude foreign capital from a central role in a nationalist development policy. Restrictions were placed in 1934 and 1940 on the degree of foreign ownership in mining operations (Wirth, 1970). But efforts were made without success to involve foreign direct investment in some of these industries. State involvement was the result both of nationalist policy and the need to develop certain sectors that domestic capital could not handle and in which foreign capital was not interested. (This question is examined in more detail with respect to the steel industry in chapter 9.)

By the end of the 1930s therefore the political structure in Brasil had changed from federation controlled by the fazendeiros of the Old Republic, to a centralised corporatist state with an internalised mechanism for labour control and a policy of indigenously stimulated growth through import substitution. This was a nationalist and populist policy from which it was presumed all Brasilian classes, not just industrial capital, should benefit. Internal class forces in this nationalist and populist course of development were dominant. Direct foreign investment in Brasil in 1930s and 1940s was limited.

8.3 The contradictions of dependent development, 1945 - 1964

The ideology of populism was not able to maintain cohesion indefinitely. In 1945 Vargas lost authoritarian control and the army ensured the installation of an elected government. It also intervened briefly in 1954, but until 1964 the state was controlled by governments dependent upon election for their mandate.[4] The period is therefore one

[4] Suffrage in Brasil is only granted to the literate population. In 1945 15.9% of the population was registered. In 1966 25.9% was registered (Erickson, 1977, p22).

in which a variety of coalitions provided political support for government, and in which class conflicts were more actively expressed.

The forces that encouraged the suppression of authority were also those that had been suppressed by authority. Industrial capitalists were concerned to gain a direct influence over policy which they were denied by the relatively autonomous Vargas government. While the increased involvement of the state in industrial enterprise was mostly in sectors that the indigenous private sector could not have developed on its own, nevertheless it was viewed as an encroachment upon areas of potential private accumulation. This was reinforced in October 1945 by decree 7666 which allowed for the nationalisation of companies that operated against the national interest (Quartim, 1971, p29). Labour was not benefiting from industrialisation as promised by Vargas's populist ideology, but was denied the power, which it might have had through political parties or the independent unions, to bring about change. So Vargas was forced by increasing pressure from industrialists, as well as from other groups (students for example), further fuelled by defeat of the axis powers, to legalise political parties and call elections for the end of 1945.

A party system of politics however was not one which suited the Brasilian corporatist system of government. Each party affiliated itself broadly with one or another class , none of them attempting to offer a broad populist platform, a position that had become untenable anyway.[5] Vargas was forced increasingly to depend on the mobilised left for his political support, but thus threatened the established, centralised form of labour control. This was an unacceptable position to the industrialists and fazendeiros alike, and Vargas was forcibly removed prior to the 1945 elections. A coalition government was subsequently installed that did not threaten to disrupt the established system of labour control.

Four governments held power during the following 19 years: Dutra's of 1945, Vargas being re-elected in 1950, Kubitscheck in 1955 and Goulart from 1961 to 1964. Each of these governments, along with the nationally based bourgeoisie, was faced with a set of contradictions similar to those faced by Vargas in 1945 (what Evans, 1979, calls the contradictions of dependent development). The interests of industrialists lay in expanded industrial growth. However, whether through the need for foreign technology, or foreign money to buy it with, industrial growth through import substitution implied a partnership also with foreign interests. But this partnership held contradictions for the participants. The independence of Brasilian capital from the power of

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[5] Three main political parties emerged from legalisation in 1945. The Uniao Democratico Nacional (National Democratic Union - UDN) represented democratic, pro-American, laissez-faire interests of the industrial owners. The Partido Social-Democratic (Social Democratic Party - PSD) was the party of the rural oligarchy. The Partido Trabalhista Brasileiro (Brasilian Labour Party - PTB) became the expression of Vargas's populism with the working class, but emerged from the labour ministry and stood for workers rights only within the already legalised union framework of the Estado Novo. The Partido Communista Brasileiro (Brasilian Communist Party - PCB) was left to fight for workers autonomy, but was repeatedly outlawed, for example after the 1935 risings, in 1947, and again after its role in strike organisation prior to the 1964 coup.

foreign business was quickly threatened, so the periods of expanded foreign influence did not last for very long and the doors were closed to foreign investment. Governments that restricted foreign influence became increasingly dependent for their political support upon the nationalist populist groups that were rooted in the state mobilised movements on the left. They threatened the form of labour control once more and pushed the national bourgeoisie back towards a foreign driven development policy. The remainder of this section briefly reviews the sequence of reversals in development policy between 1945 and 1964 which were influenced by these contradictions.

As industrial growth expanded after 1945, so did the demand for imports, from $900m in 1950 to $1,703m in 1951 (Baer, 1965, p51). Demand for foreign currency now increased, even though prices for Brasil's exports reached their post-war peak at this time because of the Korean war (see table 8.1). Furthermore the controls on supply of consumer goods imports, but without a fall in the purchasing power of the cruzeiro, fuelled inflation (table 8.1). The only alternative economic policy, given a commitment to continued internal growth, was to allow inflows of foreign capital. This would stimulate industrial growth without placing pressure on the supply of foreign currency. Industrialists therefore began to lobby for increased foreign involvement during the early 1950s, and government policy complied with these demands in 1951 and 1952, setting up the joint Brasil - U.S. Economic Development Commission and creating the National Bank for Economic Development (BNDE). "The Bank's task was to encourage Brazilian investment in infrastructural projects, particularly power and transport, so as to render Brazil more attractive to foreign investors" (Quartim, 1971, p34).

Table 8.1 Export prices, inflation and foreign capital inflows, Brasil.

Year	Coffee price Index 1953=100 $US per bag	Wholesale price changes %	Foreign capital, $USm, to all private firms Indirect	Direct
1947	n/a	-1	11	36
1948	-	12	55	25
1949	-	17	28	5
1950	-	14	25	3
1951	-	12	74	-4
1952	-	10	109	9
1953	100	25	63	22
1954	123	24	64	11
1955	87	9	66	43
1956	87	26	158	90
1957	83	3	212	144
1958	76	28	120	110
1959	60	36	124	124
1960	61	33	78	98
1961	60	50	192	108

Source: Baer, 1965.
Note: See also table 8.3.

Increased foreign involvement however was not commensurate with a populist political base, nor the strong nationalist underpinnings of the policies of the previous twenty years. Unfavourable exchange conditions for investment and regulations on profit remissions were maintained so that, as table 8.1 shows, direct investment from abroad remained low. Meanwhile real wage increases were granted to labour to compensate for inflation. The balance of payments crisis continued, while the U.S. government reduced its loan committment and terminated the Brasilian - U.S. Joint Economic Committee (Quartim, 1971, p36). Public international capital flows in 1951 and 1952 were negative (Leff, 1968, p60). A nationalist approach to development within the context of a world market in which Brasil depended upon the exports of raw materials with generally declining terms of trade therefore forced the government to depend upon labour for its political support. Populist nationalism and the left (excluding the PCB) became synonymous.

With declines once more in the price of coffee and intensification of the economic crisis in 1954, widespread strikes in Sao Paulo and Rio Grande do Sul, the rule of the elite was threatened again. The military intervened, this time not only to protect the ruling classes from the collapse of control over labour, but also in favour of a pro-imperialist approach to development.[6] The alternative of economic protection and political nationalism had proved unacceptable to the Brasilian bourgeoisie, and the 1955 election was won by the PSD-PTB candidate, Juscelino Kubitscheck, "a regime of economic euphoria and imperialist take-over" (Quartim, 1971, p40).

In 1955 the government introduced Instruction 113 which modified the exchange-rate regulations on foreign investment and profit remissions. Direct foreign investment rose rapidly (table 8.1), though

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[6] The take-over was also encouraged by the cold war and in support of U.S. resistence to the communist threat. The majority of army officers had been trained in the U.S. (Erickson and Peppe, 1976). Vargas's suicide during the coup induced mass up-risings, including an attack on the U.S. Embassy, but it didn't alter the political shift towards the admission of foreign capital investment.

it was focused in particular sectors. Of all the direct foreign investment between 1955 and 1962, 46% went to the automotive industry alone, the remainder to steel, non-ferrous metals, chemicals, cement, mechanical and electrical equipment, pharmaceuticals, food products and textiles (Leff, 1968, p61). Between 1955 and 1961 industrial output rose by 80%. Foreign investment was not confined to the private sector however. Vast government development projects were initiated, the most ambitious being the construction of the new capital city Brasilia. By 1961 the government owed more in foreign loans than the $743m of direct foreign investment (Quartim, 1971, p43).

Towards the end of the 1950s the open policy to foreign capital began to produce its own problems for indigenous classes. First it brought competition from companies with technical and financial resources which most Brasilian industrialists were unable to resist. Second, foreign political influence began to be felt through the new links with international financial interests. Negotiations for loans ($300m) in 1958 and 1959 with the IMF brought with them conditions for following a policy of economic stabilisation, designed to eliminate the balance of payments deficit so as to ensure an ability to repay debts. But this threatened the rate of economic growth which was itself the aim of a policy favouring foreign investment. Furthermore the use of as much loan capital as direct foreign investment, as well as profit remissions abroad, meant that interest payments now drained foreign currency. By the early 1960s 25% of foreign exchange payments comprised service on loans (Leff, 1968, p72).

It was at this time that the views of dependency theorists became popular in Brasil, not just amongst those groups seeking social reform, but also amongst those nationally based capitalists who saw their positions threatened by direct foreign competition.[7] The Kubitscheck government had begun the move away from foreign influence as early as 1959 when it cut off negotiations for IMF loans because of the unacceptable conditions which they carried. The 1960 elections reflected the political reaction against the new form of foreign influence. Joao Goulart, the PTB leader, became president in 1961,[8] and in 1962 the foreign driven development programme was abandoned with the reversal of instruction 113.

Two policy alternatives now faced the Goulart government. First a deflationary cut-back in development through rigid import restrictions, and further lowering of the exchange rate.[9] But this approach was being pushed by foreign financial and political interests anyway. The second was to continue development financed not by foreign capital but by restrictions on consumer imports, a return to pre-1945 policy. It was intended also that social reforms and wage increases

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[7] A major objective of the new policy was the nationalist aim to achieve industrialisation in order to escape the country's dependent trade position, but this brought instead a new kind of foreign influence.

[8] Goulart had been labour minister under Vargas in the early 1950s, and his sympathies lay in the populist, nationalist tradition which his party represented. Celso Furtado, a leading dependency academic and previous head of the BNDE, was planning minister in the subsequent Goulart government.

[9] The exchange rate had been halved in 1960.

should be made to redress the imbalance of benefits from industrialisation, which further fueled the inflationary effect of the second alternative.

Increasingly Goulart's political position became polarised, and he was forced further to the left. The situation was similar to that experienced by the Vargas government in the early 1950s, but now the crisis was deeper. In 1962 the unions called a general strike in support of Goulart's selection of PTB replacements in the cabinet which congress had threatened to reject (Quartim, 1971, p45). This was followed by the formation of an independent political leadership uniting all workers' organisations, illegal according to the labour laws of the Estado Novo. The situation worsened through 1963 with increasing numbers of strikes, political violence and collaboration of workers with peasantry in urging agrarian reform. The army was now required to intervene as it had done in 1945 and 1954, supported by the ruling classes united by the collective threat.

Support also came from the U.S. government (Erickson and Peppe, 1976), for the interests of American multinational and finance capital were closely tied, if not to the objective of rapid industrial growth in Brasil, then at least to the maintenance of opportunities for capitalist accumulation there. However, foreign interests alone cannot be credited with causing the military intervention. The repeated military interventions on behalf of the indigenous ruling classes during the post war period were solutions to conflicts within Brasilian society which were too complex to be handled through consensus once the system of labour control had been internalised within the Estado Novo itself. The institutional structures, introduced under the Estado Novo to "congeal the balance of forces prevailing at the time of its constitution" ... proved "inflexible in the face of new disturbances and contradictions" (Jessop, 1982, p167, referring to what Puolantzas calls 'exceptional' forms of the state).

When they were introduced the labour laws had provided a controlled mobilisation of workers that enhanced the prospects for expanding accumulation through industrial production. But this was a system suited only to an authoritarian state. Independent methods for the control of labour on the shop floor were developed by separate firms (see for example Humphrey's, 1982, detailed analysis of labour relations within Brasilian auto plants), but these methods, as well as the general political control of labour, relied completely upon the literal application of the labour laws. So whenever the government moved towards labour for its political support, especially in response to economic problems created by policies designed to stimulate industrial expansion, it was not just the system of labour control, smooth accumulation and industrial growth that were threatened, but the capitalist system itself. So policies aimed at encouraging indigenous capital growth in Brasil themselves produced the conditions under which this growth was threatened, either by increasing foreign influence or by the loss of control over labour.

8.4 Military rule and the authoritarian state

Persuaded by previous experiences in 1945 and 1954 when intervention had no long-term stabilising effect, the military in 1964 set about strengthening the institutional framework for suppressing political resistance. All independent political parties were banned in 1965, and two new official parties were formed.[1] The constitution was re-written in 1967 so as to allow for the easy passage of institutional acts, and the suspension of congress when required.

The labour laws of the Estado Novo remained intact but were more effectively used. Insurances on job security were withdrawn allowing capitalists to strengthen competition amongst workers and to introduce other Taylorist-like methods of shop floor control (Humphrey, 1982, p45). "The abolition of job security allowed old workers to be cast onto the scrap heap, politically militant workers to be got rid of more easily and relieved companies of any social responsibility for their workers. The consequence has been a rapid and constant turnover of labour, a key factor in maintaining low wages and in undermining workers organisation" (TIE, 1984, p12). The mobile scale that had kept wages in line with inflation was abolished. The government purged the leadership of the most active unions, especially in those that had been major strikers between 1960 and 1964. "The military government simply decapitated the radical labor movement,... (intervening) in 70 percent

[1] The parties were: one government (National Renovation Alliance - Alianca Nacional Renovadora - ARENA) and one opposition (Brasilian Democratic Movement - Movimento Democratico Brasileiro - MDB).

of those sindicatos with 5,000 members" (Erickson, 1977, p158, my addition). Strikes in 1968 by metalworkers at two plants in Sao Paulo and Minas Gerais were put down with force. "Sweeping arrests were made and trade unionists died under torture" (TIE, 1984, p13).

The political stabilisation of 1965 and 1967 was partly aimed at suppressing left wing opposition, but also at producing conditions once more attractive to foreign investment. Furthermore in its early stages the new government was actively concerned not only to court investment from abroad, but to encourage foreign expansion at the expense of national capital. The state-run Fabrica Nacional de Motores was sold to Alfa Romeo, and "Thyssen Steel was allowed to purchase some equity in Cosigua" which was owned by the state of Guanabarra (Evans, 1979, p217; <u>Business Latin America</u>, 1968, p232). (Foreign investment during the late 1960s, though greater than before 1964, was actually quite limited in magnitude. See table 8.3.) Government subsidies were cut from Brasilian firms whose productivity remained too low, and the number of bankruptcies in Sao Paulo grew from 338 in 1963 to 3,689 in 1967 (Quartim, 1971, p58).

Anti-nationalist policy did not last for long however. Military intervention was not specifically a pro-foreign movement. Rather it was a response to the inability of democratic government to control forces on the left when nationalist development policies were followed. Furthermore the involvement of foreign capital alone could not sustain development as such, because it "rarely satisfied the essential function of transforming accumulation into productive investment" (O'Donnell, 1978, p12). For example there was imbalanced growth between 1950 and 1968 with emphasis on those sectors dominated by multinational involvement. (Table 8.2 omits petroleum refining and electricity generation, from which foreign direct investment was excluded.) The objective of foreign multinationals was not the development of an elaborately linked economy,(except to the extent that their own industries should be supplied with necessary inputs) nor of an indigenous social structure, but, as with any individual capital, the growth of their own capacity to accumulate.

A policy of joint development was designed therefore to attract as much foreign capital as possible, but without compromising the interests of indigenous capital. This required considerable state participation in industries where the resources required were beyond the means of indigenous capital, where foreign interest could not be attracted, or where for national reasons foreign involvement was considered undesirable. Of all fixed investment in 1969, 60% was in state enterprise (Baer et al, 1973, p30). Exploitation of iron ore and copper reserves for example was expanded by government controlled firms as Brasilian resources, though foreign concerns would have been willing participants (Evans, 1979, p219). But the formation of Telebras (telecommunications), Eletrobras (electricity generation), Petrobras (petroleum refining) and Siderbras (steel), state holding companies for their respective government controlled concerns, presented less definite prospects for profit generation and encouraged limited interest from

Table 8.2 Direct foreign capital involvement by sector, Brasil

	% foreign owned 1969	% value added 1968	% value added 1968/1950
Local predominant			
Leather products	37%	0.6%	46%
Printing and Pub'	0%	3.0%	71%
Apparel and footwear	0%	2.8%	65%
Wood and furniture	0%	4.2%	75%
Paper products	12%	2.7%	129%
Non-metalic minerals	21%	5.8%	78%
Electrical machinery	49%	6.3%	371%
Textiles	29%	10.1%	50%
Metal fabrication	38%	11.4%	154%
Foreign predominant			
Chemicals	76%	12.1%	187%
Machinery	61%	6.0%	273%
Food and beverages	53%	15.6%	63%
Tobacco	91%	1.4%	88%
Rubber products	82%	2.0%	95%
Pharmaceuticals	94%	5.5%	187%
Transport equipment	100%	8.6%	374%
Miscellaneous excluded			

Sources: Evans, 1979, p117; Baer, 1965, p269.

abroad. Though in each case some resistance to foreign involvement was exercised, the nationalist objective was expressed by their development not for the production of profits so much as to ensure that the process of industrialisation led also to indigenous accumulation. At the same time these industries were used through price controls on their outputs to encourage further private investment.

The government also encouraged the growth of partnerships between itself and private capital, aimed at restricting the autonomy of international capital and ensuring the involvement of indigenous capital. Ford, Chrysler and General Motors for example all became direct producers in the 1950s without government participation, but when Fiat began production in the early 1970s it did so as a partner of the state of Minas Gerais (Evans, 1979, p228). Evans gives extensive details about similar projects in the petrochemicals industry, mostly through Petroquisa, a subsidiary of Petrobras created for the purpose of undertaking joint projects with foreign companies. These were not designed to assist foreign capital, only to increase the national interest in development of the economy and to ensure domestic accumulation. Some multinational corporations were dissuaded from getting involved in Brasil by the degree of government involvement required. Expansion of Petrobras into petroleum distribution in 1974 threatened to push Exxon out of Brasil, while IBM was excluded due to requirements that it should share its technology (Evans, 1979, p267/274; Business Latin America, 1977, p193/307).

Efforts were made also to include private indigenous capital in development. The UNIPAR group representing a consortium of Brasilian chemical and mining concerns, is heavily involved in Petroquisa's partnerships with multinational firms, in some cases (Brasivil and Huls-Brasil) forming partnerships itself with foreign companies (Evans, 1979, pp231-2).

Despite restrictions on multinational autonomy however, foreign investment grew rapidly, especially from 1971 onwards (see table 8.3). This growth was stimulated both by stabilisation in Brasil and by developments abroad. Working class activity was suppressed and inflation was down below 20% (table 8.3), while efforts by the state to alleviate certain bottlenecks to development, especially in the supply of steel and electricity (Wirth, 1970) improved the investment environment. Abroad the increased ability of large corporations to internationalise their operations as well as the availability of petro-

Table 8.3 Inflation and foreign investment in Brasil, 1960 - 1984, in millions of 1971 $U.S.

Year	Inflation	Direct foreign investment	Net financial inflow	Total net foreign capital inflow
1960	26.3	167	446	613
1961	33.3	178	79	257
1962	54.8	160	553	713
1963	78.5	105	194	299
1964	87.8	104	60	164
1965	55.4	183	-482	-299
1966	39.5	183	-113	70
1967	28.8	131	-34	97
1968	27.8	149	542	691
1969	20.3	269	607	876
1970	18.2	434	920	1354
1971	17.3	537	1598	2135
1972	17.4	579	2939	3518
1973	20.5	1225	2426	3651
1974	31.5	1022	4093	5115
1975	32.7	906	3557	4463
1976	41.9	1035	4790	5825
1977	44.1	1144	2745	3889
1978	40.8	1159	5385	6544
1979	77.2	1260	2043	3303
1980	110.2	880	3574	4454
1981	97.0	1065	4342	5407
1982	99.7	1182	3452	4634
1983	239.0	606	1555	2161
1984	n/a	599	1258	1857

Sources: Alves, 1985; and from IMF, Balance of Payments Yearbook, various years.

dollars meant an increased ability to invest in Brasil.

Between 1972 and 1981 inclusive, direct foreign investment in Brasil totalled $10.3 billion (1971 $U.S.) compared with $2.25 billion in the previous ten years. Total net inflow of foreign investment between 1972 and 1981 was $46.2 billion compared with $6.1 billion. But the significance of these investments can be overstated unless compared with the magnitude of indigenous growth. While they certainly drove development through their focus in key manufacturing sectors of the economy (table 8.2) or, in the case of financial loans allowing the development of those sectors by the government, the active involvement of indigenous interests was maintained. As a proportion of total fixed capital formation in Brasil the highest percentage accounted for by direct foreign investment was 6.7% in 1973, 27% of which was reported as re-investment of indigenously produced capital (see table 8.4). Of course this investment has been concentrated in manufacturing, but even here it has never formed the majority of investment. In 1981 direct foreign investment was 84% above its 1972 level, but as a proportion of total investment it was only 7.5% higher. In only one year has direct foreign investment in Brasil accounted for more than 5% of fixed capital formation. Total net foreign capital inflow shows a significant increase in participation from the late 1960s into the early 1970s. In 1972 total net foreign capital inflow accounted for 25% of fixed capital formation. But this was the highest level it ever reached.

The opposing interests of foreign and national capital were

Table 8.4 Foreign investment as proportion of total investment

Year	A	B	C	D	E	F
1963	-	8363	840	1.3%	13%	4%
1964	-	3865	626	2.7%	17%	4%
1965	-	5001	603	3.7%	30%	*
1966	-	6795	749	2.7%	24%	1%
1967	-	7155	716	1.8%	18%	1%
1968	-	8455	883	1.8%	17%	8%
1969	33%	9359	1001	2.9%	27%	9%
1970	65%	10530	-	4.1%	-	13%
1971	60%	12264	1746	4.4%	31%	17%
1972	34%	14293	2572	4.0%	23%	25%
1973	29%	18210	3271	6.7%	37%	20%
1974	23%	22434	3815	4.6%	27%	23%
1975	23%	25672	-	3.5%	-	17%
1976	26%	27052	4896	3.8%	21%	22%
1977	48%	27946	4803	4.1%	24%	14%
1978	49%	29589	4693	3.9%	25%	22%
1979	30%	27239	4132	4.6%	30%	12%
1980	21%	24870	-	3.5%	-	18%
1981	29%	24665	-	4.3%	-	22%
1982	54%	24268	-	4.9%	-	19%

A: Percentage of direct foreign investment reported as re-investment.
B: Total fixed capital formation, 1971 $U.S. billions.
C: Fixed capital formation in manufacturing, 1971 $U.S. billions.
D: Direct foreign investment as a percentage of B.
E: Direct foreign investment as a percentage of C.
F: Net foreign capital inflow as a percentage of B.
A dash (-) indicates data not available.
A star (*) indicates negative capital inflow.

Sources: Compiled from Table 8.3; IMF, Balance of Payments Yearbook, various years; United Nations, Industrial Statistics Yearbook, various years.

therefore not eliminated by military intervention. The real impact of the coup in 1964 was to allow development of the economy driven by foreign investment, with sufficient controls to protect nationalist interests, but with an ability to suppress the populist and communist reactions from the left (forces which had emerged in 1960 and 1952 under civilian governments). But the contradictions of dependent development were still present. The early years of unfettered foreign involvement under military rule gave way to a nationalist reaction from the state, so that it came "to restrict international capital to a degree almost unthinkable during the initial orthodox stage, making economic space for itself and for the national bourgeoisie" (O'Donnell, 1978, p21).

8.5 The crisis of control

The conflicts within Brasil that encouraged the imposition of authority were not eliminated by it. The continued suppression of opposition forces requires the continued support of the ruling classes and the continued suppression of the dominated classes. O'Donnell (1978) suggests that "in cases of high prior threat level the Bureaucratic Authoritarian State has more time until the appearance of an alliance that can effectively challenge it" (p9). This generalisation may be confirmed by the continuation of authority in contemporary Chile, where the original threat of communist revolution was greater than in Argentina or Brasil. But it is not possible to predict the end of military rule as a function of the strength of the initial threat.

Opposition to authority found a route for expression in 1974, and it came from classes indigenous to Brasil. The military government had placed "considerable emphasis... on legitimation based on the success of the development model" (Alves, 1985, p141). But in 1974 with the escalation in oil prices, increase in the trade deficit rapidly increasing foreign debt, rising interest rates (table 7.18) and once more quickening inflation, this credibility began to falter.[1] The potential for organised workers' resistance was intensified by the increasing size of the working class and the prolongation of suppression and worsening conditions during a period of unprecedented growth. Economic growth continued to yield disproportionate benefits to segments of the Brasilian population. The wealth gap widened while real wages fell (table 8.5). There were also reductions in social programmes. The ministry of health's proportion of the government budget fell from 4.29% in 1966 to 0.99% in 1974 (Alves, 1985, p116). Meanwhile the size of the unionised labour force grew from 1.6 million in 1964 to 5.7 million in 1979 (p188).

In 1977 it became known that the scales used by the government to calculate annual wage increases had been falsely depressed. Circumvention of the official union apparatus became increasingly effective with intensified support from workers for change, and a series of strikes began in 1978 amongst the metalworkers' unions in Sao Bernardo (near Sao Paulo), led by workers in the foreign owned auto factories (Humphrey, 1983; TIE, 1984). The strikes also inflicted economic losses on industry which had enjoyed unbroken worker peace for the past 14 years. In 1978 there were 24 strikes involving 539,000 workers, in 1979

[1] An economy driven by a heavy net inflow of capital suffers from racing inflation as the supply of money grows more quickly than the supply of output; Wachter, 1976.

119 strikes involving 3.2 million workers, 30% of them in metallurgical industries (Erickson, 1978). (This category includes auto factories and steel mills. See chapter 9 for details about strikes in the steel industry.)

Whereas the strikes of 1963 and 1964 had been organised within the framework of government administration, the significance of the new wave of strikes was their organisational basis outside the government sindicatos through an 'oposicao sindical' (union opposition). Though confronted with direct intervention as before, the structure of labour

Table 8.5 Real wages and income concentration.

Year	Real wage index	Year	Real wage index
1959	100	1968	43
1960	69	1969	42
1961	85	1970	42
1962	81	1971	42
1963	75	1972	40
1964	42	1973	39
1965	48	1974	36
1966	49	1975	35
1967	43	1976	34

Income concentration amongst economicly active people.

	Share of GNP (%)		
	1960	1970	1976
Poorest 50%	17.71	14.91	11.60
30%	27.92	22.85	21.20
15%	26.60	27.38	28.00
Richest 5%	27.69	34.86	39.00

Source: Alves, 1985.

control itself was now threatened, and workers given new hope regarding the potential for their independent organisation. Independent union organisation improved to the extent that when non-official union leaders were arrested in April 1980 at the beginning of another stoppage in the Sao Bernardo car plants, the strike was able to continue for a further six weeks before being ended by a temporary military occupation of the state of Sao Paulo.

By 1983 the economic and political situation had undermined any legitimacy the military government had retained with the ruling classes. The size of the foreign debt combined with very high interest rates in 1982 led to a default on a number of loan repayments. The IMF was required to bail out the country with short term loans to allow debt servicing. Inflation now ran out of control. Of 2 million industrial workers in Sao Paulo in 1980, 437,000 were laid off during the following two years (Alves, 1985, pp232-233). But the necessary changes in policy required to solve these problems could not be made by the military. Foreign driven development and direct political suppression, both built in to the constitution of the authoritarian state, now contributed to the intensification of the crisis. Social restructuring to solve the crises of the relationship with international capital and labour control through the state-internalised methods established in the 1930s, now required an end to authoritarianism, and military government ended in early 1985.

Bills before congress in May to reform land ownership and the labour laws (Daily Post, May 25, 1985) indicated intent to alter the social structures of the country. These also promise to change once more the relationship between Brasilian classes and foreign capital.

> The radicalisation of the Brazilian union movement with the expansion of the strikes during the past six weeks is one of the main concerns of the directors of multinational companies in Brazil. Particularly the metalurgical workers' strike in Sao Paulo has a political bent and executives warn this could deter the entry of new foreign investments, and could possibly lead to the removal of some businesses from Brazil. President of the American Chamber of Commerce in Brazil, David Benadof, said that strikes were interrupting multinationals' export programmes and jeopardized established contracts (Daily Post, May 25, 1985).

Once more Brasilian development is revealed as a process not dominated by foreign capital interests, but influenced by them via conflicts with the interests of Brasilian classes.

8.6 The non-nationality of international capital

According to the evidence in section 8.4, the economic involvement (as distinct from the political involvement) of direct foreign capital in Brasil is much smaller than indigenous capital. But foreign influence over development as a peculiarity of third world economies is questioned further by recent trends in developed nations. Foreign investment has been increasing here too. Involvement of direct foreign investment as a proportion of total private fixed capital formation in the U.S., while at low levels throughout the 1970s, rose to 4.1% and 5.5% in 1980 and 1981, figures which exceed the involvement of foreign capital in Brasil in those years (see table 8.6).[2]

What is designated as 'foreign' capital however is relevant not only to understanding this data, but also to understanding the dynamics of international development. As Sayer (1985) asks, in what sense can multinational corporations be described as belonging to one or another nation? Is Ford an American or an international company? If the answer

Table 8.6 Foreign direct investment as a percentage of private fixed capital formation in the United States.

Year	Current $ billions		FDI/PFCF
	FDI in the U.S.	PFCF in the U.S.	
1969	0.8	139	0.6
1970	1.5	141	1.0
1971	0.4	159	0.3
1972	1.0	185	0.5
1973	2.7	211	1.3
1974	4.8	214	2.2
1975	2.7	213	1.3
1976	4.4	246	1.8
1977	3.7	301	1.2
1978	7.9	360	2.2
1979	11.9	409	2.9
1980	16.9	412	4.1
1981	25.3	458	5.5
1982	13.9	441	3.2
1983	12.0	485	2.5
1984	22.4	n/a	n/a

Sources: Compiled from: IMF, Balance of Payments Yearbook, various years; United Nations, Industrial Statistics Yearbook, various years.

2 There are problems with this measure of involvement even as a simple economic indicator. The figures given for fixed capital formation in the U.S. refer to the private sector only, so the figures given in table 8.6 for the U.S. are artificially inflated.

is international, and we apply that designation to all companies with less than a certain percentage of their operations in one country (a selection of this percentage can only be arbitrary) then the United States must be classified as one of the most internationally dominated economies there is.

A view of American political leverage abroad simply as favourable to the foreign interests of international capital fails to capture the contradictions that such policies produce for the U.S. state itself. As documented in chapter 4, policies designed to further the interests of internationalised capital conflict with the interests of firms that have failed to expand at this level, for example those in the U.S. steel industry. The U.S. state is increasingly faced, like that in Brasil, with reconciling the international expansion of capital with its own national basis of legitimation and jurisdiction. U.S. hegemony abroad establishes the political power of international capital, but it also produces conflict with the interests of indigenous classes, both capital and labour. Once more a focus on international forms of capital to the exclusion of others, misses the crucial new forms of struggle and competition induced not only in countries like Brasil, but in developed nations too. (See Jenkins, 1984a, 1984b, for similar arguments.)

Brasilian development cannot simply be understood through an examination of the needs and interests of international capital. When only one segment of capital is considered the necessity of conflict between it and other factions is lost from the analysis, so that the process of development is crystallised into one of unchanging domination, usually by the international capital of developed nations over the developing or underdeveloped peripheral economies. A study of the political history of development in Brasil, provided by this chapter, shows that such a model is only appropriate to short periods when the interests of domestic classes were suppressed. This suppression itself produces tensions that tend to undermine it.

The chapter has also provided a history of state involvement in Brasilian industrial growth, necessary not only in analysing the relationship between national and international interests, but also essential if we are to understand the growth of the predominantly government controlled steel industry. Because of its state ownership and development through the use of international finance, the requirement for profitable production in steel has been absent. The following chapter shows how the steel sector became a central focus of development by the state, both to clear a bottleneck to development and to ensure nationally based accumulation. The economic viability of investment was therefore relatively unimportant so that any advantages Brasil may possess for the production of steel, such as cheap labour and abundant, high quality iron ore, have been put to poor use, while obstacles such as expensive capital have not restricted growth as they might if the industry had been left to the interests of private business.

CHAPTER 9

THE CLASS HISTORY OF BRASILIAN STEEL DEVELOPMENT

Nationally-specific class interests were central to the development of the steel industry in Brasil, as they were to the development of the economy as a whole. This chapter examines the class history of Brasilian steel development. It focuses on the public sector because of its integrated techniques (chapter 6) and because the state was so heavily involved in the industry's development. It shows that the growth of steel production was determined by political conflict, predominantly between indigenous classes, not because Brasil possessed an economic advantage in the production of steel. One outcome of this pattern of development (state monopoly) is that there is no emphasis placed on the intensive use of labour despite the existence of an apparently direct (Friedman, 1977) system of labour control in Brasil.

The need for a steel industry in Brasil became a major issue for the growing industrial classes after the 1937 revolution. Because of its high linkages and Brasil's supply of high grade iron ore, steel was central to the import substitution growth policies of the Estado Novo. Furthermore it proved difficult to attract direct foreign investment to develop the steel industry, so it had to be done by Brasilian interests. By the early 1970s therefore, when unsolicited interest was forthcoming from abroad, both private and public national capital had created their own economic space in the industry. Steel continued to develop under protection from foreign competition and, in the case of the public sector, dependent for profit less on its own economic strategy than upon its strength of lobby in government.

Development of the steel industry has been mostly influenced by conflicts between branches of capital rather than between capital and labour within the sector. For example, emphasis has been placed on increasing the productivity of capital, rather than that of labour. This reflects the relative cost of these two inputs, but it is also the result of the competitive structure in the industry and the local restrictions on labour supply that afflict most of the steel plants. So labour relations do not emphasise control over speed and intensity of work so much as maintaining labour force reproduction and reliability of supply. As a result labour relations rely less on direct control than might be expected, given a knowledge of the labour laws of the Estado Novo.

Unlike the U.S. industry therefore, class struggle within the steel sector (as opposed to struggle within Brasil in general) has not played a major role in determining the course of the industry's development. More important have been conflicts between private capital within the sector and general class interests through the state, as well as between these groups and branches of foreign capital (especially in the circuit of finance). This chapter examines those conflicts. It therefore analyses the development of an industry in Brasil that exhibits none of the characteristic features of those under the control of multinational corporations. Expensive capital and an inefficient use of labour, which is controlled through some measure of consensus, are not the 'factors' normally associated with the growth of industry in developing countries with military governments.

Section 9.1 analyses the conflicts between branches of the capitalist class and the state which determined the growth of the industry.[1] At first these happened in isolation from foreign interests, but later foreign finance became involved. Section 9.2 turns to examine labour relations in the Brasilian steel industry, and the influence these have over the intensity with which labour is used. The chapter concludes by comparing the rapid growth of steel production in Brasil with its decline in the U.S.A. Growth in Brasil has not resulted from the migration of multinational capital there, nor for the reasons (cheap labour and low costs) normally associated with such a move. Instead class forces indigenous to Brasil were responsible for encourag-

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[1] This section relies heavily on the work of others, especially Wirth, 1970; Braga, 1984; Baer, 1969; Teixeira, 1981; Dahlman, 1979; and Abranches, 1978.

ing the development of a steel industry, not because a profit could be made from it but in order to assist in the expansion of indigenous capital accumulation in general.

9.1 The forms of competition in Brasilian steel development

This section analyses the forms of competition which lay behind the growth of steel production between 1937 and the late 1970s. It is divided into four sub-sections. Section 9.1.1 examines the conditions under which the initial decision was taken by the state to develop a domestic steel industry. These included nationalist political forces and a lack of foreign interest (section 9.1.2). Problems encountered during the 1950s and 1960s (such as a shortage of skilled labour - section 9.1.3) encourage the conclusion that economic reasons alone did not justify the industry's development. But the lack of economic viability and the haphazard pattern of development created conflicts between the state and private capital interests. Section 9.1.4 reviews the resolution of these conflicts late 1960s which provided a basis for the rapid expansion of the industry (section 9.1.5) into the 1970s, an expansion that nevertheless required extensive foreign finance.

9.1.1 The lack of direct foreign interest

In 1929 30,000 tonnes of bars and light structural shapes were produced in Brasil. Steel imports totalled 514,000 tonnes (Teixeira, 1981, pp74-75). However, the reliance on external sources for high priced steel imports was neither an economic nor political problem until 1930. Only with the collapse in the coffee price, the balance of payments crisis, and the altered political structure, did the need to relieve Brasilian industry's dependence on steel imports become a major political issue. The problem in steel, unresolved until 1940, was that neither domestic expertise, nor the capital for the purchase of machinery abroad, was available. But foreign capital at first seemed uninterested and, as the Estado Novo was established, foreign involvement met with nationalist opposition.

There were two efforts before the 1930 crisis to inaugurate steel production. Both involved direct foreign investment, but the failure of each to provide a satisfactory solution to Brasil's steel problem in the 1930's was an indication of the lack of serious foreign concern. Lack of domestic coal and infrastructure were major limitations.

The first was Belgo-Mineira, formed in 1921 with foreign capital from Belgium and Luxemburg along with some local capital in Minas Gerais. Charcoal based furnaces absolved the need to depend on high ash domestic coal reserves or coal imports (both expensive). But the plant could not be built until 1934 when the federal government completed necessary rail links. Production started in 1938, and by 1940 Belgo-Mineira accounted for 61% of Brasilian rolled steel output (Wirth, 1970, p88), but still only 23% of consumption, and no flat products.

Expansion of this project as a solution to the steel problem was not possible (Evans, 1978, p88), because it was based on the economics of charcoal production and therefore limited in size and product range.

The alternative "Itabira Solution" was to be a coke based plant relying on coal imports. It was also to be financed by foreign steel companies, though their main interest was in securing supplies of high grade iron and manganese ore in return. A steel plant would be built on the coast near Vitoria, iron ore exporting ships returning with coal. The financing of a steel plant with exports of iron ore seemed the perfect solution, at least to federal interests.

There was both external and internal opposition, however, to the Itabira project. It's American backers were not really interested in building a Brasilian steel mill, only in the guarantee of ore supplies. Brasil had no coal for coke-based steel production and an inadequate rail system. The U.S. steel companies at least were not compelled by a competitive market (chapter 4) to risk capital investment abroad. In 1939 U.S. Steel sold $5 million of steel to Brasil (Wirth, 1970, p112). Internal opposition came from the Minas Government which preferred that the steel plant be constructed in its own iron ore mining region as a catalyst to industrial development to rival the power of the Sao Paulo coffee planters. It was supported in this by Belgo Mineira and other small local producers anxious to avoid within-sector compe- tition from a large, coke-based company. Eventually in 1929 Minas Gerais allowed a watered-down Itabira project which denied foreign monopoly of iron mining, and did not include a steel plant at all. The collapse of any foreign financial backing in 1929 delayed plans to implement even this project well into the 1930s.

The 1930s crisis and decline in steel consumption[2] delayed the need for domestic steel production. But the new, centralised political structure (chapter 8) meant that there was now federal support for such a project. There was also the potential for federal control over regional opposition to it, especially after the 1937 coup and introduction of the Estado Novo, which was explicit about the government's industrial growth policy.

European and American economies were also beginning to re-arm in the late 1930s, causing a rise in demand for iron ore. The government was now able to attract interest abroad in building a Brasilian steel mill by offering in exchange guarantees on ore supplies. During 1938 and 1939 plans were drawn up for a variety of projects at different locations involving Thyssen, Demag, Krupp (German), Brassert (British), Bethlehem, DuPont, and U.S. Steel, sometimes with majority direct involvement from the foreign concern, always with financial support and technical assistance (Wirth, 1970, pp95-108). The most favoured of these projects was that in which U.S. Steel would build a plant at Santa Cruz, just west of Rio, using the existing railway to Minas Gerais and domestic coal form Santa Caterina.

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[2] 1930 steel consumption was 28% of its 1929 level.

However, all of these projects ran into opposition from nationalist forces. Minerals were seen as Brasilian resources to be extricated from present foreign control. The programme of industrialisation in the Estado Novo was aimed at reducing foreign influence over Brasil, not extending it (chapter 8). Foreign control of the steel industry was acceptable to industrialists because they were aware of the limits on their own ability to develop this capital intensive industry without the prospect of rapid returns, but which was needed to supply cheap steel products to other branches of industry, but it was not to be obtained by trading away control over iron ore resources.

Internal opposition to direct foreign control of steel also came from the army, which had considerable political power after its repeated support of the government through the 1930s. Their concern was as a major consumer of steel based products: they saw steel autarky as essential in case of war. So the introduction of the Mining Code in 1940 prohibited foreign ownership not only of subsoil resources but also, under pressure predominantly from the army, steel companies using those resources (Wirth, 1970, p94).[3]

The Code was introduced just before the finance committee of the U.S. Steel corporation was to make its final decision on the Santa Cruz project, which it subsequently rejected. It is impossible to say whether the plant would have been approved if the Mining Code had not

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[3] It was relaxed the following year to allow foreign ownership in steel once more.

been passed. Most of the encouragement of foreign interest between 1937 and 1940 had come from Brasil, not from abroad. It seems likely that if U.S. Steel had considered Brasil a profitable place for steel making it would have been prepared to get involved despite being denied control. Nevertheless, a combination of nationalist forces and lack of foreign interest can be credited with determining the initial ownership pattern of the coke-based steel industry in Brasil.

Profitable or not, a steel plant was needed to allow industrial growth without intensifying the drain of steel imports on foreign currency. So the state now initiated the project, and through threats to the U.S. government that it would obtain financial assistance from Germany, extricated a loan of $20 million from the Export-Import Bank of America for the purchase of equipment from Arthur McKee and Co (Braga, 1984, p197). U.S. Steel would still supply technical assistance. The remaining $25 million was supplied by the Brasilian government.

The choice of location for the steel plant revealed less concern for economy than for political compromise. Volta Redonda was not as cheap a location for the transport of materials as Santa Cruz, while it also required $10 million expenditure on housing and services for workers at the plant. It was out of the range of naval artillery, however, and therefore the first choice of the army, while it also provided the federal government with a location that did not appear to favour the regional claims of Sao Paulo, Rio, or Minas, but would encourage growth in the depressed Paraiba valley (Baer, 1969).

9.1.2 Expansion by default

The formation of CSN in 1941, its construction and start-up of production in 1947, was part of the nationalist industrial expansion initiated by the Estado Novo. The Companhia Vale do Rio Doce (CVRD, the state-owned iron ore mining company), the FNM and the forerunner of Petrobras were created at about the same time. However, whereas these projects were the result of deliberate state policy, further steel development was privately initiated until 1964.

The maintenance of tariffs on steel imports, but not on the import of steel making equipment, encouraged the formation of a number of private firms during the 40s and 50s. The German company Mannesmann started production in 1954, using electric iron reduction and electric steel furnaces, and later charcoal. It made seamless tubes for the expanding oil industry. Other mills were initiated by indigenous capital, for example Aco Villares (1944), Companhia Siderurgica Pains (1953), and Dedini (1955) (Braga, 1984). But they were mostly of mini-mill scale, technology and product range, or the small scale Brasilian charcoal integrated variant (Teixeira, 1981, pp88-98) (see appendix C). Furthermore many of them ran quickly into financial difficulties. Between 1952 and 1967 the state was obliged to take control of five steel companies which, unlike CSN, had been independently initiated and, due to expensive capital and delayed returns, had run in to financial difficulties. So development was piecemeal, and uncoordinated.

Cosim and Cofavi were founded in 1942, using charcoal and electricity respectively. Cofavi was initially a rolling mill only and came to rely upon Usiminas for its steel supplies. Its proposed backwards integration ran into financial difficulties, so that by 1959 BNDE was the majority shareholder (Abranches, 1978, p362). Cosim went into receivership in 1967 and was taken over by the government. The Acos Especiais Itabira (ACESITA) was founded in 1944 with Brasilian entrepreneurs and finance from the Banco do Brasil (Abranches, 1978, p320). However, by 1952 the company had required so much additional financial help that it was taken over by the Banco do Brasil.

Cosipa was begun by a group of Sao Paulo engineers in 1953, but with a token initial capital of only $50,000. Construction did not start until 1959. The state of Sao Paulo and BNDE, formed the year before, quickly became involved. By 1965, when the plant eventually began production, costs had escalated so much (section 6.2) that BNDE held 58% of Cosipa's equity (Braga, 1984, p201).

Usiminas was formed in 1956 during the period of economic euphoria and expanding foreign involvement of the early Kubitscheck years. Steel was one of the key sectors in the Kubitscheck target plan (Plano de Metas - plan of goals), but there was no steel plan as such. So Usiminas began like Cosipa with private capital, rather than being state initiated like CSN. Local Minas industrialists started, once more with just $50,000, but quickly found support from the state of Minas Gerais which had long fostered the idea of developing steel and related industries in its ore mining areas. Minas supplied 24% of original equity, and BNDE 24.5%, CVRD 9%, CSN 1.5% and other local capital 1%. The remaining 40% came from direct foreign involvement (Cebrap, 1982, p85).

The equity financing of Usiminas from Nippon Usiminas Kabushiki Kaisha, arranged in 1957, coming so soon after Kubitsheck's de-nationalisation of development policy, might have indicated an expression of foreign interest in steel development previously restricted by nationalist government. However, only the timing suggests that the Japanese were concerned with Usiminas as a multinational branch plant. Nippon Usiminas was not a subsidiary of one Japanese steel company internationalising its competitive scope, but a consortium of steel and engineering companies.[4] They were therefore concerned with the Usiminas project in order to demonstrate, "not only the quality of their equipment but also their technological and entrepreneurial capabilities" (Dahlman, 1979, p56). In gaining the contracts for equipment supply through their offer of equity involvement they fought off competition from a wide range of European companies, including Crest (France), Oscar Sinigaglia and Gruiglian (Italy), Krupp, Otto Wolff, Salzgitter and Demag (Germany), and a Czechoslovakian mission, all of whom conducted negotiations with the original Usiminas group. Nippon Usiminas was committed in the initial contract to supply not only 40% of equity, but

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[4] Nippon Usiminas shareholders were: the Overseas Economic Cooperation Fund, Nippon Steel Corporation, Ishikawajima-Harima Industries Limited, Nippon Kokan K. K., Kobe Steel Corporation, Mitsubishi Heavy Industries (75%), and 49 other Japanese enterprises (Cebrap, 1982, p86).

to arrange the financing of 60% of Usiminas' equipment supply from Japan. On the Brasilian side the agreement with the Japanese guaranteed a line of credit (the loans on machinery purchase were for 15 years at 6%, lower than the rate offered by the BNDE) as well as a committment to assist in the construction and operation of the plant and training of personnel. So it was not necessary to rely for these services on CSN (Dahlman, 1979, p59), at that time a prospective competitor.

By the completion of the initial construction stage to a capacity of 500,000 tonnes, the Japanese had expanded their supply of equipment to 80% (Dahlman, 1979), but their share of equity had shrunk to only 21.5%. Costs had risen from an estimated $238 million to $325 million, excluding $60 million for the new city (Baer, 1969). By 1965 the BNDE had become the majority shareholder (59.5%), once more by default.

Foreign direct investment until 1964 was limited therefore to Belgo-Mineira and Mannesmann, both based on production scales and technology best suited to Brasil's particular limitations, and to Nippon Usiminas, whose involvement was largely to ensure exports of technology. Yet this was a time at which Brasil was being opened to direct investment from abroad. Volkswagen, Mercedes Benz and Toyota all began production in Brasil between 1953 and 1958 (TIE, 1984). Despite willingness to accept foreign involvement in steel, demonstrated by the development of Mannesmann, there was little or no interest shown from abroad in developing a coke-based, flat products industry. Foreign companies were concerned only to secure trade contracts for equipment which Brasil had to import, and in arranging financial loans for these purchases, though Krupp, Ishikawajima do Brasil and Industria Electrica Brown-Boveri S.A. were amongst companies which established plants in Brasil to make engineering equipment (Sorj, 1979; Baer, 1969, p109). In this sense the steel industry was being internationalised, but only in the circuit of finance, not productive capital, while the purpose of development was the exclusion of foreign steel from the commodity circuit. It was domestic industrial and regionally based interests that were concerned to develop a steel industry, but unlike foreign capital they did not posses the necessary resources. Though never consciously planned, the task of developing the steel industry therefore fell to the state.

9.1.3 Skilled labour supply

In addition to poor coal supplies and transport infrastructure, a lack of skilled labour also provided a constraint on the development of a technologically advanced steel industry in Brasil. Evidence of the shortage, as well as an indication of its impact on development, is demonstrated by the improvements achieved by direct Japanese involvement at Usiminas. This provides further support for the argument that it was political forces that lay behind steel industry growth rather than the economic viability of the sector itself.

There has been no problem recruiting unskilled workers for production operations, and training of semi-skilled workers is mostly conducted on the job (Sorj, 1979, p126). However, problems exist in the supply of skilled technicians and engineers who receive their training in special courses. Most skilled labour is trained through the Servico Nacional de Aprendizado Industrial (SENAI) (national institute of industrial training) which is financed through a contribution by firms amounting to 1% of their wage bill. Baer (1969) records ratios of production workers to engineers which were twice as high in the U.S. as in Brasil, and up to six times as high for technicians.

Usiminas suffered less from this problem than others due to the direct involvement of Japanese capital. The equity agreement in 1957 provided for the operation of the plant to be conducted jointly, and all the technical and administrative directors and department chiefs were Japanese. A series of joint missions were responsible for planning and locating the plant. "The Brazilians and the Japanese were to work closely in teams" though "it was implicit in the agreement that the Brazilians were to assume greater responsibility as they developed their capabilities under Japanese training" (Dahlman, 1979, p59).

Steel production began at Usiminas in 1962, just three years after the beginning of construction, whereas the opening of Cosipa was repeatedly delayed until 1965. While this was partly due to problems encountered with land stability at Cosipa, and the direction of funds by BNDE initially towards the completion of Usiminas (Teixeira, 1981), Cosipa also suffered from a lack of external technical assistance.

Kaiser, the main American designers for Cosipa, kept only 5 engineers in Sao Paulo during construction, the majority of assistance coming from Cobrapi (Dahlman, 1979, p56). Usiminas has always completed its subsequent expansion stages ahead of Cosipa and CSN. A report to the IBRD on stage III construction at Cosipa cited problems in technical management as one of the reasons for excessive delays (Cosipa, 1985). Usiminas also operates with greater labour efficiency than the other two (see section 9.2.3).

The lack of skilled labour was an additional problem for domestic interests trying to develop a steel industry. The persistence of that development, despite this and other restrictions, is further evidence that the steel industry was not expanded purely for its own profit-making potential. Indigenous, nationalist development motives were behind the industry's expansion. Import substitution (currency saving) as well as the regional and national development of an economic base, were more important than profit generation. In such a mode of growth however there lay a contradiction between the development role of steel companies as state corporations, and their positions in the market as capitalist enterprises. These conflicts had to be resolved before extensive growth of the industry could be achieved.

9.1.4 Government coordination and spheres of competition

By 1966 Brasil produced 93% of its domestic steel consumption, up from 6% in 1929 and 23% in 1939. But the pattern of this development had not been well-coordinated, government involvement except in CSN being unplanned.

The inefficiency and lack of coordination between the three coke-based plants by 1965 was a result of the political content of steel development up to this time. To satisfy regional interests capital had been sunk into three plants of about 500,000 tonnes capacity each (CSN had by 1965 expanded its capacity to over 1 million tonnes), all with an excess of rolling capacity, instead of building one at an efficient scale. Furthermore the regionally influenced decisions had failed to isolate a cost efficient location. Usiminas in 1966 held an advantage over the other two in transport costs for inputs per ingot tonne of between $1 and $4, but a $6 to $7 disadvantage on the cost of transport to market (Cebrap, 1982; BAHINT, 1966). Both CSN and Usiminas had required the construction of new cities due to their isolation from labour markets.

The BNDE was adequate as an institution for providing government finance for steel industry growth (63% of BNDE's resources went to the steel industry between 1960 and 1965) but it had failed to produce a coherent expansion strategy (Abranches, 1978). This placed the three coke-based plants in competition for government money, each anxious to further its own expansion plans in the increasingly depressed market of the early 1960s.

Demand for steel continued to stagnate with the crisis of the early 1960s and the post - 1964 deflationary policies, which included price controls on steel, intensifying competition within the sector. In 1965 steel consumption was slightly below its 1962 level, though it was during these years that Cosipa and Usiminas started production. The three coke-based plants were also committed to further expansion beyond their present inefficient scales.

Nor was conflict restricted to the government branch. "The sector's situation by the mid-1960s was characterised by intense market disputes, in a context of excess supply, idle capacity, and of a price policy initiated in 1964 which had a very negative impact upon profitability" (Abranches, 1978, p334). But the intensification of competition produced by deflationary price controls and market decline also encouraged private and state capital to unite against government policy. The industry association, IBS, which represents both private and state branches, said in 1968 that,

> ... the Brazilian steelmaking sector as a whole is completely unorganised, deficient and ill oriented with respect to its basic goals, its structure, and the economic situation of the country. It has entered a phase of impoverishment since 1964, when a severe policy was established in the country to fight the inflationary outbreak. This policy, due to the rigid and contradictory control of steel prices, has provoked a serious crisis in the sector that almost led to total ruin... (Instituto Brasileiro de Siderurgia, Boletim IBS, February, 1968, p15; quoted in English translation by Abranches, 1978, p335).

A coordinated approach to development would offer both public and private steel companies protection from competition which they were not themselves equipped to withstand. A state policy-making agency for the steel industry would benefit the steel producers in three ways: it would help to eliminate uncertainty through the formalisation of expansion proposals, it would give steel companies themselves a greater say in the development of steel industry policy, in areas of expansion, price and tariff regulation, and it would provide for an official delimitation of the division of labour between public and private firms (which amounted to a commitment by the government to keep out of the non-flat steel products sector) (Abranches, 1978).

It was also in the interests of the foreign development banks that steel industry development policy should be coordinated. Foreign pressure encouraged not just general level deflationary policies, but also specific development plans for projects in which its money was involved. So it was on the advice of the World Bank that the government contracted in 1965 Booz, Allen and Hamilton International (BAHINT) to conduct an analysis of the steel industry and produce expansion plans up to 1972. The report, submitted the following year, emphasised the economic constraints which Brasil faced as a steel producer, and reflected the stagnant steel market of recent years in its forecasts for steel demand.

While BAHINT (1966) presented a realistic economic solution, it did not take account of the internal political interests concerned with steel industry expansion. Instead it took a position which reflected that of developed country steel corporations, that Brasil was not suitable for rapid growth in steel output especially at a time when world steel supplies were abundant. (The U.S. steel companies for example, already under increasing international competition by the mid-60s, would not have been anxious to encourage the growth of steel output in other countries.) The BAHINT proposals were seen as anti-nationalist by domestic steel companies and therefore did nothing to solve the conflicts within the sector, and between it and the state (Abranches, 1978).

Pressures within the steel industry therefore contributed to those which characterised the economy as a whole (chapter 8). Deflationary policies appeased foreign interests and brought inflation under control, but also created tensions between the state and indigenous capital, even with those publicly owned branches. In 1967 therefore the government formed the Steel Industry Advisory Group (GCIS - Grupo Consultivo de Industria Siderurgica) with representatives from government, public and private companies, to formulate a national steel plan which would deal with internal grievances.

The recommendations of the GCIS were notably nationalist in comparison with those of the BAHINT report. It suggested a 25% increase in prices and an increase in tariffs to 40% for all steel products (Braga, 1984, p206). Expansion of the industry would be in two stages, one of 3.4 million tonnes to 1972 (compared with 2.2 million suggested by BAHINT) and 5.3 million tonnes to 1977, a planned capacity of 13.4 million tonnes. Plant capacities would be balanced. CSN would concentrate on the production of coated flats, Cosipa and Usiminas on un-coated flats. It was also understood that the non-flat sector should be left to private capital. Most important, the GCIS recommended the installation of a government body to formulate and coordinate steel industry policies.

The GCIS was successful because it allowed the political expression of the interests of capital within the steel sector. It provided a political solution to the competitive crisis which BAHINT had tried to solve technically (Abranches, 1978). Companies would be protected from foreign competition within their own sector through steel import tariffs, while indigenous private interests found a channel for their own protection from encroachment of the financially more powerful public companies. Some basis for relaxing competition within the state sector itself was provided through planned specialisation. The Conselho Consultivo da Industria Siderurgica (CONSIDER - Advisory Council on the Steel Industry, subsequently re-named as its jurisdiction was broadened), formed in March 1968, was to represent steel sector interests in government. This strengthened the industry's ability to compete in the formation of pricing policy,[5] previously administered in favour of the development of steel using sectors like the construction and car industries, as well as providing means for securing long term commitment from government over sources of finance for expansion projects.

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[5] CONSIDER only obtained executive powers as opposed to advisory ones in 1970 when it became the National Council of the Steel Industry. In that year it lobbied successfully for the maintenance of a 5% price-cost margin as a guideline for price increases (Braga, 1982, p209-212).

While Consider created a forum for conflicts between public companies and more general government economic policy, it was still a government department without control over day to day running of individual firms. Siderbras was created in November 1973 as a holding company, intended to allow direct government control over the running of its firms, though it thereby threatened the individual autonomy of steel companies in a way that Consider did not. (It also meant a direct financial loss to BNDE which was forced to transfer its stock to the new company.)

Through these institutional changes the form of competition both within the steel industry, and between it and other sectors, was restructured, allowing for renewed growth. Foreign commodity and productive capital were excluded, only foreign finance being admitted as a necessary participant in the industry's expansion. In the non-flat sector private entrepreneurs would find their own forms of competition with relatively inexpensive technology, but would be protected from entry by either state or foreign capital. The flat integrated sector was placed under state monopoly, its expansion to be coordinated, and competition between its companies eliminated (though problems in collecting data experienced by Themag suggest some resistance to this - see chapter 7).

The state monopoly is different from ordinary monopoly. It depends for its accumulation of surplus on state tax, credit, subsidy, tariff and prices policy, not upon its own ability to set monopoly prices. It does not therefore produce excess profits through surplus appropriation as do monopolies erected as a competitive strategy. Instead the purposes are to build industry which private capital cannot afford, stimulate regional growth, and in periods of inflationary crisis reduce the cost of inputs to other sectors, all of which facilitate continued accumulation.[6] The state has become engaged directly not just in surplus production (which it also effects through wage regulation), but more especially in surplus appropriation and redistribution. It is not necessary at any one time therefore that the steel industry should make a profit if other interests require cheap inputs of steel to stimulate growth or bring down inflation. Price controls transfer surplus produced in the steel industry to other, competitive sectors. If the industry loses money then surplus must be transferred to it, through the state via taxation or through foreign credit. Conflict between the steel sector and other class interests is therefore transferred to the arena of state policy.

Under this form of competition the pressures to improve production efficiency are relaxed, though not removed. This is because negative profits do not threaten the continuation of production in a

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[6] For a detailed analysis of functions of state monopoly see Kozlov, 1977; of the relative state autonomy usually associated with these kinds of intervention, a form which certainly applies to the Brasilian case, and the specificity of this and other state forms, Jessop, 1982, p55-57, and Fine and Harris, 1979, pp147-154. The case of Brasil is quite different in certain respects however from those considered in the literature about state monopoly capitalism. State intervention in Brasil is concerned with furthering accumulation in a fragmented class society experiencing dependent development (chapter 8), rather than purely at crisis management.

state industry. But that cost does produce conflicts within the state because losses must be drawn from other parts of the economy. Attempts have therefore been made in steel to make efficient use of capital equipment, which is expensive, and to maximise output (section 9.2.1), but not to make efficient use of labour which is cheap and in local labour markets dependent on steel industry employment. As will be seen in sections 9.2 and 9.3, this form of competition has conditioned the response of the state steel sector to the independent organisation of labour since 1978, and to the crisis of inflation and underconsumption of the early 1980s.

9.1.5 Foreign finance and Stage II and Stage III expansion

In 1969 Consider produced a national steel plan (PSN - Plano Siderurgico Nacional - Consider, 1969) based on new projections of domestic steel demand for rolled products of 11.4 million tonnes by 1980. The plan was for two stages of expansion, one to 1976, the other to 1981, to bring Brasil to a crude steel capacity of 19 million tonnes (see table 9.1).

The PSN was too late. Indecision through the preceding six years over the structure of decision making, meant that domestic supply began to fall behind demand. Especially during the pre-1974 economic euphoria in Brasil and the world boom in steel demand of 1973 and 1974, steel imports drained foreign currency and threatened to restrict

Table 9.1 PSN, 1969, planned expansion in thousands of tonnes of crude steel.

	1970	1976	1981
Flats	2,800	6,900	10.900
CSN	1,400	2,500	4,000
Cosipa	600	2,000	3,400
Usiminas	800	2,400	3,500
Non-flats	2,150	4,650	8,000
Total	4,950	11,550	18,900

Source: Braga, 1984, p216; Consider, 1969.

growth in steel using industries.[7] By 1972 forecasts were putting 1980 steel demand at 14.6 million rolled tonnes, and by 1975 at 18.5 million, above the capacity projected in the 1971 plan (see table 9.2).

Some forecasts also made provision for capacity to export. According both to the GCIS report of 1967 and the PSN of 1969, a maximum of 10% of steel output was to be targeted for export, but comparison of plans with demand forecasts shows some variation in this percentage. For example the PSN recommended expansion to 32% above contemporary forecasts for 1980 output,[8] but plans released by Consider in November 1976 to spend $18.7 billion on expansion of crude steel

[7] Imports cost $1.4 billion in 1974 (IBS, Statistical yearbook, 1985).

[8] The forecast was for 11.44 million tonnes of rolled consumption, the expansion plan for 18.9 million tonnes of crude production, which assuming 80% yield is an excess of 32%.

Table 9.2 Demand forecasts for rolled products.

	Year of Forecast 1966	1971	1975	1977	Actual Consumption
Flats					
1966	1,269	-	-	-	1,494
1970	1,795	-	-	-	2,074
1975	2,692	3,561	5,085	-	4,600
1977	-	4,325	5,354	-	5,056
1980	-	5,788	10,328	7,083	6,388
1985	-	-	18,785	13,001	5,411*
Non-flats					
1966	1,383	-	-	-	1,510
1970	2,006	-	-	-	2,105
1975	2,899	3,548	4,357	-	4,237
1977	-	4,276	5,725	-	4,250
1980	-	5,658	8,201	6,292	5,672
1985	-	-	14,674	10,844	3,838*
Total					
1966	2,652	-	-	-	3,004
1970	3,801	-	-	-	4,179
1975	5,591	7,109	9,442	-	8,837
1977	-	8,601	12,836	-	9,306
1980	-	11,446	18,529	13,375	12,060
1985	-	-	33,459	23,845	9,249*

Sources: Braga, 1984, p230; IBS, Statistical yearbook, 1985.
*: Actual consumption figures are for 1984.

capacity to 41 million tonnes by 1985 (BOLSA Review, November 1976, p623), or 32.8 million tonnes of rolled output, were less than 1975 forecasts for 1985 demand. An examination of the specific project proposals which appeared between 1971 and 1976 (table 9.3) nevertheless reveals intentions to develop the industry beyond import substitution in order to increase export earnings.

It was inevitable that foreign capital should be involved in expansion of this scale, but a distinction was drawn between domestic and export projects. The nationalist forces behind the creation of CSN were still present in the authoritarianism of the early 1970s, and national capital in steel had created economic and political space for itself through the establishment of Consider and Siderbras. The division of the industry between private and public interests allowed no room for foreign control in the production of steel for domestic sale. The PSN anticipated that 47% of expansion costs would be met by foreign loans. Financing of export projects would require direct foreign involvement, though no plants would be foreign controlled. Direct investment was to be limited to export oriented projects, and even then had to be in partnership with the state. Limiting foreign investment to 49% guaranteed improved financial flows and technical assistance without jeopardising control.

In the early 1970s foreign corporations showed great interest in this kind of arrangement, and a series of ambitious joint projects were suggested. In 1971 the construction of a plant at Tubarao near Vitoria with a capacity of 1.5 million tonnes (originally suggested in 1967 by GCIS) was to include 52% equity and 48% from Thyssen (BOLSA Review, March 1971, p154). By 1973 the plan was to build it for 3 million tonnes of semifinished output with 51% government and 24.5% each from Kawasaki and Findsider (Braga, 1984, p219; BOLSA Review, December 1973, p611). In 1971 Mitsubishi was interested in 58% control of Acesita's planned expansion to 1 million tonnes (BOLSA Review, April

1971, p217) and in the same year Nippon was seeking permission to build an 8-10 million tonne plant for semi-finished exports. This eventually took shape in plans for a plant at Itaqui (state of Maranhao) to use newly discovered iron ore reserves at Serras dos Carajas with a capacity of 4 million tonnes by 1980, and 12 million by 1985, but with 49% participation from Nippon and U.S. Steel (Braga, 1984; BOLSA Review, November 1973, p551). (Amazonia Minaracao was controlled by CVRD, but was joint owned by U.S. Steel.)

After 1974 the demand for steel both in Brasil (influenced by relatively slow economic growth, increasing oil prices and credit driven inflation) and world-wide stagnated. Both foreign and Brasilian interest in expansion of capacity declined, and most of the projects listed in table 9.3 were never implemented. Itaqui, the Hot Strip Mill of Vitoria, Santa Cruz, the Acesita expansion, the six new Direct Reduction mills and the stage IV at Cosipa were never realised.

Stage II expansions of CSN, Cosipa and Usiminas were completed between 1977 and 1978. Total rolled steel output reached 8.8 million tonnes in 1977 and in 1978 more rolled steel was produced than consumed (figure 6.1). But consumption was growing again after two years of relative decline in 1975 and 1976, and 1977 forecasts put 1980 and 1985 requirements at 13.4 million and 23.8 million tonnes respectively (table 9.2). Stage III expansion to balanced capacity for the three established mills was therefore justifiable on the basis of demand alone. Acominas was adopted to plug a projected shortfall in heavy structur-

Table 9.3 Expansion plans in the government sector existing between 1971 and 1976, thousands of tonnes crude steel.

Type of Prod'	Project	Capacity	Completion	Foreign Involvement
Flats	CSN	2,500	1974	-
		4,600	1978	-
	Usiminas	2,400	1974	-
		3,500	1978	-
	Cosipa	2,300	1974	-
		3,500	1978	-
		5,800	-	-
Semi-finished	Tubarao	3,000*	1977	Kawasaki 24.5%
		6,000*	1980	Findsider 24.5%
		9,000*	-	(Originally Thyssen 48%)
	Itaqui	4,000*	1980	Nippon and
		12,000*	1985	U.S.Steel, 49%
Flats	Hot Rolling	1,500*	1977	Klockner, 40%
	Mill, Vitoria	3,000*	1980	
Non-flats	Acominas	2,000	1980	-
	Mendes Junior	1,200	1980	Mitsui (1973)
Flats	Santa Cruz	3,000	-	-
Specialty	Acesita	1,000	-	Mitsubishi, 58% (1971)
Direct reduction	Six new mills	2,500	1980	-

Source: Braga, 1984, pp223, 219; BOLSA Review, various issues.
*: Finished capacity.

als. At present Aliperti and CSN are the only producers in this category.

Tubarao remained as the only export oriented project involving foreign steel companies. It is also distinct in Brasilian steel development because there is evidence that the Japanese involvement was aimed at the internationalisation of production, not merely the export of machinery as in the case of Nippon Usiminas. First, Kawasaki in Tubarao is one company, not a consortium of steel and engineering companies as with Nippon Usiminas. Second, when Tubarao entered production in 1984, Kawasaki and CVRD together purchased a majority share in California Steel Industries (previously the Fontana works of Kaiser Steel, closed in 1983), and renovated the rolling equipment there. The purpose was to roll sheet and plate for the construction and car industries from 800,000 short tons of slab imported from Tubarao (Iron Age, May 7, 1984, p17; American Metal Market, November 13, 1984, p3). Kawasaki, as with Nippon and Mitsubishi (chapter 5) is internationalising its production, but this strategy has only penetrated the Brasilian economy at Tubarao.

The domestic-oriented expansions relied heavily on foreign finance. But it was the merchant banks instead of the government banks that supplied the majority of early stage III foreign financing (appendix D). The rationale of merchant bank lending is different from that of development bank lending. Development banks are not necessarily lending for rental profits, but take an interest in the viability of the specific projects for which they lend money. The merchant banks are concerned to lend as much money as they can without running stocks too low. The aim is to avoid liquidity but maintain stability (chapter 2).

In the mid-1970s merchant banks were very liquid with oil dollars and therefore encouraged development projects in reliable countries like Brasil. Merchant bank lending accounted for 12% of international public debts in 1967, but 50% by the end of 1975 (Sampson, 1982, p141). While it may have been difficult to obtain all the necessary funds for Stage III expansion quickly from development banks, Siderbras found this an easy task through merchant bankers who were only concerned to obtain guarantees from the government. In 1976 and 1977 alone loans worth at least $2.3 billion were secured from merchant bank consortia for the purchase of stage III equipment from abroad (appendix D).

However, as argued in chapter 2, the relationship between productive and finance factions is only one of partnership in the initial stages of development. Stage III could not have been contemplated without foreign finance, and the decision to complete expansion helped merchant banks reduce their liquidity. But contradictions arose for both sides of this partnership. The reliability of many loans made to Third World countries, later threatened merchant bank stability as developing countries began to default on their payments. When the debtor is a foreign government, recourse to bankruptcy proceedings is no option. For creditors, in this case Siderbras, the easy availability of money and avoidance of development bank restrictions on project development meant payment of higher interest, (Scammel, 1983, p200) especially as the LIBOR on which most of these loans were based rose rapidly in the early 1980s (table 7.18). The flow of surplus abroad contradicted the import substitution purpose of development.

By 1981 therefore the class structures which had facilitated accumulation were beginning to fall apart. Escalation in Brasilian debt and inflation, continuing breakdown in the centralised method of labour control (see chapter 8), and general world crisis, caused a fall in steel demand. It also became more difficult for Siderbras to obtain funds for the completion of Stage III projects, except at Tubarao and Usiminas where direct foreign involvement assisted cash flow and technical capability. Decline in output increased the effect on costs of the escalating debt burden.

By 1983 with increased costs, stalled expansion projects and demand almost as low as it had been in 1973, the Brasilian steel industry was in a crisis which, in terms of its surface appearance, was as deep as that afflicting the U.S. industry. However, the class relations of this crisis as well as its technical form (high debt but low marginal cost) differed markedly from those in the United States. Consequently the policy response to the crisis in demand was also very different (section 9.3).

9.2 Labour relations and labour intensity in Brasilian steel

Brasil is characterised by an institutionalised system of labour relations that controls the political mobilisation of the working class and divides workers into local regions (chapter 8). Unlike the United States therefore, management in Brasilian steel does not face a united labour force. However, management does not have a free hand to organise work the way it wants, because there are problems of control at two different scales. While the institutionalised system of labour control restricts worker action at a national scale and effectively withdraws the right to voice grievances through strike action, or across a whole sector, it does not enforce any particular form of control on the shop floor. This may be worked out separately in different industries and in different geographical locations. Labour relations in steel are conditioned by local characteristics of plant location, shortages of skilled labour and the form of competition in the industry. They have been built upon the provision of welfare services and the paternalist creation of an identity of interest between workers and company.[1]

The industry is therefore characterised by an externally enforced, direct method of labour control, but a relatively indirect method within companies. Yet the two scales of control are interlinked. The indirect forms are local and are therefore dependent upon the maintenance of the labour laws to keep workers divided nationally. But it is also local action in particular places and industries in the late 1970s and early 1980s that has undermined the strength of institutional control (chapter 8).

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[1] There is evidence that suggests that this form of control has been more difficult to maintain in the labour intensive, profit dependent private sector (see section 9.2.2).

Section 9.2.1 examines the form of labour relations within the steel industry. Because many steel plants are in isolated locations they are limited by the characteristics of local labour markets. It is not possible therefore to impose as direct a system of labour control on the shop floor, like that for example in the multinational car plants in Sao Paulo which depends on high rates of labour turnover (Humphrey, 1982), because labour supply is too restricted. Section 9.2.2 examines the effect this system of relations has upon labour intensity. It is shown that at least twice as much labour is used in Brasilian mills when compared with the U.S.

9.2.1 Labour relations in Brasilian steel

Some analyses of labour relations have identified the development of a dual labour market (Doeringer and Piore, 1971). In Brasil this phenomenon has been found to exist in multinational and other modern industries, that require a technically skilled work force. They pay relatively high wages to a privileged group of qualified workers (Miller, 1971). However, Humphrey (1982) provides an alternative thesis. According to Humphrey's analysis of the multinational car plants concentrated in Sao Bernardo (a municipality of Sao Paulo), companies pay high wages not so as to maintain a stable labour force, but so that they can maintain high rates of turnover. The payment of high wages makes it easy to recruit new workers (often those dismissed from other factories), of which there is a relatively abundant supply in the Sao Paulo area. In 1977 56% of Brasilian industry was concentrated in Sao Paulo (Storper, 1984). The resulting ability to maintain a high rate of turnover means that political organisation within the work force is reduced as the number of workers with long service is kept to a minimum. Furthermore the ability to maintain a threat of dismissal is a tool used to maintain intensity of work, as well as competition between workers for promotion up the job ladder (Humphrey, 1982, pp63-104; TIE, 1984).

In the steel industry, however, plants are more dispersed, being predominantly located near inputs and require workers with specialised skills. So there is a shortage of skilled workers. A system of labour control based upon high rates of turnover is therefore less easy to establish. According to Cebrap (1982) there is an extreme graduation in wages at Usiminas: the highest non-management personnel earn 8 times the lowest. This helps to create a "double structured society", for the higher skill jobs cannot be attained by the lower level workers, many of whom have not received the necessary school education to qualify for training programmes (Cebrap, 1982, p164; Sorj, 1979, p130). "The possibility of a semi-skilled worker to rise to the category of a skilled worker is minimal" (Sorj, 1979, p130).

Detailed information on rates of dismissal would help to show that the method of control used in car factories does not apply in steel firms. Cebrap's (1982) report on Usiminas gives rates from a high of 11.2% in 1978 to 4% in 1981. The rate decreased each year. At CSN there were 547 reported dismissals in 1984 from an average labour force of 23,973, or 2.2%. In 1983 the rate was 2.7%.[2] However, Humphrey (1982, p98) gives average dismissal rates in 5 car plants for 1978 of 11.5%, which is almost the same as Usiminas in the same year.

The discrepancies between dismissal rates for the two industries indicates one of two things. First, dismissal is not used in government steel plants to control labour in the way that it is in multinational car plants. Alternatively the rate of dismissal has declined in both industries since 1978 due to pressures brought by independently organised labour.[3] Some of the steel strikes listed in table 9.5 and detailed in Appendix L included demands to increase job security. A study by Abranches (1983) conducted in 1982 and 1983 of labour force grievances at CSN shows that job security was a major concern of the workers and was the issue around which negotiations were focused in 1983. But the timing of this grievance means that it might have been a reaction to falling steel demand and output as much as to high rates of dismissal, which were already low by this time. Data on dismissal rates therefore show that the system of labour control prevalent in the car factories of the late 1970s was not used at CSN and Usiminas in the mid-1980s. But whether this indicates a change it is not possible to say from this data.

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[2] These data were obtained directly from the company.

[3] Data on dismissals for the car industry after 1978 would be required to confirm this conclusion.

There is other evidence of a less direct form of labour control (Friedman, 1977) in steel factories. The integration of social and welfare services with company operations, and the single industry focus of steel towns together build a common interest between workers and management and provide for a paternalist method of labour control in many steel firms. CSN, Acominas and Usiminas are the focus of company towns built specifically for steel workers. Housing at Volta Redonda is virtually free (Baer, 1969), raising significantly the real income of the workers: income that is lost if the worker moves on. Medical services are supplied by all the state run steel companies. At CSN 942 employees (just under 5%) in 1984 were involved in the provision of medical (733), recreational and catering services (data from the company). Appendix M lists other social benefits to steelworkers at Usiminas which are supplied above what is required by law.

Sorj's (1979) study of Belgo Mineira's wire division in Belo Horizonte identifies a similar strategy. Local transport and medical services are supplemented by the company partly to maintain reliability, for public services in these areas cannot guarantee punctual arrival at the plant, nor the maintenance of adequate levels of health. These services also establish "a paternalist relation between the firm and the workers" and become "identified by the workers as an act of benevolence towards them on the part of the firm" (Sorj, 1979, p156). Housing is supplied for technically skilled workers and management (and can be purchased via direct deductions from salary), while other services such as the restaurant and company clubs are aimed specifically at skilled workers. The general aim is to maintain a stable rather than an unstable work force.

High wages, relative job security and access to company services qualify steel workers as a privileged group. This conclusion is consistent with the traditional view of dual labour markets in Brasil (Miller, 1971), high wages being paid to attract and keep relatively scarce skilled workers, though it contrasts with Humphrey's (1982) analysis of the car industry. It is also consistent with O'Connor's (1973) and Doeringer and Piore's (1971) conclusions about labour relations in monopoly industry where high wages and provision of services can be used to buy labour peace. Furthermore the state steel plants, especially CSN and Usiminas, were located to stimulate development through their forward linkages, and to provide employment. Before CSN was built in the Paraiba valley the area was economicly depressed with an abundant but under-utilised labour force (Baer, 1969, p136). High labour turnover would not be consistent with such policy objectives.

While all industry in Brasil is subject to Estado Novo labour laws, nevertheless there is evidence that the system of control within factories, and their associated communities, are different between the car and steel industries, and in localities where the characteristics of the labour market differ. The system of labour control in steel is based more upon consensus between management and labour than is the car industry in Brasil.

9.2.2 Struggle and competition

Another difference between the car and steel industries is the form of competition. At least in the government steel firms the incentive to make a profit must be balanced with state concerns to keep steel prices low and to provide employment. (Section 9.1 showed how these conflicts are resolved through the intermediary institutions, Siderbras and Consider.) This form of competition in steel also affects the way in which labour relations have developed, especially regarding the intensity with which labour is used.

Insofar as management-labour cooperation is bought through welfare service provision, this form of control also presents labour control problems. Paternalism may help to maintain stability amongst skilled workers and ensure that labour is reproduced, it is not so suited to maintaining high speeds or intensity of work. Nevertheless high fixed capital to labour cost ratios in Brasilian flat steel (164% in 1981 compared with 17% in the U.S., table 7.8) makes this a relatively unimportant limitation.

In the government sector there is evidence that neither speed nor intensity of work is emphasised. During the early 1970s for example there was pressure on the steel industry to expand output, but capacity additions from Stage II were not scheduled for completion before 1974. Capacity was expanded therefore through intensified use of existing equipment. Table 9.4 shows how the capacity of coke, sinter, blast furnace and steel plants were stretched beyond their initial capacity ratings. There is no evidence to suggest that these improvements were the result of working the labour force any harder. Rather most of the modern equipment in steel making depends on technical adjustments for improved output. For example blast furnace output was increased by improving raw material input and material preparation, greater standardisation of operation, greater use of iron pellets, improvement in the refrigeration of valves, and the dynamiting of deposits inside the furnace (Dahlman, 1979, p206-208). Section 9.2.3 shows how Brasilian firms do not use labour very intensively when compared with firms in other countries.

Paternalism can also emphasise intra-class division through preferential treatment of skilled labour. At Volta Redonda for example the configuration of housing is divided by quality and level of worker, management at the top of the hillside, semiskilled and unskilled

Table 9.4 Capacity stretching of original equipment, Usiminas.

	Sinter	Coke	Blast Furnace	Steel
Nominal Capacity	770	507	504	500
Production in year before new equipment installed, (1973)	1,544	634	1,197	1,179 (1972)
% increase	101	25	137	134

Source: Dahlman, 1979, p149.

accommodation at the bottom, and skilled workers in the middle. "This gradation is also transmitted into the social life of the city, where everyone is connected to the firm" (Baer, 1969, p137). At Belgo Mineira the greater provision of services to high level positions which are inaccessible to the majority may create grievances as much as allowing for control. As ties to the firm are most important in isolated labour markets, so the local agglomeration of privileged workers and relative stability of the work force are conditions conducive to their collective organisation.

Strikes in the Brasilian steel industry since 1978 have been small in number and usually short in duration. Table 9.5 and Appendix L review these strikes and the issues over which they were fought. The two most notable characteristics of these events are that they are all (bar one) specific to a single company, and most of them occurred in the private sector, almost exclusively until 1984. The first illustrates how the government union structure has managed to maintain, even until 1985, a division between labour across the sector. The second demonstrates a different attitude towards labour relations in companies influenced by different competitive forces.

The two foreign run companies, Mannesmann and Belgo Mineira, have been the site of 9 strikes during this period. CSN has been virtually strike free, while Usiminas has not experienced any stoppages. This suggests an alternative reaction to independent labour organisation in the competitive private sector where profit require-

Table 9.5 Strikes in Brasilian steel, 1978 - February 1985.

Company affected	Date	Number of strikers	Duration
Mannesmann	9/78	900	6 hours
Belgo Mineira	9/78	4,100	5 days
Mannesmann, Belgo-Mineira, Pains, 1,500 other enterprises in Contagem.	9/79	36-40 thousand	4 days
Belgo Mineira	10/79	14,000	7 days
Sidepla	3/80	300	1 day
Belgo Mineira	10/80	4,500	3 days
Cimetal	1/81	250	3 days
Cosipa	2/82	7,000	1 hour
Belgo Mineira	7/83	3,000	2 days
Aparecida	11/83	60	1 day
Electrometal	11/83	50	3 days
Mannesmann	11/83	200	8 days
Acos Villares	11/83	1,400	1 hour
Mannesmann	2/84	300	5 hours
Cosipa	2-3/84	12,000	3 days
Belgo Mineira	2-3/84	3,000	3 days
CSN	6/84	22,000	5 days
Cosipa	9/84	7,000	15 hours
Aparecida	2/85	2,200	---

Source: DIEESE, and Boletim do DIEESE, various issues. See also Appendix L for details of demands.

ments may restrict the maintenance of privileged labour conditions. The strike at Cimetal in 1981 for example was conducted after the company had submitted preliminary bankruptcy proceedings (appendix L). Private sector stoppages have included demands for the reinstatement of dismissed workers and payment of wages owed by the company. Strikes in the public sector have been over wage increases and job security.

The differences in demands and the regularity of strikes may indicate a stronger use of paternalism through welfare and service provision in public sector firms than in the private sector where there is inter-firm competition. However, there are inconsistencies which indicate that the form of labour relations may be influenced as much by local conditions as by competitive structure. For example there have been three stoppages at Cosipa between 1982 and 1984. But Cosipa is without its own city and its labour market is not isolated, so the networks of paternal control may be weaker.

In general, those companies with well developed networks of dependence between workers and the company seem to have a basis for management - labour consensus which is initially sufficient to maintain smooth accumulation even as the strength of the state centralised method of control is weakened.[4] These tend to be firms in the public sector or those that are also located in isolated or single industry labour markets.

Yet this localised system of labour control could not operate if labour was united across the sector. Breakdown of the state-run municipal sindicatos opens the opportunity for workers to form a steel union. The demand by CSN workers in 1984 for wage parity with Cosipa (appendix L) spells significant changes in labour relations and control (it implies for example similar job scales in all plants and an end to competition between companies to keep skilled labour), giving the union the power to disrupt steel supply. This could bring major changes to the industry which so far class struggle has failed to affect greatly.

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[4] More detailed research at a plant level would be required to substantiate this claim.

Most steel development has been in the context of Estado Novo labour law and a spatially divided labour force. That is why the preceding sections have emphasised the relations between capital factions in determining the course of that development. But class struggle should not be de-emphasised just because it does not appear to have been instrumental in creating change.[5] The history both of steel and the Brasilian economy has depended upon the state mobilisation of labour in 1937 and the maintenance of Estado Novo labour laws until the mid-1980s.

One outcome of the form of labour relations, the form of competition and the relative cost of capital and labour inputs in Brasilian steel, is that labour is not used intensively. This contradicts most of the literature on international development which presumes that the direct forms of labour control in third world countries allow labour force flexibility which is not achieved with organised labour in developed countries (chapter 2). Yet as sections 9.2.1 and 9.2.2 have shown, although Brasil as a whole is characterised by a direct form of labour control, the particular conditions for steel production have encouraged a less rigid relationship between management and labour. The following section shows that this has led to a far less intensive use of labour in Brasilian steel than the literature on the development of the new international division of labour might lead us to expect.

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[5] Evans (1979) for example gives this as a justification for ignoring labour relations completely in his analysis of Brasilian development.

9.2.3 Labour intensity

Brasilian steel firms use more labour than those in the U.S.A. that have similar technology and product mix. The most productive year for the Brasilian industry was 1984 when output in tonnes per employee year (TPEY) was 114.4. This includes the small, relatively labour-intensive charcoal based firms. But the figures for the large coke-based plants are only marginally better. Official productivity statements put TPEY for the three at 173 for 1983 (Editora Tama Ltda., 1985). According to Cosipa (direct data), output in May 1985 was at a rate of 184 TPEY.

These levels of productivity do not compare well with steel producers in other countries. Table 9.6 compares international productivity. Differences in productivity can result from a variety of factors (section 4.3), but the Brasilian companies have modern technology, a simple flat products output mix (at Cosipa and Usiminas) and very high levels of capacity utilisation, especially in 1983. With a labour force under direct control and easily manipulable, extremely high productivity levels might be expected.

The poor figures at CSN in comparison with Usiminas and Cosipa are partly due to the product mix which includes coated flats and some structural shape. Stelco is similar to CSN though its main plant at Hamilton had older technology, a wider product range and lower capacity utilisation. Yet its productivity approached twice that of the

Table 9.6 Productivity by company, TPEY (crude tonnes per employee year.

Company		1982		1983	
Usiminas	(Brasil)	216	(190)	207	(183)
Cosipa	(Brasil)	129	(125)	214[1]	(211)
CSN	(Brasil)	100	(109)	131[1]	(140)
Dofasco	(Canada)	258		267	
Stelco	(Canada)	189		222	
U.S. Steel	(U.S.A.)	175*		274*	
Bethlehem	(U.S.A.)	219*		277*	
Nippon	(Japan)	434		419*	
Salzgitter	(Germany)	237*		221*	
Sidermex	(Mexico)	107		97	
China Steel	(Taiwan)	375		452	
Pohang	(South Korea)	726		689	

Sources: Iron Age, April 16, 1984, pp 105-106;
The figures in parentheses from Editora Tama Ltda, 1985.
*: Production below 50% capacity.
1: Production above 90% capacity.

Brasilian company. Dofasco has a similar product range and similar technology to Cosipa and Usiminas, but in 1982 it was more than twice as labour efficient as Cosipa. Improvements at Cosipa and CSN in 1983 resulted from raising capacity utilisation to 91%. U.S. Steel, Nippon, Salzgitter and Bethlehem all operated at less than 50% of capacity for the years shown.

Comparison with other developing countries reveals a vast range of efficiency. Sidermex, the state run company in Mexico, has the worst record of all countries, while Pohang, the government owned mill in South Korea, has consistently the best productivity showing in the world. China Steel also performs well.

Why is productivity so low in Brasil? There is no technological reason why Mexico and Brasil should be so much less productive than Taiwan and South Korea. However, excess labour is used in branches of Brasilian plants which are not included in North America, for example in medical and other social services. Brasilian steel firms are obliged to run their own foundries for the manufacture of spare parts (such as rolling cylinders) which the less developed engineering industry is not able to supply.

Table 9.7 shows how labour is used in CSN and Cosipa and a comparable plant (USP) in the United States.[6] Appendix N lists technology at these three plants. USP and Cosipa are technologically similar. Cosipa produces plates but has no continuous casting. The figures show that similar iron tonnage from the same number of furnaces is produced at USP as at Cosipa, but with 19% of the labour. Rolling mills at USP need 47% of Cosipa's labour. General maintenance, transport, utilities and steel at USP account for 37%, 22%, 16% and 47% of Cosipa labour. Variations in these differences may be due partly to methods of designating labour to plant branches. But the overall difference is too great to be accounted for by technology, scale or product mix. Even when foundry, medical, expansion and administrative

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[6] These data are confidential, so the plant is called USP.

Table 9.7 Labour use at CSN, Cosipa (1984 averages), and a United States plant (November 1985), by plant section.

Section	CSN	Cosipa	USP
Operations Office		341	
Coke	523	732	206
Sinter	740[1]		265
Blast Furnace	629	980	187
Steel	1435[2]	1510	589[3]
Continuous casting	354		115
Plates		1282	
Hot rolling	1096	247	457
Cold rolling	2314	535	595
Rolling maintenance	1034	572	205
General maintenance	2258	1570	576
Purchasing		551	61
Utilities	1024	589	95
Transport	863	1331	293
Quality and engineering		793	228
Other	826[4]		355[5]
Salaried staff in op's			684
Sub total:	13096	11033	4911
Foundry	423	343	
Mechanical works	1902		
Medical	43	178	
Expansion	104	634	
Mineral production	1082		
Admin' and finance	4657[6]	2526	338
Outside contractors	883		
TOTAL:	22190	14714	5249
Rolled capacity (tonnes)	2700000	2400000	2400000
Productivity at sub total:	206	218	489
Productivity at TOTAL:	122	163	457

Notes: 1: Includes coke oven maintenance.
2: Includes slabbing mill.
3: Includes 82 on electric furnaces.
4: Includes quality control, construction, purchasing, inspection metallurgy, programming and computers.
5: Includes janitors, carpenters, painters, human resources and construction.
6: Includes most medical and service workers.

Source: Direct from the firms.

and financial staff are omitted[7] from the Cosipa total, but just management and financial from the USP total, the USP labour force is 44% of that at Cosipa.

The data from CSN are not so comparable. The elaborate rolling and coating facilities greatly inflate the size of the labour force in these operations as well as in general branches such as utilities and maintenance. But totals in iron, steel and hot rolling still exhibit a large surplus over figures for USP. The capacity of most units at CSN listed in appendix N is greater than at the other plants, but much of this excess was still unused in 1984 because expansion of the rolling mill were incomplete. The new continuous casting units had just begun production in May 1985.

The size of the labour force at CSN and Cosipa has not changed appreciably since 1980 (appendix I), so the large figures are not the result of intentional labour force increases to work new capacity. The labour force has been steadily reduced at USP however, from 9,694 at the end of 1979, to 5,170 at the end of 1982. The force has increased by 10% to the end of 1985, but over the same period capacity has been reduced by the permanent closure of blast furnace and steel making capacity (Hogan, 1984), cutting crude steel capacity from 6.8 million

[7] The huge discrepency between administrative and financial staff at the three plants (USP uses 7% of CSN) may be due to designation, but also reflects the independent administration of Siderbras companies and consequent duplication of jobs. USP also has some workers at its head office in a different city, but according to experts there they number no more than 30.

short tons to 3.3 million short tons. The plant has therefore undergone considerable rationalisation since 1982, hence the high productivity figure in comparison with those for other U.S. companies reported by Iron Age for 1982 and 1983 (table 9.6).

The data in table 9.7 suggest that in Brasil more labour, perhaps twice as much, is used as in a comparable U.S. steel mill, even when labour devoted to extra activities is excluded. Even though Brasil has restrictive labour laws in comparison with the U.S.A., nevertheless labour is not used more efficiently in steel. In steel the relatively low cost of labour compared with capital, the concentration on technical as opposed to labour process alterations to improve rates of turnover (Dahlman, 1979), the state monopoly form of competition, and the paternal form of control encouraged by the dependence on local labour forces and the scarce supply of skilled labour, and the local development policy objectives of steel development, all encouraged a relatively unintensive use of labour. Steel production has expanded in Brasil therefore despite the relative unimportance of labour costs (chapter 7) and the inefficient use of labour in production, factors often cited as central to the relocation of industries by multinational corporations (section 2.3.2).

9.3 The roots of growth

This chapter has examined the class history of steel development in Brasil and how those forces have influenced the industry's growth. They differ markedly from those which influenced the decline of the industry in the United States. Until 1964 the industry responded to demand in an economy, growing during periods of capitalist hegemony but stagnating as nationalist forces across a broader class spectrum gained political power. But this development was not efficient. It was haphazard in coordination of scale, and location, yet continued despite limitations on coal and labour supply and the availability of infrastructure. The nature of the industry, combined with periods of nationalism, served to exclude direct foreign investment, so the industry could be developed to save foreign currency and foster regional development rather than to place itself in a position to make a profit. The reasons for steel development in Brasil were therefore defined by indigenous class interests through the state, rather than by capital within the steel sector striving to make a profit through independent competitive strategies, or the direct actions of foreign interests.

The conflicts between private and public interests were solved through institutional reforms in the late 1960s and early 1970s, formalising state monopoly, and providing the basis for continuation of expansion programmes which found their economic justification at a national level (in favour of those interests which influenced state policies at different times) as opposed to a company or sector level. Baer's (1969) study of CSN production in 1965, and Teixeira's (1982) of Usiminas in 1973, both demonstrate economic benefits at a national rather than a sector level. There was a net currency saving on rolled steel production (that is the cost of importing machinery, coal and finance, plus the exchange lost on ore that could have been exported was less than the foreign currency that would have been required to import the steel produced by these companies). Baer demonstrates a net currency saving of $82 per tonne (1969, p149), but there was no overall cost advantage. Actual costs in foreign currency were $74 per tonne, but domestic costs showed no appreciable advantage to Brasil (the dollar equivalent of domestic expenditure was close to $82). Teixeira does show a sizable comparative advantage to Usiminas in 1973 of about 50%, but Braga (1984) shows that the 1976 domestic cost did not justify the construction of either CSN or Cosipa. As chapter 7 demonstrates the results of single year analyses can be greatly distorted by capacity utilisation and exchange rate fluctuations. The year of Teixeira's analysis of Usiminas, 1973, was a year of capacity utilisation at Usiminas well in excess of 100% (see table 9.4). But evidence from Baer and Braga suggests that the economic benefits of a flat steel products industry in Brasil was realised at a national level only (currency saving because of import substitution), instead of by the steel sector itself (a cost advantage in steel production), a conclusion which reflects the political history of the industry's development.

The steel sector's monopoly has been state imposed (rather than adopted by capitalists in the sector as a competitive strategy as it was in the United States before 1960), so making excess profits through surplus appropriation is not necessary to its continued growth. The decline of demand in the late 1970s and early 1980s threatened a

U.S. industry which had lost its monopoly source of profit through the inefficient strategies adopted under that condition, and subsequent competition from imports. The decline in demand in Brasil during the same period did not threaten the industry in this way because its source of profit (or loss compensation) depended more upon government pricing and tariff policy.

It follows that restructuring (in the sense that it was defined in chapter 2 as class restructuring) has as yet been limited in Brasilian steel. (Class restructuring is presently focused at a national scale, at least as far as the steel industry is concerned). Whether relaxations in the direct forms of labour control will result in sector-wide labour organisation which could threaten the supply of steel has yet to be seen.) Instead of being forced to adopt restructuring strategies which manifest themselves in output and employment decline, the Brasilian industry has compensated for the crisis in consumption and debt commitment by expanding exports. Figure 9.1 illustrates the relationship between domestic demand and domestic output. Whereas output has declined in relation to demand as demand has fallen in the competitive environment of the United Sates, it has expanded in relation to demand as demand has fallen in Brasil. This is partly due to increased Brasilian capacity which was planned during periods of rapid demand growth.[8] But it is also due to the level at which that capacity

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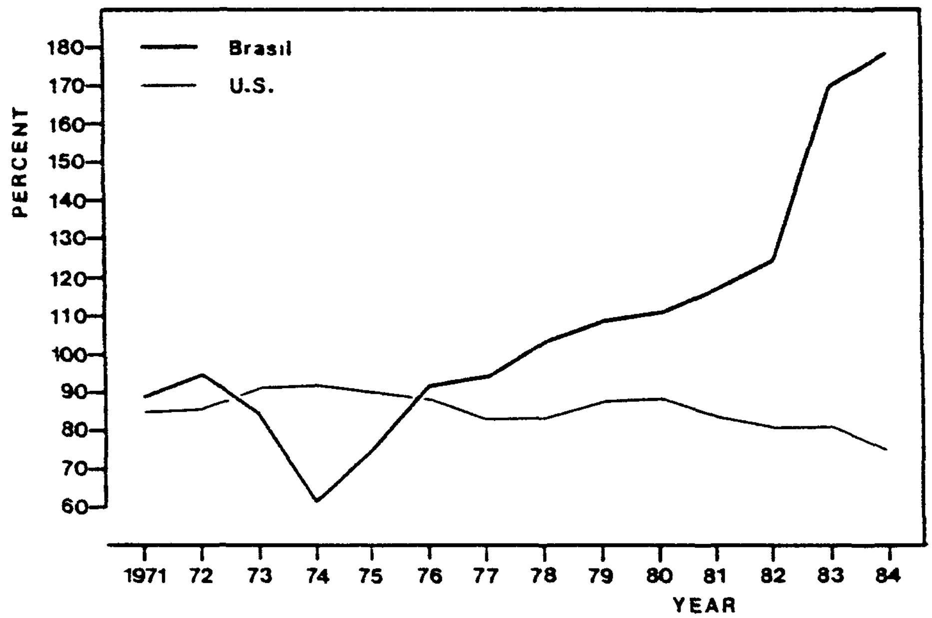
[8] It might also be argued that that it would be less easy for an industry the size of that in the U.S.A. to maintain high capacity utilisation in an environment of low world steel demand than the relatively small Brasilian industry. But this does not explain why individual companies in the U.S.A., say Inland or LTV, have had low

Figure 9.1 Domestic output as a percentage of domestic consumption, Brasil and the U.S., 1971-1984



Sources: From IBS, Statistical yearbook, various years; AISI, Annual statistical report, various years.

was used. If U.S. steel companies had operated at the same level of capacity utilisation as the Brasilian steel companies in 1982 it would have satisfied domestic demand and had some 21 million short tons of steel available for export. Instead in the U.S.A. output was reduced, capacity cut, product lines altered, new technology adopted, and labour use intensified. Workers were also pressured, by their own immediate interests as well as those of capital, to accept new agreements, new forms of organisation and wage cuts (chapter 5).

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capacity utilisation rates while Siderbras has not.

None of these strategies have been used in Brasil (though wages have been cut by keeping increases to six monthly intervals). Instead capacity utilisation has been kept high by expanding exports, a policy facilitated by low marginal costs (due to high fixed costs) and justified by their foreign currency earning. This justification reflects the state monopoly form of competition in the public sector, and interests expressed at a national level through export incentives (appendix K). These are the reasons for steel industry growth in Brasil, reasons which are very different from those which encouraged international relocation of other industries in the sphere of productive capital.

CHAPTER 10

CONCLUSION

There are three types of conclusion to be drawn from this thesis. The first is about the relationship between political and economic work in the marxist literature, and how this relationship is used in empirical analysis. The second is about steel industry development, and the third is about the implications of this analysis for the international development literature in general.

10.1 Politics, economics and empirical analysis

A common criticism made by the proponents of marxist theory about other social theories is that they distort reality by falsely separating politics and economics. Nevertheless a similar division has become apparent in the marxist literature itself. The relationship between the economic and the political is not synonymous with the division between levels of abstraction: an economic base and a political superstructure (Gibson, 1982). However the division between political and economic studies in the marxist literature does tend towards a division that mirrors that between levels of abstraction. Many toil at strengthening marxist economic theory, especially in discussions of value theory and the falling rate of profit (Shaikh, 1978; Farjoun, 1984; Morishima, 1973). But these are relatively abstract arguments. Others, usually those more concerned to explain less general events, say plant closures as opposed to national crisis or the determination of prices, tend to concentrate more on political struggles (Friedman, 1977; Burawoy, 1979; Lynd, 1982).

Some have made a greater effort to include abstract crisis theory in their concrete economic and political analyses (Aglietta, 1979; Massey and Meegan, 1982; Gordon, Edwards and Reich, 1982; Mandel, 1978). Generally these analysts show how the rate of profit is caused to fall both by abstract forces and specific actions. A declining rate of profit is an outcome of labour saving practices and increases in the real wage, themselves political issues. But a falling rate of profit itself forces managers and workers to restructure production relations in order to facilitate renewed accumulation.

However, abstract discussions about the relationship between value and price (the transformation problem) have gone virtually unnoticed in marxist empirical work. Elson (1979) even denies the need to demonstrate a link between these categories, arguing that it does not matter to marxist theory anyway. Yet value theory in its most abstract sense _is_ about the economic and political relationship between capitalists, and therefore their relationship with labour. What the solution to the transformation problem shows (Shaikh, 1977; Foot and Webber, forthcoming) is that exchange-values are disproportionate to labour-values and therefore allow not only the exploitation of labour and possession by capitalists of surplus-value, but also its redistribution amongst capitalists. The relationship of appropriation is therefore the relationship of conflict between competitors.

This thesis has purposefully used the understanding of capitalist relationships revealed through the link between value and price to direct the interpretation of empirical events. Section 2.4 defined the concept of competition in terms of the contest to appropriate surplus-value, a structure commonly omitted from marxist analyses of specific outcomes.[1] The analysis of steel development, both in the U.S. and Brasil, demonstrates in a new way how the political and economic relationship between capitalists identified in abstract value theory can be used to interpret what has happened in specific cases. By viewing class struggle and competition together, the duality of contradictions that influence the activities of factions of capital (firms, sectors, national and international groups, finance and productive, depending on conditions) are revealed. Technical changes for example are interpreted

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[1] Whether this omission is because of a political concern to investigate the relationship of exploitation between capital and labour at the exclusion of other relationships, or an ignorance of value theory, it is not possible to say.

not just as strategies to improve the control and exploitation of labour, but also to improve the appropriation of surplus from other capitalists by reducing costs or improving market share.[2] This is why the 'labour factor' should not be over-emphasised in empirical analysis (Sayer, 1985), a point illustrated in chapter 7 and section 9.2.

The first contribution of this thesis is to show how the concepts of struggle and competition at an abstract level may be combined to interpret empirical events in a piece of concrete research. And it does this by drawing the links between the economic and political branches of the marxist crisis theory, value-theory, labour process and development literature.

10.2 Steel and the international development literature

The thesis set out to explain the general relocation of steel

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[2] Conventional economics tends to focus on questions of competitive strategies at an empirical level, for example on the importance of input cost and marginal cost functions, supply and demand imbalances and input-output economics. Viewed on their own they cannot account for change, so their power of explanation is weak. Nevertheless marxist analysts have much to learn from conventional economic concepts in so far as these specify alternative strategies for capitalists in competition with each other. For example a detailed knowledge of models about technical change decisions would help to improve the understanding of how such decisions were made under certain conditions in the U.S. steel industry. This thesis however focuses on the forces which cause changes in the kinds of decisions that are made, rather than on how particular decisions are made within a set of known but unchanging conditions. By maintaining the distinction between historical theory and specific cases it allows for the integration of different kinds of economics without becoming theoretically eclectic (Fincher, 1983).

from developed to developing countries. It was presumed that this general trend itself was only a description, so that identification of the cause could only be achieved through a class analysis. Also steel is a case in which the location pattern has changed though the industry has not been demonstrably 'moved' because steel companies are not multinational corporations. The empirical task of the thesis was therefore to demonstrate why steel has declined in the U.S. and expanded in Brasil, despite the lack of a multinational corporate structure.

Analyses of industry shifts through multinational corporations show how third world locations are used to take advantage of cheap and directly controlled labour (not characteristic of labour markets in developed countries). Chapter 7 and section 9.2 show that neither of these 'labour factors' is particularly important in this case. Furthermore Brasil is not a notably cheap place to produce steel. (Unlike the studies in the international literature referred to in chapter 2, this thesis has taken the trouble to demonstrate that this is true.)

Instead the decline of steel in the U.S. and its expansion in Brasil have occurred in markedly different local class configurations and histories. Chapters 4, 5, 8 and 9 identify the local class conflicts in steel production over the period of the most recent cycle of accumulation as causes of growth and decline. These U.S. and Brasilian conflicts are relatively isolated from each other because the industry is not organised internationally. Therefore it is not possible to say that one location is better than the other for some reason, as implied by multinational plant movements.

However, the actual forms of conflicts identified by the thesis do indicate the existence of links between the decline of steel production in the U.S.A. and its growth in Brasil, even though they are less explicit than in the movement of some other industries towards the third world. In the case of steel the links appear in the spheres of finance and commodity capital.[3]

In the sphere of finance, Siderbras was able to obtain the necessary guarantees through the government to attract money which the U.S. firms could not have done. This was because for many other capital interests in Brasil the development of a steel industry was desirable, whereas in the United States its protection was not. Also, once international banks had become involved in the development of steel industries in third world countries, their interests were tied to the export potential of those countries. Implicitly therefore the interests of international financiers became vested in the decline of the steel industry in the United States and its expansion in Brasil.

The sphere of commodity capital is important because it was the

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[3] Evidence in chapter 5 especially suggests that the industry is being increasingly internationalised in the sphere of production. The Japanese companies in particular are expanding ownership in both the countries examined in this thesis, early signs of a significant alteration in the competitive structure of the industry at a world scale. However the forms of competition that have been dominant during the period examined here have largely excluded international capital in the productive sphere.

medium by which entry was gained to the U.S. steel monopoly. In 1960 imports undermined the ability of the U.S. steel producers to appropriate surplus. From that time the industry needed restructuring because neither its fixed capital stock nor the form of labour relations were suitable for the production or realisation of surplus-value under the new competitive form. Brasilian steel was not involved initially in the export of steel to the U.S., but it forms an increasing share of the recent escalation in import competition. Understanding the expansion of steel production in Brasil is therefore a part of understanding its decline in the U.S.A.[4]

The study of Brasil shows that the decision to build a steel industry was initially an outcome of indigenous class conflicts. Foreign steel companies showed a lack of interest because the location was of no advantage to them. Yet without foreign investment the development of a large integrated steel sector would not have been possible, and in most cases the decision to lend was linked to the purchase of equipment from producers in developed countries. Development banks regulate their lending in accordance with political objectives, while private banks are content with guarantees of loan repayments.[5] But this does not mean they imposed steel development on

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[4] Though this is not why Brasil was chosen as a case study.

[5] This raises an interesting question about the flow of capital between sectors. At least in the sphere of finance there is some question whether money necessarily flows towards the sectors that make the highest profit, or just to those where a given return can be earned. This has implications for many branches of economic theory (see Webber, forthcoming) that rely on the assumption of equalising profit rates.

Brasil. The decision to borrow was influenced internally. Steel industry growth was therefore an outcome of relationships between indigenous and international class forces. For indigenous capital the conflict between maintaining its national basis for political and economic independence, and the need for international assistance to facilitate expanded accumulation, helped influence a regular switching of policy between regulated and unregulated foreign involvement. Because of the particular forms taken by the conflicts over steel production, and the resultant development of the industry for political reasons rather than for its profit-making potential, the growth of the industry in Brasil can be shown to have little to do with the quality of local labour markets.

10.3 Implications for further analysis

The conclusions about what has happened in the steel industry in the places examined are specific to that industry and those places. It is not possible to generalise from this analysis therefore because international changes in the location of production need not result from the same specific causes. In other industries multinational capital plays a central role, and in other countries the form of development at various times may have been more dependent or imposed than this thesis has suggested it is in Brasil. What the thesis has done is to identify the specific elements of cause particular to the case analysed. But shifts in the location of steel production have not been fully explained because other countries need to be examined. Nor does the thesis provide evidence in support of a theory that explains why all international relocation happens, because the evidence used is specific.

However, it is possible to draw general conclusions from the present analysis about the way in which international analysis should be executed, and about the usefulness of abstract theory about capitalist production in providing explanation. The thesis began by rejecting theories of international development that try to elevate specific causes to an abstract level. Instead it examined an industry that did not seem to fit any of the cases identified by these bodies of theory, and used a framework that was less rigid in the forms of development that it expected to find (mid-level abstractions were rejected as tools for analysis - section 2.7). If this method were adopted generally in analyses of other industries like cars, textiles and electronics (a method that keeps theory at the level of the mode of production) then the analyses of development in these industries also would include the examination of local class interests, not just those of international capital. The degree to which local interests are important would depend on each case.

This thesis argues that international development patterns are influenced by international capital, but not caused by it alone. Contrary to the general conclusions of the dependency literature and theory about the New International Division of Labour, changing patterns of development in the developing periphery emerge from conflicts between various national and international class factions. The thesis also provides evidence through an analysis and explanation of the changing location of steel production that this alternative view of international development is a useful one.

APPENDIXES

Appendix A: Unicn Organisation at U.S. Minimills. 1979

Company	Capacity (tons)
A: Organised by USWA	
Crucible Inc., Specialty Metals Div, N.Y.	70,000
Timken Co. Latrobe Steel, Pa.	100,000
Canton, Ohio.	1,165,000
Georgetown Steel Corporation, S.C.	620,000
Georgetown-Texas Steel Corp., Beaumont, Tx.	600,000
Cyclops, Universal-Cyclops, Bridgeville, Pa.	120,000
Florida Steel Corp., Charlotte, N.C.	210,000
Indiantown, Fla.	218,000
Lukens Steel Co., Coatesville, Pa.	874,000
Laclede Steel Co., Alton, Ill.	800,000
Atlantic Steel Co., Atlanta, Ga.	450,000
Cartersville, Ga.	250,000
Copperweld Steel Co., Warren, Oh.	700,000
North Star Steel Co., St. Paul, Min.	400,000
Wilton, Iwa.	250,000
Babcock & Wilcox Co., Beaver Falls, Pa.	650,000
Connors Steel Co., Birmingham, Ala.	275,000
Phoenix Steel Corp., Claymont, Del.	500,000
Oregon Steel Mills Inc., Portland, Ore.	350,000
Marathon Steel Co., Tempe, Arz.	150,000
New Jersey Steel Corp., Sayerville, N.J.	250,000
Jessop Steel Co., Washington, Pa.	60,000
Carpenter Technology Corp., Bridgeport, Conn.	112,000
Northwest Steel Rolling Mills Inc., Seattle, Wash.	200,000
Calmmet Steel Co., Chicago Heights, Ill.	180,000
Eastmet Corp., Baltimore, Md.	180,000
Quanex, MacSteel Co., Jackson, Mich.	180,000
Kentucky Electric Steel Co., Coalton, Ky.	180,000
Roblin Steel Co., Dunkirk, N.Y.	170,000
Border Steel Rolling Mills Inc., El Paso, Tx.	150,000
Judson Steel Corp., Emeryville, Cal.	150,000
Cascade Steel Rolling Mills Inc., McMinnville, Ore.	130,000
AL Tech Specialty Steel Corp, Dunkirk, N.Y.	120,000
Soule Steel Co., Long Beach, Cal.	120,000
Hawaiian Estern Steel, Ltd., Ewa Beach, Hw.	60,000
Washington Steel Co., Houston, Pa.	100,000
Edgewater Steel Co., Oakmont, Pa.	95,000
Electralloy Corp., Oil City, Pa.	70,000
Joslyn Stainless Steel Div., Ft. Wayne, Ind.	60,000
Guterl Special Steels Corp., Lockport, N.Y.	55,000
	11,374,000

B: Organised by other unions.

Keystone Steel and Wire, Peoria, Ill.	600,000
Steel Service Co., Knoxville, Tenn.	200,000
Texas Steel Co., Fort Worth, Tx.	200,000
Cameran Iron Works Inc., Houston, Tx.	120,000
Owen Electric Steel Co., Cayce, S.C.	100,000
	1,220,000
	12,594,000

C: Non-unionised.

Nucor Corp., Norfolk, Neb.	450,000
Darlington, S.C.	450,000
Jewett, Tx.	500,000
Florida Steel, Baldwin, Fla.	300,000
Tampa, Fla.	252,000
Raritan River Steel, Perth Amboy, N.J.	500,000
Chapparral Steel Co., Midlothian, Tx.	475,000
Roanoke Electric Steel, Roanoke, Va.	300,000
Marathon Le Tourneau Co., Longview, Tx.	100,000
Carpenter Technology Corp., Reading, Pa.	124,000
Structural Metals Inc., Seguin, Tx.	180,000
Magna Corp, Jackson, Miss.	180,000
Auburn Steel Co, Auburn, N.Y.	170,000
Birmingham Bolt Co., Kankakee, Ill.	100,000
Intercoastal Steel Corp., Chesapeake, Va.	80,000
	4,161,000
	16,755,000

Source: USWA, Basic Steel Ingot Capacity in the United States and its Union Organization, 1979; Metals Bulletin, 1982.

Appendix B: Emergency agreements between the USWA and individual steel companies. Statements on Labour - Management participation teams.

A: CF$I

The CF&I Steel Corporation and the United Steelworkers of America agree that the respective August 1, 1980 Agreements between them shall be changed only as follows for the employees in the bargaining units listed in Attachment I.

Effective October 1, 1982 the Standard Hourly Wage Rates or hourly equivalent in effect as of August 1, 1981 shall be reduced by $1.75 per hour. The general wage increase of 15 cents per hour and the one cent per hour increase between the job class increments ir its equivalent which was to be paid August 1, 1982 shall be eliminated effective August 1, 1982.

Effective August 1, 1982, eliminate the Cost-of-Living Adjustment and Roll-in which was to be applicable August 1, 1982, and any subsequent Cost-of_living Roll-ins. Provide for a Cost-of-Living adjustment to be applicable August 1, 1983.

The 25% incentive reduction provided for by the Memorandum of Agreement dated May 25, 1982 shall be continued for the term of the Agreement.

The holidays of United nations Day, day after Thanksgiving, December 31st, Good Friday and Memorial day shall be eliminated during the period of the agreement.

Provide new vacation schedules as noted in Appendix A, effective January 1, 1983 through December 31, 1983.

Effective October 1, 1982, modify the shift differential to provide for a premium of 20 cents per hour for hours worked on the afternoon shift and 30 cents per hour for hours worked on the night shift.

Effective October 1, 1982, modify the provisions of Article 8 to provide for a premium of 25% for all hours worked on Sunday which are not paid for on an overtime basis.

Effective January 1, 1983 through December 31, 1983, eliminate all provisions related to the vacation bonus.

Effective October 1, 1982 for employees of the Production and Maintenance, Clerical and Technical and Plant Protection Department, eliminate Appendixes I and E of the respective Basic Agreements pertaining to the Memorandums of Understanding on the Service Bonus Plans. (so cents per hour worked)

Effective October 1, 1982 for Clerical and Technical Employees, eliminate the provisions of the letter of Understanding providing for the payment of 20 cents per hour for all hours actually worked on the agreed upon list of technical jobs associated with production jobs.

The earnings for any person retiring in the next five years under the percent formula will not reflect the reductions provided for in this Agreement.

Effective January 1, 1983 a profit sharing plan shall established as provided in Appendix B.

Any rate retention(s) payable under the appropriate collective bargaining agreements shall be adjusted as necessary to carry out the intent of this Agreement.

The termination date of the Basic Labor Agreements covering employees of the Monarch Limestone Quarry and Canon City Dolomite Quarry shall be modified so as not to terminate earlier than November 1, 1983. The termination dates of all other Basic Labor Agreements shall be modified so as not to terminate earlier than October 1, 1983.

Dated: September 30, 1982.
(Appendixes not included.)

B: Northwestern Steel and Wire Company, Sterling, Illinois.

Settlement Agreements for Plants 1 and 10" mill:

Effective September 12, 1982, the base wage and wage additive will be frozen at the August 1, 1982 level; and the base wage will be reduced by $1.72 per hour, and the wage additive will be reduced by $1.75 per hour, calculated at Job Class 9. Effective January 1, 1984, the Extended Vacation Program (SVP) will be eliminated. Five holidays will be forfeited. All shift premiums and vacation bonuses will be forfeited. Effective January 1, 1983, the new Regular vacation schedule as shown below will be adopted. Employees will be allowed to take time off without pay for the forfeited weeks of regular vacation, subject to the operating requirements of each department.

1 - 9 years	:	one week
10 - 19 years	:	two weeks
20 - 29 years	:	three weeks
30 years & up	:	four weeks

The expiration of this Agreement will be no less than three years from the date of the next Agreement negotiated in the Steel Division. In the event of a strike or lock-out in the Steel or Wire and Rod Division, either division would be able to participate in that strike or lock-out. All wages and COLA will be frozen at the above level. A wage re-opener only will be effective at the ending of the third year of this Rod and Wire Agreement.

The Company will install a profit-sharing program under which 20 percent will go to the employees the first year, 25 percent the second year and 30 percent the third and fourth years. Those profits left after taxes would be divided up, one/half reinvestment and one/half as the Company would see fit.

The Company will grant regular independent audits for the Union to ascertain that this profit-sharing is being properly applied.

Any employees who have lost their seniority through layoff since January 1, 1980, will be re-hired according to their prior seniority status during the life of this new Agreement as new openings become available. These employees will be credited with any prior accrued seniority.

Labor-Management Participation Teams will be instituted.

One-shift operations will be the 7-3 shift unless a different shift is mutually agreeable between the Company and the Union grievance Committee.

The vacation calculations for regular vacations through 1982 will be at the present rate. Those beginning in 1983 will be under the new rate brought about by this Agreement.

Extended vacations will be calculated through 1983 at the present rate.

All changes in the Insurance Agreement or the Pension Plan in the Basic Steel Agreement will be incorporated in this Agreement.

Any employee with 30 years or more of service as of December 31, 1982, may have the option to retire under a 70/80 mutually agreed to pension with the supplement if the employee meets the other requirements under the present 70/80 Pension Agreement. In addition, those employees who presently have 28 and 29 years of service would qualify for this after they accrue 31 years of service.

All other provisions of the agreement remain in effect, including Letters of Agreement, except those changed by the above proposals.

C: Extracts from agreements on setting up Labour-Management Participation Teams.

From agreement between Penn-Dixie Steel Corporation and the USWA:

Participation Team meetings shall be called by the co-chairman during normal working hours as often as the employee and supervision members agree. A Participation Team shall be free to discuss, consider and decide upon proposed means to improve department or unit performance, employee morale and dignity, and conditions of the work site. Appropriate subjects, among others, which a Team might consider include: use of production facilities; quality of products and quality of the work environment; safety and environmental health; scheduling and reporting arrangements; absenteeism and overtime; incentive coverage and yield; job alignments; contracting out; and energy conservation and transportation pools. The Participation Committee and the Participation Teams shall have no jurisdiction over the initiation of, or the processing of, complaints or grievances. The Participation Committee and the Participation teams shall have no authority to add to, detract from, or change the terms of the Basic labor Agreement.

A Participation Team shall be free to consider a full range of responses to implement performance improvement, including, but not limited to, such items as bonus payments or changes in incentive performance pay. A participation Team may also consider one-time start-up bonuses for employees of new facilities who reach target levels in specified periods.

Among the job alignment problems to be discussed, considered, and decided upon by Participation Teams in maintenance trades are problems arising out of overlapping duties of certain skilled trades.

From agreement between Wheeling Pittsburgh Steel Corporation and USWA:

During the period of this Agreement the Corporation will institute in all plants covered by the appropriate Basic Labor Agreements, a program designed to change the parties relationship from boss-vs-worker to a participative management program in which all workers have a voice in the operation of the Company. The Corporation will spend at least one million dollars to establish and implement this program, during the period of this agreement, on training and consultants, unless the Parties agree that the program has been effectively implemented without the necessity to spend the full amount.

The program will be designed to solve mutual problems at the departmental level by joint participation of workers and management. The parties will address all matters relating to the work place including all necessary efforts to reduce problems concerning contracting-out.

A Participation Management Team Review Commission will jointly select consultants used to advise the Participation Management Committees or Teams, or train members of such Committees or Teams.

The local unions will select employee members of the Participation Management Committees. The Company will select management members. As specified in the current basic labor agreements the teams established will not be empowered to change the basic labor agreements, including the rights of Management.

The parties are confident that this program will change the present relationship to a cooperative effort where every employee will participate in the day to day decision-making process on matters affecting their daily lives.

Appendix C: Steel firms in Brasil, type of steel products and 1984 rolled output.

Company	Method	Products	Output
Acos Anhanguera S.A.	Electric	Bars	258,297
Acos Finos Piratini S.A.	Direct	Bars, wire	134,508
Acos Minas Gerais S.A. ACOMINAS	Coke	Bars, shapes	-
Acos Villares S.A.	Electric	Bars, wire	31,321
Cimetal Siderurgia S.A.	Charcoal	Bars, shapes	183,603
Cia. Acos Especiais Itabira ACESITA	Char/Elec	Special, bars	570,668
Cia. Brasileira do Aco - CBA	Electric	Bars	31,858
Cia. Ferro e Aco de Vitoria COFAVI	Electric	Bars, shapes	170,251
Cia. Industrial Itaunense	Electric	Bars	112,387
Cia. Sid. de Alagoas - COMESA	Electric	Bars, shapes	31,759
Cia. Sid. da Amazonia - SIDERAMA	BOF	Bars, shapes	14,503
Cia. Sid. Belgo Mineira	Charcoal	Bars, wire	717,438
Cia. Sid. da Guanabara - COSIGUA	Electric	Bars, wire	687,298
Cia. Sid. de Mogi das Cruzes COSIM	Charcoal	Bars, shapes	81,767
Cia. Sid. Nacional - CSN	Coke	Coated flats	2,425,702
Cia. Sid. do Nordeste COSINOR	Electric	Bars, shapes	37,190
Cia. Sid. Pains	Charcoal	Bars, wire	268,977
Cia. Sid. Paulista - COSIPA	Coke	Flats	2,443,392
Cia. Sid. de Tubarao - CST	Coke	Slabs	2,012,686
Copala Industrias Reunidas S.A.	O Hearth	Bars	8,333
Dedini S.A. Siderurgica	Electric	Bars, wire	235,253
Electrometal Acos Finos S.A.	Electric	Bars, wire	30,638
Lafersa Laminacao de Ferro S.A.	Charcoal	Slabs, wire	26,907
Mannesmann S.A.	Char/Elec	Tubes, wire	538,500
Sid. Aconorte S.A.	Electric	Bars, wire	184,034
Sid. Barra Mansa S.A.	Charcoal	Bars, shapes	194,736
Sid. Cearense S.A.	Electric	Bars, shapes	42,924
Sid. Fi-El S.A.	Electric	Bars, wire	102,810
Sid. Guaira S.A.	Electric	Bars	229,365
Sid. Hime S.A.	Electric	Bars, shapes	186,438
Sid. J.L. Aliperti S.A.	Char/Elec	Bars, shapes	264,475
Sid. Lencois Paulista S.A. SIDELPA	Electric	Bars	13,900
Sid. Mendes Junior S.A.	Electric	Bars, wire	145,859
Sid. N.S. Aparecida S.A.	Electric	Bars, wire	74,001
Sid. Riograndense S.A.	Electric	Bars, shapes	370,232
Sid. Santo Stefano S.A.	Electric	Shapes	5,558
Usina Santa Olimpia S.A.	Electric	Bars, shapes	96,765
Usina Sid. da Bahia S.A. USIBA	Direct	Bars, wire	244,176
Usinas Sid. de Minas Gerais USIMINAS	Coke	Flats	2,952,310
Villares Industria de Base VIBASA	Electric	Bars, wire	256,878

Source: Instituto Brasileiro de Siderurgia, Statistical yearbook, 1985.

Appendix D: Selected foreign loans to Brasilian steel companies.

Year	Lending source	Quantity	Debtor, (purpose) and Terms where available
1962	Japanese Govt through BNDE	\$8.3m	Usiminas, '67-'72, 6%
1962	Eximbank of Japan	\$24.8m	Usiminas
1963	U.S. and Euro' consortium	\$40m	Cofavi, (expansion to 380,000 tonnes by 1967)[1]
1963	IADB	\$1.5m	Cofavi
1965	Eximbank U.S.	\$6m	CSN (stage II)
1965	Japanese Govt.	Y8,952m (\$24.5m)	Usiminas (for payment of previous loan) '68-'73 $5^1/_2$%
1965	IFC	\$4m	Aco Villares '68-'75 $7^1/_2$%
1968	Eximbank U.S.	\$35m	CSN (steel finishing equipment) '68-'83 6%
1968	Nippon Usiminas	\$12m	Usiminas (equity injection to maintain 40% ownership)
1968	CFEIM	\$7.5m	Siderama
1970	French Consortium	FFr.50m	Usiba
1970	Foreign sources through BNDE	\$61m	Cosipa, Usiminas
1971	A British Merchant Bank	\$4.6m	CSN (sintering plant purchase in Britain)
1971	BOLSA	\$8.7m	Piratini (construction)
1971	Japanese consortium	\$80m	Usiminas (stage II)[2]
1971	IDB, IBRD, Eximbank U.S.	\$480m	Stage II expansion
1971	Eximbank U.S. U.S. Consortium	\$4.95m \$4.95m	CSN (Electrolytic tinning line) 6%

1971	Eximbank U.S.	$0.9m	Cosigua (Construction equipment from U.S.) '73-'80 6%
1972	IDB	$43m[3]	CSN (stage II) '73-'88 6%
1972	Eximbank U.S.	$323m	CSN, Cosipa, Usiminas
1972	IBRD	$64.5m	CSN '77-'92
		$64.5m	Cosipa 9%
		$63.0m	Usiminas
1972	IDB	$125m	CSN, Cosipa, Usiminas
1974	IDB	$40m[4]	CSN
		$63m	Cosipa
1975	IBRD	$95m[4]	CSN '80-'95
		$60m	Cosipa 10%
1975	British consortium	£20m	Acesita (U.K. equipment)
1975	International consortium	$55m	CSN
1975	Eximbank U.S.	$7m	Acesita (U.S. equipment)
	U.S. consortium	$8.8m	'75-'85 $8^{3}/_{4}$%
1976	British consortium	£50m	Siderbras (stage III contracts in U.K.)
1976	Eximbank, Japan	$216m	CSN '77-'89
		$133m	Cosipa 8%
		(in Yen)	(Japanese equipment)
1976	Ferrostaal (GDR)	DM550m	Acominas (export credit)
1976	International consortium		Siderbras
		$70m	'77-'82 $1^{7}/_{8}$ +LIBOR
		$40m	'77-'84 $2^{1}/_{8}$ +LIBOR
		$20m (in DM)	'77-'84 "
		$20m (in SWFr)	'77-'84 "
			Acesita
		$40m	'77-'82 $1^{7}/_{8}$ "
		$40m	'77-'84 $2^{1}/_{8}$ "
1977	IBRD	$95m	CSN
		$60m	Cosipa
1977	IBD	$63m	CSN
		$40m	Cosipa

1977	French consortium	FFr.750m	CSN, Cosipa, Usiminas
1977	GDR consortium	DM254.9m	CSN, Cosipa, Usiminas
1977	Japanese consortium	Y65,000m Y40,000m	CSN Cosipa
1977	U.K. consortium	£50m	CSN, Cosipa, Usiminas
1977	IFC Thyssen Hutte	$10m $8.8m	Cosigua (Towards Thyssen's Purofer DR equipment)
1977	U.K. consortium	£150m	Acominas (Towards equip' from Davy Ashmore totalling 215.6m, including Ster37m for the Blast Furnace.)
1977	Eximbank, Japan	$114m (Yen)	Usiminas '77-'95 8%
1977	Nippon Usiminas	$11.4m (Yen)	Usiminas
1977	Eximbank U.S. U.S. consortium	$25.2m $25.2m	CSN CSN
1977	International consortium	$495m	Acominas (see appendix G)[5]
1977	French consortium	FFr750m	Acominas
1977	Japanese consortium	 $50m Y15b	Siderbras '80-'86 $2^{1}/_{8}$ +LIBOR '80-'86 0.7% +Tokyo prime
1977	Banco Exterior de Espana	$10m	Siderama
1977	IFC	$7m	Cimetal (expansion from 50 to 142,000 tonnes
1977	Eximbank U.S.	$11.4m	CSN (U.S. equipment) 8%
	Japanese consortium		Tubarao (50% spent domestically)
1978	"	$350m	$1^{1}/_{4}$ +LIBOR
1979	"	$250m	$1^{3}/_{8}$ +LIBOR
1980	"	$100m	$1^{3}/_{8}$ +LIBOR
1978	A U.K. Bank	£13.7m	Acominas (Davy Ashmore contracts)
1979	International consortium	$100m	Siderbras $1^{1}/_{8}$ +LIBOR

1979	International consortium	$25m $75m	Siderbras CSN		
1979	Japanese consortium	Yen 8b Yen 8b	Siderbras	10yrs 15yrs	.3% +Tokyo

Notes: 1: This project was never completed.
2: Estimated cost of project $235m - the balance to be obtained from IDB, IBRD and local sources.
3: At this stage the government was seeking external credits of $690m for financing stage II expansion.
4: Source: FTC, 1977.
5: See appendix G for details of banks concerned, and terms on this loan.

LIBOR = London Interbank Offering Rate.

Source: BOLSA, Monthly review, various issues, except notes 4 and 5.

Appendix E: Some foreign loans to Brasilian Government Institutions for internal dispersment.

Year	Lending Bank	Amount	Receiving institution and purpose of loan
1965	U.S. Government	$150m	40% of it to the BNDE and FINAME, for development projects.
1967	AID	$100m	The Brasilian Government for financing imports of U.S. machinery and equipment.
1968	Otto Wolff	DM50m	BNDE to finance imports of West German machinery, equipment and technical services.
1967/8/9	French Consortium	FFr.30m	Each year at $6^3/_4$% to BNDE to finance imports of French machinery and equipment.
1976	International consortium	$100m	BNDE for purchase of machinery in basic industry projects. 5 year loan.
1976	LBI	£20m	BNDE for purchase of U.K capital equipment.
1977	International consortium	$42m	To Banco do Brasil. $^1/_4$% above the LIBOR.
1977	International consortium	$145m $15m in DMs $45m in Yen	BNDE development loan, dollar and Deutschmarks at $1^7/_8$ - $2^1/_8$% above LIBOR, Yen at 0.4 - 0.6 above Japanese prime rates.
1979	International consortium	$300m	State of Rio de Janeiro. For 12 years with 6 years grace, at $^3/_4$% above LIBOR.

Source; BOLSA, Monthly review, various issues.

Appendix F: Loans outstanding to CSN, Cosipa and Usiminas, 1984

1. CSN

Source	Interest	Currency	Millions of Cruzeiros Current	Millions of Cruzeiros LongTerm
Imports Financed		Various	69,188	-
Banco do Brasil		US$	609,983	-
BNDES	5%	Various	129,436	681,626
FINAME	4% to 10%	ORTN	116,768	530,785
BACEN - (Resolution 63)	11.25%	US$	174,559	557,402
Other local	6% to 20%	Various	201,438	30,192
Bank of America	12%	US$	4,873	-
Eximbank USA	6% to 8%	US$	7,475	54,251
BID	8%	Various	39,166	171,271
BIRD	7.25% to 8.5%	US$	43,627	192,515
Exibank Japan	7% to 8%	Yen	100,329	530,801
Citibank	11.75%	Various	3,343	393,447
First of Boston	12%	US$	4,849	-
Bank of Tokyo	11.6042%	US$	18,369	220,431
Banque du Paris	7.5%	FF	1,966	4,301
Banque Francaise	7.5%	FF	-	9,904
Ferrostal AG	9.5% to 10.5%	DM	6,817	17,575
B' of Nova Scotia	12.7553%	US$	-	159,200
Banco do Brasil Nassau Bahamas	12.998%	US$	-	95,520
Saudi Intern'tl	12.8959%	US$	-	63,680
Lloyds Intern'tl	12.7729%	Various	-	258,472
Banco Argentina	14.625%	US$	-	12,736
Imports Financed		Various	99,215	-
Other Foreign	6.75% to 9.5%	Various	947	640
			1,632,348	3,984,749

Due dates on long term loans

Year	CR$ 1000s
1986	697,013,282
1987	714,537,084
1988	579,914,380
1989	602,047,953
1990	536,385,851
1981 - 1999	854,850,618

2. <u>Cosipa</u>

Source	Currency	Millions of Cruzeiros Current	Long term
BNDES	Various	219,755	1,442,415
Resolution 63	US$	100,888	458,658
FINAME	ORTN	73,332	349,650
Banco do Brasil	Various	134,616	171,686
Citibank N.A.	US$	33,326	121,640
Resolution 674/882	CR$	75,010	-
Banco de Investimentos	CR$	23,552	47,104
Banco Bozano Simonsen	Various	12,776	50,177
Banco Real de Invest'to	CR$	38,198	-
Cia Real de Credito Imobiliario	CR$	35,154	-
Other local	Various	108,062	1,078
Bankers Trust Co.	US$	13,634	323,060
Eximbank Japan	Yen	54,962	277,129
Lloyds International	Various	-	331,358
Finance of Raw Materials	US$	177,802	-
IDB	Various	27,713	105,619
IBRD	Various	30,032	92,083
Banco Exterior de Espana	US$	25,312	54,114
Eximbank USA.	US$	3,912	41,633
Group of French Banks	FF	3,711	32,566
Other foreign	Various	42,732	85,222
		1,234,479	3,985,192

Due dates on long term loans

Year	CR$ 1000s
1986	779,313,465
1987	730,092,555
1988	620,739,319
1989	541,083,567
1990	384,502,246
1991 - 1996	926,461,719

3. Usiminas

Source	Currency	Millions of Cruzeiros Current	Long term
BNDES	US$	8,199	4,099
BNDES	ORTN	68,760	387,949
FINAME	ORTN	46,766	241,346
Citibank	US$	16,716	59,701
Banco Sumitomo Brasileiro	US$	955	53,173
Banco Real S.A.	US$	11,401	47,377
Other local	Various	131,789	420,197
Nippon Usiminas KK	US$	2,285	2,361
Nippon Usiminas KK	Yen	72,221	355,342
Bank of Tokyo	US$	126,947	-
Crocker International	US$	40,163	-
Banco do Brasil S.A.	US$	38,791	-
Citibank	US$	-	227,713
Citibank	Yen	-	35,788
Bank of America	US$		63,680
Other Foreign	Various	183,265	321,071
		748,258	2,219,780

Year	CR$ 1000s
1986	462,238,848
1987	461,730,669
1988	383,884,867
1989	328,524,477
1990	239,417,237
1991-2000	2,219,796,913

BNDES	Banco Nacional do Desenvolvimento Economico e Social
FINAME	Agencia Especial de Financiamento Industrial
IBD	International Development Bank
IDRB	

Sources: Company Reports, 1984.

Appendix G: Medium term eurocurrency credits to Acominas: details of a consortium loan to Acominas, guaranteed by The Federative Republic of Brazil, March 1977.

The loan agreement was for U.S. $495 million equivalent. Organised by Morgan Grenfell $ Co. Limited. Divided into three sections:

1. U.S. $200 million, managed by:

    Chase Manhatton Limited
    Libra Bank Limited

   with participation from:

    Bank of Montreal
    First Chicago Panama S.A.
    Bank of America N.T. & S.A.
    Banque Internationale a Luxembourg S.A.
    Kuwait International Investment Co. s.a.k.
    United California Bank
    Crocker National Bank
    Security Pacific National Bank
    Wells Fargo Bank N.A.

   This amount in three tranches:

    A: Maximum U.S. $100 million for 5 years from date of drawdown, at $1^{7}/_{8}$ per cent.

    B: Minimum U.S. $50 million for 6 years from date of drawdown, at 2 per cent.

    C: Minimum U.S. $50 million for 7 years from date of drawdown, at $2^{1}/_{8}$ per cent.

   These spreads are all quoted over the London Interbank Offered Rate (LIBOR) for 6 month US$ deposits.

2. U.S. $125 million, managed by:

   Morgan Grenfell $ Co. Limited
   Banque de Paris et des Pays Bas

   with participation from:

   Barclays Bank International Limited
   National Westminster Bank Limited
   The Hongkong and Shanghai Banking Corporation
   Midland Bank Limited
   Credit Lyonnais
   Banque de l'Indochine et de Suez
   Banque Nationale de Paris
   Societe Generale

   This amount for 6 years with drawdown allowed until March 1978, at $1^{15}/_{16}$ per cent above LIBOR.

3. DM 400 million, managed by:

   Compagnie Luxembourgeoise de Banque S.A. (Dresdner Bank Group)

   with participation from:

   Bayerische Landesbank Girozentrale
   Compagnie Financiere de la Deutsche Bank A.G.
   West LB International S.A.
   Commerzbank International S.A.
   Hypobank International S.A.
   BfG Luxembourg S.A.
   DG Bank-Deutsche Genossenschaftsbank

   This amount on the same conditions as the second section.

Source: Aco Minas Gerais S.A. - Acominas (1977).

Appendix H: The calculation of material and energy costs

1. Coal

Prices for coal are calculated from the following CSN data (CSN, 1983):

Year	Domestic Purchases 1000s CR$	Domestic Purchases Tonnes	Imported Purchases 1000s CR$	Imported Purchases Tonnes
1979	648,028	364,857	1,966,739	1,251,933
1980	1,419,275	331,577	4,539,728	1,249,097
1981	2,941,274	263,364	7,886,662	1,136,823
1982	7,821,676	309,111	20,720,257	1,436,136
1983	17,484,412	288,819	70,156,113	1,804,870
1984	46,272,136	286,642	194,686,114	2,049,986

These figures yield the following prices per tonne in cruzeiros:

Year	Domestic	Imported
1979	1,697.44	1,553.99
1980	3,669.75	3,471.03
1981	10,202.77	5,968.85
1982	22,692.57	13,842.89
1983	55,079.94	33,447.60
1984	161,428.31	94,969.76

Total tonnes of coal consumed by the Brasilian steel industry are as follows. (The only coal consumed is by coke steel plants, and the three plants in the analysis are the only coke steel plants producing in Brasil. 1984 figures have been alterred to account for coal consumption at CST.) Total cost = prices x tonnes consumed:

Year	Tonnes Coal Consumed Domestic	Tonnes Coal Consumed Imported	Total cost CR$ 1000s Domestic	Total cost CR$ 1000s Imported
1979	1,234,425	3,932,047	2,094,819	6,110,401
1980	1,995,468	4,205,876	7,321,372	14,598,595
1981	1,419,007	3,926,385	14,478,128	23,436,592
1982	1,040,285	4,258,207	23,607,187	58,946,359
1983	1,009,133	4,766,952	55,583,045	159,445,010
1984	842,078	5,678,227	135,934,000	539,261,210

2. Iron ore

The price at September 1983 (industry expert estimate) was U.S.$7.65. Deflated by the IPA, this yields an average price for 1977 which is 11% below the estimate by Teixeira for that year. Prices yielded are:

Year	Price CR$ per tonne
1979	211
1980	436
1981	908
1982	1,744
1983	4,678
1984	15,730

and consumption of iron ore per tonne of crude steel output was as follows:

Year	CSN	Brasil
1979	1.24	1.04
1980	1.34	1.03
1981	1.38	1.02
1982	1.41	1.06
1983	1.35	1.06
1984	1.38	1.12

Open hearth furnaces closed at CSN in 1980, hence the general increase in ore consumption. Use of electric furnaces elsewhere in Brasil reduces the overall ore consumption ratio. So for Usiminas and Cosipa an ore rate of 1.38 tonnes per tonne of crude steel output is assumed.

Then $P = p \times O \times r$

where P = Total cost of ore consumed
p = price per tonne of ore
O = total crude steel output
r = ore rate per tonne of crude steel output

3. Other material and energy inputs

IBS statistical yearbook gives average prices in cruzeiros for all other material and energy inputs recorded in table 7.6.

The quantities consumed are taken from consumption data at CSN and then estimated for Cosipa and Usiminas on the basis of crude steel output, known technology differences, and Brasilian consumption rates from IBS, as in the case of iron ore.

For example, average electricity consumption at CSN is some six times higher at 660 Kwh/tonne of output, than at Tubarao. The former has cold rolled finishing and coating lines, the latter no rolling equipment. Usiminas and Cosipa do not have coating facilities, so a consumption of 450 Kwh/tonne has been assumed. The average rate for the U.S. idustry over 6 years is 496 Kwh/tonne.

Tin, zinc and alloys other than ferro-manganese and ferro-silicon have been omitted as either negligible, or as mainly used in the manufacture of coated products and therefore an additional distortion on a cost analysis of hot and cold rolled (but uncoated) sheet.

Sources: IBS, Statistical yearbook, 1985; CSN, Performance and prospects, (1984), Company reports, various years; Teixeira, 1981; IBS, Indeces de precos dos productos siderurgicos, 1985; Industry expert estimates on iron ore prices.

Appendix I: Calculation of labour, parts and maintenance costs, Brasil.

1. Labour:

The number of workers at the three plants is:

Year	CSN[e]	Cosipa[c]	Usiminas[c]	Total
1979	21,000	15,321	15,366[d]	51,687
1980	21,157	15,364	15,715	52,436
1981	21,502	15,535	15,380	52,417
1982	21,105	14,373	14,949[d]	50,427
1983	20,421	14,096	14,519	49,036
1984	21,328[a]	14,733[b]	14,606	50,667

[a]: Direct data from the company.
[b]: May 1985.
[c]: From company report productivity and output data.
[d]: Estimated.
[e]: Editora Tama Ltda., Suma Siderurgia, 1985.

IBS data on labour costs is:

Year	Number of Workers	In Millions of CR$ Payroll	Welfare	Total	Thousands CR$ Yearly average wage
1979	142,024	23,422	7,990	31,412	221.1739
1980	146,084	47,353	16,068	63,421	434.1406
1981	137,339	97,378	35,257	132,634	965.7417
1982	144,360	205,766	77,732	283,498	1,963.8265
1983	137,551	420,032	162,000	582,032	4,231.3905
1984	144,036	1,179,934	424,180	1,604,114	11,136.8960

So wages at the three companies are:

Year	Number of workers	Total wages paid Millions CR$	Av Yearly Wage, US$	Av Yearly Compensation, US$
1979	51,687	11,432	6,119	8,207
1980	52,436	22,765	6,150	8,236
1981	52,417	50,621	7,616	10,371
1982	50,427	99,010	7,940	10,940
1983	49,036	207,490	5,292	7,333
1984	50,667	564,273	4,433	6,026

2. Parts and Maintenance:

Based on an industry expert estimate, this is taken as 2.5% of the current value of property, plant and equipment:

Year	Total 1000s of CR$[a] property, plant + equipment, after depreciation	Parts and Maintenance 1000s CR$
1979	189,439,000	4,736,975
1980	366,883,000	9,172,075
1981	786,011,000	19,650,275
1982	1,641,679,000	41,041,975
1983	8,174,558,000	204,363,950
1984	25,272,355,000	631,808,870

a: See appendix J.

Appendix J: The calculation of depreciation charges, Brasil.

NOTE: All figures at December 31st.

1: Calculation of rates by companies, for table 7.8.

Accumulated depreciation on fixed capital, in millions of current cruzeiros:

	1979	1980	1981	1982	1983	1984
CSN	14,253	26,108	57,701	126,401	396,955	1,538,782
Usiminas	22,377	41,147	89,099	200,961	527,143	1,739,622
Cosipa	6,110	11,601	32,246	80,740	268,143	1,066,425
	42,739	78,856	179,046	408,103	1,192,242	4,344,829

Accumulated depreciation on defered expenses, in millions of current crueiros:

CSN	371	1,077	3,108	9,127	32,245	203,322
Usiminas	495	1,193	4,200	10,233	41,140	190,776
Cosipa	278	608	1,734	6,981	35,473	186,019
	1,145	2,879	9,042	26,341	108,858	580,117

Total accumulated depreciation:

A:	43,844	81,735	188,088	434,443	1,301,099	4,924,946

Total accumulated depreciation, revised by ORTN to the following year's value:

B:	69,337	152,719	368,606	1,111,346	4,102,367

Yearly depreciation (A - B):

7,102*	12,398	35,369	65,837	186,753	822,580

*: Depreciation for 1979 is estimated as a proportion of total accumulated depreciation on capital and defered costs for 1979, that proportion equal to the average rate of depreciation as a proportion of accumulated depreciation in the other five years.

2. Total accumulated fixed capital and defered charges, current thousands of cruzeiros, totals for three companies.

Year	Fixed Capital	Defered charges	Total capital
1979	235,615,998	26,005,712	261,621,710
1980	412,143,676	71,827,192	483,970,868
1981	897,772,952	197,558,247	1,095,331,199
1982	1,910,887,992	540,599,018	2,451,487,010
1983	6,994,749,356	1,643,526,148	8,638,275,504
1984	22,120,452,705	5,853,757,801	27,974,210,506

The totals for 1983 include CR$992,952,811 thousand added above the ORTN revaluation on 1982 fixed capital.

3. Calculation of depreciation assuming 30 year life of capital, for table 7.16:

Total fixed capital and defered charges accumulated at the end of each year, and new capital added each year. Capital added is the difference between total capital for consecutive years.

	1984 Cruzeiros, millions.		1984 dollars
Year	Total capital	Capital added	Capital added
1984	27,974,210	737,729	231,698,800
1983	27,236,481	4,279,435	1,344,043,600
1982	22,957,046	2,304,296	723,711,050
1981	20,652,750	2,378,486	747,011,930
1980	18,274,264	2,798,791	879,017,270
1979	15,475,473		

An equal distribution of the remaining capital over the 25 years from 1955 to 1979 (CR$619,018,920 million, or $194,416 thousand per year) can be assumed. It makes no difference how the capital is distributed over the 25 years from 1955 to 1979, so long as a straight line depreciation is used.

Yearly depreciation (D) is then:

$$D(x) = \sum_{n=1}^{n=x} A(n)/30$$

where n = each year, n = 1 is 1955, n = 30 1984
A(n) = capital added in each year n
D(x) = depreciation in year x

Depreciation per year:

	1984 dollars	Current dollars
1979 = ($194,416,000/30) x 25	= $162,013,330	$116,480,160
1980 = ($194,416,000/30) x 25 +$879,017,270/30	= $191,313,896	$155,885,400
1981 = ($194,416,000/30) x 25 +$879,017,270/30 +$747,011,930/30	= $216,214,296	$192,319,990
1982 = ($194,416,000/30) x 25 +$879,017,270/30 +$747,011,930/30 +$723,711,050/30	= $240,337,996	$222,785,220
1983 = ($194,416,000/30) x 25 +$879,017,270/30 +$747,011,930/30 +$723,711,050/30 +$1,344,043,600/30	= $285,139,429	$274,332,390
1984 = ($194,416,000/30) x 25 +$879,017,270/30 +$747,011,930/30 +$723,711,050/30 +$1,344,043,600/30 +$231,698,800/30	= $292,862,696	$292,862,696

Sources: Companhia Siderurgica Nacional, (Annual): Relatoria de Atividades Companhia Siderurgica Nacional: Rio de Janeiro. 1980 - 1984; Companhia Siderurgica Paulista, (Annual): Financial Statements: Sao Paulo. 1980 - 1984; Usinas Siderurgicas de Minas Gerais, (Annual): Relatorio da Administracao: Belo Horizonte. 1980, 1981, 1983, 1984.

Appendix K: Selected incentives to export steel from Brasil.

1. Export credit premium.

This is an 11% premium on the FOB value of exported manufactured goods. This can be deducted from the payment of three kinds of taxes; 1) PIS - Social integration programme, which supplies money for the BNDES, 2) FGTS - Employee provident fund, 3) INAMPS - Employee health, security and pension fund. In order to qualify the product must include a minimum of 75% value added in Brasil.

Credit premiums were in force from 1969 until 1979, and reinstated in 1981 (Portaria MF-78, 01-04-81; Portaria 292, 16-12-81).

For example, slab sold by Tubarao to Lukens steel in the United States at $170 per tonne FOB, earned an export credit premium of $18.7 per tonne.

2. Income tax exemptions.

Brasilian companies may deduct from their taxable earnings the proportion of those earnings equal to the ratio of export revenue to total revenue. Current income tax is at 30%. (Decree Law 1158, 16-03-71.)

3. Suspension of IPI payment.

IPI is a value added tax. This is exempt on the value added to the exported goods by the exporting firm, a sum normally paid by the purchaser. This does not benefit the firm itself except by reducing the price of the export. Law Number 83263, 9/3/79, Article 25.

4. Suspension of ICM.

Products manufactured for export are not subject to sales tax (ICM). Law Number 4502, 3/11/64, Article 7.

5. IPI and ICM credits on purchases.

When purchasing components and raw materials for the manufacture of products, firms may offset against their fiscal liability the amount paid in respect of IPI and ICM on those purchases, once the final product is sold on the export market.

Appendix L: Strikes in Brasilian Steel, major demands and other details.

1. Mannesmann, September 1978. 900 workers for 6 hours, requesting a 20% wage increase to be made immediately instead of in stages.

2. Belgo Mineira, September 1978. 4,100 workers for 5 days. Workers demanded a 20% wage increase, company offered 3%.

3. Mannesmann, Belgo Mineira, Pains, September 1979. Part of a general strike in Contagem involving 1,500 companies and between 36 and 40 thousand workers. For 4 days. Requested an 80% wage increase, 20% immediately. Workers wanted to designate their own members as officials of the union. Twenty-three other demands including the provision of day-care facilities. There was considerable confrontation with the police during this strike. 600 police were used to break up picketers at Mannesmann. Some people were injured. At least 62 arrests were made, though most had been released by the end of the strike.

4. Belgo Mineira, October 1979. Demand that minimum wage should be adjusted in accordance with the government decree of July. Increase in vacation pay, 15% share of profits, and formation of a workers' committee.

5. Sidelpa, March 1980. 300 workers for 1 day. Wages due 7 days before had not been paid.

6. Belgo Mineira, October 1980. 4,500 workers for 3 days. Demands for wage and benefit increases, wage adjustments to be made every three months instead of every six, reduction to a 40 hour week, and the institution of a committee to deal with medical and social insurance, and to control punishments applied to the employees.

7. Cimetal, January 1981. 250 workers for 3 days. November's wages and the thirteenth month had not been paid. Pollution in blast furnace work areas. Cimetal was engaged in bankruptcy procedures during the strike.

8. Cosipa, February 1982. 7,000 workers for 1 hour. Wage increase demanded to match productivity increase. Also increase in transport allowance, Christmas bonus, and free meals.

9. Belgo Mineira, July, 1983. 3,000 workers for 2 days. The company broke a non-firing agreement by dismissing 14 workers. Workers asked for a 1 year stability of employment. 22 more workers were fired. Strike was taken to labour court. No solution.

10. Aparecida, November 1983. 60 workers for 1 day. Wages payment late. Reinstatement of 4 dismissed workers.

11. Electrometal, November 1983. 50 workers for 3 days. Readjustment of wages according to the price index. This was conceded to the lowest paid workers.

12. Mannesmann, November 1983. 200 workers for 8 days. Readjustment of wages according to the price index. No solution.

13. Aco Villares, November 1983. 1,400 workers for 1 hour. Readjustment of wages according to the price index.

14. Mannesmann, February 1984. 300 workers for 5 hours. Protest against the dismissal of 22 workers.

15. Cosipa, March 1984. 12,000 workers for 3 days. 88% wage increase demanded, and a guarantee on job stability. The company accepted wage increase of 70%, and offered to reduce dismissals, but without a stability guarantee. Workers occupied the plant with support from women and children outside. Blast furnace shut down. Police entered the plant and dispersed the workers. Strike ended without agreement.

16. Belgo Mineira, March 1984. 3,000 workers for 3 days. Protest against the dismissal of 98 workers. Plant occupied. Strike ended through compromise with the ministry of labour.

17. CSN, June 1984. 22,000 workers for 5 days. Demand for wage increase to the level of Cosipa, with three monthly adjustment. Double time for overtime. Wage changes to be dated 1st May not 1st July. Strike and occupation when demands refused. No settlement after court hearing.

18. Cosipa, September 1984. 7,000 workers for 15 hours. Demand for three monthly wage adjustment. Plant occupation and outside support, but police were also inside the plant throughout the stoppage. No agreement.

19. Aparecida, February 1985. 2,200 workers. Demands included real wage increase of 15%. No dismissals for 1 year, and reduction to a 40 hour week.

Source: DIEESE, and Boletim do DIEESE, various years.

Appendix M: Monetary and non-monetary benefits at Usiminas, 1980, which are beyond what is required by labour law.

1. Wage and salary benefits:

    a: A 5% addition to pay every 5 years.
    b: 40% addition to wage for hours worked between 10 p.m. and 5 a.m. (instead of the 20% required by law).
    c: 8 days pay for each year with no absences.
    d: Half a month extra pay for one year term of service, increasing by 10% of monthly income each additional year to a maximum of 2 month salary premium.
    e: Up to 7 days extra pay at time of vacation depending on attendance record.
    f: After 10 years service, an extra months salary, after 20 years two months, after 30 years three.

2. Assistance benefits.

    a: Financial association of employees (loans in case of illness, funeral, etc.).
    b: Transfer allowance (one months pay).
    c: Financial help for moving expenses.
    d: Housing.
    e: Reimbursement of medical expenses.
    f: Uniform (work clothing).
    g: Group life insurance scheme.

3. Community benefits.

    a: Leisure clubs.
    b: Community centre.
    c: Consumers' cooperative.
    d: Loan cooperative.
    e: Distribution of medicines.
    f: Schools.
    g: Marriage and mourning licences.
    h: Vaccinations.

Source: Cebrap, 1982.

Appendix N: Technology at CSN, Cosipa and USP, the three plants for which labour breakdown is listed in table 9.7.

All tonnages are in millions of tonnes of annual capacity.

CSN:

Coke:	Five batteries, 198 ovens, 2.332m tonnes.
Sinter:	Four plants, 5.734m tonnes.
Blast furnaces:	Three furnaces, 4.219m tonnes.
Steel plant:	Three BOFs, 4.6m tonnes.
Calcinating:	.437m tonnes of lime, .109m tonnes dolomite.
Con' casting:	Three units, 3.5m tonnes of slab.
Blooming mill:	1.5m tonnes.
Rails and heavy structurals:	.29m tonnes.
Hot strip mill:	Two continuous, 1.5 and 3.2m tonnes.
Pickling:	Four continuous, 3.085m tonnes.
Cold strip mill:	Three continuous, 1.977m tonnes.
Annealing:	Four continuous, .96m tonnes.
Temper mills:	Four, .478m tonnes.
Tinning lines:	Six, 1.08m tonnes.
Galvanising:	Three continuous, .52m tonnes.
Electro' cleaning:	Three, .435m tonnes.

Note: The above lists all equipment at the end of Stage III expansion. It is known that at the end of 1984 at least two of the three continuous casters were not in operation, and the continuous galvanising and annealing lines were incomplete, and the plant was operating at an effective capacity of 2.7m tonnes of finished product.

Cosipa:

Coke:	Five batteries, 203 ovens, 1.62m tonnes.
Sinter:	Three plants, 4.98m tonnes.
Blast furnace:	Two furnaces, 3.01m tonnes.
Steel plant:	Four BOF's, 3m tonnes.
Slabbing:	One mill, 2.3m tonnes.
Plate mill:	.6m tonnes.
Hot strip mill:	1.8m tonnes.
Cold strip mill:	.84m tonnes.

USP:

Coke:	Two batteries, 233 ovens.
Sinter:	One plant.
Blast furnace:	Four furnaces, one out of commission, one on stand-by, two in use.
Steel plant:	Four BOF, two at 3.5m tons closed, two at 2.8m tons in use. Two electric, .5m tons.
Con' casting:	2m tons of slab.
Slabbing mill:	3.3m tonnes.
Blooming mill:	1.5m tons.
Hot strip mill:	4.4m tons.
Hot skin pass:	.727m tons.
Cold reduction:	3.175m tons.

Sources: CSN, Performance and prospects, 1984; Hogan, 1984; Metal Bulletin, 1982; and data from companies.

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