4.1 Introduction

Melting and casting of metals and alloys, particularly that of iron, are generally considered as the mother of industrial progress. More than 90 percent of all manufactured goods and capital equipment use castings as engineered components or rely on castings for their manufacture. The use of castings is versatile. Castings are required in textile mills, agricultural and agro based machines, multi-storied buildings, highways, railroads and locomotives, trucks and automobiles, aircrafts and spacecrafts, ships and submarines, tools and implements of war, household appliances, mortuary accessories and even in idols, bells and crowns.

India is the sixth largest producer of castings in the world in terms of tonnage, and second largest in total number of foundries. There are about 5000 foundries in the country producing annually about 3.2 million metric tonnes of castings. Bulk quantity of casting are produced by gray iron (74 percent) followed by steel castings (9.6 percent) ductile iron (8 percent) and aluminum castings (6.8 percent). Foundries in India are located at Agra, Howrah and Kolkata, Batala, Ludhiana and Jalandhar, Coimbatore, Chennai,
Kolhapur and Belgaum, Ahmedabad and Boroda, Pune, Mumbai and Bangalore.

More than 93 percent of the market for casting is shared by ferrous castings, of which, iron casting accounts for nearly 90 percent, and the rest is shared by Ductile and Malleable casting. Non-ferrous castings especially that of aluminum, are mainly used in automobile sector and account for a small share in the market for castings. Demand for iron castings, in domestic market mostly originate in sectors like auto components, pipes, machine and machine tools. Automobiles, machine and machine tools are the two major segments of demand for steel castings (Table 4.1).

The estimated installed capacity of foundry industry in India is about 7.5 million tonnes, and the estimated capacity utilisation on an average is 45.6 percent (West Bengal Pollution Control Board, 1997). More than 95 percent of Indian foundries are in the small and tiny sectors with wide variation in sizes, products, technology standards and work culture (Institute of Indian Foundrymen, 2000). The average productivity is around 12-20 metric tonnes per man per year and the average rejection rate is 7.8 percent (Institute of Indian Foundrymen, 2003). The average productivity in global foundry industry is approximately 70 metric tones per man per annum. It is estimated, that during the period from 1990 to 1999 the foundry industry in India has recorded a growth rate of nine percent per annum. However, if we consider the period 1995 to 2000 the production of various types of castings
largely fluctuated, and the average growth rate was close to six percent for the whole period (Table 4.2).

Exports as well as imports of castings are not very significant in India. There are about 250 units directly or indirectly exporting castings abroad. Exports of castings include sanitary or municipal castings and industrial castings. During the period 1995-96 to 2000-2001, there was a general growth in exports. Out of that sanitary castings recorded a faster growth than industrial castings (Table 4.3).

4.2 Foundries in Howrah

Foundry industries in West Bengal are mostly concentrated in Howrah-Calcutta region, spreading over an area of about 25 square miles. On both sides of the Benaras Road and in and around Belgachia, Baltikuri, Bamungachi, Liluah and Belur, one can locate the iron foundries by the chimneys of cupola. This area with high concentration of iron foundries was the pioneer in the field of castings in India. Howrah was among the four major districts in Bengal province of colonial India where industries emerged by the beginning of the nineteenth century. According to the factory statistics for the year 1939, the number of factories in Howrah was 218. These factories accounted for about 12.8 percent of the provincial total. And the share of industrial workers was 19.5 percent to the provincial aggregate.

The Bengal Industrial Survey states that the major industries in Howrah were jute mills, cotton mills, general engineering and ship-building
Not more than 100 types of machine tools were manufactured in India till the Second World War. Bengal imported machines for mining, agriculture, processing and preservation of food, construction, textile mills, paper mills, leather industry and general engineering. One of the reasons for this dependence was admittedly the absence of efficient and adequate metallurgy industry to support machine and machine tools industry. Industries relating to casting, forging, stamping need precede or develop simultaneously with the manufacture of machines. However, in India, one unit started producing structural steel in Howrah only at the beginning of the 20th century. Prior to the First World War there were eight foundries in Howrah, as recorded in a report on industrial enquires (Cumming, 1908). During the Second World War, manufacturing industries in different lines improved greatly in India, as imports became difficult, and partly because of the active assistance rendered by the government. As a result, the number of foundries in Howrah also increased during the same period. By the year 1959, there were a total number of 92 foundries in the district, of which 44 were medium sized units. Inter-dependence of industries in Howrah created external economies. There were more than 100 engineering units per square mile (Reserve Bank of India, 1964).

During the British rule, industries such as shipbuilding, jute, textiles, railways and trams were set up in the Calcutta-Howrah region. All these industries required castings and as a result foundries were established. Cast iron soil pipes and manhole covers were also produced to meet domestic
and foreign demands (Government of India, 1958). The municipal castings once used in the roads of Paris were all produced in the foundries of Howrah (Rajeev, 2004). Eastern Region especially Howrah pioneered the industry because bulk of the engineering industries were located in this region. Only after Independence, i.e., after 1947, foundries were set up in different parts of the country to cater to the growing requirements of industrialisation.

Most of the foundry owners were local residents. A graphic description of how a petty trader gradually turned into an industrialist can be found in the autobiography of Alamohan Das (1950), upon whose name the industrial area was later named Dasnagar. There were owners from neighbouring districts of Calcutta and 24- Parganas, and other provinces of India such as Uttar Pradesh and East Punjab. Majority of the owners were Hindus and a large number among them are from a particular caste, namely, Mahisyas. There was high concentration of skilled workers in the area. Most of the workers and employers belonged to the same caste and this homogeneous caste identity helped forming close ties between the workers and their employers.

In the early 1970's the estimated total production of metal casting in India was about eight million metric tonnes. Of which West Bengal contributed nearly six million metric tonnes, that is, 75 percent of all-India outputs (West Bengal Pollution Control Board, 1997). Due to the gradual development of alternative raw materials together with industrial sickness in the Eastern region the demand for cast iron products declined significantly. At
present, the state's share in national aggregate production has declined to 20 percent. And the estimated production capacity of foundry units in Howrah, is currently 6.8 million metric tonnes per annum (West Bengal Pollution Control Board, 1997).

A large number of foundries closed down over the years in developed countries due to environmental concerns and perhaps rising labour costs (Gandhi, 2003). It was estimated that since 1980, one in every four foundries was shut down in the United States. As a result, for developing countries, opportunities to capture a larger share of export market increased in the globalised regime. However, the share in the global market does not increase automatically. This depends largely on how the products of the developing countries, adapt to the global requirements of quality. Most of the foundries in Howrah are facing the threat of non-viability with signs of stagnation and closure.

4.3 Data Source and Limitations

The NSSO has identified 432 foundry units in West Bengal. Of these 320 units employing about 40,000 workers are located in the district of Howrah. In the year 1996, West Bengal Pollution Control Board identified 229 cast iron foundry units in Howrah in order to implement pollution control norms. Of these, 196 units are small and medium sized, whose gross fixed capital did not exceed Rs. 5 crore, inclusive of pollution control device. It is obligatory for the foundries to apply to the Board for the 'consent to operate' every year and
the Board maintains records regarding emission standard and air quality as well as general information of gross fixed capital, annual production, composition of inputs and numbers of labour. These 196 units can be considered as the ‘population’ of small and medium foundries in Howrah.

A 10 percent sample was targeted through stratified circular sampling with a random start. The units were first stratified according to their location in the cluster, and sample units were randomly chosen from each location according to their respective share in the total number of units. The response to the survey was quite low; many units tended to avoid interacting with me. Several rounds of random choices were tried to achieve a representative sample. In all 43 units situated in Belgachia, Baltikuri, Bamungachi, Liluah, Benaras Road and Belur were ultimately selected for survey. Of these, 26 units, covering about 13 percent of the population responded to the survey. A questionnaire containing 39 questions was canvassed to collect several quantitative as well as qualitative information.

The low rate of response to interview was due to the lack of knowledge and transparency on the part of the entrepreneurs in maintaining operational data. Even those responded many tried to distort facts regarding annual output, number of workers, wages and the terms of contracts as regards labour and output. Data received from the owners were later cross checked. As the processes of production for small and medium enterprises in Howrah are more or less uniform, judgments on the basis of inter-firm comparison also helped in checking the reliability of data. Where there are gross distortions in
statements, that is, information received during field survey deviates largely from the official data received from the secondary sources, I used that information which appears more reasonable according to inter-firm comparison. Besides, repeated interviews of some key informants like officials of Indian Foundry Association, Howrah Foundry Association, trade union activists as well as workers of foundries and a few metallurgical engineers in the area provided better insights. Thus, information received from the field survey during the period June 2003 to August 2003 was verified by various other secondary sources.

4.4 Composition of the Cluster

The foundry units in Howrah are mostly gray iron foundries, and all the units surveyed are Directory Manufacturing Enterprises (DME) by the size categories used by NSSO (NSSO, 1998). All the 26 units visited are registered with District Centre for Small Scale Industries, Howrah. Most of them are also registered with different departments of government authorities related to industry.

About 27 percent of the units are proprietary firms, 42 percent are in the category of partnership and the rest private limited companies (Table 4.4). There are two associations of foundry owners in Howrah namely Indian Foundry Association and Howrah Foundry Association. Of the surveyed units about one-fourth are members of Indian Foundary Association, 15.4 percent
associated to Howrah Foundry Association and 50 percent are members of both and two of them are not member of any association (Table 4.4).

Of the owners about 42 percent are Bengali by linguistic origin while the rest are non-Bengali owners (Table 4.5). This reflects the fact of gradual transfer of ownership from original Bengali owners to Marwaris. Most of the Marwari owners of jute mills in the locality diverted capital from the sick units and entered into the foundry industry primarily as traders. The owners of about 80 percent of the units are the original owners, i.e., either they commissioned the unit on their own or inherited the foundry from their predecessors. The rest, entered into the foundry business in the current generation by buying from others (Table 4.5). This implies that the process of transfer largely occurred in the earlier decades and still continues.

The distribution of units according to the year of incorporation reveals that only two units in the sample entered into the industry in the last 10 years (Table 4.6). Ten out of 26 units are operating for more than 30 years. Only recently, the West Bengal Pollution Control Board has imposed restrictions on locating foundries in residential areas. However, even before the regulation, the number of new entrants during the last 10 to 15 years is very few. This definitely indicates to the stagnation in the cluster.

So far as the family background of the owners are concerned, 21 out of the 26 are second-generation foundry owners (Table 4.5). This implies that most of them have inherited foundries from preceding generations. To the second-generation owners, knowledge to run the unit is acquired from the
earlier generation. None of them had to depend on bank loans for initial investment financing, and very few ever approached for formal credit. Most of them do not feel any need for such loans in a depressing market and avoid formal loans that require declaration of operational facts.

4.5 Production Process

Foundries in Howrah are endowed with abundant supply of traditionally skilled manpower, proximity to raw material sources and port, an appropriate climate for casting and a strong tradition of metal casting for more than a century. The small or medium scale foundry units of Howrah produce a variety of castings by using pig iron, rusted iron scrap, byproducts of molten metal along with hard coke, coal and fire wood as fuel, and lime stone as fluxing agent. Some times hard burnt refractory fire bricks are used inside the cupola to maintain the required level of temperature. The bricks also resist unwanted chemical reactions during melting operations. The foundries in Howrah are producing castings with limited manufacturing infrastructure using the green sand and oil case process. The four major stages in the production process of iron casting are: (i) Pattern making; (ii) Sand preparation; (iii) Moulding and core making; and, (iv) Melting. Castings are produced by pouring molten metal into a previously shaped mould cavity, which forms the outside shape of the casting. The inner surface of hollow castings is formed by pre-shaped cores located by core prints in the mould cavity. Moulds for castings are made by connecting bonded sand around a
wood or metal pattern contained in a mould box, and cores are similarly formed by compacting bonded sand in appropriately shaped core boxes. Moulds and core boxes are normally in two halves to permit removal of the pattern and core. After making the mould, the pattern is removed, cores are assembled, the mould is cleared and molten metal poured into it (Figure 4.13).

Except in a few, most of the foundry units in Howrah do not have their own pattern making shop. Customers get them ready from experienced pattern makers in the cluster. Most of the units do not have any sand control equipment. Sand is prepared manually and the moisture content is adjusted by the experienced workers. Moulding is also done manually and 95 percent of the units adhere to floor-moulding. Even the hot liquid metal, which comes out from the cupola after a certain period of charging is carried out manually in buckets, and poured into the moulding pots. Most of the foundries in Howrah use old-fashioned single blast cupola, where air is blown at one level. This type of cupola is not energy efficient. Some of them modified their cupola into divided blast system, which reduces the consumption of coke and increases the level of quality and melting rate.

The small and medium scale foundries in Howrah usually produce semi-finished or rough castings, which are machined in respective engineering units. The major types of castings produced in Howrah are valves, pumps, wheel, pulley, spares of rail, steel plant and chemical plants, furnace parts, tube-wells, agricultural implements, hydraulic machine parts, projector, fan body, as well as spares for rice and jute mills. Castings produced in Howrah,
are exported in large quantities to Bangladesh, Nepal, Saudi Arab, Hongkong, Bahrain, Indonesia and the United States. Municipal castings especially, manhole covers of required specification, are the main exports to the United States. Besides, engineering castings are exported to other countries.

4.6 Labour Process

There is a popular notion that inflexibility of labour market hinders competitiveness of industries. Since the 1970s, the foundries in Howrah experienced a drastic decline in demand from Indian railways. Lack of demand resulted in lockouts preceded by labour strikes in most of the foundries. Since then, the labour processes have undergone remarkable changes. Labour is usually employed on a contractual basis. In some of the units owner employs permanent workers only in furnace related activities. In the survey, we find, one foundry employing all permanent workers. Most of the owners were reluctant to disclose the actual number of workers, in their units. Many of them said that they do not need to know the number of workers or terms of payment as they solely negotiate with the contractor assigned for the job. The job contractor decides the number of workers required for a particular job.

Labour contractors employ groups of workers and also negotiate the terms of payment with them. The contractor is usually a ‘head moulder’, who is the key person in terms of skills in a foundry. Alternatively, the contractor has acquired knowledge of foundry activities either from his family
or through interactions with workers in foundries. They usually do not possess any formal license rather enjoy extra economic power to monitor the groups of workers. In every foundry, there is a panel of contractors, who maintain the payroll of employed workers.

A contractor, in a foundry, is not merely a labour contractor in the usual sense of the term, but something more than that. The owner contracts out the whole process starting from moulding to loading finished castings, and the contractor gets commission of about Rs.150 (US$ 3.3) per tonne delivered. Contractors are actually not outsiders in a foundry, but, the most reliable persons of the owner. Although very much internalised in the production organisation of a foundry, the contractor appears as a separate employer in official statements. He has to undertake a large share of responsibility, not only of employing labour but to organise the production on behalf of the owner. The labour contractors secure orders of castings, buy molten metal from the foundry owner and then organise moulding and casting operations. The kind of subcontracting is a mixture of both industrial subcontracting and labour subcontracting. Beyond that it is also sharing of management responsibilities in securing orders as well as that of transportation and delivery.

In a foundry, there are different grades of skilled and unskilled workers identifiable according to their assignments in the production process. In the charging process, that is, those related to furnace, there are mainly three grades of worker: charger, furnace-man and lifter. The charger is the person
who looks after the whole process of charging, the furnace man, maintains the cupola furnace and the lifter, carries the molten metal. The head moulder with his fellow mould makers prepare the sand and make the mould as well as the core. Most of the workers in Howrah come from adjacent areas such as Hooghly, Burdwan, Uluberia, Bagnan and Mecheda. They do not undergo any formal process of acquiring skill but endowed with skills, passed across generations in the family. Only in one of the units, we noticed a few female workers. They do not work in the core production process; separate iron particles from sand grains. Because of the hazardous nature of work and hard labour required, female or child workers are excluded from the labour process in a foundry.

Usually, in a foundry, the workers involved in the charging process are permanent workers and receive wages on monthly basis. The workers in the moulding phase work under a contractor and receive wages on the piece-rate basis. The working hours is not maintained very rigidly in most of the units. Normally, the worker works 10 to 12 hours a day. Due to differences in the nature of work, the working hour varies for different workers. In a charging day, the melting operation of a foundry is carried out for about four to eight hours, depending upon the size of the unit. The inhuman working condition is quite explicit. In a charging day half-naked workers carry red-hot molten metal in buckets even in high temperature zones. In most of the small foundries, there is one or two fixed charging days in a week. However, due to lack of demand the average number of charging days in a month has declined

86
in most of the small foundries. As a result, for the small foundry owners it becomes difficult to maintain even a small number of skilled labour as permanent workers.

The contractor negotiates the total labour cost for a particular job with the owner. On an average, the labour cost paid by the owner is about Rs.1000 -1500 (US$ 21.8-32.7) per tonne of castings. The contractor pays wages according to the occupational grades of the workers. In the larger units, the wages of permanent workers are settled on a yearly basis though negotiation with the union. Both permanent and contract workers in a foundry industry are entitled to festival allowance, medical benefits like E.S.I. as well as Provident Fund. The contracted workers receive all these benefits incorporated in the terms of payment with the contractor and the owner pays permanent workers directly. Minimum monthly wages of unskilled workers in iron foundry, as declared under the Minimum Wage Act, as on 31.12.97 is Rs.1673 (US$ 36.4) per month (Government of West Bengal, 1998). Skilled workers in Howrah are earning a monthly income above this minimum level, while the unskilled workers are deprived of their scheduled minimum wages (Table 4.7 and Table 4.8). In most of the units periodic wage increment of the workers, either had been discontinued or became irregular. The bargaining power of unions declined even in the larger units. Because trade unions apprehend lockouts or closure, which could even destroy the existing scope of earnings.
4.7 Factor Productivity Ratios

Using primary data on labour (L), replacement value of fixed capital (K), present value of output (O), present value of input (I), value added in the reference year (V) and total emoluments received by hired labour (E) for the reference year 2000-2001 productivity ratios\(^{13}\) are computed for each of the foundry units surveyed (Table 4.9a and Table 4.9b). Similar ratios are computed for the unorganised manufacturing units in West Bengal as well as of all-India based on ‘Unorganized Manufacturing Enterprises in India: Salient Features’ NSS Fifty-first Round, 1998. We have used the definitions of capital, labour, value added and emoluments in the latter source in computing similar ratios for Howrah. These ratios are then compared with productivity ratios in average Small Scale Industries\(^{14}\) (SSI) of India (Government of India, 1988). The classificatory definition of SSI units is on the basis of upper ceilings in investment in plant and machinery. The DMEs are defined by the NSSO on the criteria of employment. However, there is a large overlap in the two categories of units. In the sample, about 77 percent of the units satisfy both of the criteria. Thus the averages of the productivity ratios for DMEs in Howrah are compared to similar ratios computed for

\(^{13}\) Capital productivity: \(V/K\); Labour productivity: \(V/L\); Capital intensity: \(K/L\); Average value added: \(V/O\); Share of emoluments in value added: \(E/V\); Return to capital: \((V-E)/K\).

\(^{14}\) As per Government of India Notification No. 857 (E) dated 10 December, 1997 an industrial undertaking in which the investment in plant and machinery, whether held on ownership terms or on lease/ hire purchase basis does not exceed Rs. 30 million is graded as small scale industrial undertaking.
DMEs in West Bengal and India as a whole and also for SSI units in India. This exercise leads to following observations (Table 4.9c):

1. The average productivity of capital in the foundry units in Howrah is higher than that of DMEs in India as a whole. However, the former is less than that of DMEs in West Bengal, and also that of SSI units in India.

2. The foundry units in Howrah largely produce low-value added products. The SSI units in India and the DMEs in West Bengal and in India as a whole produce on an average higher value added goods than the foundry units in Howrah.

3. Capital-intensity of foundry units in Howrah is about 3.8 times higher than that of DMEs in the rest of West Bengal. Also, these foundries are 1.5 times more capital intensive than average SSI units in India and 1.8 times than average DME units in India as a whole.

4. Labour-productivity is higher in the foundry units of Howrah than that in the DMEs in the rest of West Bengal and in DMEs and SSIs in India. Labour-productivity in Howrah foundries is 2.7 times higher than that in average DME units of West Bengal and 117 per cent higher than that of DMEs in India.

5. The share of emoluments in value-added is low in the foundry units. The labour in the foundries of Howrah gets a share of value-added which is low
relative to labour’s share in average DME units in West Bengal as well as that in all-India.

6. The return to capital, as a proxy of profitability, is higher in foundry units of Howrah, if compared to those of DME units in West Bengal as well as to those of DME units in India.

Thus the stagnation of the cluster can be explained neither by low profitability of firms nor by low productivity of labour. Moreover, in the previous section we discussed about the labour market in Howrah which is fairly flexible with contractual labour, weak trade unions and none to execute minimum wage legislations. In the following sections we look at the constraints that hinder competitive response, and many of those can be located beyond the realm of market.

4.8 Constraints in Forward and Backward Linkages

During the period 1990 to 1999 here had been a declining trend in the production of grey iron and malleable iron castings in the global market. And, the demand for ductile iron and steel castings is on the rise (Gandhi, 2003). The demand pattern of metal castings underwent a significant shift primarily due to development of alternative materials and increasing concern about quality.

Use of closer substitutes like plastic pipes, fittings, sanitary items and stainless steel and aluminum pan has already reduced the demand for iron castings. Nowadays consumers seem to be least concerned about product life.
cycle, and have greater affinity towards sophisticated, better finished, good-looking products made up of light materials. Moreover, prices of substitute goods made up of plastics and other light materials are much lower than those of iron products. As a result, metal casting is facing increasing competition from alternative materials such as non-metallic, power metallurgy, composites, fibre-reinforced plastics, and also other more sophisticated methods of forming and shaping. Larger foundries who were major suppliers of railway sleepers lost the market as the use of concrete non-metallic sleepers has been increasing.

Demand has been increasing for thin wall sections, high precision in pattern, fine finish and little machine tolerance. There are about 600 listed variables, that determine the quality of castings and those cannot be maintained through traditional technology, and experience of workers (Murthy, 2000). Surface finish, dimensional tolerance, flatness, general wall thickness, squareness, angular tolerance, machine allowance and hole tolerance are the major physical determinants of good castings. Apart from these, mechanical properties like ultimate strength, elongation, hardness or metallurgical characteristics like material specification, micro porosity, cavities, stresses, segregation and gas content are the main parameters in judging the quality of castings. There is an increasing demand of castings with thin wall sections, accurate design, fine finish, of little machine allowance and narrow operating limits regarding dimensional tolerance. High precision in
pattern, strict rejection control and high-speed-low-energy core making are some of the requirements to get hold of a greater market share.

The small or medium foundries in Howrah were organised neither for large volume of production nor for thin walled components with the required quality standard. This is evident from the fact that although foundries of Howrah were the pioneers in the field of castings, did ever meet demand for automobile castings, which is for both consistent quality and large volume. The foundries in Howrah, who depend largely upon traditional skills are either marginalised or stuck in the lower end of the market. In a liberalised regime the gap between domestic and export markets is gradually wiping out. Hence, foundries heavily depending on fixed clients in a protected economy are facing immense pressure to upgrade technology in order to survive. Small and medium scale foundry units of Howrah, those who were highly dependent on purchases from Eastern Railway on the one hand, and jute, textile and engineering industries of the region on the other, now face serious trouble.

The marked decline in government investments is also responsible for demand deficiency. Demand for castings is a derived demand, which originates in capital goods sector in particular, and the manufacturing sector in general. The capital goods industry is mostly dependent on investment driven demand in infrastructure or core sector projects. Due to a fall in government investments, during the period 1990-91 to 1998-99, the compound annual rate of growth of Indian manufacturing shows a declining trend (Table 4.10).
Decline in public investment throughout the last decade has changed the sectoral weightage of Indian manufacturing, which explains the declining trend in demand for casting at least in the home market. If we look at the sectoral distribution of growth, we find that between 1990-91 to 1997-1998 more than half, that is 52.5 percent of the growth accounts for consumer goods, while basic intermediate goods and capital goods accounted for only 16.3 percent and 11.8 percent respectively (Table 4.11). Consumer goods industry, in recent periods, is emerging as the biggest employer in the manufacturing sector. Chandrasekhar (1997) also argues that in all probability there is a persistent decline in industrial investments and stagnation even in private corporate investment. The kind of liberalisation pursued in India is a consumption-led boom where rapid growth in new markets is bound to exhaust itself just as the 'once-for-all' market that import substitution initially provided.

Third, studies (Nambiar et al., 1999; Beri and Rammohan, 1995) show that as an effect of import liberalisation, the weight of manufacturing imports in manufacturing GDP has increased significantly. The import intensity has increased in almost all of the industries during the post-liberalisation period. Foundries that grew in a policy regime of import-substitution, are presently facing the threat of losing demand, due to reductions in customs duty and abolition of quantitative restrictions.

The unpredictable fluctuations in input prices also have a regressive effect on the foundries in Howrah. Earlier, the government was the
only supplier of pig iron. Supply was restricted and the quality of the material was inferior. Now several private enterprises specialise in producing high quality pig iron. Tata Metallics, NICO, Kalinga, Ajdia as well as IISCO are the main suppliers of pig iron. Coke of different grades is purchased from a few private bhattas located in Dhanbad and Asansol areas. Foundry grade coke is not easily available. Decontrolling price, and greater concern about profitability in both private and public sector plants, resulted in an increase in the prices of raw materials, adversely affecting the small foundries. Following the withdrawal of the government control over prices and distribution of raw materials, the supply depends on a few traders. Stiglitz (2003) argued that privatising a monopoly before an effective competition or regulatory authority was in place, might simply replace a government monopoly with a private monopoly, even more ruthless in exploiting the consumer.

Within a short period between November 2002 and February 2003, prices of pig iron, steel scrap and coke increased by 31.6 percent, 26.5 percent and 33.4 percent, respectively. During the same period, prices of diesel oil increased by 36 percent. As because oil is required for the blower during charging, hikes in the prices of diesel also added to the cost of production (Table 4.12). The fluctuations in raw material prices inhibit planning for future production especially for the small foundries who cannot afford large inventories. Six major local dealers of raw materials dominate the input market in Howrah. However, they often restrict the supply of inputs thus pushing the input prices.
In a situation of losing margins, everyone is trying to get a larger share of the existing market and competition becomes fierce. In order to stop price undercutting, the Foundry Associations have decided a benchmark sale price of castings, Rs.16.5 (US$ 0.4) per kg. However, the small foundries who are engaged in the production of low-valued castings often sell at prices below the stipulated minimum.

The situation is not very different in the case of export-linked units. As reported by the Indian Foundry Association, the quantity of exports from India, per year is around 1500 metric tonnes. And foundries located in Howrah have the largest share in the exports in terms of tonnage. The exports growth notwithstanding, networks of sub-contracting have not grown significantly. This is because municipal or sanitary castings with low value-added accounts for the largest share of exports. Only those units who do not have adequate capital to purchase raw materials agree to work with an exporting unit. In that case inputs are supplied to the sub-contracting units by the exporting firm. Otherwise, to a small foundry engaging in export related productions are not much profitable, as because, payments are delayed.

Finally, the historical trajectory of industrial retrogression in Eastern India, and the 'path dependence' also shapes the future course of response of these foundries. Since the Partition of India, (1947) jute mills located in the region were divorced from the supply of raw jute. Later on, industrial sickness, low capacity utilisation in the public sector, textile mills and engineering industries, and deteriorating labour relations, gradually
eroded the industrial base. Further, the political decisions of the Union Government that favoured investments in other states changed the future composition of industries (Roy, 1972). With the closure of public sector engineering industries, textiles and jute mills, the foundries of Howrah are de-linked from the demand of good quality castings.

The geographical concentration of modern manufacturing industries such as automobiles, machine tools, valves and pumps, steel rolls as well as other capital goods being away from the state, it is difficult to compete due to higher transaction costs. By using the components of change analysis, Banerjee, (2005) has shown that for the period 1987-88 to 1997-98, the competitive component for West Bengal was positive. This implies that industries in the state had been growing at a faster rate, than their national counterparts. However, the allocative component of the state is negative, implying that the state specialises in slow growing industries which is due to locational disadvantage.

4.9 Organisation of Production

During the last two decades, resurgence in the foundry industry was apprehended on the basis of the simple perception that closing down of units in the developed countries shall create opportunities for developing countries to increase their share in exports. The process of liberalisation and opening up of markets was envisaged as sufficient to redirect global demand for labour intensive goods toward developing countries. However, the expectation did
not realise in all of the developing countries. Although very few could increase their global share by increasing their capabilities.

The foundries in Howrah are characterised by lack of consistency in quality, poor surface finish, excessive machining allowance, low yield and high rates of defects and rejection. These have led to disadvantages like long production cycles, low profit margin, inefficient use of energy and poor competitive strength. These units mostly produce castings with low-value added. The physical turnover in the foundries of Howrah is 16 metric tonnes per man per year, which is within the range of national average in the foundry industry. However, the average physical turnover in foundry industry by global standards is about 4.4 times the physical productivity of labour in the foundries in Howrah (Indian Institute of Foundrymen, 2003).

It is generally assumed that the technology market works efficiently. If this was true, why foundries in Howrah, with a large pool of traditionally skilled work force, are not responding adequately to changing markets through upgrading technology? To answer this question we should look into the organisations and institutions upon which the market is embedded. The standard theories of economic development both for macro and micro levels consider only flow variables as terms of analysis. These formulations do not in any critical way require the concepts of stocks such as organisation and behaviour inside the firm.

The organisation of production in foundry units of Howrah is unique in character. There are three major types of foundries according to
their production structure: (a) Foundries producing three to four types of finished products; (b) Those selling only molten metal and letting out floor area for moulding (c) Units engaged in some fixed job work as well as selling molten metal. As reported in my survey, about 15 percent of the units belong to first category and 38.5 percent and about 46 percent belong to second and third categories respectively (Table 4.5).

The traditional production organisation is ‘popularly’ called as Galamal and the second category of operation represents the unadulterated version of this typical system. The owner of a foundry owns a cupola and floor-moulding area, employs his own workers for furnace operations, sells liquid metal to intermediaries and let out the floor area for moulding. The skilled labour works as intermediary, secures orders for diverse castings, purchases liquid metal from cupola owners, employs shop floor workers for moulding, and sells castings as per orders. This situation suited well in a protected market, where orders from engineering industries, Railways or textiles and jute mills, after several layers of contracts fed these foundries with abundant demand.

With the decline of engineering industries in Eastern India and due to a qualitative shift in demand pattern, this type of production structure faced immense pressure. As the demand decreased, financing purchase of inputs and securing orders of castings gave entry to non-Bengali traders in Howrah, creating a triad of owner-trader-labour contractor as the revised version of the Galamal system. The traders would search out orders, often get the pattern
made and then would get the castings cast on 'cash and delivery' basis. This suited everybody. The risk aversed owner need not have to depend on for formal credits from banks and is satisfied with his margin. Because, most of the owners inherited their foundry, to them running the unit efficiently means that it should at least ensure an earning enough to maintain their family. Besides, the trader was happy with a role confined to financing and trading where profits can be derived without knowing the intricacies of production. For both the owner and trader it is either a survival strategy or making money without disturbing the inertia of traditional methods.

With increasing dependence on finance commercial capital gets control of the foundry leading to transfer of ownership. As a result, with the changing production organisation there is a simultaneous process of gradual transfer of ownership from the traditional Bengali owners to the non-Bengali trading community. This kind of production organisation, is never favourable for a responsive change towards upgradation of the traditional production process.

Shen's (1984) analysis shows that there is a very high degree of variation in inputs to get a given output, and this can only be explained by differences in organisational effectiveness in different countries. This study suggests that market-inefficiency is not the entire problem and that organisational inefficiency or X-inefficiency may be more significant. The situation of inertness and stagnation, even in the face of global competition, can be explained with the schematic view of X-efficiency theory (Libenstein,
It is suggested that the efficiency route of a firm is activated by two types of environmental pressure — one from the ‘bottom’, and the other from the ‘top’. Pressure from the bottom arises when buyers or users of the goods have alternatives. In other words, the market is competitive and everyone is forced to reduce price to the competitive level in order to survive. The other pressure refers to those from the owners or owner’s representatives, which is a kind of managerial pressure. These two simultaneously determine the choice set of efforts at different levels in the organisation of production, which in turn implies a certain mode of translation of inputs into outputs. The organisational system is characterised by a feedback arrangement between results and efforts. The feedback mechanism depends on three aspects of the system — the appropriateness of the observed results, the effectiveness of the transmission to the effort source and, the responsiveness of the effort source.

The pressure of competition did not affect these foundries earlier as they more or less enjoyed a protected market. In the present situation of losing market share the foundries did not respond to innovate. Rather they try to escape from the competitive forces either by confining themselves to the lower end of the market or by evasion of taxes. Organisational efficiency persists at a low level due to the absence of impersonal management and systematic assessment of observations. Most of the foundries in Howrah are family owned firms. Irrespective of the type of ownership foundries operate with traditional technology. In the absence of a detailed input-output analysis, to the owner putting pressure on existing wages seems to be the only feasible
way to reduce costs. The owner's strategy is to reduce per unit cost of effort. The worker on the other hand, alienated from the entire production process shows little concern about efficiency goals. This leads to a prisoner's dilemma kind of situation, where the pressure sent from one level is only partially transmitted to the next level. The pressure gets relaxed further due to the loosely connected system of owner-trader-contractor.

Moreover, investments in fixed capital involve long-term commitments to particular products and production volumes. Because of substantial uncertainty about future demand conditions it seems plausible to choose production techniques that heavily rely on labour. Besides, it stimulates the tendency of transferring working capital to personal assets thereby reducing the potential for long-term growth. In a competitive situation new capital is normally inclined to introduce best available technologies in order to take advantage of relatively cost-efficient production. These capital constitute the regulating capital or the key firms in the industry. However, in the foundries in Howrah, the gradual transfer of ownership establishes the dominance of commercial capital. The traders, with little long-term commitment to the industry fails to play the role of regulating capital in leading the necessary technological upgradation.

The availability of undervalued labour following the erosion of labour institutions allows old vintages of capital stock to get replaced slowly. It also impedes the Schumpeterian process of creative destruction, as flexible wages gives an additional option to non-innovative firms (Kleinknecht, 1998;
Michie and Sheehan, 2003). In such situations, the regulating capital could survive by continuously shifting product market boundaries, by product and process innovations. However, so long as the numerical strength of regulating capital remains weak, introduction and diffusion of new technology happens to be slow. As a result, destructive price competition based on lower wages gravitates the industry to a low wage trap, away from the 'high' road to development (Banerjee, 2005).

The units of the third category are those who do not depend solely on orders secured by intermediaries but produce better quality castings for fixed clients. Although, not in actual operation, the Galamal nomenclature based on a triadic structure is maintained in official statements in order to take advantage of excise concessions.

4.10 Institutions: A Relevant Site

In the previous section we discussed why the production organisation of a foundry in Howrah is not conducive to necessary technological upgrading. The foundries in Howrah, characterise a low-level equilibrium—confined in the lower end of the market, they survive with traditional technology together with sub-optimal efforts from low-paid workers. The organisations of capital and production are not conducive for sustainable competitiveness. In this section we locate the institutional impediments that exist outside the firm and hinder responses to changing markets.
Mokyr (2002) has shown that it is possible for an economy to get stuck at a low level of income, because the institutions are inappropriate for technological progress. Individuals receive signals from market prices which operate within a complex chemistry of institutions that conditions the very signal radiation process. In that sense, a variety of local institutions become critical determinant of successful implementation of policies (Sinha, 2002). Stiglitz (2002) argues that forcing liberalisation without proper institutions put in place may cause instability, the cost of which are disproportionately borne by the poor. Martinussen (2001) and Chelliah (2002) discusses how industrial policies in the post liberalisation period in India are constrained and distorted by institutional impediments.

The neoliberal argument relating to diffusion of technology is based on the assumption that the international technology market works efficiently. Firms optimize the allocation of resources with full knowledge of available technologies. It is also argued that firms use technologies efficiently and there is no need of any process of acquiring capabilities as the learning curve is more or less predictable. Firms are assumed to acquire and use technologies as individual units and specialise relying on anonymous market transactions. This paradigm ignores externalities that emerge in technology diffusion among vertically integrated firms. And, thus refutes any need for coordinated effort to build technological capabilities.

However, manufacturing enterprises do not acquire technological capabilities in isolation. Industries having strong intersectoral linkages cannot
predict the learning curve of their suppliers and subcontractors (Lall, 1992; Lall, 1997). As a result, firms in the same vertical production link may run at different levels of technological efficiency. And, passive learning takes a long time in adapting to more demanding situations. This is evident from the fact that exports of engineering in India are growing at the rate of 10 to 15 percent annually, while that of castings remained low at about three percent. Thus, foundries in India are perhaps not ready yet to be hooked in the global value chains. Among the developing countries Korea, China and Taiwan are taking the lead with their competence in producing global standards of high-valued castings.

Technology learning is a conscious and cumulative process, and highly context specific. In dynamic situations firms do not automatically move to the right factor combinations adopting the right type of technology. Explaining the growth of the Taiwanese machine tools industry Amsden (1985) argues that the division of labour in these industries is conditioned not only by the size and growth rate of the market but also by its type. The graduation from low-income buyers to penetrating of markets in developed countries helped in achieving a higher growth path. Foundries in Howrah although account for the largest share in the volume of exports of castings from India are not capable to cater to the higher end of the market. For traditional products penetrating markets of higher value added depends not so much on developing sophisticated models as on improving the durability, reliability and precision of products. The process of capability building
involves advancements at all levels, viz., procurement, process of production, managerial and organisational efforts. However, attaining these capabilities needs appropriate institutions and policy interventions.

In developing countries markets often fail to send signal about the appropriate choice of technology because of widespread information imperfections and missing markets. The owners of foundries in Howrah do not realise the need for investment in building capabilities and may not know the appropriate mode. The learning process appears to be risky and unpredictable. This is because the firm may not be able to raise finances to cover their losses during the learning period due to capital market failures. In Howrah, most of the foundry owners do not even learn the information on the changing pattern of demand, the areas where even small foundries can get a sizeable share of high-valued market. On the other hand, in a few cases, efforts to upgrade technology turned to be futile as they were not market linked.

Capital market failures are widespread in developing countries and are likely to be worse for small and medium sized enterprises. Besides inadequate development and segmentation of capital markets, financial intermediaries may suffer from inadequate information on small borrowers. Informal credit sources are averse to finance technological development because of their lack of knowledge and also the risks involved in doing so. At the initial stages there were strong feelings of homogeneous caste identity in Howrah that helped in forming close ties among owners and workers.
However, at present, linguistic and caste ties create closed groups of non-Bengali owners and hinder interlocking networks of support across units. As a result the capital market is fragmented, and market fails in producing its allocative effects over a wide enough domain.

The supply-side issues relating to attaining higher levels of technology are often ignored in the neoliberal notions of technology diffusion. Markets often fail in mobilising necessary skills. The owners/managers of foundries in most of the cases are not aware of the skills required. Moreover, they are rooted in traditional ways of manufacturing and training that make them averse to further training of employees. In Howrah, the problem is further acute due to the nature of capital organisation. Commercial capital that acquired ownership in most of the foundries is interested in short-term profits instead of building technological capabilities for a longer period. The non-Bengali trader usually appoints an obedient reliable manager of his own community as the key person in business affairs. As because maneuvering of books of accounts and different modes of tax evasion are important sources of revenue to the firm, obedience to the owner is weighted higher against technical competence.

Moreover there are a number of technological functions that have features of public goods whose rewards are difficult to appropriate by private firms. Markets usually fail in developing special skills, promoting quality awareness and setting of industrial standards. The Indian Foundry Congress, 1998 (Indian Institute of Foundrymen, 1998) admitted that the actual
production work done by a foundry operator is only 40 percent of the total work done. Rest of the time spent by him is in setting his work place, looking for the materials, tools and due to unanticipated hindrances. Energy conservation is yet another major area that deserves attention. A study of small foundry units indicates that energy conservation potential to the extent of nine percent in coke consumption and 19 percent in furnace oil and electricity exists on an average (Kapoor, 1998). Improved heat recovery, better furnace utilisation, recovering and reusing the bed coke, as well as, improving coke to metal ratio largely helps in reducing costs.

The pattern making is still in its infancy. Foundries in South Korea take two weeks for a trial casting supply, China takes 12 days, while Japan 10 days. India takes minimum of six months to develop a cylinder block, and this is primarily where the race is lost (CII and World Bank, 2002). What is required is facilitating collective indivisible inputs, which the small foundries could not afford individually. Common technology support agency, a common laboratory, sand washing and grading plant, a central marketing cell should be primarily provided by the government. The wafer thin lead in per unit labour costs is often eroded due to infrastructural bottlenecks, regulatory hassles and lack of good quality raw materials.

The market based approach argues that trade liberalisation alone are sufficient to induce technological dynamism. It is argued that openness leads to increased competition which induces cost-cutting technological change across all sectors. However, the argument on technology related benefits of
liberalisation is theoretically fragile and not empirically robust (Deraniyagala and Fine, 2001). The negative effect of trade liberalisation on manufacturing performance and technology upgrading in Sub-Saharan Africa during the 1990s goes against the neoliberal notion (Deraniyagala, 2006). We also see that although economic reforms in India have increased the pressure of competition in the foundry industry that did not lead to technological upgradation. As a result of market failures, often markets clear at a low-growth equilibrium, where firms specialise in low-technology activities even under free trade.

There is a missing link between the external forces of globalisation that increases competitive pressure and the capability of a country to leverage the opportunities, created in a liberalised regime. Instead of assuming technological progress as an automatic response to liberalised trade for developing countries selective protection and strategic participation in the international market helps building long-term technological capabilities. Moreover, the mode of strategic participation of a country and the choice of techniques are strongly related to each other. The choice of technological combination is not neutral with respect to effects on long term technological development. The technological development of a country should be positioned in the societal construct, identifying operational instruments and policies which could stimulate competition and growth in multiple sub economies that coexist in the developing countries (Bagchi, 1978). Given the increased mobility of resources, it needs strong complementary immobile
resources to attain dynamic comparative advantage. Saeed and Prankprakma (1997) suggests, that in a dual economy, technological development policies should attempt to promote competition among the monopolistic firms, while providing positive assistance to the competitive smaller firms.

The technological notions of institutions, usually ignores social institutions as reference of analysis and heavily depends on the deliberative rationalised action of the economic agent. However, the transaction costs characteristics of an industrial institution do not only depend on exogenously given technology. The complex matrix of behavioural standards embodied in culture and historical realities critically influence those costs. This draws our attention to broader issues behind the market like the social dispositions of an economic agent, which transaction cost theories usually ignore. Platteau (1994) suggests that markets are not external to society, and can only function in the contexts of appropriate social arrangements. Generalised morality, effective external sanctioning institutions, decentralised network of sanctions and coordinated public and private institutions, are the preconditions for effective functioning of market. The space of exchange relationships and related institutions in Howrah, largely falls short of these social preconditions.

In the face of global competition, the organisational or institutional responses are not adequate. They are not spontaneously responding to altered incentives and changing relative factor prices, as conceived of in ‘induced innovation hypothesis’ (Ruttan and Hayami 1984). This is because individual responses are not one way causations. Rather, they are the outcome of a
complex chemistry in the relationships between markets, institutions and cultural endowments. The distinct allocation rules pursued by existing institutions dictate the mode of livelihood, affecting personality, habits, tastes, identities and values (Bowles, 1998). In the wake of liberalisation it was predicted that more the economy gets released from political influence, rationalities of contract would replace custom and acquired characteristics would replace ascribed ones. However, Harris-White (2004) argued that the social institutions, which regulate the Indian economy in significant ways, are resistant or immune to changes in macroeconomic policies.

In the absence of appropriate organisations and institutions if the forces of competition are left to operate in a vacuum then development may remain latent. The short-sighted responses to markets trigger aggregate effects that abort the potential of the cluster. Illegal maneuvering of raw materials, under-invoicing of outputs, and different modes of evading taxes are the frequently chosen paths by the owners of foundries to increase profit. Moreover in such situations horizontal cooperation among firms becomes weak and as a result, cooperative efficiency suffers in industrial clusters.

What is needed is a deliberate intervention, which helps give a direction to the evolutionary process. However, the mere existence of market failures does not call for remedial interventions. Because, in certain circumstances market failures may be outweighed by its benefits and in others, markets can develop efficient cooperative solutions to perceived failures (Lall, 2002). Interventions are justified where market failures retard
industrial development and where market-driven solutions take too long to emerge.

Although there are strong notions that in the process of globalisation the State is becoming powerless. The usual modes of state intervention, through demand management or exchange rate policy are besieged by the volatility of finance.\textsuperscript{15} However, Weiss (1997) contradicts the myth of powerless state. Globalisation is subject to its countertendencies. There are increased tendency of regionalisation, and differential domestic state capacities in adapting with the dynamics of internationalisation. In this context the strategic role of the State should be redefined (Chandrasekhar, 1997). The kind of intervention needed is less extensive and less directive termed as 'governed interdependence'. That is a system of central coordination based on the co-operation of government and industry (Turnham, 1993; Weiss, 1995). A number of studies on East Asian economies analysed in a historical perspective how institutional and organisational changes were orchestrated in different phases of development.\textsuperscript{16} It was a kind of strategic integration with the international economy, promoting capital accumulation and animating dynamic profit-investment interactions that helped in releasing dynamic comparative advantage. The countries best able to develop local assets and strategies are the best placed to generate growth and employment under the competitive conditions of globalisation.

4.11 Summary and Conclusions

1. Foundries began to set up in the early nineteenth century in Howrah. The foundries in the cluster are mostly grey iron foundries, producing spares and components for jute mills, textile mills, railways and other engineering implements. The largest share in exports of castings from India in terms of tonnage accounts for the foundries in Howrah. However, these are mostly low-valued municipal and sanitary castings. Despite absence of any significant entry barrier, the number of new units in the cluster, is very few and most of the units reported, low capacity utilisation and decline in production compared to previous years.

2. Labour market is flexible and the workers are employed on the basis of ‘quasi’ contract mediated through the labour contractors. These contractors, although very much internalised in the production organisation of a foundry are assigned as sub-contractors, in order to avoid direct transactions with the labour. In most of the foundries capital is mobilised from personal resources or from close ties within the same community. Formal credits are avoided due to uncertainty in a depressed market and to avoid the necessary disclosure of operational facts. Return to capital is high in these units compared to average DME or SSI units both in the rest of West Bengal and in India. Labour productivity is also high compared to similar size categories of manufacturing enterprises. However, the share of emoluments in value-added is relatively low in these foundries.
3. There is a significant shift in the demand pattern of castings, which is primarily due to increasing use of alternative materials, and demand for improved quality. The foundries in Howrah are not capable to meet the global requirements of quality that is in favour of thin wall sections in large volume. Moreover, during the 1990s, there was a consistent decline in public investment in India. This resulted in a declining trend in the growth of capital goods, in specific, and manufacturing in general. This in turn, reduced the demand for castings in the domestic market. The price decontrol, on the other hand, increased fluctuations in prices of inputs. These fluctuations inhibit planning for future production, at least in the cases of the small foundries who cannot afford a large inventory.

4. The stagnation and inertness of the foundries in Howrah is primarily due to technological obsolescence. The causes cannot be explained with the notion of efficient functioning of factor and technology markets. The typical production organisation in these foundries, Galamal, characterised by a loosely connected triad among owner-trader-labour contractor, is not favourable for a competitive response. Moreover, absence of impersonal management, and systematic assessment of operational facts makes these foundries X-inefficient. While facing global competition, in a liberalised regime, these foundries do not respond adequately to upgrade. They remained confined in
the lower end of the market and maintained a survival strategy depending on different modes of tax evasion.

5. The foundries in Howrah is characterised by a low-level equilibrium. They are confined in the lower end of the market, they survive with traditional technology, together with sub-optimal efforts from low-paid workers. The transfer of technology is not automatic. In developing countries market often fails to signal the appropriate choice of technology because of widespread information imperfections and missing markets. Technology learning is a conscious and cumulative process, and highly context specific. Moreover, the process of capability building involves advancements at all levels, viz., procurement, process of production, managerial and organisational efforts. Market failures in developing skills, supplying collective indivisible inputs as well as in mobilising capital hinder technology diffusion in Howrah. Moreover, markets are not external to the society and can only function in the contexts of appropriate social arrangements. The space of exchange relationships and related institutions in Howrah largely falls short of these social preconditions. In order to ameliorate market failures remedial interventions are required as market-driven solutions take too long to emerge.