



Industry Structure and the Pattern of Innovation: Basic Metal Industry of India

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** Formerly with CSIR-NISTADS; presently with CVS, Delhi University*

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Summary

There are three major groups of basic metals industry namely basic iron and steel (code 241), basic precious and other non-ferrous metals (code 242) and casting of metals (code 243). Each of these groups also has several important subgroups. In the case of iron and steel India is the fourth largest producer in the world. Because iron and steel belongs to the core sector, sustained growth of this group is a prerequisite for attaining the high level of GDP growth.

Out of the seven subgroups (5-digit) of this industry only in two subgroups, namely railway track materials of steel (24107) and wire of steel (24108) the presence of the informal sector is found to be quite significant. However the most important subgroups of iron and steel are steel in ingot and hot rolled and cold rolled steel which are dominated, in fact monopolized, by a handful of large producers. MSMEs of all categories are present as well as dominant in only one subsector, i.e. railway track materials of steels (24107). The other sectors with good performance of MSMEs are Ferro-alloys Tube/pipe fittings of basic iron & steel and wire of steel.

The sectors with exclusive domination of large firms have poor performance of MSMEs; these sectors are pig iron & spiegeleisen (24101), direct reduction of iron (24102), steel in ingot (24103) and hot rolled and cold rolled steel (24105). The productivity, measured in terms of value added per labour is highest for the sectors code 24102 and 24103 where capital labour ratio is also very high. In these sectors, patterns of contractual linkages evidenced through the proportion of enterprises 'contract in' only increases systematically as the size-class decreases while the proportion of enterprises 'contract out' either exclusively or together with 'contract in' increases systematically as the size class increases.

As regards exports, only in sector code 24107 MSMEs, particularly small enterprises, have 100% export share and in sector 24106 MSMEs have 54% export share and for others MSMEs have very low export share.

It is noted that the new industrial units are being established more or less in every sector and segment of MSMEs with the exception of codes 24101 and 24102 where no micro enterprises have been set up, code 24107 where no small enterprises have been set up and code 24106 where no medium enterprises have been set up over the last five years.

However, the number of enterprises in contractual relationship is much higher for the old group than the younger ones. It is obvious that it takes time for firms to establish credibility, trust and rapport in market and develop business linkages. Basic iron & steel industries are concentrated more or less in eight states, namely West Bengal (WB), Jharkhand, Orissa, Chhattisgarh, Gujarat, Maharashtra, Karnataka and Andhra Pradesh together sharing more than 85% of the GVA of the sector. Not many MSMEs are found in the core region of the iron & steel production, particularly in WB, Jharkhand and Orissa. Presence of MSMEs is more in the Western states of Gujarat and Maharashtra and in the states Punjab, Rajasthan, Uttar Pradesh (UP), with low share in total basic iron & steel production and where large units are not dominant. This suggests that the inter-

linkages between large and small units are not a widespread phenomenon in the basic iron & steel industry.

Important non-ferrous metals include aluminium, copper, nickel, tin, lead, gold and silver metals that are refined through electrolysis method and are more expensive than ferrous metals. The most widely used non-ferrous metals are aluminium, copper, zinc, lead, nickel and Tin. The single most important 5-digit sector is production of aluminium (24202) with 65% GVA share in 3 digit code.

Out of the six subgroups (5-digit) of the industry only in one (production & refining of precious metals namely Au, Ag, Pt) (code 24205) the presence of the informal sector is found to be quite significant with 59% contribution to GVA of the respective 5-digit groups. Among the formal sector MSMEs, although micro enterprises are not significant, small enterprises are very important with their share varying between 7 and 45% of the GVA of the six subsectors (5-digit). For medium enterprises, it is very high (57%) for code 24205. The large enterprises are dominant in all sectors except sector code 24204 where its GVA share is 52.32 % and sector 24205 where they are absent.

In formal sector enterprises, productivity is highest for the sector code 24205 with highest capital labour ratio. Incidence of the formal sector micro enterprises working on contract is very high. Excepting 16% of the enterprises who neither contract in nor out (independent), all other micro enterprises are involved in contracting some way or other. Intensity of contracting enterprises increases as size class increases in MSMEs. Among the large firms, almost all the enterprises are involved in some or other forms of contracting and half of them are involved in both contract in and contract out modes, signifying a great deal of interaction with the MSMEs in the non-ferrous metal industries.

Small and medium enterprises have significant share in exports. SMEs are however significant exporters particularly in the sectors codes 24201, 24205 and 24209.

Business linkages of MSMEs are significantly high and increase with their age. A very large number of MSMEs with contractual relations are found in 21 to 30 years age group. High density of contractual relations of the MSMEs indicates difficulty of independent operations particularly in getting access to market and raw materials and also indicates network advantages of business linkages.

These industries are spatially dispersed over the country depending on the availability of raw materials: In copper products and alloys (24201), the top seven states according to their GVA are Goa, Gujarat, Rajasthan, Jharkhand, Madhya Pradesh, Maharashtra and D & N Haveli. In aluminium (24202), the top six states according to their GVA are Orissa, Chhattisgarh, Karnataka, Maharashtra, Jharkhand and West Bengal in descending order. In the manufacture of lead, zinc and tin products (24203), the top five states are Uttarakhand, Andhra Pradesh, Kerala, D & N Haveli and J & K. In the sector production and refining of precious metals (Au, Ag, Pt etc)

(24205), only three states Rajasthan, Karnataka and Maharashtra figure in. In Maharashtra, the entire production is carried out by micro enterprises, while in Karnataka it is done by small enterprises. In Rajasthan, 82% GVA share is contributed by medium sized enterprises. Large enterprises are conspicuously absent in this sector.

Metal castings are used widely for infrastructural purposes. The tubes, pipes and non-ferrous casting find application in wide range of industries from chemical to precious metal and jewelry making industry. The two most important 5-digit sectors present in casting of metals (243) are Tubes, pipes and hollow profiles & tube or pipe fittings of cast iron/cast steel (24311) and Other iron and steel casting & products (24319)

Only in Casting of non-ferrous metals (24320) the presence of informal sector is quite significant. In formal sector, the share of MSMEs in GVA is highest for the sector code 24320. Small enterprise segment has much higher productivity than the micro segment, but not very different from the medium segment, and the pattern is similar with respect to capital intensity.

Incidence of the formal sector micro enterprises working on contract is very high. Excepting 17% of the enterprises who neither contract in nor out (independent), all other micro enterprises are involved in some form of contracting. Intensity of contracting enterprises increases as size class increases in MSMEs. The contract density is also very high among the large enterprises signifying dense interactions or inter-linkages among enterprises of different size classes.

The share of micro enterprises in total export is quite low, excepting for the sector code 24320 where it has a reasonably high export share. However, the small enterprises have significantly higher share than that of the micro and medium enterprises. The highest percentage share is for the sector code 24320. Large sector enterprises are dominating in exports with total share of 63.12%.

The industries comprising both casting of iron & steel and casting of non-ferrous metals are concentrated in selected states, namely Maharashtra, Gujarat, Tamil Nadu, West Bengal, Karnataka and Andhra Pradesh, accounting for over 80% of GVA of the sector. Since for the casting of these products the raw materials used are iron and steel metal ingots and non-ferrous metals (Al, Zn, Cu etc) ingots, it is evident that the leading states in this sector are also leading states in sectors basic iron and steel industries (241) and manufacture of basic precious and other non-ferrous metals (242).

The liberalization in the Indian Industrial policy has been a catalyst for the growth of private sectors in the metal industry. The major changes in policy took place in the post liberalization phase. With the post liberalization policies the private players in the field of steel industries and other basic metal manufacturing industries also gained an opportunity to expand their market operations. The steel industries were now free to come up with cost efficient technologies such that it was at par with the counterpart in the global market. The Indian Iron and steel industry suffers various drawbacks such as lack of funds, appropriate technology, land acquisition related

problem, lack of proper infrastructure etc. In spite of the drawbacks the basic metal Industries specifically the Iron and steel industries have adapted themselves to the current market situation given the present industrial policies. As a part of such initiative various labs and organizations have been established to carry out R&D activities in order to upgrade manufacturing processes to advanced technologies. Many of the domestic manufacturing units are also engaging themselves into contracts with global peers in order to get a hold on the global market and also to import advanced technologies. The Indian metal industries have also started investing in energy efficient process of production.

Even though the basic metal Industry in India faces various obstacles it has managed to improve its performance over the decade from 1999-2000 to 2009-2010. Productivity, measured in terms of value added per unit of labour, is found to increase in all the size-classes excepting the medium sized class which shows a negative trend. Over the decade, the overall number of enterprises increased in the states of Punjab, Rajasthan, Uttar Pradesh, Gujarat, Maharashtra and Andhra Pradesh. Uttar Pradesh, Jharkhand and Andhra Pradesh experienced increase in labour productivity across all size classes.

For all the size classes excepting the medium, and belonging to the formal sector of manufacturing, the sector of Basic precious & non-ferrous metals witnessed decline in the number of enterprises over the decade. The labour productivity increased across all size classes within the manufacturing units involved in manufacture of non-ferrous metals however capital intensity increased only within the medium and large manufacturing units under this sector. Several states, notably, Jharkhand, W.B., Chhattisgarh and Karnataka displayed significant rise in the number of enterprises manufacturing non ferrous metal over the decade. Among top 15 states involved in the manufacture of basic precious and non-ferrous metals production, significant increase in labour productivity among MSMEs as well as large enterprises is found in Madhya Pradesh, Maharashtra and Karnataka.

The number of micro manufacturing units involved in casting of metals declined in 2010 as compared to 2000. This might be due to scaling up in the production process. Labour productivity of casting of metals increased in all the size classes except for the medium size group where capital intensity declined. Capital intensity in this sector also declined in large manufacturing units but only to a small extent. In terms of growth in number of enterprises in casting of metals sector, Punjab, West Bengal, Andhra Pradesh and Bihar witnessed a better performance where MSMEs are the major beneficiaries. There is significant rise in labour productivity and capital intensity for casting of metals in the states of Rajasthan, Maharashtra and Andhra Pradesh.

In terms of technology usage in the basic metal Industry most of the metal manufacturing units across different sectors mainly deploy medium to higher medium level of technology. Technology innovation has taken place to some extent within the metal industries in India during 2000-2010. This indicates the fact that there have been some investments in R&D during the decade.

The long term goal of Indian metal industries to compete with their global peers has also been an instrumental factor towards technology innovation. The pressure to cater to the increasing demands of the domestic industries, which directly or indirectly depend on the finished or semi processed product of the basic metal industries, has also been a factor for investments made towards technology development. There has also been scaling up of the manufacturing units between 2000 and 2010 in order to maintain the supply and demand balance in the global as well as the domestic market. Considering the overall scenario we may argue that in order to satisfy the demands of market there has been quite a lot of technological up gradation and advancement in the basic metals sector.

Chapter 1:

Introduction

Metals industry is an indispensable part of an economy and plays a central role in the growth of its industrial production. Metal forms a key ingredient of inputs to almost all the industries¹. Thus, the development of the metal industry is essential for industrializing countries like India. The present report examines the pattern of development of the industry, its organization, size structure, inter-linkages and innovativeness in the metal industry in India over the last decade. Metal industry in India is quite sizeable at present accounting for around 2.5% of the country's GDP.

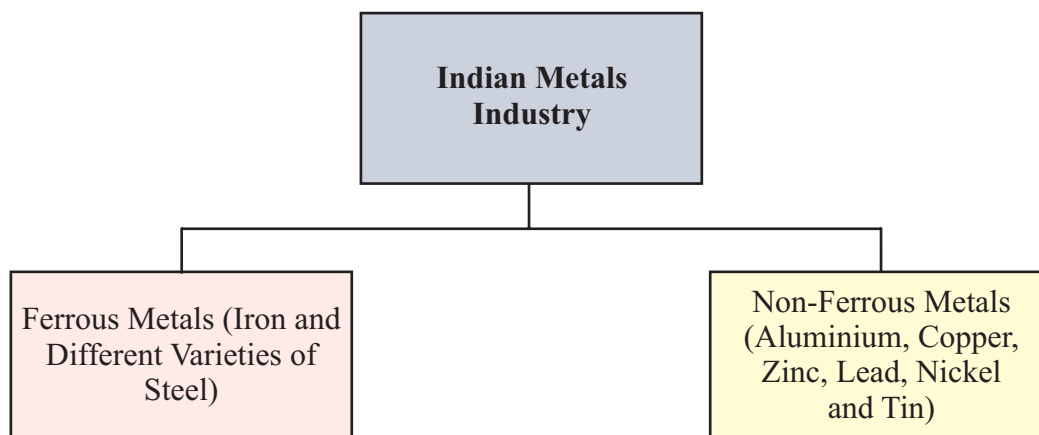
Industry Overview

The Indian metal industry has two main segments, namely ferrous metals and non-ferrous metals. Ferrous metals primarily consist of iron and different varieties of steel. The demand for these comes from construction and automobile sectors. Non-Ferrous metals on the other hand include aluminum, copper, zinc, lead, nickel and tin. Demand for non-ferrous metals comes from sectors such as agriculture, automobiles, railways, telecommunications, construction and chemicals.

Ferrous Metals :

1. Iron

Iron ore is the basic raw material primarily used in the production of pig iron, sponge iron, steel and alloy steel. The demand for iron ore comes mainly from the iron and steel industry. It uses iron ore in lumps as well as fines after pelletization, sintering and briquetting. Sponge iron is used as a substitute in place of scrap in electric arc furnaces and in mini steel plants.



¹For instance, iron and steel as well as other metals are used not only in construction of physical structure like building, factories, stadiums, airport, and infrastructure like roads, bridges, railways, telephone towers, but also to produce machinery, equipments, motor vehicles, ships, spacecraft, hand-tools, arms and ammunition, daily used utility goods, and so on. Growth of the iron and steel industry is very much linked with the development of most other industries, infrastructure and services like transport.

India is currently the leading producer of iron ore in the world. Indian production of iron ore constitutes around 10% of the world iron ore output. The production of iron ore constituting lumps, fines and concentrates was estimated at 218.64 million tonnes (MT) in the year 2009-10. During 2009-10, among the states, Orissa recorded the highest production of 79 MT (36%), followed by Karnataka 43 MT (20%), Goa 39 MT (18%), Chhattisgarh 26 MT (12%), Jharkhand 23 MT (11%). The remaining 3% production was reported from Andhra Pradesh, Madhya Pradesh, Maharashtra and Rajasthan. Grade wise analysis reveals that, out of total output of 218 MT, iron ore lumps accounted for 91.7 MT (41.9%), fines 126.2 MT (57.7%) and concentrates 0.76 MT (0.3%), respectively (*Planning Commission, Working Group Report, 12th Five Year Plan*).

India ranks fourth among the top global iron ore producers. Among the top global consumers of iron ore, India ranks third. The total domestic consumption of iron ore during 2009-10 was reported to be around 90 million tones, of this around 98% was accounted for by iron and steel (including sponge iron industries). India is also the second largest exporter of iron ore in the world, after Australia *Indian Bureau of Mines (IBM) and Directorate General of Commercial Intelligence and Statistics (DGCI & S), Kolkata*).

2. Steel

India's economic growth is reliant upon the growth of the Indian steel industry. While steel continues to enjoy dominance in the traditional sectors such as construction, housing and ground transportation, special steels are increasingly used in engineering industries such as power generation, petrochemicals and fertilizers. India possesses a central position on the global steel map, with the establishment of the new state-of-the-art steel mills, continuous modernization and up gradation of older plants and improvement of energy efficiency.

India is currently the fourth largest producer of crude steel in the world and is expected to become the second largest in the near future. The total market value of the Indian steel sector stood at US\$ 57.8 billion in 2011 and is predicted to touch US\$ 95.3 billion by 2016. The sector contributes to nearly 2 per cent of the gross domestic product (GDP) and employs over 5,00,000 people (*India Brand Equity Foundation (IBEF)*). According to recent estimates total steel production in India recorded a growth rate of 3.5 per cent during the period October 2012–October 2013. In quantity term, “Production of steel in India is expected to reach 149 MT by the end of the 12th Five Year Plan period,” as per G Mohan Kumar, Secretary, Ministry of Steel.

India's real consumption of total finished steel stood at 53.789 million tonnes (MT) during April–December, 2013. Production for sale of the finished steel was 60.446 MT, registering a growth of 5.2 per cent during the period owing primarily to growth in production by major producers such as Steel Authority of India Ltd (SAIL), Tata Steel and Rashtriya Ispat Nigam Ltd (RINL) (IBEF).

Non Ferrous Metals:

1. Aluminium

Aluminium is one of the most common and widely used metals and its production outstrips that of all other non ferrous metals. Aluminium ranks second, next only to steel, in terms of volumes used due to its excellent malleable properties.

The total production capacity of aluminium in India increased from 1.08 MT in 2006-07 to 1.86 MT in 2010-11. The production of primary aluminium in India was estimated at 1.63 MT in 2010-11, whereas the consumption during 2010 was 1.59 MT representing a 'Per Capita' consumption of about 1.3 kg which was in the range of 0.5 kg about a decade back. The installed capacity of alumina refineries in India currently stand at 4.60 MT. (*Indian Minerals Yearbook 2011 (Part II), Aluminium and Alumina*).

The consumption of primary aluminium in India has risen sharply since 2005 to reach 2.1 MT by 2011. Since the late 1980s, till 2002, the consumption remained almost stagnant, around 0.5- 0.6 MT. The main reason for this spurt in growth after 2002 lies in the demand generated from the automobile sector, construction, electrical and packaging sectors. The key consumer industries in India are transportation, power, electrical sector, packaging and construction.

2. Copper

Copper is a strategic metal, whose growth is closely linked to any country's economic and industrial growth. It is an indispensable commodity for many end use sectors, which are on fast growth track. The Indian copper industry is classified into two broad categories: Manufacturers of refined copper (copper cathodes and rods) and manufacturers of copper products. The refined copper manufacturers are custom smelters viz. Sterlite Industries (Vedanta Group) and Birla Copper (Hindalco group), which process imported copper concentrate to produce copper cathodes and rods which can be further processed into bars, rods and wires.

Though India is abundant in copper resources, but the mined production of copper is quite low and stagnant since last five years. Hindustan Copper Limited (HCL) is the lone producer of copper in India, producing around 3.12 million tonnes of ore and around 30,000 tonnes of metal every year, which is less than 5% of the country's requirement of copper concentrate (*Indian Bureau of Mines (IBM)*).

India's refined copper consumption has increased at 10% per annum over the last four years. Electrical, transport and consumer durable manufacturing sector are expecting to lead the growth in future copper demand. The future copper demand by 2015-16 is projected at GDP growth rate of 8% is 1.2 million tones (IBM).

3. Zinc

Zinc is a silvery blue-grey metal with a relatively low melting and boiling point. It is the third most used non-ferrous metal after aluminium and copper. Globally, about 50% of zinc produced is used in galvanizing of steel products to protect them from corrosion. While zinc was a known metal in ancient times, its production with modern technology started in India only in 1966, with the smelter at Debari. Zinc concentrates are the raw material for zinc smelter. Zinc ore consists of sulphate, sulphide mineral with galena, chalcopyrite and copper sulphide minerals.

The production of zinc concentrates in India decreased by 1% from 1,427,231 tonnes in 2010-11 to 1,412,291 tonnes in 2011-12. Entire production of zinc concentrates was reported from Rajasthan. The entire output of lead and zinc ore and concentrates in both the years was reported by mines owned by Hindustan Zinc Ltd, a private sector unit. The production of zinc ingot metal, which stood at 783,647 tonnes in 2011-12, increased by 6%, as compared to that in the previous year. Hindustan Zinc Ltd. contributed 97% of the total output. The remaining production was by Binani Industries Ltd. The entire production was reported from private sector.

The largest consumer of zinc is galvanizing industry. The zinc once used for galvanizing as well for brass making is not recoverable. Owing to its corrosion resistance in varied types of environment, zinc is used for protecting steel by way of galvanizing. The galvanising industry alone consumes about 57% of zinc, followed by coatings 16%, die-casting alloys 14%, oxides & chemicals 7% and extruded products 6%. The estimated consumption of zinc during the year 2010-11 and 2011-12 was calculated on the basis of production of zinc, import and exports of zinc (not alloyed). The estimated consumption, thus arrived at was 542,591 tonnes in 2010-11 and 558,879 tonnes in 2011-12. The data on trade of zinc (not-alloyed) was taken from DGCI&S. In addition to this, some quantities of recycled zinc are also consumed in various industries (IBM).

India accounts for 5% of the world's total reserves of zinc, and stands fifth among the principal countries holding zinc reserves. The world mine production of zinc increased to 12.8 MT in 2011 from 12.4 MT in 2010. China (34%), Australia (12%) and Peru (10%) were the leading producers followed by USA and India (6% each) and Canada & Mexico (5% each) (IBM).

Exports of zinc from India are in the form of ores and concentrates, zinc & alloys including scrap, zinc and alloys in the form of bars, rods and plates. Exports of zinc ores and concentrates decreased up to 5,591 tonnes in 2011-12 as compared to 67,501 tonnes in the previous year. China was the only importer in the year 2011-12. Exports of zinc and alloys & scrap during 2011-12 were 2,95,071 tonnes as against 2,642,51 tonnes in the preceding year. Almost entire exports during 2011-12 were of zinc & alloys while those of scraps were

nominal. Malaysia (21%), Rep. of Korea (14%), Chinese Taipei/Taiwan (11%), China (9%) and UAE (6%) were the main destinations (IBM).

Imports of zinc in the country are in the form of zinc ores and concentrates, zinc and alloys including scrap, zinc spelter, zinc and alloys in the forms of bars, rods, plates, mazak, etc. Imports of zinc ores and concentrates decreased to 63,194 tonnes in 2011-12 from 88,171 tonnes in the preceding year. Imports were mainly from Australia (59%), Benin(15%), Peru(13%), Ireland(12%). Imports of zinc and alloys & scrap during 2011-12 were 131,432 tonnes compared to 112,228 tonnes in 2010-11. The major suppliers were UAE (20%), Kazakhstan (12%), China (8%), Rep. of Korea (7%) and Australia (6%) (IBM).

4. Lead

Lead is a soft, heavy, toxic and a highly malleable metal. It is bluish white in color, when freshly cut, but blemishes to dull grey when exposed. The largest single use of lead today is in the manufacture of lead acid storage batteries. In order to meet the steadily increasing demand from lead acid battery sector, there is a huge market of lead scrap recycling.

Government of India has enacted Battery Management and Handling Rule (BMHR) 2002 which will further increase the availability of scrap from organized sector. It is estimated that worldwide more than 50% of refined lead produced is from recycled material (*Indian Minerals Yearbook 2011 (Part II) Lead & Zinc*).

In 2012, refined lead production in India was around 1,69,301 MT. The main producers of lead are Hindustan Zinc Limited (HZL) and India Lead Limited (ILL).

Global production of lead is estimated to have grown strongly in 2012, and it is expected that production will grow around 4–5% on average, in the near term driven by the automotive and Industrial battery sectors.

In years to come, India is expected to be one of the key drivers of growth in the Asian region, second only to China. India's domestic market is expected to witness a robust growth of around 6% in the coming years, driven mainly by the UPS battery and replacement battery sectors. The influx of many major automobile manufacturers, making India and other BRIC countries production hubs, underpins the increasing positive outlook for lead.

According to Newsletter of the Indian Metals Study groups, “The global usage of refined lead metal is expected to increase by 4.8% to 11.09 M in 2013. It is anticipated that Chinese lead demand will increase by 6.7% this year, driven by automotive and e-bike production as well as mobile phone networks. Demand in Europe is expected to rise by 1.9% in 2013. In the United States usage is forecast to grow by 1.2%.”(*Newsletter of the Indian Metals Study groups “Metals Despatch” (June 2013)*).

5. Nickel

Nickel is the main alloying metal needed in the production of certain types of stainless steel. Nickel is used in the production of alloys - stainless steel used in gas turbines and chemical plants; alloy of iron and nickel used in electronics and special engineering. This metal is used in manufacture of rechargeable batteries and catalysts.

World production of primary Nickel during 2011 was 1.612 million metric tonnes (MMT), up by 11.53% as compared with 1.446 MMT in 2010; whereas, the world's consumption during 2011 was at 1.608 MMT vis-à-vis 1.465 MMT in 2010, up by 9.76%.

Russia, Canada and Norway are the world's largest nickel exporters accounting for almost 49% of world exports, while European Nations and Japan are top two consumers of the metal. On the other hand, China, USA and Germany are the world's largest nickel importers accounting for around 48% of world imports.

According to MCX, the annual demand for nickel in India is around 40,000 MT and its market in India is completely dependent on imports. Nickel prices in India are fixed on the basis of the rates that are prevalent in the international spot market, and Indian Rupee and US Dollar exchange rates. Economic events such as national industrial growth, global financial crisis, recession and inflation affect metal prices. Commodity-specific events such as the construction of new production facilities or processes, new uses or the discontinuance of historical uses, unexpected mine or plant closures, or industry restructuring affect the market. On the other hand, trade policies set by the Government (implementation or suspension of taxes, penalties, and quotas) affect supply as they regulate (restricting or encouraging) material flow (*MCX (Multi Commodity Exchange of India Ltd.) metal and energy report*).

6. Tin

Tin is a malleable, ductile metal (can be made into a thin strip and can be formed into many shapes). It is also very useful in making different kinds of alloys. An important feature of tin is that its melting point is very low, only 232 degrees, and therefore has a wide range of application in solders and joining wires. It has a remarkable resistance to corrosion and is also resistant to toxicity. This is the reason why tin is widely used to keep beverages, food items, liquids, to prevent these from getting spoilt.

Bolivia, Malaysia and Indonesia are known to be very rich in tin deposits. However, in India, there are not many known deposits of tin. There is a small deposit in Madhya Pradesh and attempts have been made, to develop flow sheets, for extraction of tin from that cassiterite.

In 2011, global mine production of tin was about 253,000 tones (Carlin, 2012). It is projected to increase to 261,000 tones by 2013, to decrease to 256,000 tones by 2015, and to remain at that level through 2017. In Egypt, new capacity is planned to come at the Abu Dababb tin and tantalum mine, which is expected to begin operation by 2013 and to produce about 1,530 t/yr of tin.

In 2010, global production of refined tin was about 321,000 tonnes. It is projected to increase to 343,000 tonnes by 2013, 362,000 tonnes by 2015, and 385,000 tonnes by 2017. In China, annual production capacity is expected to increase to 180,000 tonnes/yr of refined metal by 2017. In Indonesia, the Yunnan Tin Co. Ltd. planned to develop a tin smelter, which would increase the country's production capacity to 55,000 tonnes/yr by 2017. In Thailand, production capacity is expected to increase to 30,000 tonnes/yr by 2017 (*Review of Selected Global Mineral industries in 2011 and an Outlook to 2017*, United States Geological Survey (USGS) report, (2013)).

Size structure of the manufacturing enterprises and the level of concentration in basic metals

There are many MSMEs in the metals industries in India, but the large enterprises are also sizeable in number. Micro and small enterprises have more or less equal share in total number of enterprises. MSMEs as a whole share around 15% of GVA whereas large enterprises account for 85% of GVA generated by the sector. However, among the large enterprises there is high level of concentration, with a few firms having a large market share.

Table1: Size Distribution of Enterprises			
Size	No. of Enterprises	Share in the No. of Enterprises (%)	Share in GVA (%)
Micro	2,821	42.4	1.49
Small	2,784	41.84	9.63
Medium	374	5.62	3.74
Large	675	10.14	85.13
All	6654	100	100

Source: Compiled from ASI, 2009-10 unit level data

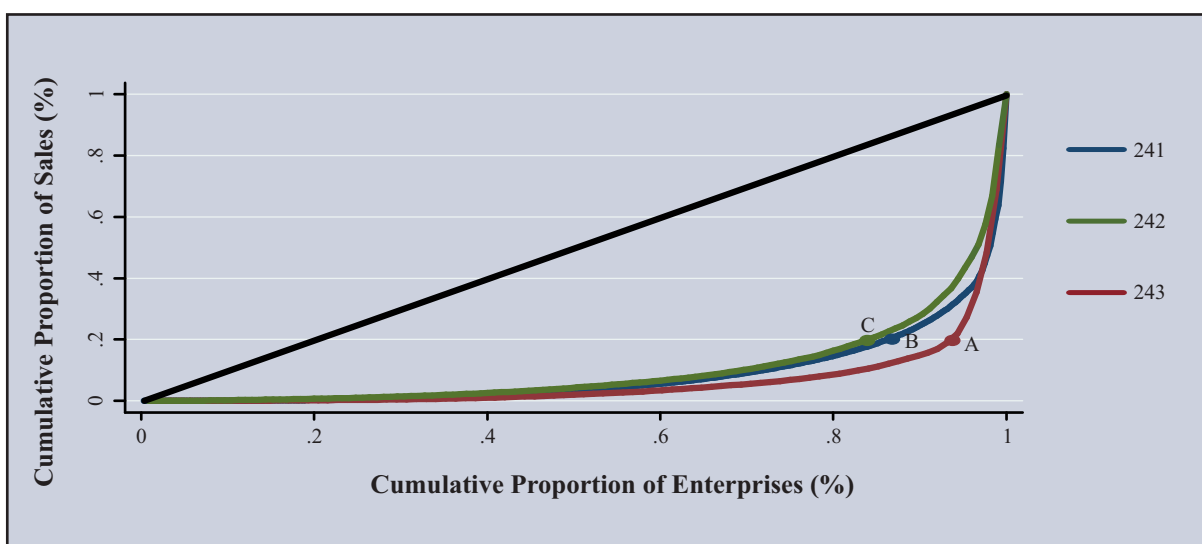
Figure 1a depicts the well known *Lorenz Curve*, describing the market concentration among enterprises under all the three (3 digit) product categories (viz. basic iron and steel -241, basic non-ferrous metals - 242 and casting of metals-243) as per CMIE data. Horizontal axis represents the cumulative percentage of enterprises, whereas the vertical axis represents the cumulative percentage of sales. The black colored 45-degree line represents the line of equality and the other three curves labeled 241, 242 and 243 represent the respective product categories. The farther

away a particular curve is from the line of equality, the more would be market concentration. One can clearly figure out just by looking at the figure that for all the three product categories, the total sales is quite unequally distributed, as the three curves (241, 242 and 243) sink fairly below the line of equality.

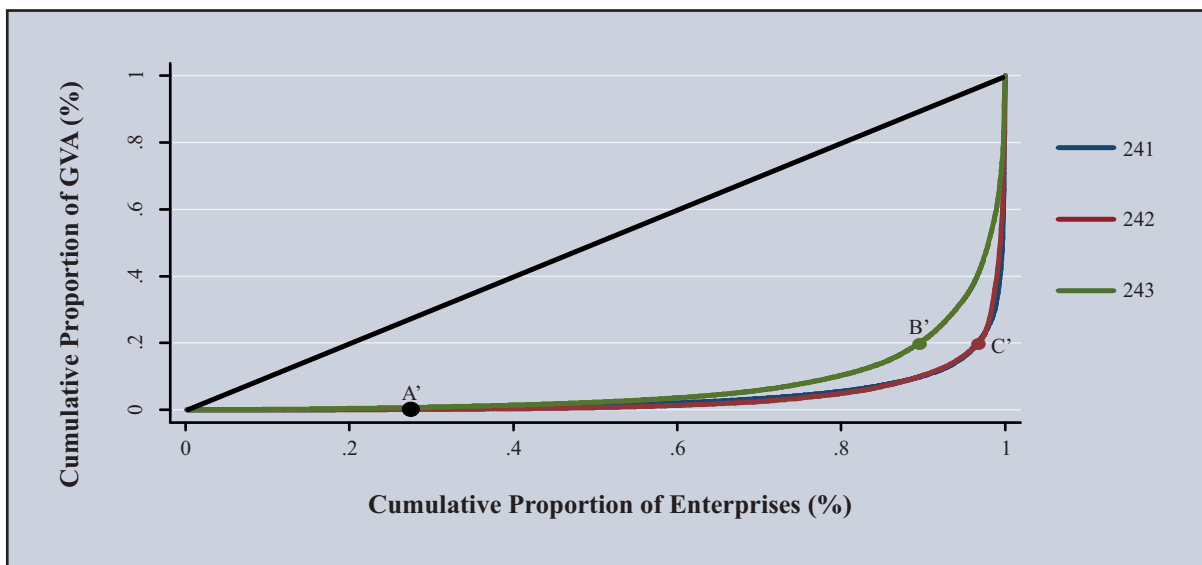
As per CMIE, under 241 (Manufacture of basic iron and steel), lowest 85% (approx.) of enterprises capture 20% of the total sales (*see Figure 1a, point B*). This means that top 15% enterprises capture around 80% of the total sales. Thus, in manufacture of basic metals, a large part of market is being captured by just a few enterprises. Therefore, we may say that a monopolistic kind of a market structure is present for this product category as per CMIE data.

Figure 1b shows the market concentration of enterprises as per ASI data. The total GVA as per ASI appears to be highly unequally distributed, as the three curves (241, 242 and 243) sink extremely below the line of equality.

Figure 1a : Market Concentration (CMIE)



As per ASI, under the same product category viz. 241, the lowest 95% (approx.) of enterprises contribute merely 20% (approx.) of the total GVA generated under this product category, and the rest 80% of the total GVA is being contributed by just the top 5% (approx.) of enterprises (*see Figure 1b, point C*). This reinforces our conclusion for the enterprises under 241, as per CMIE, that there seems to be a monopolistic kind of a market structure present for this product category, because a large part of the market is being captured by just a few enterprises.

Figure 1b : Market Concentration (ASI)

Also, as we can see in Figure 1b (point A'), around lowest 40% of the enterprises' share in total GVA is almost negligible. Thus the entire GVA, as per ASI data is contributed by just the top 60% of the enterprises, irrespective of the product category to which they belong.

In the case of basic precious and other non-ferrous metals (242), as per CMIE, lowest 95% (approx.) of the enterprises capture 20% of the total sales (*see Figure 1a, point A*). This means that around 80% of the total sales is captured by just the top 5% (approx.) enterprises. Thus, under manufacture of basic precious and other non-ferrous metals, a large part of market is being captured by just a few enterprises. Therefore, we may say that a monopolistic kind of a market structure is present for this product category as per CMIE data.

As per ASI, under the same product category viz. 242, the scenario is exactly the same as ASI. The lowest 95% (approx.) of enterprises contribute merely 20% (approx.) of the total GVA generated under this product category, and the rest 80% of the total GVA is being contributed by just the top 5% (approx.) of enterprises (*In figure 1b, Lorenz curve for 242 coincides with that of 241 at C'*). This also reinforces our conclusion for the enterprises under 242, as per CMIE, that there seems to be a monopolistic kind of a market structure present for this product category, because a large part of the market is being captured by just a few enterprises.

Under code 243 (Casting of metals), as per CMIE, lowest 82-83% (approx.) of enterprises capture just 20% of the total sales (*see Figure 1a, point B*). This means that just the top 17-18% (approx.) enterprises capture around 80% of the total sales. Thus, under casting of metals, a large part of market is being captured by just a few enterprises. Therefore, we may say that a monopolistic kind of a market structure is present for this product category as well, as per CMIE data.

As per ASI, under 243, as one can clearly see in Figure 1b, the lowest 90% (approx.) enterprises capture merely 20% of total GVA (*see Figure 1b, point B'*), again reinforcing our conclusion, as per CMIE.

Thus, for all the product categories relating to the Manufacture of basic metals, we can say that a large part of the market is captured by just a few enterprises, indicating that a high degree of monopoly power is enjoyed by the top basic metals enterprises of the country.

An overview of the policies taken by the Govt. of India relating to the iron and steel industry

Before 1972, there was a price and distribution control determined by the Joint Plant Committee (JPC) (Iron and Steel Control). All major steel plants and railways became members of JPC. Further, levies were charged for Steel Development Fund (SDF), Engineering Goods Export Assistance Fund (EGEAF), JPC Cess and Freight Equalization Fund (FEF). In 1972 however, dual pricing system was introduced wherein, heavy structures, flats and railway materials were made available at low prices. On the other hand, other product prices were allowed to increase significantly. In 1982, this dual pricing system was reviewed by the Bureau of Industrial Costs and Prices (BICP). While distribution to priority sector remained under control in 1992, private production was completely decontrolled. Levies to SDF, EGEAF and JPC Cess continued, but Freight Equalization was completely abandoned. Further, import duties for various semi-finished and finished steel products were significantly reduced to the tune of around 20%. Further discussion on the policy issue is made in the next chapter. In any case it was expected that the policy change would bring about technological dynamism, competitiveness and growth of the metal industry feeding the other sectors.

The present Report is organized as follows. The current chapter being introductory provides an overview of the basic metal industry in India and abroad. The chapter 2 discusses the next, constraints and growth of metal industries and the performance of basic metal manufacturing units between 2000-2010. Chapter 3 makes a detailed analysis of basic metal industry as regards productivity, growth, value added, contractual relationship, exports as well as their regional variation. The last, Chapter 4 makes an estimate of the technology levels of the various manufacturing units and based on this infers the pattern of innovations made by the different size classes and subsectors of manufacturing units between 2000 and 2010.

Chapter 2 :

Constraints and Growth of the Metal Industries during 2000 - 2010

It is already mentioned that the Indian metal industry is broadly divided into three distinct categories: (i) the basic iron and steel industries, (ii) the non ferrous metal industries and (iii) casting of metal. Although the first category is the predominant one, other two are also quite important. We will discuss each of these three categories separately:

I. Basic Iron and Steel Industries

India is currently the fourth largest producer of crude steel in the world and is the second largest growing economy of the world after China as per the 2011 data. The liberalization in the Indian Industrial policy has been a boost for the growth of private sectors in the steel industry. The major changes in policy took place in the post liberalization phase. The Steel industry was not only removed from the list of industries reserved for the public sector but was also exempted from the provisions of compulsory licensing. Further, this industry is also included in the list of high priority industries for automatic approval for foreign equity investment up to 51% and currently this limit is 100%. Deregulation in the price of steel took place in the year 1992 and trade policies were liberalized such that import and export of steel were allowed freely. As a result of these policy changes the domestic steel industry was put on the same platform with the global steel production units. With the post liberalization policies the private players in the field of steel industries also gained an opportunity to expand their market operations. The steel industries were now free to come up with cost efficient technologies such that they were at par with the counterpart in the global market[1].

The capacity of production units and the export and import values of the steel manufacturing units have experienced an increasing trend due to contribution from the private sectors. During the last decade more than 12 mt of capacity has been added in the steel industry, this is mostly in the private sector. Recently, the steel industry is receiving significant foreign investments such as POSCO - South Korean steel producer - and Arcelor - Mittal Group - UK/Europe based steel producer - announcing plans for establishing 12 mt production units each in India. The levy on steel development fund was discontinued from April 1994 as a result of which the main producers received a greater flexibility in responding to the market. In this period there has been large scale infrastructure development in India as a result of which the per capita consumption of steel has increased significantly and such a trend in consumption of steel is pointing towards an unprecedented growth potential of the steel industry and market in India. As per a report by Price Water Cooper House, the Indian steel industry mainly focuses on five different business trends each of these have been discussed below in detail[2]

Focus on the Domestic Market:

As per the world steel association the Indian domestic consumption of steel has increased at CAGR of 9.4% between 2004 and 2010 whereas the per capita consumption of steel is only 51.7kg as compared to the world per capita consumption of 2010. This indicates that the domestic per capita consumption of steel has large prospects of improvement. And therefore remains an area of utmost importance when it comes to the various business trends followed in the country in favor of development and growth of Indian steel industry. The infrastructure segment of industries consumes about 61% of the total steel produced by Indian industries. Along with this the new manufacturing workshops of the foreign auto makers have also consumed a significant proportion of the steel produced in the country. Consequently industry concentration ensued; the Indian steel companies have now started concentrating on the flat steel segment. A large quantity of steel produced by the Indian steel industries was exported to meet global demands. Eventually India turned to a net importer of steel rather than an exporter during the year 2006-07. This motivated the steel companies of India to expand their capacities. The strong demand conditions coupled with the availability of young and skilled workforces and abundant mineral resources in India has also been a crucial reason behind the competitive mind set of Indian steel industries which has also been an inducement to expand the plant capacities. Further, the Indian steel industries are also penetrating the rural market by expanding their distribution networks in the rural areas. As per the report by Price Water House Coopers, the company Essar Steel, under the brand name Essar Hypermart, has set up one of the largest retail chains for steel. It offers customized services to original equipment manufacturers (OEMs), small and medium enterprises (SMEs) and retailers. SAIL, as on January 2011, had 2,579 dealers in 630 districts against 200 dealers in 2006. Another company, JSW Steel, too, in order to make the most of the demand in semi-urban and rural areas has expanded its distribution points.

Alliance with Global Peers:

In the recent years a number of agreements and joint ventures have been announced between Indian steel companies and global counter parts. Since the domestic steel consumption in India has grown at the rate of 9.4% CAGR between 2004 and 2010 and the global consumption of steel has grown only at 4.65% for the same period, global counterparts in this field are hopeful about the continued growth of consumption within India and wish to set a foothold in the Indian market. As a result a number of collaborations have taken place between Indian and various global partners in order to set up integrated green field plants in India. The alliances between Indian steel companies and global peers such as Tata Steel India-Nippon, JSW-JFE and Bhushan-Sumitomo will allow the Indian counter parts to have access to the latest technologies leading to the production of high end value added steel and thus prepare the Indian players to face the market competition globally.

Recent Problems:

As per Price Water House Coopers report, due to economic slowdown, increased interest rates and declining steel prices the Indian steel companies have witnessed a decline in the overall profitability. But as the market boomed in 2010 the Indian steel companies raised funds by taking advantage of the capital market through equity dilution.

Investments Towards Land Acquisition and Environment Conservation:

In India various mine allocations face numerous issues in getting environmental clearances and also face serious issues related to land acquisition. Therefore the Indian steel companies are currently focusing on these areas by investing quite a significant proportion of their funds in various land acquisition schemes and environmental friendly methods of production. In a sense the steel industries are moving towards innovating advanced technology of production which will definitely lead to a cleaner environment and production of better quality goods.

Challenges Faced by Indian Iron & Steel Industries

The Indian Iron and steel industries face various challenges and this coupled with the slow growth of the economy together poses a huge hurdle to the development of the Iron and steel industries. Few of the issues faced by these industries are discussed below:

Land Acquisition and Environment Regulations:

The setting up of steel making units requires a huge area of land. For example: the proposed POSCO plant in Odisha and the Arcelor Mittal plant in Karnataka required huge areas of land close to 2000 to 3000 hectares.³ Acquiring large chunk of land in a highly populated country like India has always been a matter of concern. The rules regarding appropriate compensation to the land owners remained unclear for long in India. This together with the delay in obtaining environmental clearance poses a serious threat to the establishment of steel manufacturing units in India.

Major problems faced by the industry

Shortage of Coking Coal:

India is currently not self sufficient in coking coal and about 65% of the domestic requirements of the coking coal is met through imports. The indigenous variety of coking coal in our country is high in ash content and therefore is not suitable for the Indian steel industries. The Indian steel producing capacity has been increasing currently due to the increase in the domestic consumption as well as to meet the demands in the global market. The new units mostly use blast furnaces to produce steel and consequently would raise the demand for coking coal. As India imports a high volume of coking coal the profitability of the Indian steel enterprises has been linked to global coal prices. This in turn poses a risk to the overall growth of the steel companies.

Shortage of Domestic Iron ore and its Inefficient Pricing :

India has abundant iron ore mines which provide the Indian steel industries with inexpensive and high quality iron ores. However the increase in the incidents of illegal mining in India has led to a ban on iron ore mining, which in turn raised the price of the ore. Few of the steel plants in Odisha and Karnataka have also witnessed 70% utilization of the total plant capacity, such under utilisation is definitely an indicator of poor performance.

Insufficient Infrastructure and Logistics :

Indian Iron and steel industry is totally dependent on Indian logistics and infrastructure facility such as Railways, road and water transportation. Drastic improvements are required in Indian infrastructure as inefficient roads and railways have always been a hurdle in timely delivery of raw materials and finished products in and out of the steel Industries. Indian railways have a poor haulage capacity and also have low heavy haul freight as compared to its global peers.

Slow adoption of modern technology :

Indian steel industry has been experiencing a very low performance scale based on technology and productivity indices. This is mainly due to the use of obsolete technology of production and use of poor quality of raw materials in steel making, for example, the high impurities such as alumina and silica in iron ore, high ash content and variation of quality in coal. This has affected various performances indicators of steel plants, such as, blast furnace productivity, coke rate, energy consumption and blast furnace slag volume. Steel making technologies such as FINEX and ITmk3 can make the best utilization of indigenous iron ore mines and non-coking coal for iron-making.

i Performance of Basic Iron & Steel Sector :

1. Growth of the number of MSMEs:

The number of micro enterprises in the basic iron and steel industry (formal sector) declined by 17%, over the decade from 1999-00 to 2009-10 (Table 1a). However, there is significant increase in number of enterprises in small, medium and large size classes with the highest percentage increase (169%) for the large size class. This reflects that micro enterprises have either closed or may have expanded their size capacities.

Table 1a: No. of firms across MSMEs in the formal sector of Basic Iron & Steel manufacturing			
Size	2009-10	1999-00	% change
	No. of Firms	No. of Firms	
Micro	1026	1236	-17.0
Small	1583	957	65.4
Medium	257	101	154.5
Large	497	185	168.6

Source: Own estimates from ASI, 1999-00 & 2009-10 unit level data

2. Changes in productivity & capital intensity across MSMEs in basic iron & steel manufacturing

Productivity, measured in terms of value added per unit of labour, is found to increase in all the size-classes however, for medium sized enterprises with negative trend. The small sized enterprises witnessed the highest increase (44%) (Table2). In terms of change in capital intensity, all size classes except small sector show negative trend. Also small enterprises have the highest percentage change in a decade in terms of both productivity and capital intensity.

Table2: Productivity & Capital intensity across MSMEs in formal sectors of manufacture of Basic Iron & Steel (at 2009-10 prices) (Absolute figures in Rs lakh)						
Size	2009-10	1999-00	2009-10	1999-00	% change in productivity (2000-2010)	% change in capital intensity (2000-2010)
	Productivity (VAD/L)	Productivity (VAD/L)	Capital Intensity (K/L)	Capital Intensity (K/L)		
Micro	2.3	2.2	1.0	1.2	6.2	-18.9
Small	5.2	3.6	5.6	4.9	43.7	14.9
Medium	7.6	8.4	10.4	12.7	-9.1	-17.8
Large	12.7	11.1	34.5	81.3	15.0	-57.6

Note: GDP deflator has been used to change 1999-00 estimates into 2009-10 prices.

Source: Own estimates from ASI, 1999-00 & 2009-10

3. Growth of the number of enterprises across states in basic iron & steel manufacturing

Over the decade, the overall number of enterprises increased in the states like Punjab, Rajasthan, Uttar Pradesh, Gujarat, Maharashtra and Andhra Pradesh. In Haryana, except large size class, all the other size classes show negative trend. In Maharashtra, Karnataka and Tamil Nadu, micro size class shows negative trend in number of enterprises. In medium size class, all states except Haryana and Tamil Nadu show negative change in number of firms and most importantly in Haryana, there were 21 firms in medium enterprises in 1999-00 which disappeared in the year of 2009-10 (Table 3). In case of number of large enterprises, all states show a rising trend.

Table 3: Number of Firms in basic iron & steel production												
State	Micro			Small			Medium			Large		
	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change
Punjab	195	180	8.33	178	96	85.42	1	0	100	14	7	100.00
Haryana	25	48	-47.92	16	29	-44.83	0	21	-2100	12	5	140.00
Rajasthan	70	49	42.86	116	125	-7.20	14	1	1300	7	3	133.33
U.P.	75	64	17.19	108	114	-5.26	14	7	100	21	3	600.00
Bihar	20	31	-35.48	18	24	-25.00	1	0		6	17	-64.71
W.B.	71	29	144.83	76	1	7500.0	18	0		73	8	812.50
Jharkhand	7			35			16			35		
Orissa	11			114			16			69		
CG	46			145			35			58		
Gujarat	130	95	36.84	147	125	17.60	1	1	0		17	70.59
Maharashtra	85	109	-22.02	177	155	14.19	37	32	15.63	38	16	137.50
Andhra	81	61	32.79	107	46	132.6	41	0		36	28	28.57
Karnataka	6	19	-68.42	14	25	-44.00	19	1	1800	25	20	25.00
T.N.	85	107	-20.56	83	34	144.1	16	22	-27.27	34	9	277.78

Source: Own estimates from ASI, 1999-00 & 2009-10

4. Changes in labour productivity and capital intensity across states

Among top 14 states in the manufacture of basic iron and steel production, Uttar Pradesh, Jharkhand and Andhra Pradesh experienced increase in labour productivity across all size classes. These are the states which are also rich in mineral resources. For the MSMEs, in addition to the above mentioned states, Punjab, Rajasthan, Gujarat and Tamil Nadu also raised labour productivity. Most of these cases capital intensity also increased.

Table 4: Labour productivity (VAD/L in Rs. Lakh) in basic iron & steel production (at 2009-10 prices)												
State	Micro			Small			Medium			Large		
	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change
Punjab	1.8	1.4	26.0	3.9	2.4	65.0	2.9	-	-	4.5	13.1	-66.0
Haryana	2.9	2.4	18.1	3.4	7.1	-52.1	-	8.9	-	12.9	22.4	-42.4
Rajasthan	3.5	0.9	302.6	5.6	4.1	39.1	4.0	2.6	54.4	7.2	8.3	-13.7
U.P.	2.2	2.0	7.9	6.3	5.6	14.3	6.6	0.7	833.5	17.8	3.3	446.6
Bihar	4.3	1.0	309.6	8.7	2.4	261.2	30.1	-	-	34.7	13.8	151.8
W.B.	1.0	5.1	-80.6	4.1	1.1	278.0	5.4	-	-	13.4	5.8	128.7
Orissa	2.2	-	-	4.9	-	-	3.9	-	-	6.4	-	-
CG	2.0	-	-	2.9	-	-	5.9	-	-	9.4	-	-
Gujarat	2.6	1.5	68.5	5.1	2.1	142.6	0.1	3.1	-95.5	10.5	18.6	-43.7
Maharashtra	2.8	2.4	13.3	3.9	4.2	-8.3	8.7	6.3	38.2	18.1	17.6	2.7
Andhra	2.3	1.1	115.5	4.6	3.0	53.2	7.1	-	-	12.6	8.1	55.5
Karnataka	0.6	1.3	-55.9	12.7	2.8	354.8	6.3	7.2	-12.4	42.4	10.1	320.9
T.N.	3.0	2.2	38.9	8.0	2.4	229.3	2.6	16.8	-84.5	11.7	6.2	88.4

Source: Own estimates from ASI, 1999-00 & 2009-10

Table5: capital intensity (K/L) in Rs. lakh in basic iron & steel production (at 2009-10 prices)												
Sector Code	Micro			Small			Medium			Large		
State	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change
Punjab	1.1	0.6	77.5	3.6	4.9	-26.7	2.3	-	-	13.0	6.8	92.4
Haryana	1.2	1.4	-18.6	4.7	7.7	-39.6	-	17.8	-	31.4	54.3	-42.1
Rajasthan	1.3	0.4	180.8	3.9	5.2	-25.0	6.6	6.6	-0.4	15.5	8.3	87.2
U.P.	0.7	1.3	-43.4	7.9	8.4	-6.9	12.9	4.2	208.2	18.4	179.0	-89.7
Bihar	0.4	0.5	-17.3	2.0	2.3	-15.1	3.2	-	-	14.8	24.5	-39.8
W.B.	1.2	2.8	-57.1	11.1	1.1	899.8	16.9	-	-	33.4	19.3	73.3
Jharkhand	1.4	-	-	4.9	-	-	26.4	-	-	49.6	-	-
Orissa	1.8	-	-	5.6	-	-	12.5	-	-	36.0	-	-
CG	0.9	-	-	4.5	-	-	9.6	-	-	38.0	-	-
Gujarat	1.1	1.5	-26.2	8.9	4.4	101.9	2.5	39.3	-93.6	35.4	189.0	-81.3
Maharashtra	0.9	0.9	6.0	4.2	5.1	-18.4	7.7	10.9	-29.7	38.4	97.3	-60.6
Andhra	1.0	1.3	-27.5	7.1	3.4	110.0	7.2	0.0	720	41.0	17.4	135.5
Karnataka	0.5	0.8	-40.6	5.2	3.0	71.9	7.7	3.7	108.4	60.4	249.0	-75.8
T.N.	1.1	0.7	50.1	6.2	2.3	166.4	8.0	12.3	-34.9	28.2	21.0	34.5

Source: Own estimates from ASI, 1999-00 & 2009-10

II. Basic Precious and Non-Ferrous Metals

5. Growth of the number of enterprises across size classes in manufacture of basic Precious & non-ferrous metals

All the size classes excepting the medium group in the formal sector of manufacturing Basic precious & non-ferrous metals witnessed decline in the number of enterprises over the decade from 1999-00 to 2009-10. In the medium segment however, there is 308% increase (Table 6).

Table 6: No. of firms across MSMEs in formal sectors of manufacture of Basic precious & non-ferrous metals			
Size	2009-10	1999-00	(%) Change
	No. of Firms (242)	No. of Firms (272)	
Micro	472	542	-12.92
Small	322	332	-3.01
Medium	49	12	308.33
Large	52	62	-16.13

Source: Own estimates from ASI, 1999-00 & 2009-10

6. Changes in productivity & capital intensity across MSMEs in manufacturing basic precious & non-ferrous metals

All the size classes witnessed rise in labour productivity. Capital intensity increased only in medium and large size classes. Capital intensity however declined in micro and small size classes.

Table 7: Productivity & Capital intensity across MSMEs in formal sectors of manufacture of Basic precious & non-ferrous metals(at 2009-10 prices) (in Rs lakh)						
Size	2009-10	1999-00	2009-10	1999-00	% change in productivity	% change in capital intensity
	Productivity (VAD/L)	Productivity (VAD/L)	Capital Intensity (K/L)	Capital Intensity (K/L)		
Micro	2.7	2.2	0.9	1.1	25.2	-24.7
Small	8.1	6.2	4.3	5.0	30.2	-13.9
Medium	6.4	5.2	10.6	3.1	22.6	238.0
Large	30.9	23.3	40.7	34.5	32.7	18.1

Source: Own estimates from ASI, 1999-00 & 2009-10

1. Changes in the number of enterprises across states in manufacture of basic precious & non-ferrous metals

Several states, notably, Jharkhand, W.B., Chhattisgarh and Karnataka displayed significant rise in the number of enterprises over the decade. In Haryana, all the size classes except the large group witnessed decline in the number of enterprises. Only medium enterprises of below listed states show positive change over the decade (Table 8).

Table 8 : Number of Firms in precious & non-ferrous metals												
State	Micro			Small			Medium			Large		
	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change
Bihar	8	6	33.33		15						2	-200.00
Gujarat	85	69	23.19	25	49	-48.98	5	4	25	3	1	200.00
Haryana	39	49	-20.41	35	22	59.09				2	15	-86.67
Kerala	11	8	37.50		1					2	4	-50.00
M.P.	5	37	-86.49	11	44	-75.00				7	3	133.33
Maharashtra	58	122	-52.46	40	30	33.33	18			7	16	-56.25
Rajasthan	20	6	233.33	19	28	-32.14	4	1	300	4	1	300.00
Tamil Nadu	25	62	-59.68	27	10	170.00	3			0	1	-100.00
U.P.	40	52	-23.08	21	15	40.00				0	8	-800.00
W.B.	25	3	733.33	6	6	0.00	1			4	4	0.00
Jharkhand	2			3						2		
Chhattisgarh	3			4						1		
Karnataka	18	0		15	8	87.50	0	0		3	0	
Goa	1	0		0	3	-300	0	0		4	1	300

Source: Own estimates from ASI, 1999-00 & 2009-10

2. Changes in productivity & capital intensity across MSMEs in manufacturing basic precious & non-ferrous metals

Among top 15 states involved in the manufacture of basic precious and non-ferrous metals production, significant increase in labour productivity among MSMEs as well as large enterprises is found in Madhya Pradesh, Maharashtra and Karnataka. These are the states which are rich in mineral resources. In Rajasthan and Tamil Nadu, labour productivity increased among MSMEs.

Table9: Labour productivity (VAD/L in Rs. lakh) in basic precious & non-ferrous metals (at 2009-10 prices)												
State	Micro			Small			Medium			Large		
	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change
Bihar	0.30	2.70	-89.04	0.00	6.88	-100.00	0.00	0.0	-	0.00	20.07	-2007
Gujarat	1.99	1.92	3.20	5.50	3.76	46.26	7.53	3.87	94.59	14.73	112.0	-86.85
Haryana	1.29	1.88	-31.15	3.41	3.53	-3.48	0.00	0.0	-	4.97	10.08	-50.70
Kerala	1.02	1.14	-10.44	0.00	2.27	-100.00	0.00	0.0	-	23.24	15.68	48.24
M.P.	7.94	1.46	443.16	3.40	3.04	11.80	0.00	0.0	-	6.83	3.28	107.84
Maharashtra	2.96	2.85	3.77	4.24	1.19	255.83	6.54	0.0	654	9.90	3.78	162.03
Rajasthan	2.46	1.11	121.77	6.95	5.79	20.04	20.61	8.12	153.8	9.26	23.02	-59.75
Tamil Nadu	5.66	1.16	390.09	4.60	7.39	-37.74	1.35	0.0	135	0.00	12.36	-1236
U.P.	1.79	1.39	28.62	3.50	3.52	-0.59	0.00	0.0	-	0.00	9.03	-903
W.B.	0.97	1.35	-27.71	3.94	1.78	121.02	3.32	0.0	332	10.66	11.78	-9.53
Jharkhand	0.68			68.78					-	19.42		1942
Chhattisgarh	2.68			6.32					-	35.19		3519
Karnataka	5.60	0.00	560	10.09	4.58	120.56	0	0.0	-	18.9	0.00	1890
Goa	6.64	0.00	664	0	17.1	-100.00	0	0.00	-	166	13.12	1165.2

Source: Own estimates from ASI, 1999-00 & 2009-10

Table 10 : Capital intensity (K/Lin Rs. lakh)in basic precious & non-ferrous metals (at 2009-10 prices)												
State	Micro			Small			Medium			Large		
	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change
Bihar	0.32	0.48	-32.98	-	13.35		0.0	0.0	-	0.00	9.40	-940
Gujarat	1.00	0.99	0.70	2.46	5.77	-57.37	13.96	5.61	148.9	66.06	432.00	-84.71
Haryana	0.96	1.65	-42.10	4.41	3.13	40.79	0.0	0.0	-	3.39	12.26	-72.33
Kerala	0.28	0.29	-4.02		1.76		0.0	0.0	-	17.49	14.94	17.09
M.P.	0.23	1.11	-79.09	4.21	3.50	20.17	0.0	0.0	-	17.81	12.05	47.87
Maharashtra	1.12	1.92	-41.61	3.00	4.66	-35.70	6.10			28.28	38.94	-27.39
Rajasthan	1.69	0.45	278.9	9.84	3.55	177.14	15.5	2.89	437.1	5.57	97.28	-94.28
Tamil Nadu	0.42	0.40	6.45	2.58	2.50	3.54	15.9				291.00	
U.P.	0.64	0.35	84.32	2.07	2.84	-27.28	0.00		-		10.47	
W.B.	0.20	0.82	-75.09	4.53	3.09	46.77	3.76		376	18.78	32.86	-42.85
Jharkhand	0.26			7.18			0.00		-	44.73		
Chhattisgarh	0.79			6.22			0.00		-	120.0		
Karnataka	0.86	0.00		6.27	2.72	130.09	0.00	0.00	-	18.57	0.00	
Goa	0.64	0.00			14.48		0.00	0.00	-	13.21	19.42	-32.00

Source: Own estimates from ASI, 1999-00 & 2009-10

III. Casting of Metals

9. Growth of number of enterprises across size-classes in casting of metals sector

The number of enterprises in micro sized class decreased by around 18% over the decade from 1999-00 to 2009-10 (Table 11). However, in all other size classes there has been significant rise in the number of enterprises with the highest increase of 162% (Table 11) in number of medium enterprises.

Table 11: No. of firms across MSMEs in formal sectors of casting of metals			
Size	2009-10	1999-00	(%) Change
	No. of Firms	No. of Firms	
Micro	1329	1615	-17.7
Small	888	634	40.1
Medium	68	26	161.5
Large	134	59	127.1

Source: Own estimates from ASI, 1999-00 & 2009-10

10. Decadal change in labour productivity and capital intensity across MSMEs in casting of metals sector

Labour productivity increased in all the size classes except for the medium one where capital intensity declined substantially. Capital intensity also declined in large size class but only to a small extent.

Table 12: Productivity & Capital intensity across MSMEs in formal sectors of casting of metals (at 2009-10 prices) (in Rs lakh)						
Size	2009-10	1999-00	2009-10	1999-00	% change in productivity	% change in capital intensity
	Productivity (VAD/L)	Productivity (VAD/L)	Capital Intensity (K/L)	Capital Intensity (K/L)		
Micro	2.0	1.6	0.8	0.8	23.1	4.5
Small	4.9	3.9	4.3	4.0	25.7	8.9
Medium	4.3	5.4	5.2	15.3	-21.5	-65.8
Large	7.1	6.6	13.9	14.9	7.5	-6.7

Source: Own estimates from ASI, 1999-00 & 2009-10

11. Growth of number of enterprises across states in casting of metals sector

In terms of growth in number of enterprises, Punjab, West Bengal, Andhra Pradesh and Bihar display better performance where MSMEs are the major beneficiaries. As opposed to this, most other states experienced decline in the total number of enterprises.

<i>Table 13: Number of Firms in Casting of metals</i>												
State	Micro			Small			Medium			Large		
	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change
Punjab	196	90	117.78	49	27	81.48	2	1	100	2	2	0.00
Haryana	1	55	-98.18	8	29	-72.41	1			2	0	
Rajasthan	28	77	-63.64	26	21	23.81				3	5	-40.00
U.P.	76	120	-36.67	43	52	-17.31				8	7	14.29
Bihar	109	9	1111.1	36	11	227.27		1		8	1	700.0
W.B.	175	16	993.75	47	14	235.71	2			8	1	700.0
Jharkhand	14			10						2		
Orissa	7			7			1			4		
CG	9			25			1			3		
Gujarat	306	406	-24.63	151	117	29.06	9	1	800	17	3	466.67
Maharashtra	121	232	-47.84	170	128	32.81	17	2	750	25	10	150.0
Andhra	65	65	0.00	37	28	32.14	10	1	900	13	10	30.0
Karnataka	83	90	-7.78	72	27	166.67	10	6	66.67	8	3	166.67
T.N.	102	113	-9.73	166	111	49.55	12	2	500	29	4	625.0

Note: In 2009-10 code- 243, in 1999-00 code -273

Source: Own estimates from ASI, 1999-00 & 2009-10

12. Change in labour productivity and capital intensity in casting of metals sector

There is significant rise in labour productivity in the states like Rajasthan, Maharashtra and Andhra Pradesh. In micro and small enterprises segment, significant increase in productivity is shown by states like W.B., Andhra Pradesh and Tamil Nadu. In medium size class Punjab, Haryana and W.B. experienced substantial rise in labour productivity. It is to be noted that most of the states and segments that witnessed rise in labour productivity also experienced rise in capital intensity.

Table14 : Labour productivity (VAD/L in Rs. lakh) in Casting of metals (at 2009-10 prices)												
State	Micro			Small			Medium			Large		
	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change
Punjab	1.44	2.63	-45.22	1.94	2.42	-19.91	6.53	1.25	423.26	4.39	4.63	-5.23
Haryana	1.74	1.98	-12.16	4.17	10.03	-58.42	3.09			5.73	0.00	
Rajasthan	1.88	1.59	18.45	7.09	6.49	9.30	0	0.00	-	12.87	9.59	34.16
U.P.	1.6	1.73	-7.61	5.26	7.86	-33.12	0	0.00	-	1.17	3.34	-65.01
Bihar	1.58	0.97	62.69	5.26	2.91	80.49	0	2.11		12.73	4.84	162.94
W.B.	2.38	0.82	190.16	4.82	1.63	196.22	3.14	0.00		5.19	54.93	-90.55
Jharkhand	1.61			5.12	0.00		0	0.00	-	10.78	0.00	
Orissa	2.11			3.11	0.00		1.96	0.00		7.83	0.00	
CG	1.15			2.15	0.00		3.79	0.00		4.11	0.00	
Gujarat	1.99	1.67	18.96	4	2.56	56.45	3.39	19.15	-82.30	10.25	1.91	436.41
Maharashtra	1.93	1.65	16.97	6.47	2.62	146.94	5.81	4.84	20.15	10.96	3.41	221.57
Andhra	2.8	1.22	129.49	4.74	2.20	115.49	2.94	2.89	1.74	4	0.87	362.25
Karnataka	2.3	1.42	61.60	5.27	2.80	88.47	5.59	4.96	12.65	2.43	17.64	-86.22
T.N.	2.41	1.20	100.33	4.6	4.94	-6.85	2.95	1.40	110.48	5.19	10.43	-50.22

Source: Own estimates from ASI, 1999-00 & 2009-10

Table 15: capital intensity K/Lin Rs. lakh in Casting of metals (at 2009-10 prices)												
Sector Code	Micro			Small			Medium			Large		
State	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change	2009-10	1999-00	% Change
Punjab	0.95	1.42	-32.90	2.29	2.34	-2.30	1.69	3.18	-46.85	7.43	4.06	82.97
Haryana	1.5	0.89	67.68	19.48	7.25	168.75	2.93	0.00		6.69	0.00	
Rajasthan	0.68	0.60	13.04	9.93	6.50	52.70	0	0.00	-	6.43	15.01	-57.16
U.P.	0.65	0.79	-17.29	7.58	10.55	-28.18	0	0.00	-	14.05	7.31	92.29
Bihar	0.78	0.23	246.8	5.36	3.53	52.03	0	1.64		23.83	22.61	5.39
W.B.	0.64	0.10	567.65	4.41	1.71	158.16	2.19	0.00		6.21	26.42	-76.49
Jharkhand	0.7	0.00		7.01	0.00		0	0.00	-	6.66	0.00	
Orissa	0.57	0.00		1.29	0.00		16.86	0.00		3.88	0.00	
CG	0.31	0.00		4.25	0.00		2.68	0.00		26.65	0.00	
Gujarat	0.85	0.91	-6.14	3.77	3.92	-3.84	3.93	4.92	-20.15	10.2	9.03	12.92
Maharashtra	0.71	0.69	2.51	3.7	2.31	60.27	3.26	2.48	31.61	21.51	16.18	32.95
Andhra	1.09	0.68	60.79	4.07	2.84	43.49	14.04	1.04	1252	13.47	15.61	-13.69
Karnataka	0.99	0.73	36.50	3.03	2.08	45.99	4.72	9.94	-52.53	2.32	9.31	-75.08
T.N.	0.98	0.60	62.83	4.28	3.98	7.48	3.07	3.35	-8.42	10.17	22.16	-54.10

Source: Own estimates from ASI, 1999-00 & 2009-10

Chapter 3:

Industry structure and the performance of the basic metal industry: a disaggregated analysis

Manufacture of basic metals consists of three main groups (3-digit), namely, Manufacture of basic iron and steel (code 241), Manufacture of basic precious and other non-ferrous metals (code 242) and Casting of metals (code 243). For this industry the following aspects are studied: presence of informal sector enterprises in the industry and relative contribution/ performance of micro and small (and medium, if existing) enterprises (based on NSSO data); relative contribution/ performance of micro, small and medium enterprises of the formal sector and level of concentration of the large enterprises (based on ASI data); concentration among the listed enterprises (based on CMIE data); participation of the different size classes of enterprises in exports; nature of inter-linkages between large and small enterprises, and if the former help the latter in their business development or export; reasons for the growth of the micro and small enterprises and of the industry; locational factors and (state) Government policies influencing the performance and geographical concentration of the industry. Given the importance and distinctiveness of each of the 3-digit groups, these groups will be dealt with separately wherever possible.

I. Basic iron and steel manufacturing (Code 241):

In India Iron and Steel production is done by the enterprises belonging to both public sector as well as private sector. On the basis of roots of production, the Indian steel industry can be divided into two categories: (a) Integrated production, which involves conversion of iron ore into steel. There are three major integrated steel players in India, namely SAIL, Tata Steel and RINL. (b) Secondary production - usually mini steel plants make steel by melting scraps or sponge iron or both. Essar Steel, Ispat Industries and Lloyds steel are the largest producer of steel through this route. [6] As the production of iron and steel, especially converting iron ore into processed iron or steel, requires large economies of scale and thus demands substantial amount of fixed investment, the involvement of MSMEs, particularly micro and small ones, is necessarily insignificant in this activity where large enterprises predominate. Further value addition or further processing of the iron/ steel produced by the large enterprises may however be done by the MSMEs and the resultant output is categorised in other subgroups of the 3-digit industry. Thus, various size classes of enterprises as well as various subgroups in the industry may become inter-linked.

Being a core sector, its sustained growth is a prerequisite for attaining the high level of GDP growth. India is the fourth largest producer of steel in the world. Crude steel production for year 2011-12 is 73.79 million tonnes. As per the 'National Steel Policy 2005' country is expected to raise this production to 110 million tonnes by the year 2019-20. [2] However, based on actual production and consumption in the subsequent years, particularly in 2006-07

when domestic steel production grew at the rate of 10.9% and consumption at 11.6%, the production target of steel was revised in 2008. According to the revised estimates iron and steel production was projected at 180 million tones as target to be achieved by 2019-20.[3] We would see what role MSMEs can play in this regard. MSMEs are found to be involved in the industry in many ways, such as, manufacturing finished goods by using processed iron & steel produced in large firms, directly exporting their produce or indirectly through other firms, contracting-in manufacturing jobs from others as well as contracting-out manufacturing work to others. Whether these varieties of contracting relations of the MSMEs are the result of industry structure or market structure or technology or because of government policy would be analysed. The following broad themes are looked into: structure covering the relative contribution of the formal and informal sectors, their concentration, contractual relationships, productivity, capital intensity and contracting, exports, age wise contractual linkages, regional dispersions and government policies for growth.

Industry structure of the basic iron & steel industry

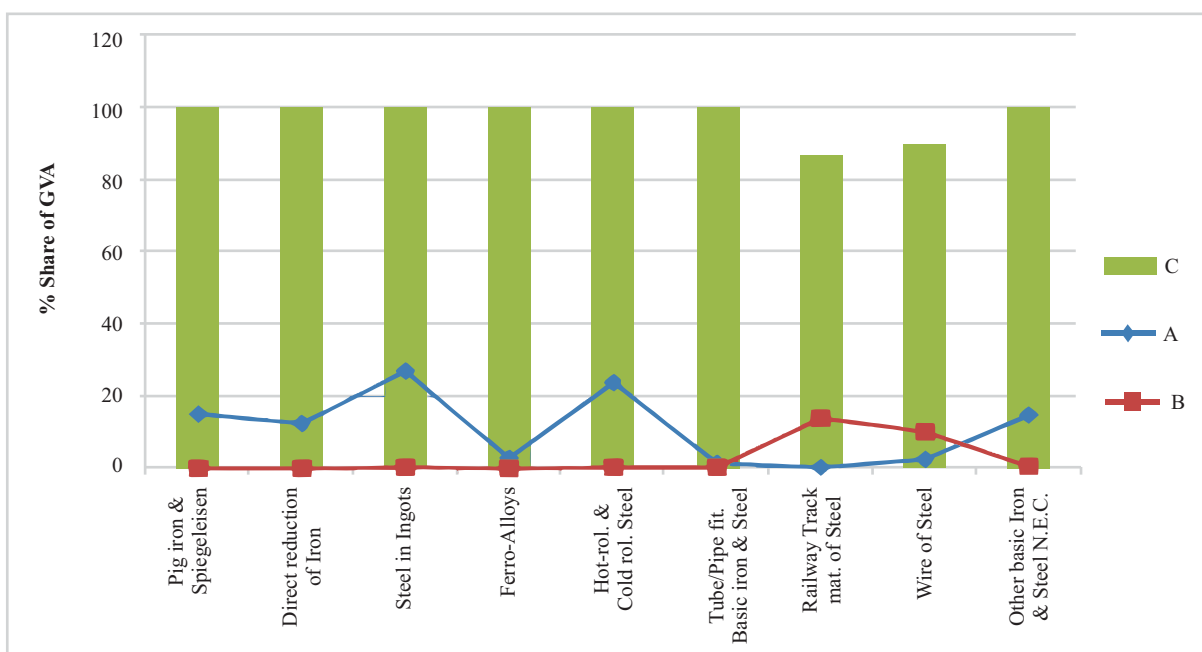
Industry structure refers to not only the size structure of enterprises, notably the percentage distribution of the number of enterprises and their production across MSMEs and large enterprises but also various kinds of inter-enterprise relationships among as well as within different size classes of enterprises. Technological factors and scale economy, given the market size, largely determine size distribution as well as distribution across smaller (5-digit) subgroups of basic iron and steel industry, and the distribution in turn determine inter-enterprise relationships. In fact, size distribution and the relationship may be mutually reinforcing each other and at times the industry as a whole may benefit from the structure through greater resource mobilisation and its better use. As per NIC 2008, Basic iron and steel industry has nine 5-digit subgroups: 24101 - pig iron & spiegeleisen in pigs, blocks or other primary forms; 24102- direct reduction of iron (sponge iron) & other spongy ferrous products, 24103 - steel in ingots or other primary forms, and other semi finished products of steel; 24104- ferro alloys; 24105- Hot-rolled & Cold rolled products of steel; 24106 - tube or pipe fittings of cast steel; 24107 - railway track materials of steel; 24108 - wire of steel by cold drawing or stretching; 24109 - other basic iron and steel n.e.c. It may be mentioned that some of these subgroups represent downstream activities of some other, such as industry codes 24107 & 24108 use products from industry code 24103 as input.

1. Relative contribution of the formal and informal sectors to the industry

As already indicated, presence of MSMEs may be found in both the formal as well as informal sectors. Those manufacturing enterprises which are required to be registered under Factory Act (1948) belong to the formal or organized or registered sector. Remaining manufacturing units, by default, are considered as belonging to informal or unorganized or unregistered sector, although they may enlist themselves with agencies, like, KVIC, Silk Board, SSIB, etc.

The presence of the informal sector in manufacturing of basic iron & steel (241) is however not very significant. Also the formal sector share varies from 86% to 100% among 5-digit subgroups. The reason appears to be that this industry requires high investment of capital.

Figure 2a : Distribution of GVA across formal & informal sectors of basic iron & steel Industries



Note- 1. ASI data for the year 2009-10, and NSSO and CMIE data for the year 2010-11. A: share of 5 digit group formal and informal sectors in combined GVA (ASI+NSSO) for group 241

B: Share of informal sector in combined GVA (ASI+NSSO) for each 5-digit code (%)

C: Share of formal sector in combined GVA (ASI+NSSO) for each 5-digit code (%)

(i) Presence of MSMEs in informal sectors (based on NSSO 2010-11):

Out of the seven subgroups (5-digit) of the industry only in two subgroups the presence of the informal sector is found to be quite significant. These two subgroups are railway track materials of steel (24107) and wire of steel by cold drawing or stretching (24108) with 14% and 10% (Figure 2a) contribution to GVA of the respective 5-digit groups. The presence of informal sector in sub-sector code 24107 and 24108 may be due to the fact that these two sectors are not as much technology intensive as is sub-sector code 24101, 24102, and 24103. The share of these two subgroups in the gross value added by the 3-digit group basic iron and steel is also not at all high (only 0.13% and 2.59 %). Further, in the informal sector, micro enterprises account for 100% of GVA, which amounts to Rs 35900 lakh in absolute term.

(ii) Presence of MSMEs in the formal sector (based on ASI 2009-10)

The two most important 5-digit subgroups present in the iron and steel manufacturing are (a) Manufacture of steel in ingots or other primary forms, and other semi-finished products of steel (24103) which has 27% share of the GVA of the 3-digit code, and (b) Manufacture of Hot-rolled & Cold rolled products of steel (24105) which has 24% share of the GVA of the 3-digit code (Figure 2a). These two subgroups together share more than a half of the total GVA by the basic iron and steel (241). The reason being that these two sub-groups represent semi-finished and finished products in the process of Iron and steel making, to be sold in market for further modification and uses by the other subgroups of iron and steel industry as well as by other industries. There are three other significant 5-digit sectors, viz., manufacture of pig iron & spiegeleisen in pigs, blocks or other primary forms (24101), manufacture of other basic iron and steel n.e.c (24109) and manufacture of Direct reduction of iron (sponge iron) & other spongy ferrous products (24102) and each one is having around 13-15% share of the GVA of 3-digit group.

(a) Share of micro enterprises

The share of Micro Enterprise in Manufacture of Basic iron & Steel (code 241) is abysmally low. The highest share of Micro Enterprises in the GVA of 5-digit groups of ASI is found to be only 38 % (Figure 2b) for the sector manufacturing of railway track materials of steel (24107). But this subsector itself has low share in basic iron & steel production. In all other subsectors the micro enterprises have single digit contribution. This indicates that there is negligible contribution of the micro enterprises in iron and steel manufacturing as reported in ASI. It will be discussed soon why their presence is so nominal in this industry.

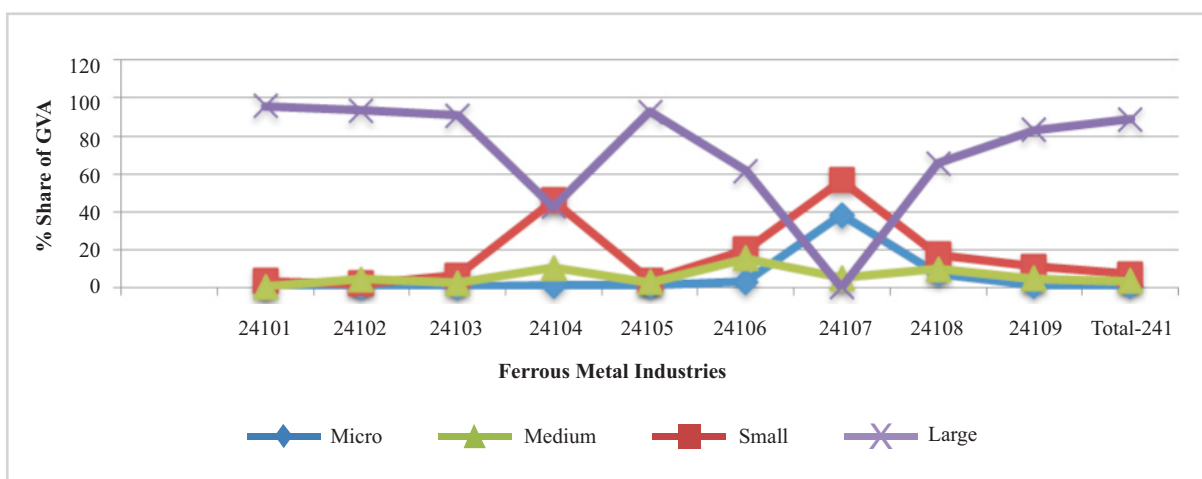
(b) Share of small enterprises

The share of Small Enterprises in manufacture of Basic iron & Steel (code 241) is also low, although higher than that of Micro Enterprises. The highest share of Small Enterprise GVA among 5-digit ASI groups is 57 % (Figure 2b), again for the sector manufacturing of railway track materials of steel (24107). The other significant shares are 46% for ferro-alloys (24104) and 20% for the sector manufacturing of tube or pipe fittings of cast steel (24106). The two other sectors with significant share of small enterprises are Manufacture of wire of steel by cold drawing or stretching (24108) and other basic iron and steel n.e.c. (24109). This reveals that there is significant contribution of the small enterprises in manufacturing of basic iron and steel, although the 5-digit subsectors with high GVA contribution by small enterprises are those with low share in the GVA of the 3-digit group. Very high presence of micro and small enterprises in the production of items under codes 24107 and 24104 is probably due to specific government policy like procurement from small firms or their production was under reservation earlier.

(c) Share of medium enterprises

The contribution of Medium Enterprises in the Manufacture of Basic iron & Steel (code 241) is very low quite similar to that of Micro Enterprises. The highest share of Medium Enterprises in the GVA of the ASI 5-digit groups is only 15% (Figure 2b) for the sector manufacturing of tube or pipe fittings of cast steel (24106). It is 10% for the sub-sector ferro-alloys (24104). The other five subsectors have single digit representation. This reveals that contribution of the medium sized enterprises to GVA of ASI sector manufacture of basic iron & steel is quite low. Thus the major part of the value addition of the basic iron and steel sector is generated by the large enterprises. In other words, large enterprises dominate the basic iron and steel industry, with some exceptions of few less important subgroups like codes 24104, 24106 and 24107. Further, it will be shown below that among the large enterprises a few very large ones dominate. What would be the implication of this dominance of (a few) large enterprises in terms of their relationships with MSMEs, competitiveness/ productivity, and thereby future growth of the industry? Before taking up these issues we would first have a glance at the level of concentration in the industry.

Figure 2b : Share of GVA across MSMEs and Large Enterprises in formal sector of basic Iron and Steel Industries



Note: 24101 - pig iron & spiegeleisen in pigs, blocks or other primary forms; 24102- Direct reduction of iron (sponge iron) & other spongy ferrous products, 24103 - steel in ingots or other primary forms, and other semifinished products of steel; 24104- ferro alloys; 24105 Hot-rolled & Cold rolled products of steel; 24106 - tube or pipe fittings of cast steel; 24107 - railway track materials of steel; 24108 - wire of steel by cold drawing or stretching; 24109 - other basic iron and steel n.e.c.; 241 – basic iron & steel.

Source: Own estimates from ASI, 2009-10

Large enterprises and their concentration

In a very simple way the level of concentration is measured – first, in terms of the share of the top five firms in total gross value added by the industry group under ASI; and then, in terms of the share of top five listed companies in total sales of all the listed companies belonging to the industry group as reported in CMIE. (A comprehensive analysis of market concentration using Lorenz curve for all the three digit industry groups is already done above in the chapter1). Top 5 companies' share in GVA as per ASI data is very high in all the important 5-digit groups. Even among the least important groups in terms of share in GVA, code 24108 (wire of steel by cold drawing or stretching) has moderately high 5-firms concentration (54% share of GVA (Figure 3)). Moreover, CMIE data on the listed companies reveal that the 5-digit groups with high 5-firms concentration (in terms of shares in ASI gross value added) also have high 5-firms concentration in terms of shares in sales. However, such an oligopolistic structure is also the global feature of the industry. CCI (2009) report on steel industry however did not find any anticompetitive behavior, cartelization or joint pricing practices by the large firms (CCI, 2009, India's Steel Industry). It is however noted that “the government preferences towards big steel players especially in the context of iron ore captive mining have put smaller players at disadvantageous state in the market. Big players, with full or partial captive facilities, do enjoy low cost of production and secure supply of raw material. Nevertheless, inherent nature of the steel industry, which requires huge initial investments to create production base and expand the capacities, is also responsible for the oligopolistic nature of the industry” (CCI, 2009).

In brief, all this points to the fact that the informal sector in general as well as formal sector micro enterprises have not evolved much in these product categories. This is probably due to high initial fixed investment requirement as well as monopolization by a few large enterprises. It is to be further noted that in most of the cases, top 5 firms belong to the category of private enterprises. The only 5 digit sector which has significant presence of all categories of MSMEs in ASI code 241 is the Manufacturing of railway track materials of steel (24107). In fact MSMEs together share almost 100 % of GVA of this sector. This is the only sector where the large enterprises sector is absent which is probably due to reservation of production or procurement policy. The other sectors with good performance of MSMEs are manufacturing of ferro-alloys (24104), manufacturing of tube or pipe fittings of cast steel (24106) and Manufacture of wire of steel by cold drawing or stretching (24108) having total share of 57.46 %, 38.42 % and 34.29% (Figure 2b).

Obviously the sectors with poor performance of MSMEs, mainly manufacture of pig iron & spiegeleisen in pigs, blocks or other primary forms (24101), Manufacture of Direct reduction of iron (sponge iron) & other spongy ferrous products (24102), Manufacture of Hot-rolled & Cold rolled products of steel (24105) and manufacture of steel in ingots or other primary forms, and other semi finished products of steel (24103) are the ones where the large firms

exclusively dominate. For example, the pig iron market is mainly dominated by USHA Ispat Ltd. having 52.37 % market share in sales while in the other enterprises like SAIL, Tata Steel have integrated plant, pig iron is used as raw material for further steel making process.

In the same way, hot-rolled & cold-rolled products of steel market is mainly dominated by the Steel Authority of India Limited (SAIL) having share of 37.67% in sales which is finished product of steel. The large sales share is attributable to its market strategy. For better market penetration, it has launched a Rural Dealership Scheme in order to encourage use of quality steel items in predominantly rural areas, and to increase the penetration of the company's branded products in the country's hinterland.⁴

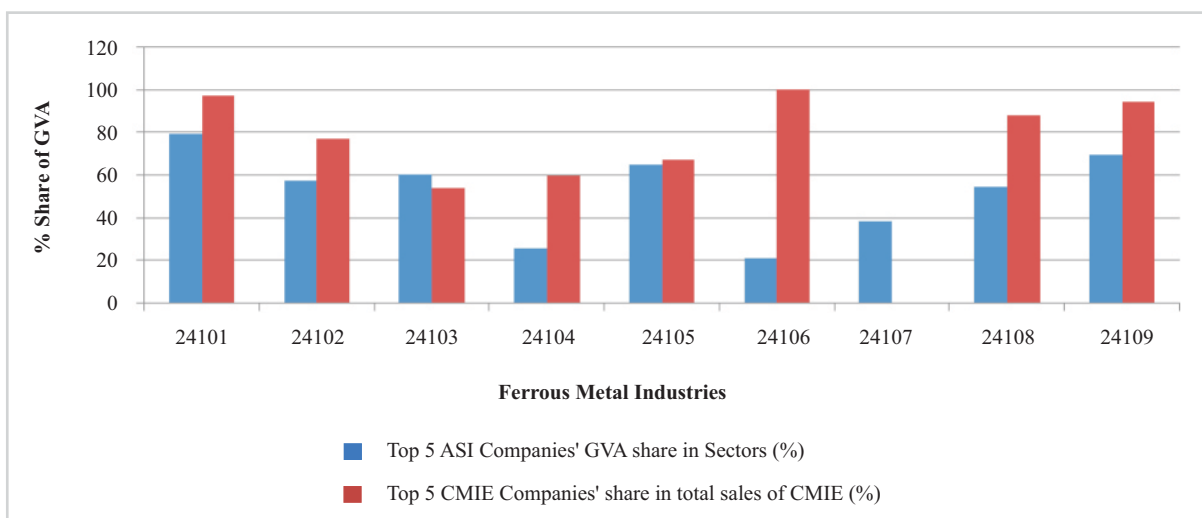
In terms of the distribution within MSMEs, out of 3364 enterprises, 1026 are micro sized, 1584 are small and 257 are medium. Out of 1026 micro enterprises 315 are in code 24105, 223 enterprises are in code 24109 and 184 for code 24108 .The least number of Micro enterprises found in code 24102.

Among the Small enterprises, out of 1584 small enterprises 492 are in code 24103, 363 enterprises are in code 24109 and 286 for code 24105 (Table 2) .The least number of small enterprises is focused in code 24107.

Among the Medium enterprises, out of 257 Medium enterprises 74 are in code 24102, 48 are in code 24103, 46 enterprises are in code 24105 and 42 for code 24109. The least number of Medium enterprises is found in code 24107, 24106 and 24104 respectively. Overall, the maximum number of MSMEs is found in Sector codes 24103, 24105 and 24109 having total enterprises 666, 622 and 625 respectively.

The industry structure is characterized by high level of concentration of a few large firms. Unorganized sector enterprises as well as formal micro enterprises are not much in numbers. Probably their independent operation is very difficult at very low scale and thus requires support of larger enterprises, for example in order to access market, technology or raw materials. We would see if there exists any kind of contractual relationship other than pure market based arms length transactions among enterprises.

Figure 3 : Market Concentration of Firms under each 5 digit code for basic Iron & Steel Industries



Note: 24101 - pig iron & spiegeleisen in pigs, blocks or other primary forms; 24102- Direct reduction of iron (sponge iron) & other spongy ferrous products, 24103 - steel in ingots or other primary forms, and other semifinished products of steel; 24104- ferro alloys; 24105 Hot-rolled & Cold rolled products of steel; 24106 - tube or pipe fittings of cast steel; 24107 - railway track materials of steel; 24108 - wire of steel by cold drawing or stretching; 24109 - other basic iron and steel n.e.c.; 241 - basic iron & steel.

* 100% share is of 3 companies

Source: Own compilation of ASI and CMIE data

1. **Contractual relations of MSMEs**

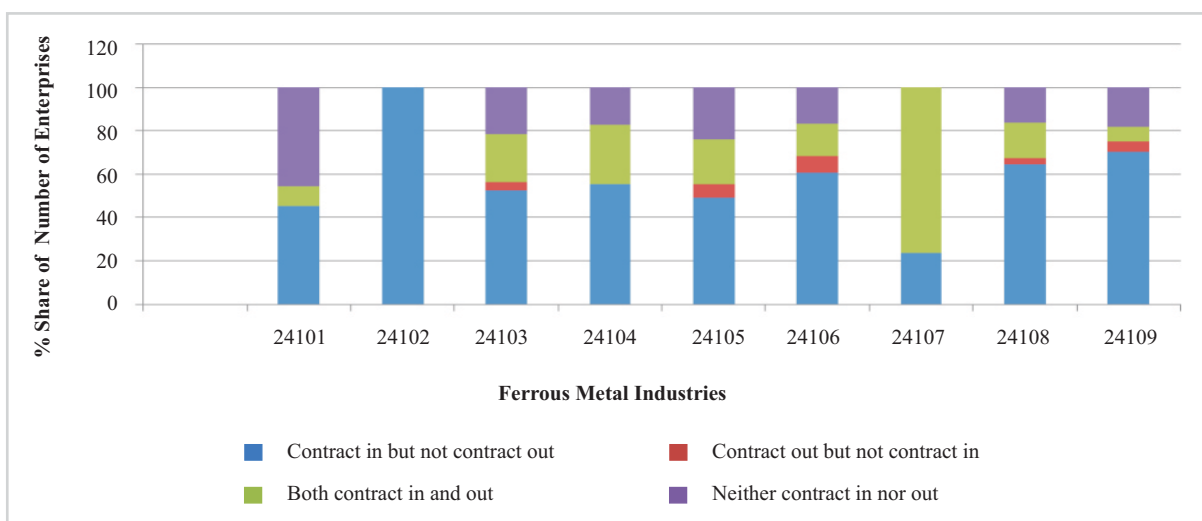
ASI data provides information about the firms contracting in and contracting out and volume of transaction under contract but does not provide information about who is the transacting partner and the terms of contract. Nonetheless it gives an idea about the extent of involvement of the enterprises of each size classes in contractual relations.

(i) **Micro enterprises**

Incidence of the formal sector micro enterprises working on contract is very high. Excepting 21% of the enterprises who neither contract in nor out (independent), all other micro enterprises are involved in contracting some way or other: 57% contract in, 4% contract out and 17% both contract in and contract out (Figure 4). Distinguishing feature of the manufacture of railway track materials of steel as compared to other 5-digit subsectors is that a much higher proportion of micro enterprises contract out manufacturing job over and above a large proportion contracting in. The sub-sector manufacture of Direct reduction of iron exhibits 100% contract in but not contract out. The reason is that the Direct reduction of iron (sponge iron) acts as a raw material for steel making. So enterprises which are involved in its

manufacturing sell their products to the enterprises which have steel making facility. Also the sub sector manufacturing of railway track material (24107) has 100% contracting relationship.

Figure 4 : Contractual relations of the Micro Enterprises



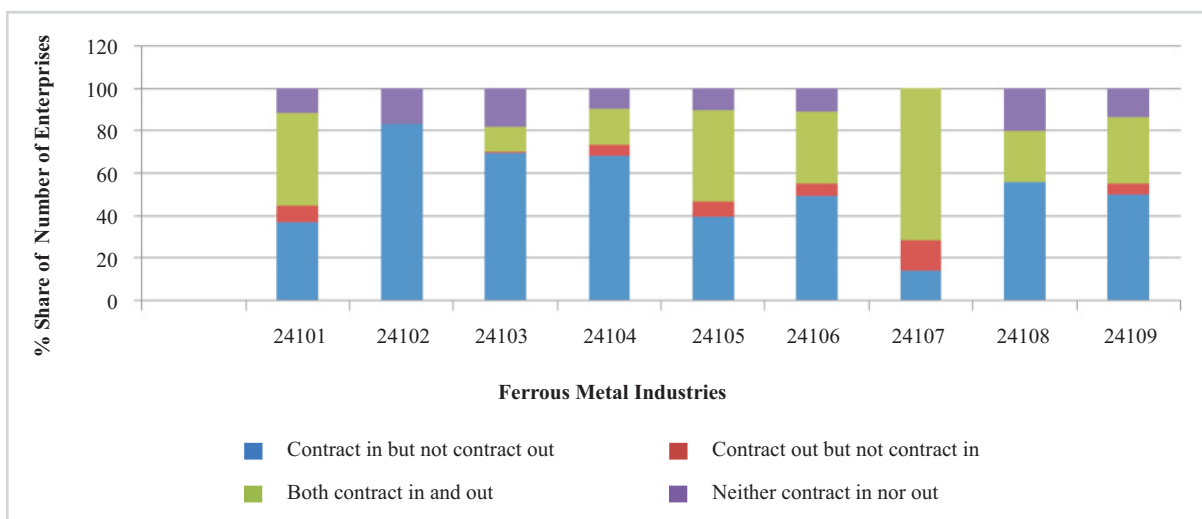
Note: 24101 - pig iron & spiegeleisen in pigs, blocks or other primary forms; 24102- Direct reduction of iron (sponge iron) & other spongy ferrous products, 24103 - steel in ingots or other primary forms, and other semifinished products of steel; 24104- ferro alloys; 24105 Hot-rolled & Cold rolled products of steel; 24106 - tube or pipe fittings of cast steel; 24107 - railway track materials of steel; 24108 - wire of steel by cold drawing or stretching; 24109 - other basic iron and steel n.e.c.; 241 – basic iron & steel.

Source: Own estimates based on ASI, data

(ii) Small Enterprises

Intensity of contracting enterprises is even higher among the small enterprises. As much as 85% of the enterprises are involved in some or other form of contractual relationship – 56% contract in, 4% contract out and another 25% both contract in and contract out (Figure 5). The sector manufacturing of railway track material of steel (24107) is involved in 100% contracting. Among other 5-digit subgroups relatively higher proportion of contracting in enterprises are found in codes 24101, 24102, 24103, 24104 and 24108. High contract density among the small firms reflects their dynamism and specialization and greater scope for technological progress.

Figure 5 : Contractual relations of the small Enterprises



Note: 24101 - pig iron & spiegeleisen in pigs, blocks or other primary forms; 24102- Direct reduction of iron (sponge iron) & other spongy ferrous products, 24103 - steel in ingots or other primary forms, and other semifinished products of steel; 24104- ferro alloys; 24105 Hot-rolled & Cold rolled products of steel; 24106 - tube or pipe fittings of cast steel; 24107 - railway track materials of steel; 24108 - wire of steel by cold drawing or stretching; 24109 - other basic iron and steel n.e.c.; 241 - basic iron & steel.

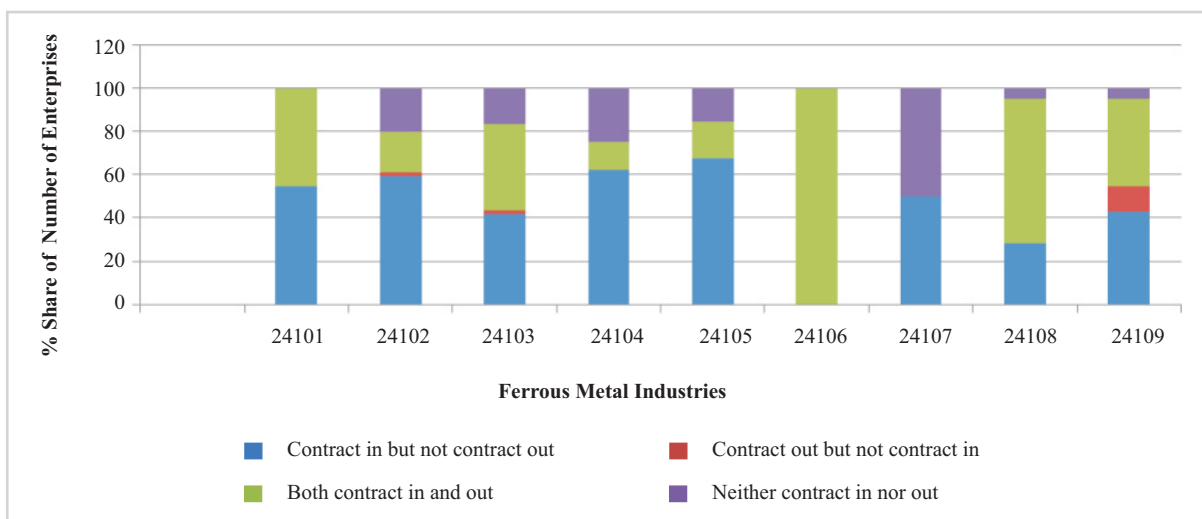
Source: Own estimates based on ASI, data

(i) Medium enterprises

Medium sized enterprises are found to have even higher intensity of contracting relation and this feature is distributed over all the subsectors – only 14% of them are not involved in contracting, 51% contract in and 32% both contract in and out (Figure 6). Proportion of both contracting in and out is higher in medium category than micro or small ones.

This pattern is also noticed among the large enterprises, the only difference is that the proportion of contracting in is slightly lower and that of the contracting in and out slightly higher.

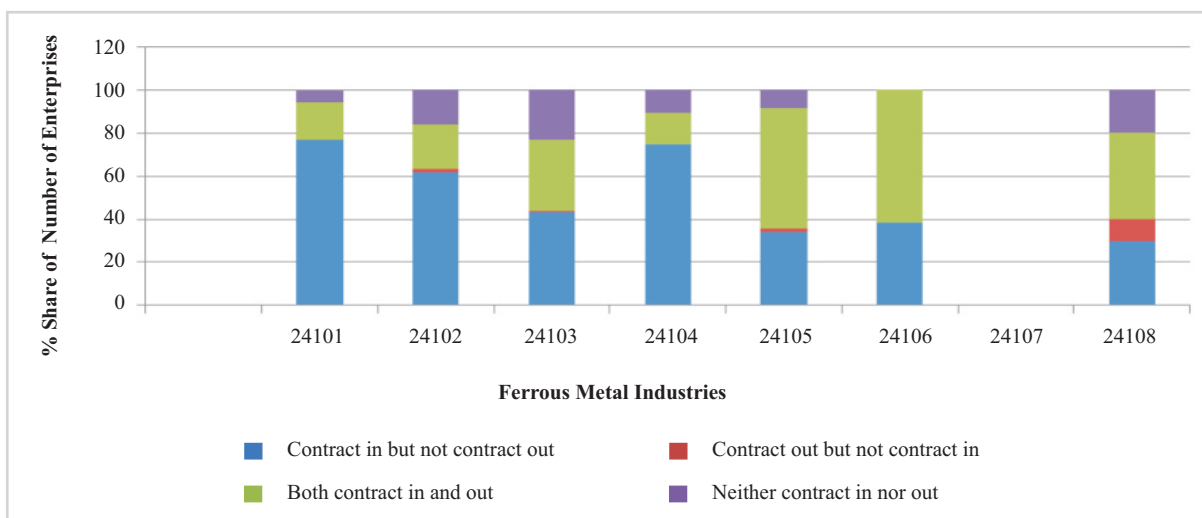
Figure 6 : Contractual relations of the Medium Enterprises



Note: 24101 - pig iron & spiegeleisen in pigs, blocks or other primary forms; 24102- Direct reduction of iron (sponge iron) & other spongy ferrous products, 24103 - steel in ingots or other primary forms, and other semifinished products of steel; 24104- ferro alloys; 24105 Hot-rolled & Cold rolled products of steel; 24106 - tube or pipe fittings of cast steel; 24107 - railway track materials of steel; 24108 - wire of steel by cold drawing or stretching; 24109 - other basic iron and steel n.e.c.; 241 - basic iron & steel.

Source: Own estimates based on ASI, data

Figure 7 : Contractual relations of the Large Enterprises



Note: 24101 - pig iron & spiegeleisen in pigs, blocks or other primary forms; 24102- Direct reduction of iron (sponge iron) & other spongy ferrous products, 24103 - steel in ingots or other primary forms, and other semifinished products of steel; 24104- ferro alloys; 24105 Hot-rolled & Cold rolled products of steel; 24106 - tube or pipe fittings of cast steel; 24107 - railway track materials of steel; 24108 - wire of steel by cold drawing or stretching; 24109 - other basic iron and steel n.e.c.; 241 - basic iron & steel.

Source: Own estimates based on ASI, data

As already mentioned, the ASI data do not mention the terms and conditions of the contracts as well as who is the other party of a contractual transaction. Whether the contractual transaction take place within the same size class of enterprises or between different size-classes of enterprises are not very clear from this data set. *However, the data show that the proportion of enterprises contracting in only increases systematically as the size-class decreases while the proportion of enterprises contracting out either exclusively or together with contracting in increases systematically as the size class increases. This is indicative of the existence of vertical transactions, particularly larger enterprises contracting out to smaller ones. Moreover, generally very high proportion of enterprises contracting in often together with contracting out which indicates significance of horizontal transactions, i.e., contracts between enterprises within the same size class.* As already noted that there is very high level of concentration in this group of industries, and we may conjecture that the high contract density may be linked to high concentration.

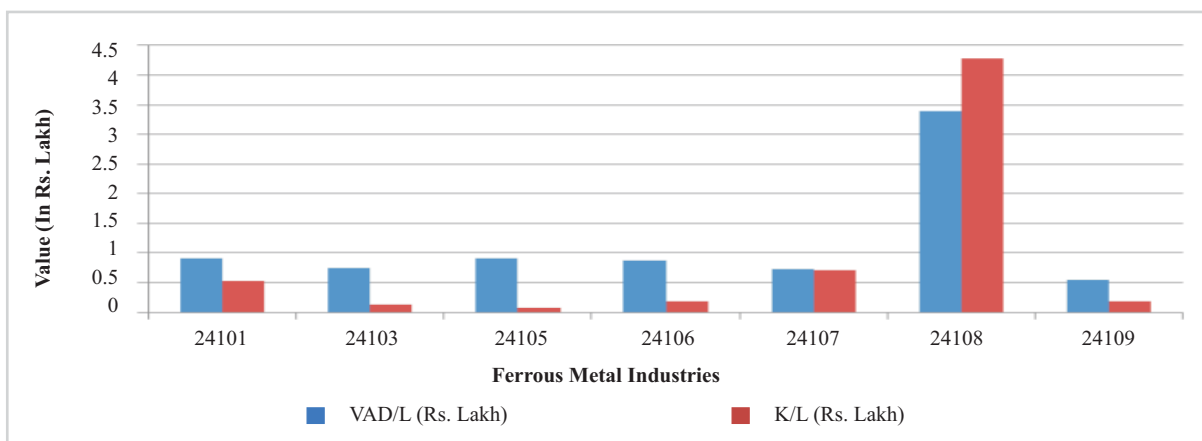
It is yet to be examined whether the predominance of contractual relations help raise, productivity, innovation, capital investment, business growth or the growth of the industry in general through bringing about dynamism of product and process innovations, exploring new markets and so on. Some of these issues are raised below.

2. Productivity, capital intensity and contracting

(i) Productivity of the informal sector MSMEs (NSSO)

It is already mentioned that in the informal sector there is no small and medium-sized enterprises engaged in manufacturing basic iron and steel, only micro enterprises are found. Out of its seven major 5-digit subsectors manufacture of wire of steel by cold drawing or stretching (24108) has the highest labour productivity (Rs 3.4 lakh value added per labour) in the group of micro enterprises (Figure 8). Other sub-sectors of micro enterprises have much lower productivity (less than Rs 1 lakh value added per worker).

Figure 8 : Value added per labour of micro enterprises in Manufacture of basic iron and steel (NSSO 2010-11)



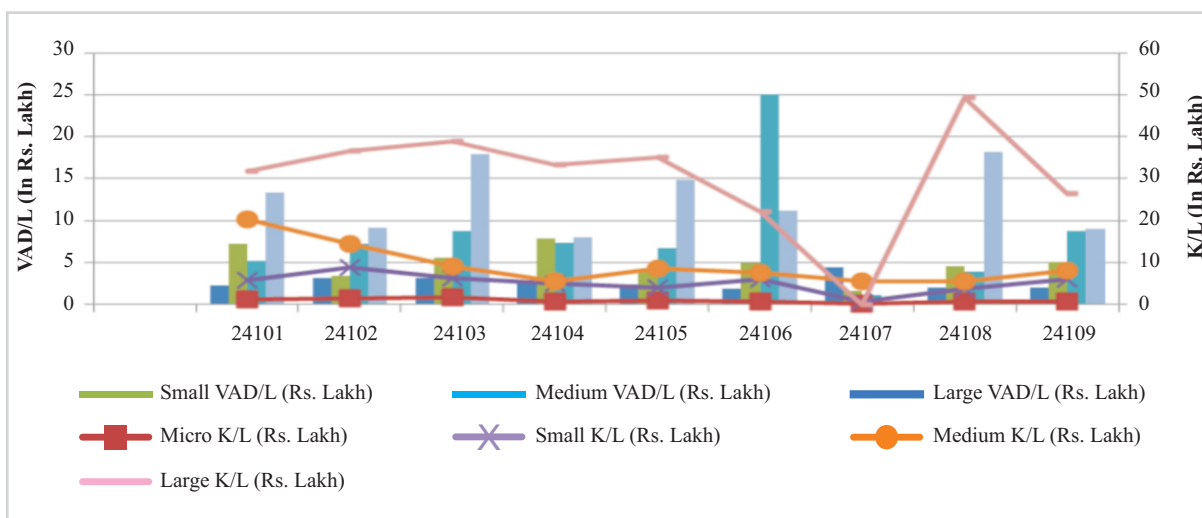
Note: 24101 - pig iron & spiegeleisen in pigs, blocks or other primary forms; 24102- Direct reduction of iron (sponge iron) & other spongy ferrous products, 24103 - steel in ingots or other primary forms, and other semifinished products of steel; 24104- ferro alloys; 24105 Hot-rolled & Cold rolled products of steel; 24106 - tube or pipe fittings of cast steel; 24107 - railway track materials of steel; 24108 - wire of steel by cold drawing or stretching; 24109 - other basic iron and steel n.e.c.; 241 - basic iron & steel.

Source: Own estimates based on NSSO (2010-11) 67th Round Unit level data

(ii) Productivity of MSMEs belonging to formal sector (ASI)

Figure 9 depicts the productivity as well as capital intensity across size-classes of enterprises engaged in the manufacturing of basic iron and steel. Productivity is measured in terms of value added per labour and capital intensity is measured in terms of value of fixed capital (excluding land and building) per unit labour. It may be seen that there is a tendency towards rise in VAD/L and K/L with increase in size classes. However within a size class productivity variation across subsectors appears to have no relation with the capital to labour ratio.

Figure 9 : Value added per labour & capital Labour ratio of the MSMEs in basic iron & steel (ASI-2009-10)



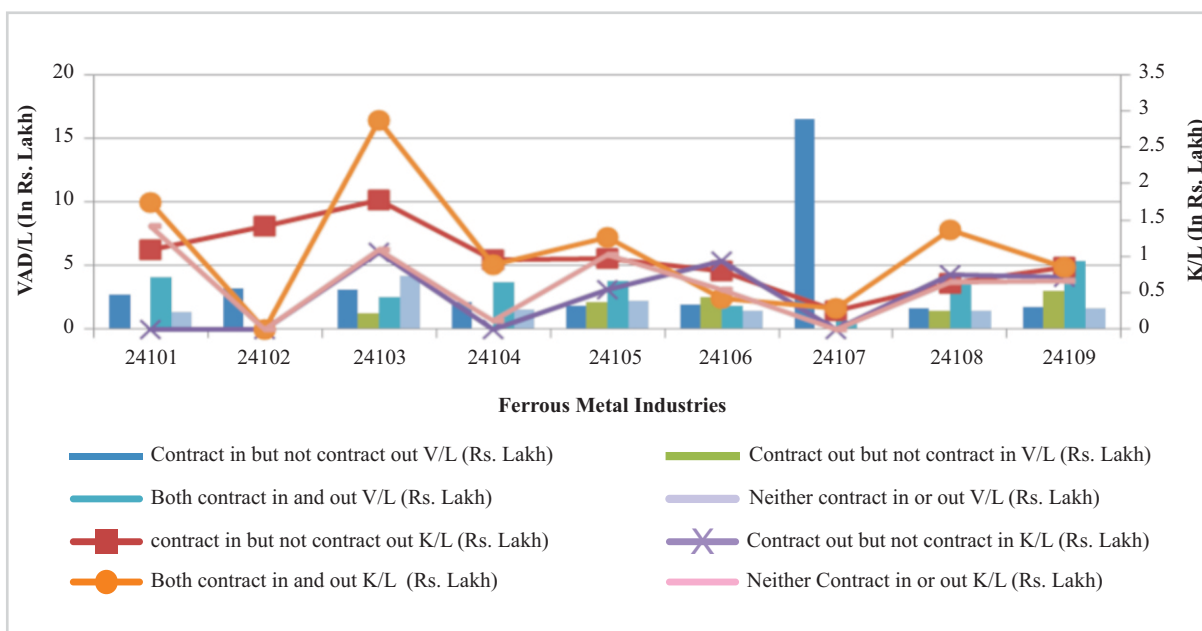
Note: 24101 - pig iron & spiegeleisen in pigs, blocks or other primary forms; 24102- Direct reduction of iron (sponge iron) & other spongy ferrous products, 24103 - steel in ingots or other primary forms, and other semifinished products of steel; 24104- ferro alloys; 24105 Hot-rolled & Cold rolled products of steel; 24106 - tube or pipe fittings of cast steel; 24107 - railway track materials of steel; 24108 - wire of steel by cold drawing or stretching; 24109 - other basic iron and steel n.e.c.; 241 - basic iron & steel.

Source: Own estimates based on ASI 200-10 data

Productivity of Micro Enterprises

In the case of registered or formal sector, high productivity of the micro enterprises is found in the sub-sector manufacture of railway track materials of steel (24107) with the value added per labour per year being Rs 4.43 lakh. In this sector micro enterprises are present in a sizeable proportion. Also, these micro enterprises are found to have 100% contracted in and have high productivity of labour. For the remaining subsectors the labour productivity is moderately high varying between Rs 1.89 lakh in case of tube & pipe fittings (24106) and Rs 3.20 lakh in case of direct reduction of iron (24102). It is found that in the remaining subsectors micro enterprises that have both contract in and out relations, enjoy much higher value added per labour and also have higher fixed capital per labour than those operating independently or only contracting in.

Figure 9.1 : Contract, value added and productivity in Micro Enterprises

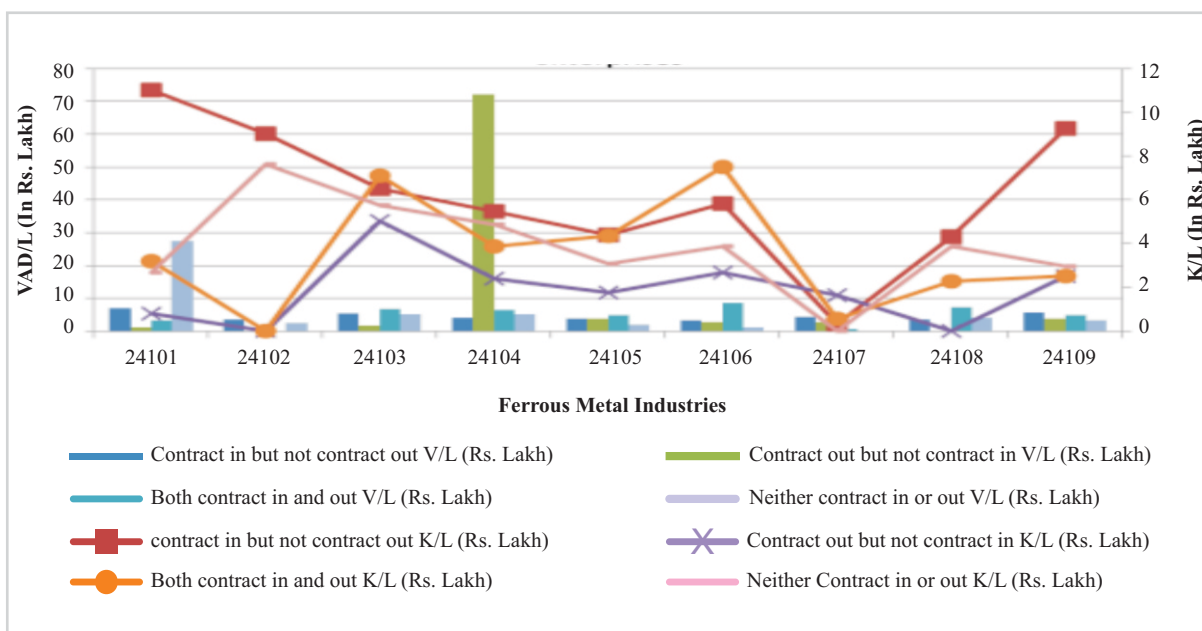


Source: Own estimates based on ASI, data

Productivity of small enterprises

Labour productivity of the small enterprises is generally higher than that of the micro enterprises with the exception of railway track materials of steel in which value added per worker amongst small enterprises is as low as Rs 1.59 lakh. The subsector having highest productivity of small enterprises is manufacture of ferro-alloys (24104) with value added per labour being Rs 7.88 lakh and manufacture of pig iron & spiegeleisen in pigs, blocks or other primary forms (24101) with value added per labour being Rs 7.28 lakh. Excepting for these three outliers value added per labour in the remaining subsectors lies between Rs 3.41 lakh to 5.57 lakh. As mentioned earlier, higher presence of small enterprises is found in the subsectors 24104 to 24107 where a large proportion of these enterprises are also involved in contracting who often have high productivity of labour as well as high capital labour ratio.

Figure 9.2 : Contract, Capital intensity and labour productivity in Small Enterprises



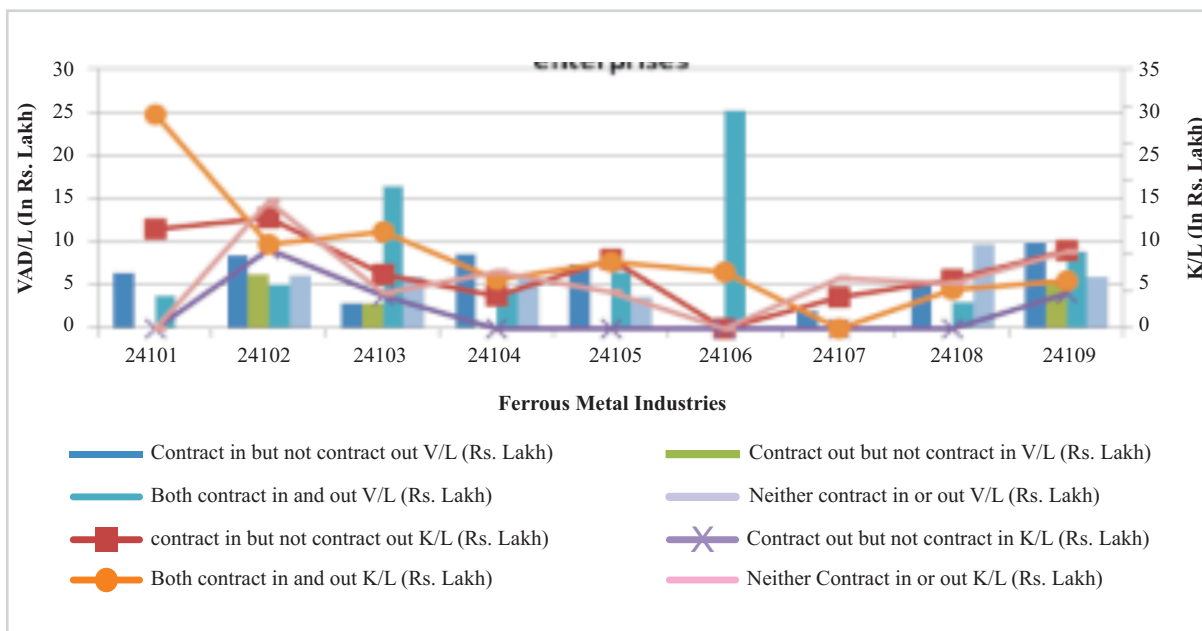
Source: Own estimates based on ASI, data

Productivity of Medium Enterprises

There is wide variation of productivity across subsectors among the medium sized enterprises. It varied from Rs 1.11 lakh in railway track materials to Rs 25 lakh in ferro-alloys. Barring the exception of pig iron, railway track materials and wire of steel all the subsectors have systematically higher labour productivity. Variation in capital intensity is also quite large across subsectors. Irrespective of status (whether contract in or contract out or operate independently), medium sized enterprises have higher labour productivity.

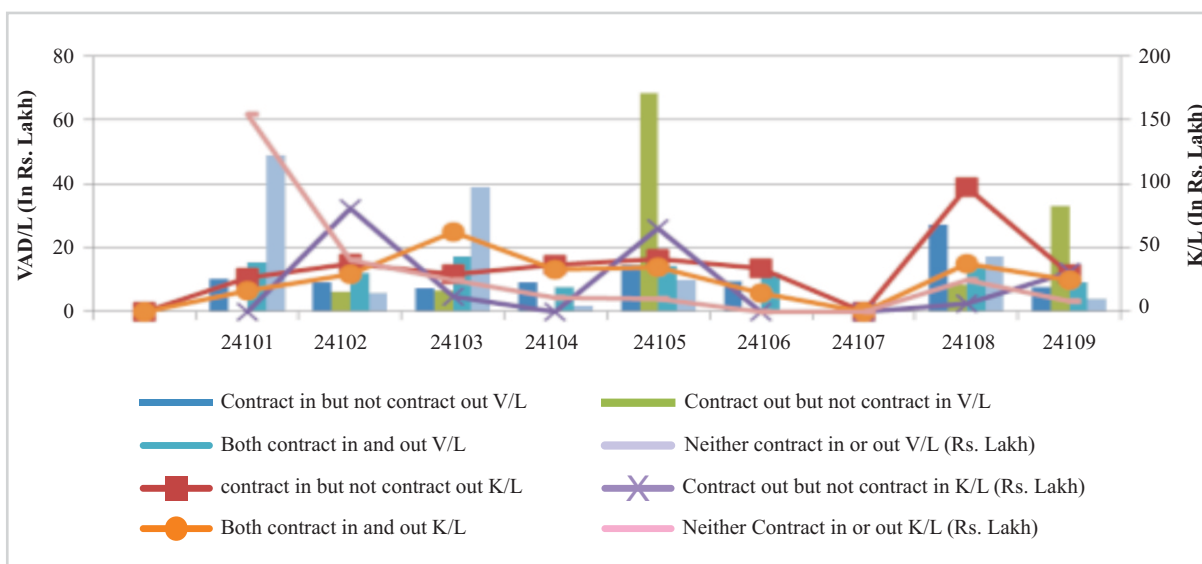
Similarly large enterprises in general have larger value added per worker than that of MSMEs. Further, among the contracting large firms, those both contracting in and out have higher value added per labour than those who only contract in. Here, only exceptions are sector codes 24101 and 24103 where enterprises not involved in contracting have high productivity.

Figure 9.3 : Contract, Capital intensity and productivity on Medium Enterprises



Source: Own estimates based on ASI, data

Figure 9.4 : Contract, Capital intensity and productivity of Large Enterprises



Source: Own estimates based on ASI, data

3. Exports by manufacturing MSMEs (as per ASI data)

ASI unit level data provide information about a unit's participation in export, volume of exports. Using this data base we would see to what extent MSMEs are involved in exports. We would also see whether the enterprises working on contract have higher probability of exporting, and whether the enterprise-size is important in this regard and whether exports help raise productivity.

i. Share of micro enterprises

The share of Micro Enterprises in total Export of basic Iron & steel by the ASI firms is insignificant. In no subsector except one, the micro is found to export. In manufacture of tube or pipe fittings of cast steel (24106) micro enterprises have around five percent share of the exports of the subsector. Very high proportion of enterprises is found to be involved in contracting. Productivity in this sector is however on the lower side and capital labour ratio is moderately high as compared to other subsectors.

ii. Share of small enterprises

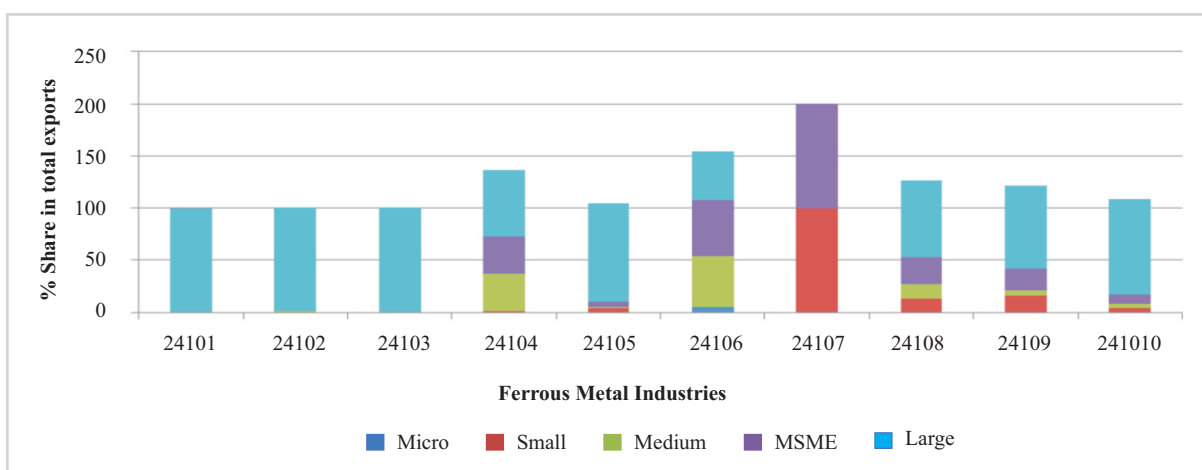
The small enterprises generally have a low share in total manufacturing exports made by the ASI sector. The only exception is the manufacture of railway track materials of steel (24107) which has 100 % (Figure 10) share by small in export. Almost all the small enterprises in this subsector are involved in contracting and around 71.5% of them both contract in and out, and remaining 28.5% are equally divided between only contract in and only contract out. In addition to this, small enterprises in Manufacture of other basic iron and steel n.e.c (24109) have 16% export share and manufacture of wire of steel by cold drawing or stretching (24108) have 13 % export share (Figure 10). These two exporting subsectors for the small, also have quite high labour productivity and reasonably high capital labour ratio together with high contract density.

iii. Share of medium enterprises

Export performance of the medium sized enterprises is also low in general. The highest share in export is found to be 49.17% for the sector manufacture of tube or pipe fittings of cast steel (24106) and 35.86 % (Figure 10) for the manufacture of ferro-alloys (24104). These subsectors have very high labour productivity and moderately high capital intensity. The other sector having double digit share in export is the manufacture of wire of steel by cold drawing or stretching (24108) which has high capital intensity and moderately high labour productivity. Almost 100% of the subsector 24106 and 2/3rds of the subsector 24108 are involved in both contract in and out which apparently have significant effect on bringing about dynamism in the subsectors. The other two sectors having significant export share are manufacture of other basic iron and steel n.e.c. (24109) and manufacture of Hot-rolled & Cold rolled products of steel (24105).

In brief, for only the sector of manufacture of railway track materials of steel (24107), MSMEs, particularly small enterprises have 100% export share (Figure 10). The other sector having good performance in export is manufacturing of tube or pipe fittings of cast steel (24106) with 54% export share. It indicates that large enterprises are the main exporters in most of these subsectors and their contractual relations within group and with MSMEs appears to benefit them for even export performance.

Figure 10 : Contribution of firms in total export of each five digit code of basic Iron and Steel



Source: Own estimates based on ASI, data

As per Export Import data published by Ministry of Commerce, the highest share in export by India is of sub-sector Hot-rolled & Cold rolled Steel (24105) with 0.84 % of total export. India's total export for the year 2012-13 is 163,431,883.77 Rs. lakh.[8] However if we take into account MSME's data, in sub-sector code 24105, total MSME export share is only 4.85% (Table 16, which highlights the fact that large enterprises are significantly involved in exporting. The next sub-sector having reasonably good share in export is Ferro alloys (24104) with share of 0.62%.

Table 16 : Contribution of firms in total export of each five digit code of basic iron and steel (EXIM data bank)		
Description	Total Export (Rs. lacs) 2009-10	% Share in total India's Export 2012-13
Pig iron & spiegeleisen (24101)	96174.61	0.06
Direct reduction of iron (24102)	27969.15	0.02
Steel in ingots (24103)	221,797.90	0.14
Ferro-alloys (24104)	1019649.85	0.62
Hot-rol. & Cold rol. steel (24105)	1,370,511.08	0.84
Railway track mat. of steel (24107)	15476.53	0.0095
Wire of steel (24108)	176864.94	0.11

Source : Ministry of Finance

4. Age wise pattern of contractual linkages

The pattern of contractual linkages on the basis of enterprise age-group highlights the fact that the new industrial units are being established in each sector and segment of MSMEs excepting subsector codes 24101 and 24102 of micro enterprises, code 24107 of small enterprises and code 24106 of medium enterprises where no new establishment in the age group of 0-5 years was set up during the period under consideration. Further, most of the new enterprises are in contractual relationship possibly for accessing markets or intermediate inputs in face of competition from the other old and incumbent firms. However, the number of old enterprises participating in contractual relationship is more than the number from newly set up enterprises. The reason might be that over time older firms have established more credibility, trust and rapport in market than by the young firms.

Among micro enterprises of manufacture of Basic Iron & Steel (241), the majority of enterprises are in contractual relationship with other enterprises. There are no new enterprises established in the age group of 1 to 5 years for the sector code 24101 and 24102, while remaining sectors have both old and new enterprises. It is observed that the least number of enterprises are in 'contract out but not contract in' category. In terms of age-wise contractual relationship, majority of enterprises are in the age category 6-10, 11-15, 16-20, 21-30 & 31-50. The contractual relationship is low in the age group of longer than 50 years.

Among small enterprises, the majority are in some sort of contractual relationship with other enterprises. There is least number of small enterprises in 'contract out but not contract in' category, a feature similar to that of micro enterprises. However unlike micro enterprises, the subsector codes 24101 and 24102 are found in age group of 2 to 5 years as well as in old age group. Several new enterprises have been established in sub sector codes 24105, 24106 and 24109. In terms of age-wise contractual relationship, majority of enterprises are in the age category 6-10, 11-15, 16-20, 21-30 & 31-50. Also in the age group 2 years to 5 years, the enterprises are active in contractual relationship.

Among medium enterprises, the majority are in contractual relationship with other enterprises as 'contract in but not contract out'. In the age group of longer than 50 years, three sub-sectors of codes 24102, 24103, 24104 and 24105 are found. In terms of age-wise contractual relationship, majority of enterprises are in the age category 6-10, 11-15, 16-20. Also new enterprises are active in having contractual relationship.

Among large enterprises, the majority of enterprises are in contractual relationship with other enterprises as 'contract in but not contract out' as well as 'both contract in and out'. Almost all the large enterprises have presence in old age group as well as new establishments. This might be due to the reason that major public as well as private sector firms including Tata Steel, SAIL and JSW Steel are expanding production capacity. [7] For example, SAIL has installed and operationalised the new state-of-the-art furnace which will increase hot metal capacity at RSP to 4.5 million tonnes per annum (MTPA) from its present capacity of 2 MTPA.[3] Similarly Tata Steel has acquired 100% stake of Anglo-Dutch company 'Corus' in 2007.[5]

Table 17.1: Age wise distribution of contractual linkages of Micro Enterprises in Manufacture of Basic Iron & Steel (241)

Age (Years)	A	B	C	D	A	B	C	D	A	B	C	D
	Number of units in pig iron & spiegeleisen in pigs, blocks or other primary forms (24101)				Number of units in direct Reduction of Iron (Sponge iron) (24102)				Number of units in steel in ingots / other primary forms, & other semifinished products of steel (24103)			
0												
1												
2									6		1	
3												
4												
5											4	1
6 to 10	5								10		18	5
11 to 15			5						24		5	11
16 to 20	15				1					5		10
21 to 30	5			9	6				15			
31 to 50				16								
>50									11			
Total	25	0	5	25	7	0	0	0	66	5	28	27
	Ferro-Alloys (24104)				Hot-Rolled & Cold Rolled Products of Steel (24105)				Tube or pipe fittings of cast steel (24106)			
0												
1					5		15					
2					5		10					
3												
4					10		6		5			
5			1	5	5	5	5					

6 to 10					35		15	21	5			5
11 to 15	5		6		35		10	10	10	5		
16 to 20					10		5	5	10			1
21 to 30	5				23	10	10	19	5		5	
31 to 50	6		1		16	5			5			
>50					10		5	5			5	5
Total	16	0	8	5	154	20	66	75	40	5	10	11
	Railway track materials of steel (24107)				wire of steel by cold drawing or stretching (24108)				Other basic iron and steel N.E.C. (24109)			
0												
1												
2							5		5			
3							5		10			
4			5				5		9			5
5	5								10			
6 to 10					37		5	6	47			
11 to 15					5	5		5	15	10	10	10
16 to 20			6		12		4	5	15		5	
21 to 30					31			5	25			21
31 to 50			5		23			9	15			5
>50					11		6		6			
Total	5	0	16	0	119	5	30	30	157	10	15	41
All Micro Enterprises									589	45	178	214

Note: A-contract in but not contract out; B- contract out but not contract in, C - both contract in and out, D - neither contract in or out

Source: Own estimates based on ASI 2009-10 data

Table 17.2: Age wise distribution of contractual linkages of Small Enterprises in Manufacture of Basic Iron & Steel (241)

Age (Years)	A	B	C	D	A	B	C	D	A	B	C	D
	Number of units in pig iron & spiegeleisen in pigs, blocks or other primary forms (24101)				Number of units in direct Reduction of Iron (Sponge iron) (24102)				Number of units in steel in ingots / other primary forms, & other semifinished products of steel (24103)			
0												
1												
2									6		1	
3												
4												
5											4	1
6 to 10	5								10		18	5
11 to 15			5						24		5	11
16 to 20	15				1					5		10
21 to 30	5			9	6				15			
31 to 50				16								
>50									11			
Total	25	0	5	25	7	0	0	0	66	5	28	27
	Ferro-Alloys (24104)				Hot-Rolled & Cold Rolled Products of Steel (24105)				Tube or pipe fittings of cast steel (24106)			
0												
1					5		15					
2					5		10					
3												
4					10		6		5			
5			1	5	5	5	5					

6 to 10					35		15	21	5			5
11 to 15	5		6		35		10	10	10	5		
16 to 20					10		5	5	10			1
21 to 30	5				23	10	10	19	5		5	
31 to 50	6		1		16	5			5			
>50					10		5	5			5	5
Total	16	0	8	5	154	20	66	75	40	5	10	11
	Railway track materials of steel (24107)				wire of steel by cold drawing or stretching (24108)				Other basic iron and steel N.E.C. (24109)			
0												
1												
2							5		5			
3							5		10			
4			5				5		9			5
5	5								10			
6 to 10					37		5	6	47			
11 to 15					5	5		5	15	10	10	10
16 to 20			6		12		4	5	15		5	
21 to 30					31			5	25			21
31 to 50			5		23			9	15			5
>50					11		6		6			
Total	5	0	16	0	119	5	30	30	157	10	15	41
All Small Enterprises									892	62	402	227

Note: A-contract in but not contract out; B- contract out but not contract in, C - both contract in and out, D - neither contract in or out

Source: Own estimates based on ASI 2009-10 data

Table 17.3: Age wise distribution of contractual linkages of Medium Enterprises in Manufacture of Basic Iron & Steel (241)

Age in (Years)	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out
	Number of units in pig iron & spiegeleisen in pigs, blocks or other primary forms (24101)				Number of units in direct Reduction of Iron (Sponge iron) (24102)				Number of units in steel in ingots / other primary forms, & other semifinished products of steel (24103)			
0												
1					1			2	1			
2	1				7		5		1		1	
3					1		5					
4					10		1	1	2	1		6
5	4				7	1	1				1	
6 to 10	1				10		2	10	6		11	1
11 to 15					1			1	2			1
16 to 20			5		1				6		5	
21 to 30											1	
31 to 50					1				1			
>50					5			1	1			
Total	6	0	5	0	44	1	14	15	20	1	19	8

	Ferro-Alloys (24104)				Hot-Rolled & Cold Rolled Products of Steel (24105)				Tube or pipe fittings of cast steel (24106)			
0												
1				1	1							
2							5					
3					6			5				
4												
5					1							
6 to 10			1	1	13							
11 to 15	1				7			1				
16 to 20	1				1		1	1			5	
21 to 30	1						1					
31 to 50					2							
>50	2						1					
Total	5	0	1	2	31	0	8	7	0	0	5	0

	Railway track materials of steel (24107)				wire of steel by cold drawing or stretching (24108)				Other basic iron and steel N.E.C. (24109)			
0				1								
1									5			1
2							1					
3					1							
4									1		1	
5												
6 to 10	1						6		4		8	
11 to 15							1	1			1	1
16 to 20					5				6	5	7	
21 to 30									1			
31 to 50							6		1			
>50												
Total	1	0	0	1	6	0	14	1	18	5	17	2
All Medium Enterprises									131	7	83	36

Source: Own estimates based on ASI 2009-10 data

Table 17.4: Age wise distribution of contractual linkages of Large Enterprises in Manufacture of Basic Iron & Steel (241)

Age in (Years)	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out
	Number of units in pig iron & spiegeleisen in pigs, blocks or other primary forms (24101)				Number of units in direct Reduction of Iron (Sponge iron) (24102)				Number of units in steel in ingots / other primary forms, & other semifinished products of steel (24103)			
0												
1	1								1			5
2					1		1		6		2	
3	9		1		6				6		7	
4	8				20		3	16	2	1	3	1
5	2				17		5	2	7		5	
6 to 10	3			1	24	1	10	3	13		2	1
11 to 15			1	1	3	1			7		8	10
16 to 20	3		2		1		7		2		9	6
21 to 30					3				1		1	1
31 to 50			1						3		2	
>50	1		1		6		1		6		2	5
Total	27	0	6	2	81	2	27	21	54	1	41	29

	Ferro-Alloys (24104)				Hot-Rolled & Cold Rolled Products of Steel (24105)				Tube or pipe fittings of cast steel (24106)			
0												
1				1					5			
2	5		1						1			
3	1				1		7	1			5	
4	1				3		2		1			
5	6				4		4		5		1	
6 to 10	2			2	4		1	5	1			
11 to 15	4		2		3		3					
16 to 20					4	1	11				3	
21 to 30	2				4		3				6	
31 to 50					2		6				6	
>50			1				4					
Total	21	0	4	3	25	1	41	6	13	0	21	0

	Railway track materials of steel (24107)				wire of steel by cold drawing or stretching (24108)				Other basic iron and steel N.E.C. (24109)			
0												
1									2			
2					1			1	2		6	
3									1		1	
4												1
5									3		1	
6 to 10								1	6		7	1
11 to 15						1			8	1	1	
16 to 20					1						2	
21 to 30							1		3		7	
31 to 50					1		3		2	1	3	
>50											2	
Total					3	1	4	2	27	2	30	2
All Large Enterprises									251	7	174	65

Source: Own estimates based on ASI 2009-10 data

5. Regional dispersion of the basic iron & steel industries

Basic iron & steel industries are not dispersed all over the country, rather concentrated more or less in eight states, namely West Bengal, Jharkhand, Orissa, Chhattisgarh, Gujarat, Maharashtra, Karnataka and Andhra Pradesh sharing more than 85% of the GVA of the sector (Table 18). The reason for such distribution is that the industry is located in close proximity to mineral reserves, namely iron ore and coal. According to Indian Bureau Of Mines, major economic deposits of iron ore are found to be associated with volcano-sedimentary banded iron formation (BIF) of Precambrian age. Geographically, the Precambrian iron ore formation is distributed in five broad belts/zones, wherefrom hematite, an enriched ore which is also the principal ore for iron making in the country, is mined. The 5 prominent zones are:

Zone A: Singhbhum in Jharkhand and Cuttack in Orissa

Zone B: Dantewara & Durg in Chhattisgarh and Chandrapur & Gadchiroli in Maharashtra

Zone C: Bellary Hospet belt in Karnataka

Zone D: Goa, Ratnagiri in Maharashtra and North Karnataka

Zone E: Metamorphosed BIF along the west coast in Karnataka & Kerala [5]

Jharkhand and Chhattisgarh appear to be the major manufacturing centres of basic iron & steel and the production is done by a handful of very large firms. In fact, because of scale economies large firms dominate the industry in all the above mentioned states, although in the states like West Bengal and Maharashtra the average size of large firms is relatively smaller. Further, not many MSMEs are found in the core region of the iron & steel production, particularly in WB, Jharkhand and Orissa. The reason is the monopoly of large public and private players in this sector. Presence of MSMEs is more in the Western states of Gujarat and Maharashtra and the states like Punjab, Rajasthan, UP, with low share in total basic iron & steel production where large sectors are not dominating.

Table 18: State wise distribution of basic iron & steel industries (241)

Sector Code 241	Micro		Small		Medium		Large		Total		
State	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	Total GVA (Rs. Crore)	% Distribution of GVA across states
Punjab	195	11.25	178	46.88	1	1.16	14	40.72	388	828	1.25
Haryana	25	1.32	16	2.73	0	0.00	12	95.95	53	1303	1.97
Rajasthan	70	9.87	116	60.96	14	11.35	7	17.82	207	679	1.03
U.P.	75	1.64	108	11.51	14	5.34	21	81.51	218	1546	2.33
Bihar	20	0.88	18	9.04	1	4.65	6	85.43	45	604	0.91
W.B.	71	0.32	76	2.79	18	2.41	73	94.48	238	5779	8.72
Jharkhand	7	0.04	35	2.25	16	1.93	35	95.78	93	9835	14.85
Orissa	11	0.06	114	5.40	16	2.37	69	92.17	210	6629	10.01
Chhattisgarh	46	0.34	145	2.25	35	1.76	58	95.65	284	11082	16.73
Gujarat	130	0.87	147	6.12	1	0.01	29	93.00	307	5817	8.78
Maharashtra	85	0.75	177	7.55	37	5.68	38	86.02	337	6650	10.04
Andhra	81	1.28	107	6.38	41	8.43	36	83.91	265	4672	7.05
Karnataka	6	0.01	14	0.83	19	2.88	25	96.28	64	5930	8.95
Tamil Nadu	85	2.76	83	10.44	16	1.89	34	84.90	218	2462	3.72

Source: Own estimates based on ASI, 2009-10 data

On the average this industry has witnessed high productivity of labour. Among the eight states with high share of GVA, Jharkhand, Gujarat, Karnataka & Maharashtra have very high value added per labour and excluding Karnataka & Jharkhand, other two states have low capital labour ratio, while West Bengal and Orissa have comparatively low productivity despite moderately high capital intensity. Jharkhand has much higher labour productivity of

MSMEs as compared to other states. Karnataka has highest productivity of Rs 21.29 lakh (Table 19). Overall, productivity of the industry seems to be dominated by the large firms. In New Industrial Policy (2006-2011) of Karnataka, it has put Steel as one of the thrust area for which incentive, concession, and capital investment subsidy to small scale industries (SSIs) would be given. [7]

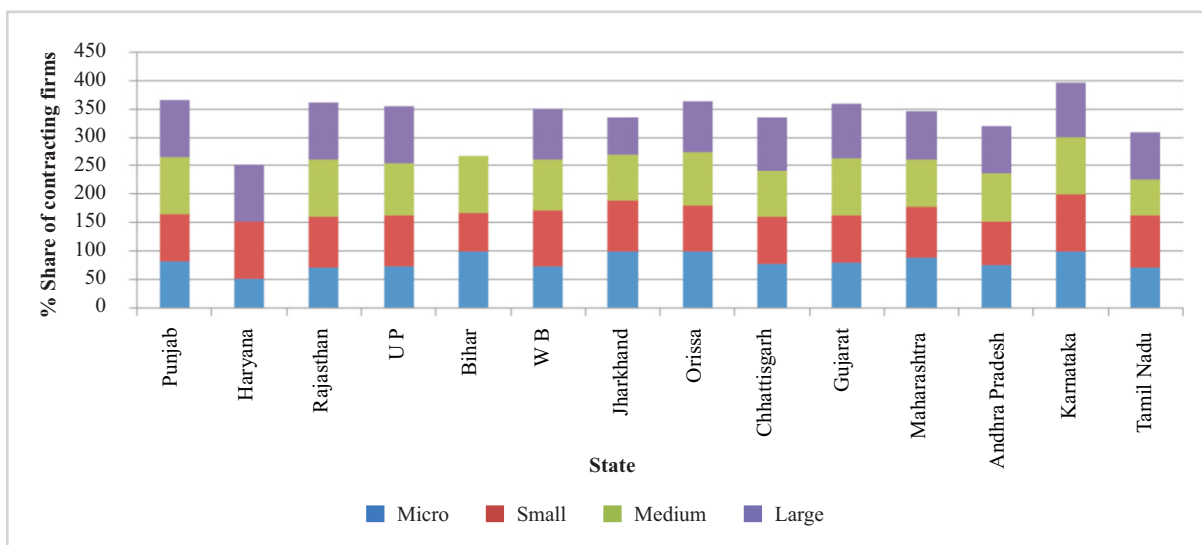
Table 19: Labour productivity and capital intensity in basic iron & steel production (241)										
Sector Code 241	Micro		Small		Medium		Large		Total	
State	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)
Punjab	1.76	1.05	3.91	3.62	2.90	2.29	4.46	13.02	2.85	2.67
Haryana	2.87	1.17	3.40	4.66	0.00	0.00	12.93	31.43	5.31	9.07
Rajasthan	3.54	1.26	5.63	3.87	3.98	6.60	7.18	15.45	4.86	3.56
U.P.	2.17	0.71	6.34	7.85	6.59	12.87	17.76	18.37	6.02	6.73
Bihar	0.97	0.44	3.32	1.95	17.21	3.22	25.76	14.78	5.57	3.02
W.B.	0.99	1.21	4.08	11.08	5.37	16.89	13.35	33.38	6.10	15.42
Jharkhand	3.29	1.44	5.42	4.86	12.89	26.40	8.91	49.60	7.86	25.15
Orissa	2.18	1.78	4.87	5.57	3.90	12.50	6.41	35.97	5.16	15.89
Chhattisgarh	1.99	0.86	2.85	4.52	5.92	9.57	9.36	37.99	4.42	11.38
Gujarat	2.56	1.10	5.06	8.89	0.14	2.53	10.47	35.38	4.50	8.07
Maharashtra	2.75	0.93	3.86	4.18	8.71	7.69	18.11	38.35	5.72	7.60
Andhra	2.29	0.97	4.62	7.13	7.12	7.21	12.58	40.98	5.38	9.86
Karnataka	0.58	0.48	12.71	5.20	6.34	7.74	42.44	60.35	21.29	27.05
Tamil Nadu	3.01	1.09	7.99	6.22	2.60	8.03	11.65	28.24	6.23	7.79

Source: Own estimates based on ASI, 2009-10 data

As discussed earlier, the proportion of contracting enterprises in this group of industries is very high irrespective of size or location. Among the top 8 states with high GDP shares, Karnataka has 98% contracting enterprises, whereas Chhattisgarh, Orissa, West Bengal and Maharashtra have around 84 to 88% of the enterprises engaged in contracting. In Karnataka MSMEs, all the enterprises are involved in contracting. For other states, medium and large firms have higher tendency to contracting than the micro and small enterprises except Jharkhand and Orissa where 100% micro enterprises are involved in contracting.

The share of total export is highest for Maharashtra which accounts for 68.59 % of total export (Table 20). The other states having significant export share are West Bengal with 15.83% share and Gujarat with 4.99% share. One of the reasons for high exports from these states may be their good connectivity through ports. All the exporting firms are found to be engaged in contractual relationship. Probably, contractual relations may help the exporting firms to maintain timeliness and quality control. Even those MSMEs that participate in exporting are all having contractual relations with other firm. It is interesting to note that MSMEs of Chhattisgarh, Rajasthan and Bihar have 100% export share. In Haryana, Jharkhand, Orissa and Uttar Pradesh, the large enterprises are the exclusive exporters. Also for large enterprises in states like West Bengal, Gujarat and Maharashtra, the export share varies from 94 to 98%.

Figure 11 : State wise contractual relationship of basic iron & Steel Industry



Source: Own estimates based on ASI, 2009-10 data

<i>Table 20: State-wise Exports of basic iron & Steel Industry</i>											
Sector Code 241	Micro		Small		Medium		Large		Total		
State	A	B	A	B	A	B	A	B	No. of Export-ing firms	Share of total Export	B
Punjab	0	0	98.10	100	0.00	0	1.9	100	12	1.57	100
Haryana	0	0	0.00	0	0.00	0	100.0	100	2	2.10	100
Rajasthan	0	0	34.19	100	65.81	100	0.0	0	11	0.10	100
U.P.	0	0	0.00	0	0.00	0	100.0	100	1	0.30	100
Bihar	0	0	0	0	0	0	0	0	0	0.00	0
W.B.	0	0	3.15	100	2.74	100	94.11	100	33	15.83	100
Jharkhand	0	0	0.00	0	0.00	0	100.0	100	1	1.23	100
Orissa	0	0	0.00	0	0.00	0	100.0	100	1	0.22	100
Chhattisgarh	35.23	100	53.14	100	11.63	100	0.0	0	11	0.08	100
Gujarat	0	0	3.68	100	0.00	0	96.32	100	3	4.99	100
Maharashtra	0	0	1.18	100	1.20	100	97.62	100	28	68.59	100
Andhra	0	0	0.50	100	78.59	100	20.91	100	13	3.41	100
Karnataka	0	0	0	0	0	0	0	0	0	0.00	0
Tamil Nadu	0	0	56.74	100	1.48	100	41.78	100	15	0.82	100

Note: A – % state-wise total export; B - % of exporting firms in contractual relationship

Source: Own estimates based on ASI, 2009-10 data

II. Industry structure of Basic precious and other non-ferrous metals (code 242):

Non-ferrous metals include metals that contain very small amount of iron. They are expensive than ferrous metals and these are refined through electrolysis method. The most widely used non-ferrous metals are aluminium, copper, nickel, tin, lead, gold and silver. India ranks 6th in bauxite and manganese ore deposit. Bauxite ore is chief source of aluminium. India ranks 10th in aluminium production.[20]

Copper is an important non-ferrous base metal having wide industrial applications, ranging from defense, space programme, railways, power cables, mint, telecommunication cables, etc.[12] On the other hand, aluminium is the most abundant metal in the earth's crust. It also has wide applications in various areas, such as, transport and building & architectural sectors; packaging; food & chemical industries; electrical sector; machinery & equipment; consumer durables and also in defense sector. In automobile industry, aluminium is gradually replacing steel. In India, aluminium is consumed mainly in the electrical sector (48%). The major end-use of aluminium is as rolled sheets, extrusions and foils. [14] Worldwide, high-alumina chromite, largely from podiform deposits is used in refractory application while iron-rich ores, largely from stratiform deposits are utilised in metallurgical and chemical applications.[17] The largest single use of lead today is in the manufacture of lead acid storage batteries while the single largest use for the zinc is in galvanizing industry.[16] On the other hand, tin is a scarce element. Tin is used mostly for tin plating, soldering and in making bronze.[15] Manganese dioxide is used for manufacturing dry cell batteries in which it functions as a depolariser of hydrogen. Iron & steel industry was the bulk consumer of ferro-manganese accounting for about 92% consumption in 2009-10.[18] Nickel, when added in small quantity to iron, increases its properties manifold and makes the product hard and stainless. The reason behind the demand of primary nickel in the entire world is for the production of stainless steel. When it is used in plating, it makes the surface tarnish-resistant and provides polished appearance.[19] Gold, silver and platinum are mostly used in manufacturing of jewelry.

Structure of the basic precious and other non-ferrous metals (code 242):

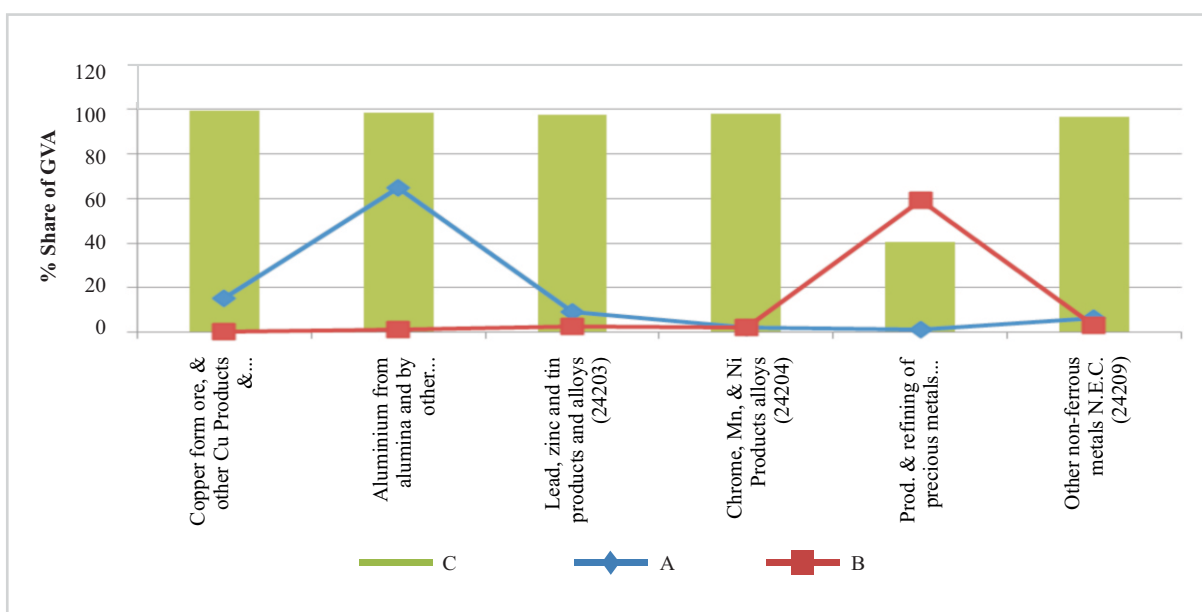
1. Relative contribution of the formal and informal sectors to the industry

As already indicated, presence of MSMEs may be found in both the formal as well as informal sectors. Those manufacturing enterprises which are required to register under Factory Act (1948) belong to the formal or organized or registered sector. Remaining manufacturing units, by default, are considered as belonging to informal or unorganized or unregistered sector, although they may enlist themselves with agencies, like, KVIC, Silk Board, SSIB, etc. The presence of the informal sector in manufacturing of basic precious and other non-ferrous metals (242) is however not very significant except one sector. The reason appears to be that this industry requires high capital and technology investment.

(i) Presence of MSMEs in informal sectors (based on NSSO 2010-11):

Out of the six subgroups (5-digit) of the industry only in one subgroup the presence of the informal sector is found to be quite significant. This subgroups is production & refining of precious metals (Au, Ag & Pt) (24205) with 59.32% contribution to GVA of the respective 5-digit groups (Figure12). The presence of informal sector in sub-sector code 24205 is perhaps attributable to the fact that this sector is not as much technology intensive as other sub-sectors.

Figure 12 : Distribution of GVA across formal & informal sectors of basic precious and other non-ferrous metals Industries



Note: ASI data for the year 2009-10 and NSSO and CMIE data for the year 2010-11. A: share of 5 digit group formal and informal sectors in combined GVA (ASI+NSSO) for group 242

B: Share of informal sector in combined GVA (ASI+NSSO) for each 5-digit code (%)

C: Share of formal sector in combined GVA (ASI+NSSO) for each 5-digit code (%)

(ii) Presence of MSMEs in the formal sector (based on ASI 2009-10)

The single most important 5-digit sector involved in manufacturing of Basic precious and other non-ferrous metals (242) is manufacture of aluminium from alumina and by other methods. Products of aluminium and alloys (24202) enjoy a GVA share in 3 digit code at 65% (Figure 12). The other less prominent but significant sectors are manufacturing of Copper from ore & other Copper products & alloys (24201), manufacturing of lead, zinc and tin products and alloys (24203) and manufacturing of other non-ferrous metals n.e.c. (24209) having GVA share in 3 digit code at 15.18%, 9.35% and 6.63% respectively (Table 19). There are three other significant 5-digit sectors, viz., manufacture of pig iron &

spiegeleisen in pigs, blocks or other primary forms (24101), manufacture of other basic iron and steel n.e.c. (24109) and manufacture of Direct reduction of iron (sponge iron) & other spongy ferrous products (24102) and each of these sectors has around 13-15% share of the GVA of 3-digit group. The remaining 5-digit sectors are manufacturing of chrome, Mn, & Ni products alloy (24204) and production & refining of precious metals (Au, Ag & Pt) (24205) having GVA share in 3 digit group at 2.39 % and 1.42 % respectively.

(a) Share of micro enterprises

The share of Micro Enterprises in Manufacture of Basic precious and other non-ferrous metals (code 242) is abysmally low. The highest share of Micro Enterprise GVA in ASI code 242 is only 4.35% (Figure 13), which is for the sector manufacturing of lead, zinc and tin products and alloys (24203) and 4.34 % for Manufacture of other non-ferrous metals n.e.c. (24209). Each sector has only single digit percentage share in GVA.

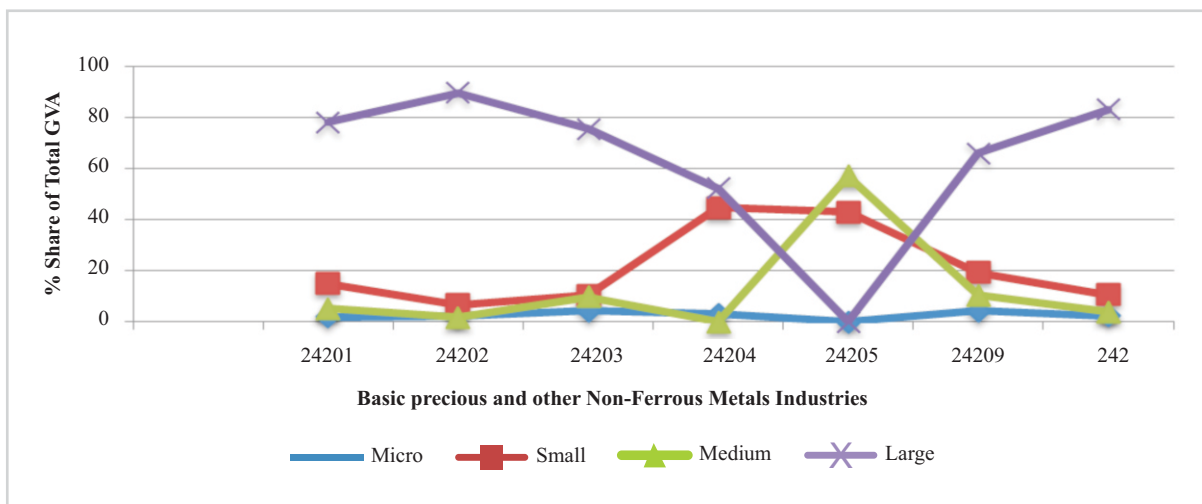
(b) Share of small enterprises

The share of Small Enterprises in Manufacture of Basic precious and other non-ferrous metals (code 242) is larger than Micro Enterprises. The highest share of Small Enterprises in GVA is 44.67% (Table 20) which is for the sector manufacturing of chrome, Mn, & Ni products alloy (24204). Next in the order is the sector prod. & refining of precious metals (Au, Ag & Pt) (24205) with 43% share. For other sectors small enterprises contribution varies from 10 to 19% with only exception of Aluminium industry where the share is around 7% (Figure 13).

(c) Share of medium enterprises

The share of Medium Enterprises in Manufacture of Basic precious and other non-ferrous metals (code 242) is very low excepting the 5-digit sector prod. & refining of precious metals (Au, Ag, Pt) (24205), where these enterprises share is 57 % (Figure 13). For other non-ferrous metals n.e.c. (24209), the share is 10.38 %. In the remaining four sectors medium enterprise enjoys single digit share.

Figure 13 : Share of GVA across MSMEs and Large Enterprises in formal sector of basic precious and Other Non-Ferrous Metals Industries



Note: 24201 - Copper from ore, & other Cu products & alloys; 24202 - Aluminium from alumina and by other methods and products of aluminium and alloys; 24203 - lead, zinc and tin products and alloy; 24204 - chrome, Mn, & Ni products alloy; 24205 - prod. & refining of precious metals (Au, Ag, Pt); 24209 - other non-ferrous metals n.e.c.

Source: Own estimates based on ASI, 2009-10 data

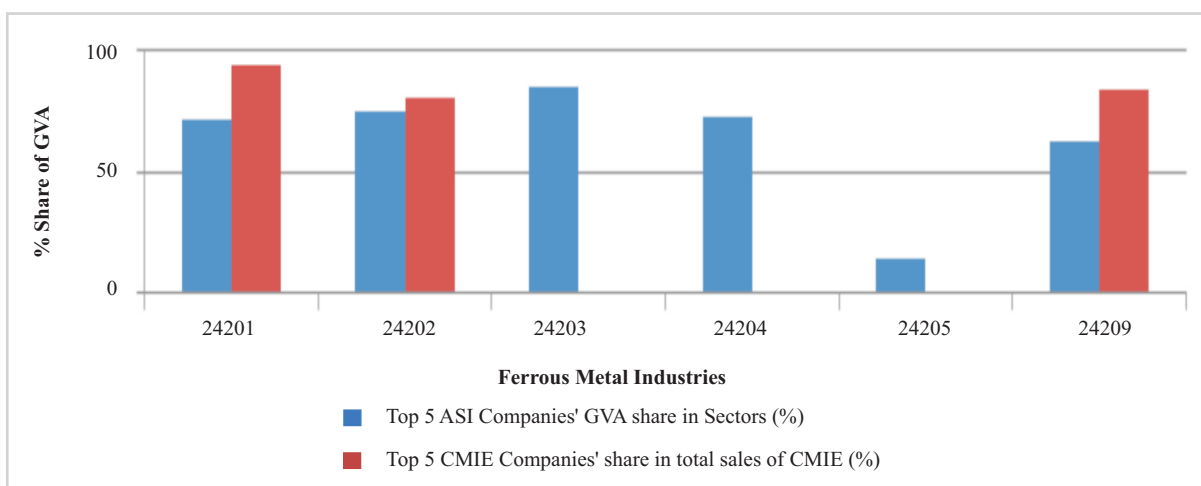
2. Large Enterprises and their concentration

Level of concentration is measured first in terms of top five firms' share in total gross value added by the industry group under ASI and then in terms of the share of top five listed companies in total sales of all the listed companies belonging to the industry group as reported in CMIE. Top 5 companies' share in GVA as per ASI data is fairly high in all 5-digit groups except production & refining of precious metals (Au, Ag & Pt) (24205) which has top 5 companies' GVA share at 14% only (Figure 14). The sector where top 5 companies GVA share is highest is manufacture of lead, zinc and tin products and alloys (24203) with GVA share of 85%. For the sector Aluminium from alumina and by other methods and products of aluminium and alloys (24202), top 5 companies' share in GVA as per ASI data is 75%, and as per CMIE data, top 5 companies share in sales is 81%. CMIE data also show top 5 companies' share in sales is 95 % for code 24201 and 84 % for code 24209.

The very high sales share of top 5 companies' (CMIE) in the sector copper from ore & other Cu products and alloys (24201) indicates the domination of big players in the market. Aditya Birla group companies Hindalco and Indo Gulf Corporation Limited have share of 54% in the market. The other major players are private firm Sterlite and public sector firm Hindustan Copper limited. Similarly, the high sales share of top 5 companies' (CMIE) in the sector Aluminium from alumina and by other methods and products of aluminium and alloy (24202) indicates the domination of big players - Hindalco and its subsidiary Indian Aluminium company limited have sales share of 56%. Further, this company is the largest aluminium producer in India.[11]

In the sector other non-ferrous metals n.e.c. (24209), the sales share of top 5 CMIE companies is the highest (84%). The largest player in this field is Hindustan Zinc limited having sales share of 62% alone.

Figure 14 : Market Concentration of Firms under each 5 digit code for basic precious and other Non-Ferrous Metals



Among the MSMEs, out of 895 enterprises, 472 are micro sized, 322 are small and 49 are medium. Out of 472 micro enterprises 168 are in code 24202 and 104 enterprises are in code 24209. Among the Small enterprises, out of 322 small enterprises 118 are in code 24202 and 85 enterprises are in code 24201 (Table 20). Among the Medium enterprises, out of 49 Medium enterprises 22 enterprises are in code 24202.

Majority of the MSMEs belong to Micro & Small categories. Out of total 895 ASI units, 80% belong to three 5-digit groups, namely, manufacturing of Aluminium from alumina and by other methods and products of aluminium and alloys (24202), Manufacturing of Copper from ore & other Cu products & alloys (24201) and manufacturing of other non-ferrous metals n.e.c. (24209).

The large enterprises are dominating in all sectors except sector code 24204 where its GVA share is 52.32 % and sector 24205 which does not have any large enterprise.

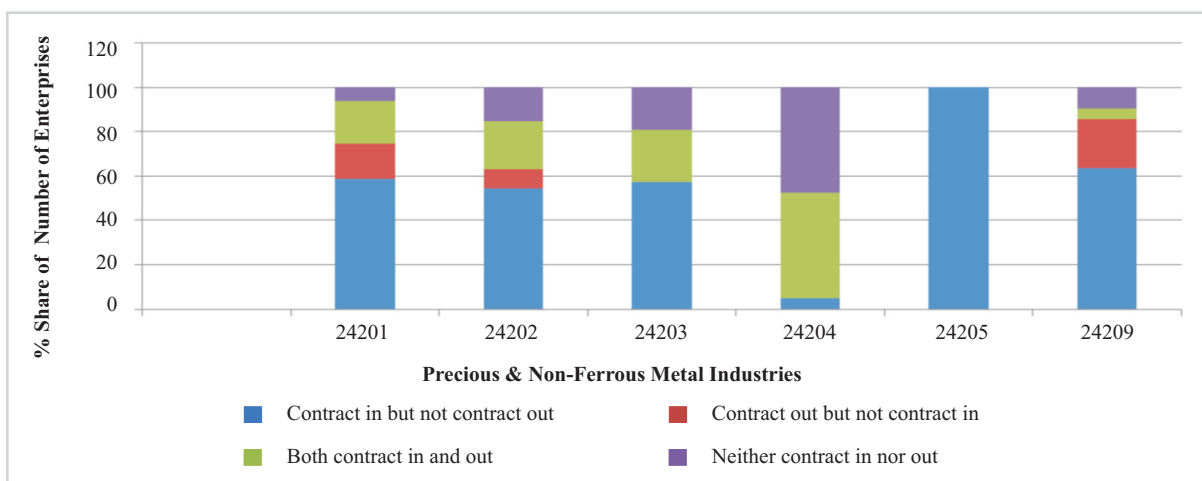
3. Contractual relations of MSMEs

ASI data provides information about the firms contracting in and contracting out and volume of transaction under contract but no information about who is the transacting partner and the terms of contract. Nonetheless it gives an idea about the extent of involvement of the enterprises of each size classes in contractual relations.

i) Micro enterprises

Incidence of the formal sector micro enterprises working on contract is very high. Excepting 16% (Figure 15) of the enterprises who neither contract in nor out (independent), all other micro enterprises are involved in contracting some way or other – 55.5% contract in, 11% contract out and 19% both contract in and contract out. Distinguishing feature of the manufacture of chrome, Mn, & Ni products alloy (24204) as compared to other 5-digit subsectors is that an equal proportion of micro enterprises are involved in both contracting in & out and not contracting at all. Also its 47.62% firms which are not involved in any kind of contracting are highest for this Micro segment.

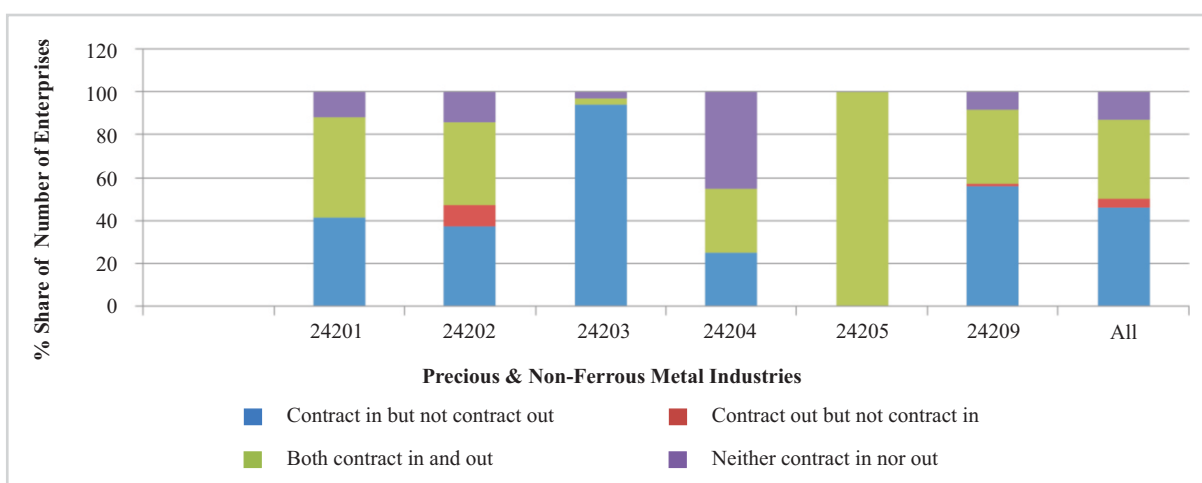
Figure 15 : Contractual relations of the Micro Enterprises



(iv) Small Enterprises

Intensity of contracting enterprises is even higher among the small enterprises. As much as 87% of the enterprises are involved in some or other form of contractual relationship – 46% contract in, 4% contract out and another 37% both contract in and contract out (Figure 16). Proportion of both contracting in and out is higher in medium category than micro or small ones. Among the 5-digit subgroups relatively higher proportion of contracting in enterprises are found in codes 24203 and 24209. High proportion of contracting out firms is found in code 24202. The distinguishing feature is that 100% firms are involved in both contract in and out for sector code 24205. High contract density among the small firms reflects their dynamism and specialization and greater scope for technological progress.

Figure 16 : Contractual relations of the Small Enterprises



(i) Medium enterprises

Medium sized enterprises are found to have high intensity of contracting and distributed over all the subsectors – only 20.4% of them are not involved in contracting, 35% contract in and 39% (Figure 17) both contract in and out. Proportion of both contracting in and out is higher in medium category than micro or small ones. Similar to small enterprises, 100% firms are involved in both contract in and out for sector code 24205. Cent percent firms involved in contract in but not contract out and both contract in and out is for sectors lead, zinc and tin products and alloys (24203). The highest percentages of firms not involved in any sort of contracting are found in sector other non-ferrous metals n.e.c. (24209).

The pattern is very different among the large enterprises where no firms are present which are not involved in any sort of contracting. This reflects that large enterprises benefit from contractual relationship.

Figure 17 : Contractual relations of the Medium Enterprises

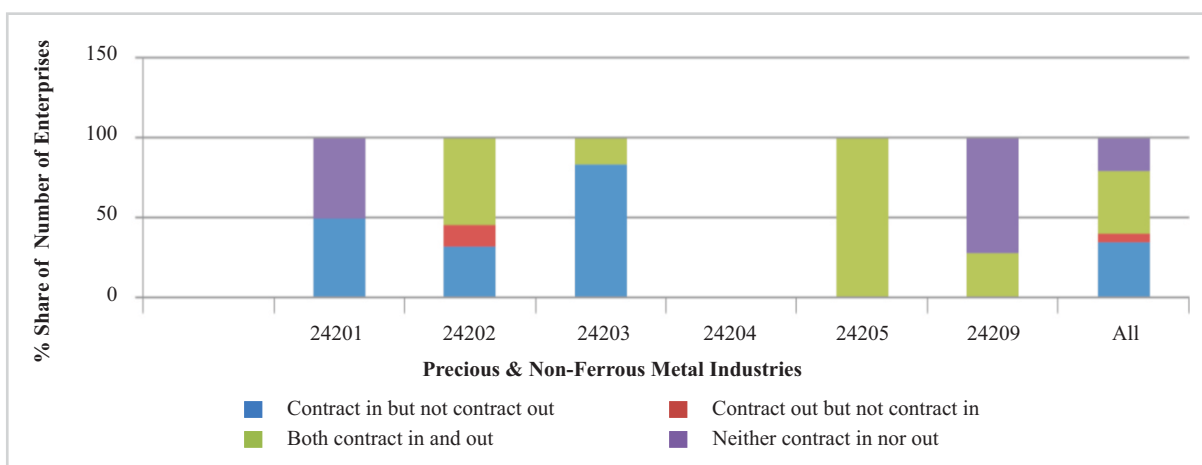
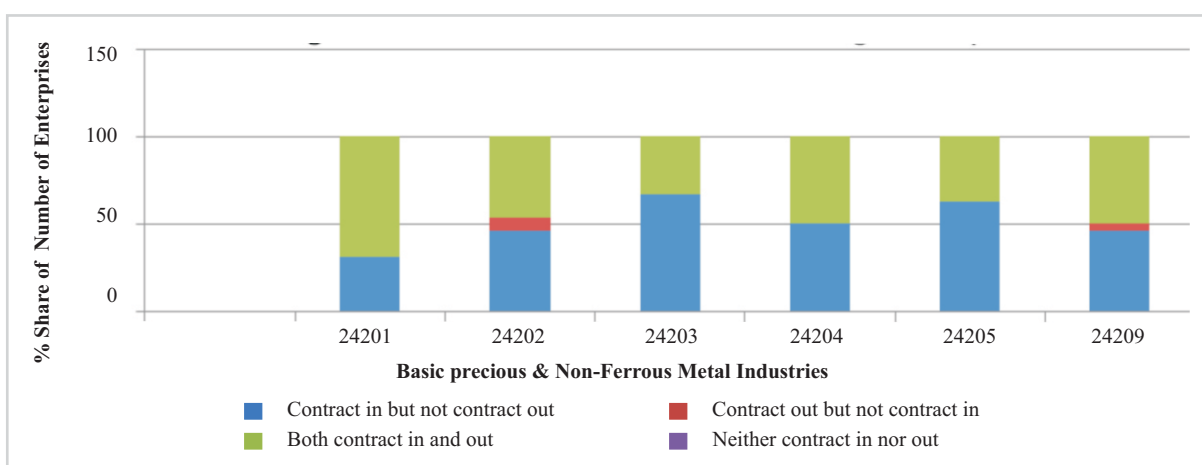


Figure 18 : Contractual relations of the Large Enterprises



As already discussed ASI data do not mention the terms and conditions of the contracts as well as who is the other party of a contract transaction. Whether the contract transactions take place within the same size class of enterprises or between different size-classes of enterprises are not very clear from this data set. However, the data show that the proportion of enterprises contracting in only increases systematically as the size-class decreases while the proportion of enterprises contracting out either exclusively or together with contracting in increases systematically as the size class increases. This is indicative of the existence of vertical transactions, particularly larger enterprises contracting out to smaller ones. Moreover, generally very high proportion of enterprises contracting in often together with contracting out which indicates significance of horizontal transactions, i.e., contracts between enterprises within the same size class. As already noted that there is very high level of concentration in this group of industries, and we may conjecture that the high contract density may be linked to high concentration.

It is yet to be seen whether the predominance of contractual relations helps raise productivity, innovation, capital investment, business growth or the growth of the industry in general through bringing about dynamism of product and process innovations, exploring new markets and so on. Some of these issues are raised below.

4. Productivity, capital intensity and contracting

Productivity of the informal sector MSMEs (NSSO)

It is already mentioned that in the informal sector there is no medium-sized enterprises engaged in manufacturing basic iron and steel, only micro and small enterprises are found. Out of its six major 5-digit subsectors manufacture of chrome, Mn & Ni products alloy (24204) has the highest labour productivity (Rs 0.77 lakh value added per labour) of the micro enterprises (Figure 19). Other sub-sectors having less productivity is Copper and other Cu products & alloys (24201) (Rs 0.71 lakh value added per labour). For small enterprise segment, only sector Aluminium from alumina and products of aluminium and alloys (24202) has productivity which is highest among micro and small enterprises of informal sector (Rs. 1.56 lakh value added per labour).

Figure 19 : Value added per labour of Micro Enterprises in Manufacture of basic precious & Non-Ferrous Metal Industries (NSSO 2010-11)

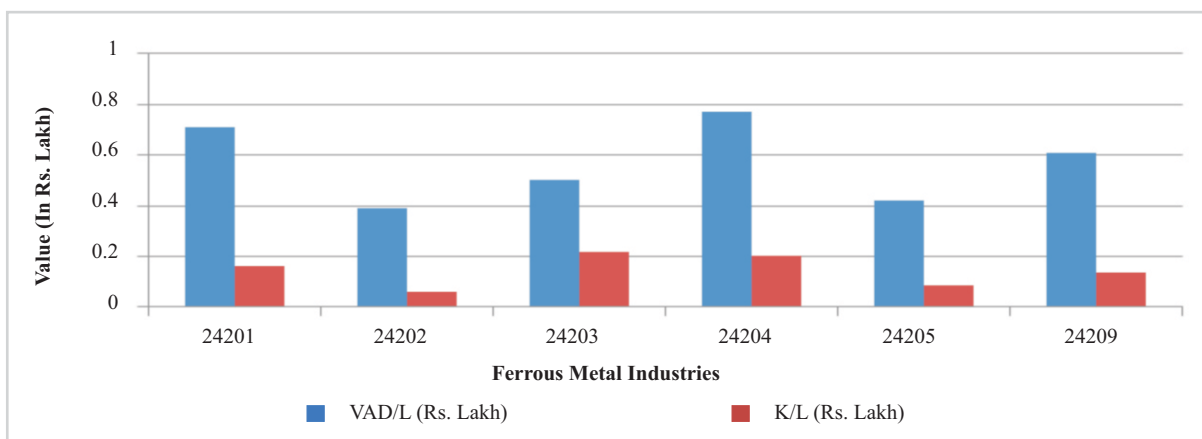
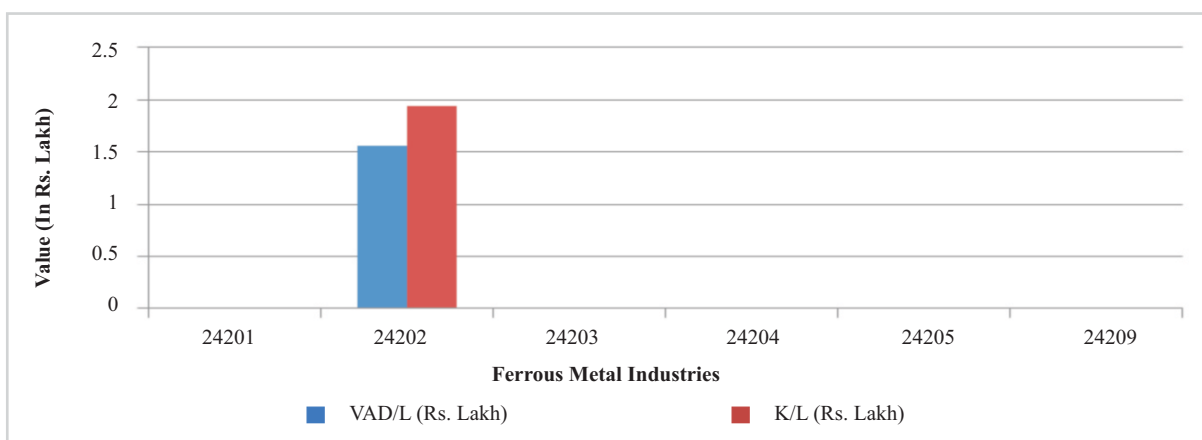


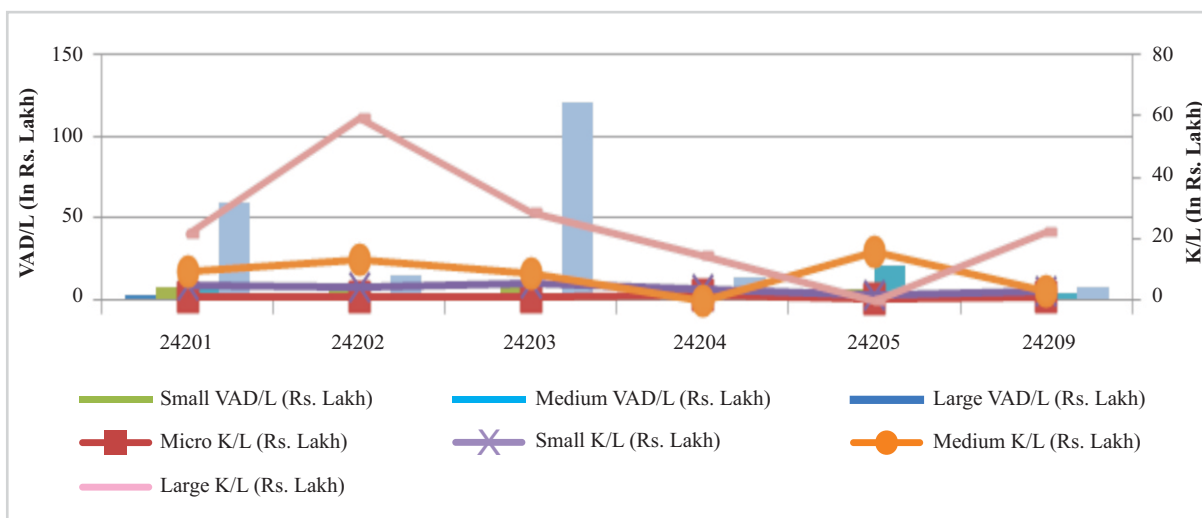
Figure 20 : Value added per labour of Small Enterprises in Manufacture of basic precious & Non-Ferrous Metal Industries (NSSO 2010-11)



Productivity of MSMEs belonging to formal sector (ASI)

Following figures describes the productivity as well as capital intensity across size-classes of enterprises engaged in the manufacturing of basic iron and steel. Productivity is measured in terms value added per labour (VAD/L) and capital intensity is measured in terms of value of fixed capital (excluding land and building) per unit labour (K/L). It may be seen in figure 21 that there is a tendency towards rise in VAD/L and K/L with increase in size classes. However within a size class productivity variation across subsectors appears to have no relation with the capital to labour ratio.

Figure 21 : Value added per labour & capital labour ratio of the MSMEs in basic precious & Non-Ferrous Metal Industries (ASI-2009-10)

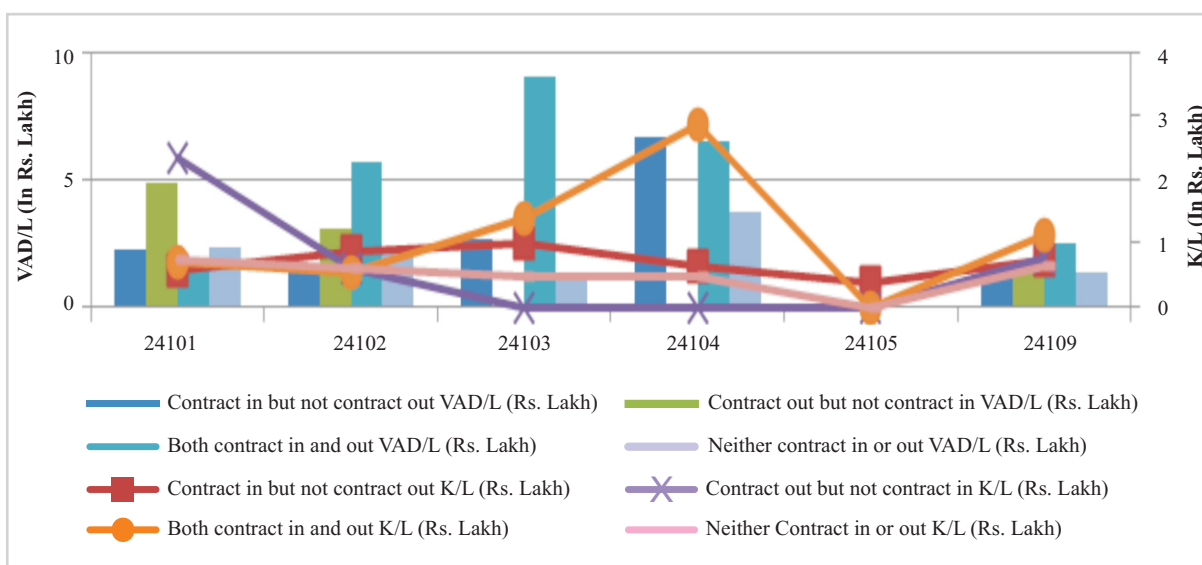


Source: Own estimates based on ASI, 2009-10 data

(i) **Productivity of Micro Enterprises**

In the case of registered or formal sector very high productivity of the micro enterprises is found in the sub-sector manufacture of chrome, Mn and Ni products and alloys (24204) with the value added per labour being Rs lakh 5.2 (Figure 21). Also, this subsector has highest capital labour ratio in spite of the fact that micro enterprises are not present in a sizeable proportion. For the remaining subsectors it is moderately high varying between Rs 1.55 lakh in case of other non-ferrous metal (24209) and Rs 3.91 lakh in case of Pb, Zn & Sn products and alloys (24203) with the only exception of production & refining of precious metals (Au, Ag & Pt.) where the relevant estimate of productivity is lowest with the lowest capital intensity.

Figure 21.1 : Contract, value added and productivity in Micro Enterprises
basic precious & Non-Ferrous Metal Industries

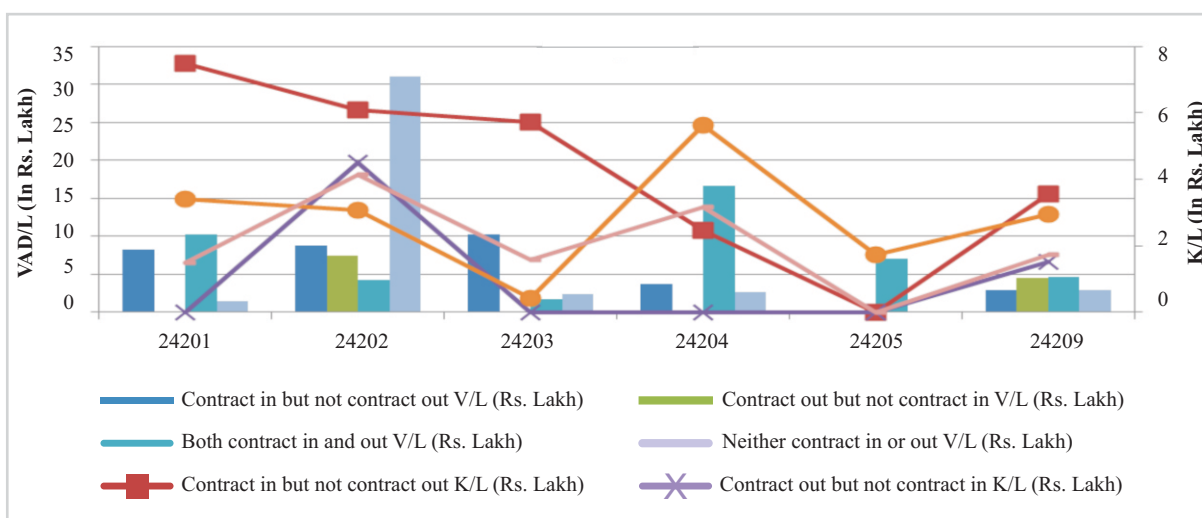


Source: Own estimates based on ASI, 2009-10 data

(ii) Productivity of small enterprises

Labour productivity of the small enterprises is general higher than that of the marginal enterprises. The subsector having highest productivity of small enterprises is manufacture of Al from Alumina (24202) with value added per labour being Rs 10.12 lakh and manufacture of Pb, Zn & Sn products and alloy (24203) with value added per labour being Rs 8.36 lakh (Figure 21.2). Each sector has significant productivity excepting other non-ferrous metal (24209) which has 3.54 Rs lakh as value added per labour. As mentioned earlier, higher presence of small enterprises is found in the subsectors 24201, 24202, 24203 and 24209 where a large proportion of these enterprises are also involved in contracting who often have high productivity of labour as well as capital labour ratio.

Figure 21.2 : Contract, capital intensity and labour productivity in Small Enterprises
basic precious & Non-Ferrous Metal Industries



Source: Own estimates based on ASI, 2009-10 data

(iii) Productivity of medium enterprises

There is wide variation of productivity across subsectors among the medium sized enterprises. It has highest productivity of Rs 21 lakh in production & refining of precious metals (Au,Ag,Pt)(24205) (Figure 21.3). Variation in capital intensity is also quite large across subsectors. Irrespective of whether contract in or contract out or operate independently, among MSMEs medium sized enterprises have higher labour productivity except for sector code 24203 where productivity of medium enterprises is lower than that of small enterprises.

Similarly barring few exceptions large enterprises in general have larger value added per worker than the MSMEs. Further, among the contracting large firms, those both contracting in and out have higher value added per labour than those only contracting in. The highest productivity is for the sector code 24203 having Rs 121 lakh as value added per labour and this sector also has high capital labour ratio.

Figure 21.3 : Contract, capital intensity and productivity on Medium Enterprises
basic precious & Non-Ferrous Metal Industries

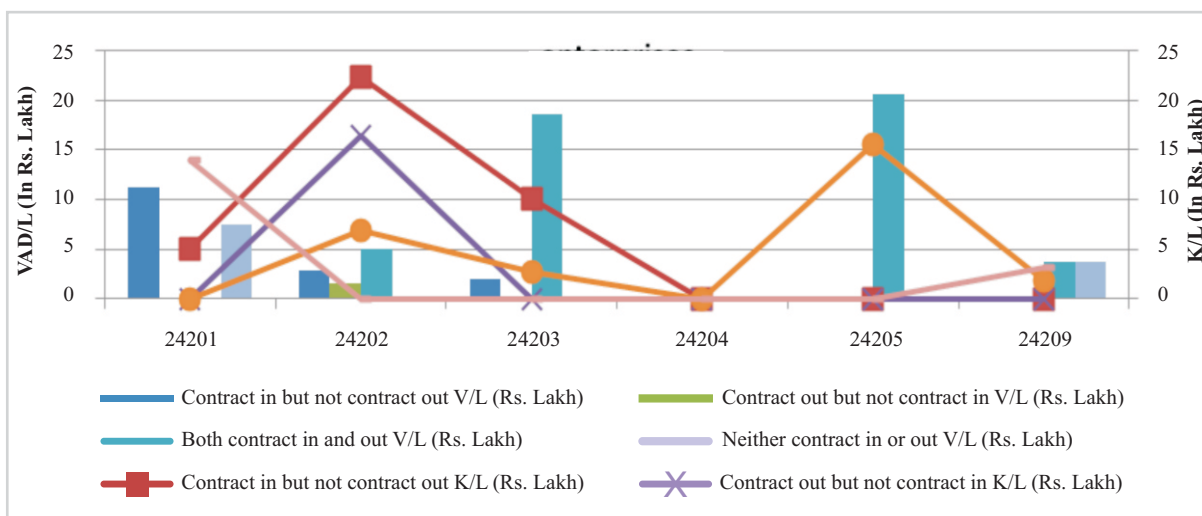
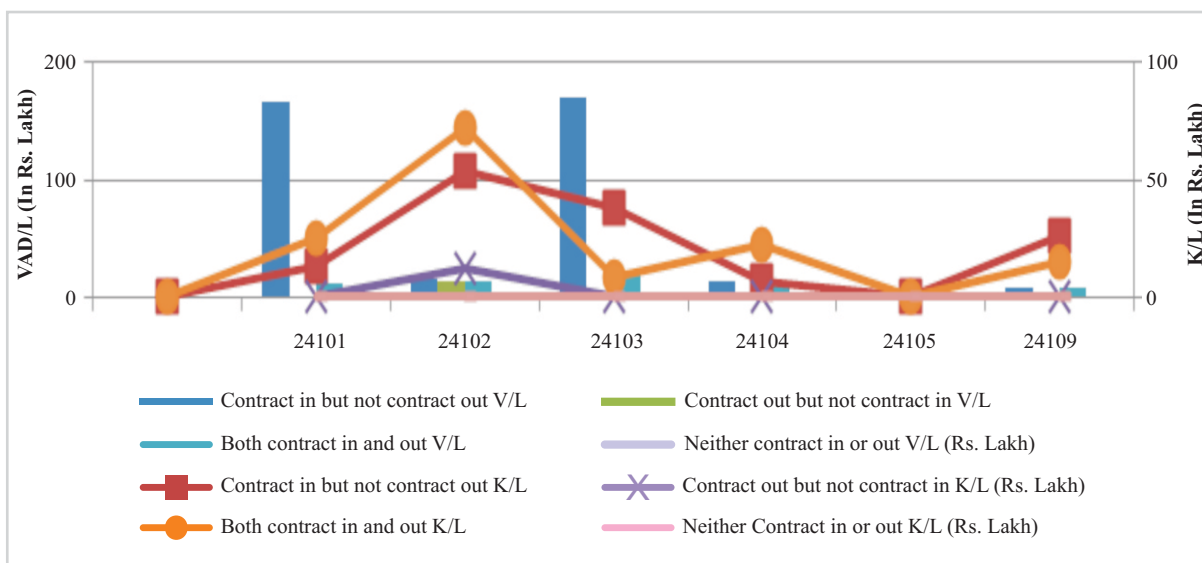


Figure 21.4 : Contract, capital intensity and productivity of Large Enterprises



5. Presence of MSMEs in ASI (Export)

i) Share of small enterprises

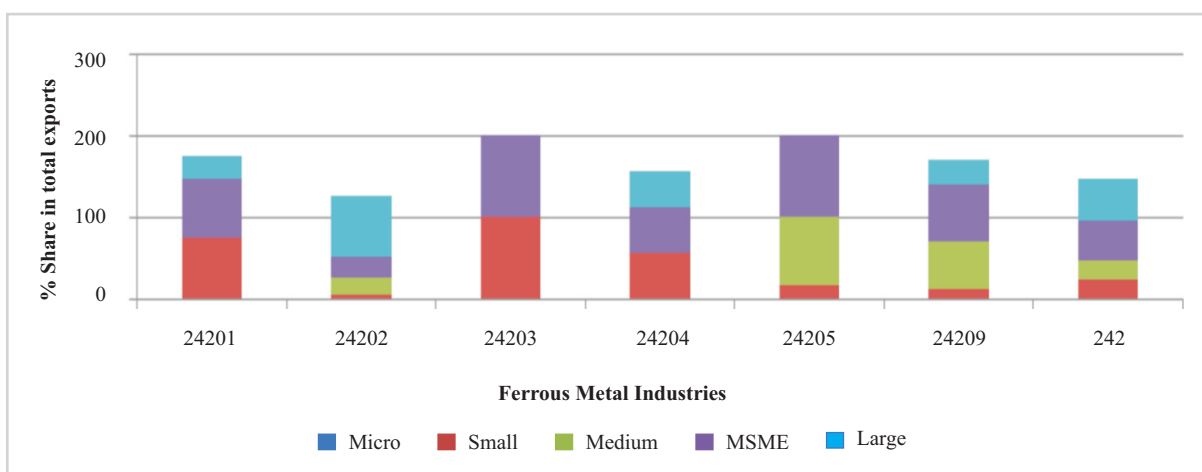
As the Micro Enterprises are not involved in exports, we will discuss about small enterprises whose export share is significantly high. In every 5-digit sectors, small enterprises have significantly high export share. In the case of manufacture of lead, zinc and tin products and alloys (24203), these enterprises have 100% share in export. Other sectors with good performance are manufacture of Copper from ore & other Cu products & alloys (24201) and manufacture of chrome, Mn & Ni products alloy (24204) having export share of 74 % and 56 % respectively (Figure 22).

ii) Share of medium Enterprises

Out of six sectors, only three sectors are found to have medium enterprise exporting. The highest share of Medium Enterprises is 84% for the sector manufacturing of prod. & refining of precious metals (Au, A & Pt) (24205). The other two sectors are manufacturing of other non-ferrous metals n.e.c. (24209) and manufacturing of Aluminium from alumina and by other methods and products of aluminium and alloys (24202) having export share of as 59 % and 21 % respectively (Figure 22).

In Brief, in the Manufacture of Basic precious and other non-ferrous metals (Code 242), MSMEs have significant share in Export. The sectors with significant export by MSMEs are manufacture of other non-ferrous metals n.e.c. (24209) and manufacture of Al and products (24202) from alumina.

Figure 22 : Contribution of firms in total export of each five digit code of basic precious & Non-Ferrous Metal Industries



Source: Own estimates based on ASI, 2009-10 data

6. Age wise pattern of contractual linkages

On the basis of age-wise contractual linkages among micro enterprises, it can be said almost 86% of the enterprises are involved in contractual relationship. Among these, a large number of enterprises are found in 21 to 30 years age group. Among new enterprises, which are fewer in number, a majority are involved in contracting (Table 21).

Among small enterprises of Manufacture of Basic precious and other non-ferrous metals (242), the majority of enterprises are in contractual relationship with other enterprises. Out of total 322 enterprises, 148 are in 'contract in but not contract out' relationship having share of 46%, while other enterprises are in relationship as 'both contract in and out' (119). Therefore almost 87% of enterprises are involved in contracting (Table 21.1). In term of Age wise contractual relationship, majority of enterprises are in the age category 6-10, 11-15 and in the age group of 2 years. The contractual relationship is low in the age group longer than 50 years.

Among medium enterprises of Basic precious and other non-ferrous metals (242), majority are in contractual relationship with other enterprises as 'contract in but not contract out' and 'both contract in and out'. Almost 80% of the enterprises are in contractual relationship. Out of total 49 enterprises, 17 are in 'contract in but not contract out' relationship while 19 are in relationship as 'both contract in and out' (Table 21.2). There is least number of enterprises in 'contract out but not contract in' category. In term of Age wise contractual relationship, majority of enterprises are in the age category 1, 2, 16-20 and 21-30.

Among large enterprises manufacturing Basic Iron and other non-ferrous metals, everyone is found to be involved in some or other form of contracting. In term of Age wise contractual relationship, majority of enterprises are in the age category 11-15, 21-30, 31-50 and longer than 50.

Table 21 : Age wise distribution of contractual linkages of Medium Enterprises in Manufacture of basic precious & Other Non-Ferrous Metal (242)

Age	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out
	Copper from ore, & other Cu products & alloys (24201)				Aluminium from alumina and by other methods and products of aluminium and alloys (24202)			
0								
1								2
2					3			
3	5					5	5	
4					5			
5							5	
6 to 10	5	5			15	5		
11 to 15	10				18	5	5	13
16 to 20	5				5		5	5
21 to 30	15	5	4	5	25		6	
31 to 50	5		10	1	11		10	5
>50	10	5	4		9			1
Total	55	15	18	6	91	15	36	26

	Lead, zinc and tin products and alloys (24203)				Chrome, Mn, & Ni products alloy (24204)			
0								
1								
2	4						5	
3	5			5				
4	4							
5	5		5					
6 to 10	5			5				
11 to 15	5		5					3
16 to 20	15		5	6	1		5	
21 to 30			5					2
31 to 50								5
>50	5							
Total	48	0	20	16	1	0	10	10

	Prod. & refining of precious metals (Au, Ag, Pt) (24205)				Other non-ferrous metals n.e.c. (24209)			
0								
1								
2	1							
3						4		
4					6			
5					7			
6 to 10					7	5		
11 to 15					6			
16 to 20					10			
21 to 30					15	9		5
31 to 50					10	5	5	5
>50					5			
Total	1	0	0	0	66	23	5	10
Total Micro Enterprises					262	53	89	68

Source: Own estimates based on ASI, 2009-10 data

Table 21.1: Age wise distribution of contractual linkages of Small Enterprises in Manufacture of Basic precious and other non-ferrous metals (242)

Age	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out
	Copper from ore, & other Cu products & alloys (24201)				Aluminium from alumina and by other methods and products of aluminium and alloys (24202)			
0								
1	4						6	
2	5		4					
3	2				4	11	4	3
4	4				4			4
5	4						5	
6 to 10			16		7			
11 to 15	5			5	4		11	9
16 to 20			10	5	7	1	13	
21 to 30	10		1		11			
31 to 50			9		1		5	1
>50	1				5		1	
Total	35	0	40	10	44	12	45	17

	Lead, zinc and tin products and alloys (24203)				Chrome, Mn, & Ni products alloy (24204)			
0								
1								
2								
3	7						5	
4								
5			1		4			
6 to 10	4				1			5
11 to 15	5							
16 to 20	5							
21 to 30								
31 to 50	5						1	4
>50								
Total	30	0	1	1	5	0	6	9

	Prod. & refining of precious metals (Au, Ag, Pt) (24205)				Other non-ferrous metals n.e.c. (24209)			
0								
1								
2								
3			5					
4					1			
5								
6 to 10					1		2	
11 to 15					20			5
16 to 20			1		1			
21 to 30								
31 to 50					5		14	
>50					6	1	5	
Total	0	0	6	0	34	1	21	5
Total Small Enterprises					148	13	119	42

Source: Own estimates based on ASI, 2009-10 data

Table 21.2: Age wise distribution of contractual linkages of Medium Enterprises in Manufacture of Basic precious and other non-ferrous metals (242)

Age	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out
	Copper from ore, & other Cu products & alloys (24201)				Aluminium from alumina and by other methods and products of aluminium and alloys (24202)			
0								
1						2		
2					5		1	
3								
4				5				
5					1			
6 to 10								
11 to 15								
16 to 20							5	
21 to 30	5				1		1	
31 to 50							5	
>50						1		
Total	5	0	0	5	7	3	12	

	Lead, zinc and tin products and alloys (24203)				Chrome, Mn, & Ni products alloy (24204)			
0								
1	5							
2								
3								
4								
5								
6 to 10								
11 to 15								
16 to 20								
21 to 30								
31 to 50								
>50			1					
Total	5	0	1	0	0	0	0	0

	Prod. & refining of precious metals (Au, Ag, Pt) (24205)				Other non-ferrous metals n.e.c. (24209)			
0								
1								
2								
3							1	
4								
5								
6 to 10								
11 to 15								
16 to 20			4				1	5
21 to 30								
31 to 50								
>50								
Total	0	0	4	0	0	0	2	5
Total Medium Enterprises					17	3	19	10

Source: Own estimates based on ASI, 2009-10 data

**Table 21.3: Age wise distribution of contractual linkages of Large Enterprises
in Manufacture of Basic precious and other non-ferrous metals (242)**

Age	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out
	Copper from ore, & other Cu products & alloys (24201)				Aluminium from alumina and by other methods and products of aluminium and alloys (24202)			
0								
1					1			
2						1	1	
3							1	
4					1			
5							2	
6 to 10					2			
11 to 15	4		2				2	
16 to 20					1		1	
21 to 30			5		2		2	
31 to 50			1		1		2	
>50			1		4	1	1	
Total	4	0	9	0	12	2	12	0

	Lead, zinc and tin products and alloys (24203)				Chrome, Mn, & Ni products alloy (24204)			
0								
1								
2	1							
3								
4								
5								
6 to 10					1			
11 to 15								
16 to 20								
21 to 30								
31 to 50	1		1				1	
>50								
Total	2	0	1	0	1	0	1	0

	Prod. & refining of precious metals (Au, Ag, Pt) (24205)				Other non-ferrous metals n.e.c. (24209)			
0								
1								
2								
3					1			1
4								
5					1			1
6 to 10					1			1
11 to 15							1	
16 to 20					1			1
21 to 30					1			1
31 to 50							2	
>50								
Total	0	0	0	0	5	0	3	0
Total Large Enterprises					24	2	26	0

Source: Own estimates based on ASI, 2009-10 data

7. Regional dispersion of the basic precious & other non-ferrous metals industries

The different non-ferrous metals are distributed in different geographical locations in India.

Copper & other Cu products & alloys (24201)

In the sector Copper products and alloys (24201), the top seven states in terms of GVA are Goa, Gujarat, Rajasthan, Jharkhand, Madhya Pradesh, Maharashtra and D & N Haveli. The state having highest GVA share is Goa followed by Gujarat and Rajasthan with GVA share 30%, 19.38% and 18.67% respectively (Table 22). The reason for the higher GVA share is their close proximity to the ore reserves. Largest resources of copper ore to the tune of 777.17 million tonnes (49.86%) are in the state of Rajasthan followed by Madhya Pradesh with 377.19 million tonnes (24.2%) and Jharkhand with 288.12 million tonnes (18.49%). Copper resources in Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Meghalaya, Odisha, Sikkim, Tamil Nadu, Uttarakhand and West Bengal accounted for about 8% of the total all India resources. [12]

Also in D & N Haveli, 100% GVA share comes from small enterprises, 100% from Medium enterprises in Maharashtra and 100% from large enterprises in Goa (Table 22). In states like Jharkhand, Rajasthan, Madhya Pradesh and Gujarat, 77 to 100% of GVA share comes from big enterprises.

In terms of labour productivity, Goa has the highest figure of Rs 166 lakh per labour per year (Table 23). For other states, productivity varies between Rs 4 lakh to Rs 36 lakh. Among these states, Maharashtra has highest capital intensity of Rs 13.21 lakh per labour per year.

The proportion of contracting enterprises is 100% in Goa state only. In other states, the proportion of contracting enterprises varies between 33 to 75%. This variation is primarily due to wide variation in the micro size class where the proportion of contractual enterprises vary between 0 to 67% ,while small medium and large enterprises have 100% contractual relationship.

As regards exports, only enterprises of Madhya Pradesh and that too of large size class are involved in exporting. Also all exporting firms are involved in contractual relationship. Hindustan Copper Ltd. a public sector enterprise, is a major player in this sector with its operations in states like Jharkhand, Rajasthan, Madhya Pradesh and Maharashtra. Other major players are Hindalco and Sterlite Industries Ltd. [12]

India's refined copper consumption has increased at 10% per annum over the last four years. The demand of copper by 2015-16 is projected to be 1,227 thousand tonnes assuming 8% GDP growth. As per the feedback from the end user industries, high growth in copper demand is likely to be from sectors like Electrical, Transport (auto and railways), Air conditioner and Refrigerator (ACR) Manufacturers and Consumer durable manufacturing sector and the newer potential end use sectors emerging including gas supply, plumbing tube, solar water heater and desalination.[12] In the same way growth of MSMEs for this sector can be projected.

Table 22: State wise distribution of Copper & other Cu products & alloys (24201)

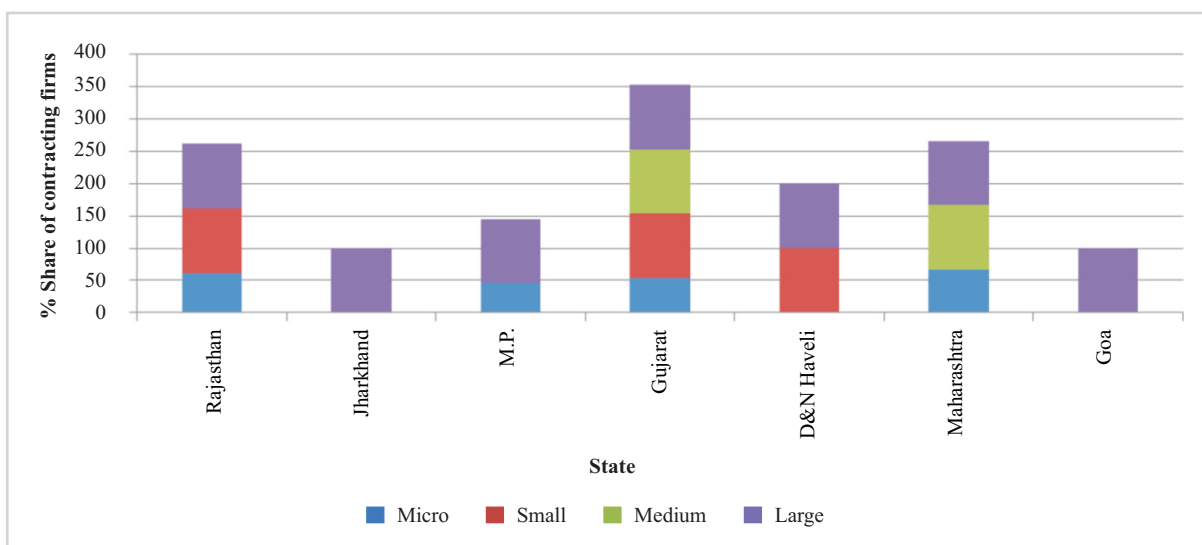
	Micro		Small		Medium		Large		Total		
State	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	Total GVA (Rs. Crore)	% Distribution of GVA across states
Rajasthan	8	0.90	4	1.87	0	0.00	1	97.23	13	418.6	18.67
Jharkhand	1	0.13		0.00		0.00	1	99.87	2	217.28	9.69
M.P.	5	3.40		0.00		0.00	6	96.60	11	128.37	5.73
Gujarat	35	2.18	15	17.01	5	3.48	1	77.33	56	434.49	19.38
D&N Haveli		0.00	5	100.0		0.00		0.00	5	90.50	4.04
Maharashtra	10	0.22	0	0.00	5	99.78	0	0.00	15	99.62	4.44
Goa		0.00		0.00		0.00	4	100.00	4	673.00	30.02

Table 23:labour productivity and capital intensity in Copper & other Cu products & alloys (24201)

	Micro		Small		Medium		Large		Total	
State	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)
Rajasthan	3.01	1.36	8.88	1.51	0.00	0.00	17.27	1.64	5.92	1.43
Jharkhand	1.35	0.51	0.00	0.00	0.00	0.00	18.77	6.98	10.06	3.75
M.P.	7.94	0.23	0.00	0.00	0.00	0.00	6.08	6.31	6.92	3.55
Gujarat	2.77	1.29	6.88	1.91	7.53	13.96	32.83	184.00	4.84	5.85
D&N Haveli	0.00	0.00	35.51	1.46	0.00	0.00	0.00	0.00	35.51	1.46
Maharashtra	0.37	0.04	0.00	0.00	11.29	5.01	0.00	0.00	4.01	1.70
Goa		0.00		0.00		0.00	166.00	13.21	166.00	13.21

Source: Own estimates based on ASI, 2009-10 data

Figure 23 : State wise contractual relationship of Copper & other Cu products & alloys Industry



Source: Own estimates based on ASI, 2009-10 data

Table 24: State wise Export of Copper & other Cu products & alloys (24201)											
	Micro		Small		Medium		Large		Total		
State	A	B	A	B	A	B	A	B	No. of Export-ing firms	State share in Exp. (%)	Exporting firms in contract relations (%)
M.P.	0		0		0		100	100	1	25.95	100

- Note: i. For other state it is negligible.
 ii. A- % of state-wise total Export; B - % of exporting firms in contractual relationship.
 iii. Source: Own estimates based on ASI 2009-10 data

Aluminium & other aluminium products & alloys (24202)

In the sector Aluminium from alumina and by other methods and products of aluminium and alloys (24202), the top six states in terms of GVA are Orissa, Chhattisgarh, Karnataka, Maharashtra, Jharkhand and West Bengal in descending order. Orissa alone accounts for 52% of country's resources of bauxite followed by Andhra Pradesh (18%), Gujarat (7%), Chhattisgarh and Maharashtra (5% each) and Madhya Pradesh and Jharkhand (4% each). Major bauxite resources are concentrated in the East Coast bauxite deposits in Orissa and Andhra Pradesh. [14]

In terms of GVA share, Orissa and Chhattisgarh together account for over 72% of GVA generated by the subgroup. In all the above mentioned states excepting Maharashtra, there is domination of large enterprises who contribute from 91 to 100% of state GVA. In Maharashtra, there is significant share of MSMEs in GVA of the state which is 46 % (Table 25).

In terms of labour productivity, Jharkhand is the leading state with VAD/L exceeding Rs 45 lakh (Table 26). Next is Chhattisgarh. In terms of capital labour ratio, Orissa is the leading state although its productivity is low.

As regards contracting, all medium & big firms are involved in contracting. Similarly, all small enterprises in all the states except Maharashtra are involved in contracting. States having 100% contractual relations are West Bengal, Chhattisgarh, and Karnataka.

In case of exporters, 100% of these firms are involved in contractual relationship. Also, only medium and large enterprises are involved in exporting.

The big integrated dominant players of this sector with interests from mining to metallurgy and processing are Hindalco and Nalco.[20] Nalco is Asia's largest integrated alumina-aluminium complex and continues to be the leading producer of alumina amounting for 42% of the total production during 2011. It's main operating plant is situated in Orissa which reflects the very high GVA share of Orissa among other states in this sector.[20]

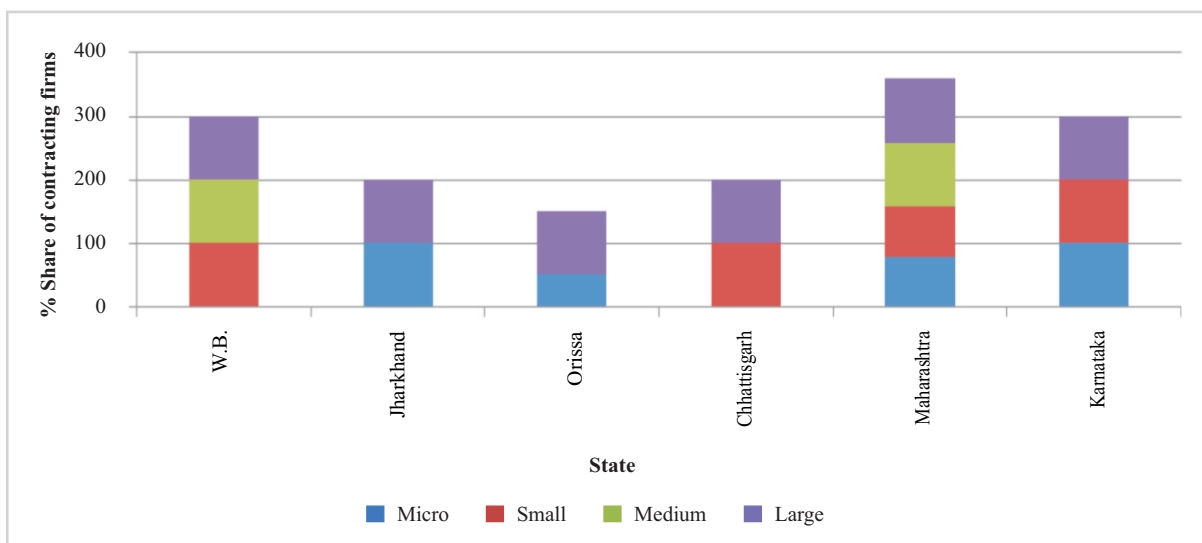
Table 25: State wise distribution of Al & other Al products & alloys (24202)											
	Micro		Small		Medium		Large		Total		
State	No. of Enterp -rises	% of total state GVA	No. of Enterp -rises	% of total state GVA	No. of Enterp -rises	% of total state GVA	No. of Enterp -rises	% of total state GVA	No. of Enterp -rises	Total GVA (Rs. Crore)	% Distribution of GVA across states
W.B.	0	0.00	5	4.21	1	3.69	4	92.10	10	212	3.09
Jharkhand	1	0.0003	3	8.63	0	0.00	1	91.37	5	239	3.48
Orissa	6	0.02	0	0.00	0	0.00	5	99.98	11	3551	51.86
Chhattisgarh	0	0.00	3	0.36	0	0.00	1	99.64	4	1405	20.52
Maharashtra	22	4.51	27	19.73	12	21.52	4	54.23	65	286	4.17
Karnataka	4	1.01	5	0.83	0	0.00	2	98.16	11	336	4.91

Source: Own estimates based on ASI, 2009-10 data

Table 26: Labour productivity and capital intensity in Al & other Al products & alloys (24202)										
	Micro		Small		Medium		Large		Total	
State	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)
W.B.	0.00	0.00	4.25	5.12	3.32	3.76	10.66	18.78	6.72	10.45
Jharkhand	0.01	0.01	68.78	7.18	0.00	0.00	20.08	82.48	45.28	20.81
Orissa	1.08	0.47	0.00	0.00	0.00	0.00	15.06	170.00	7.43	77.46
Chhattisgarh	0.00	0.00	7.00	7.86	0.00	0.00	35.19	120.00	14.05	35.83
Maharashtra	3.21	0.99	4.35	3.12	4.83	6.91	12.62	36.65	4.56	5.16
Karnataka	1.73	0.04	1.68	1.84	0.00	0.00	19.22	10.13	4.89	2.69

Source: Own estimates based on ASI, 2009-10 data

Figure 24 : State wise contractual relationship of Al & other Al products & alloys Industry



Source: Own estimates based on ASI, 2009-10 data

Table 27: State wise Export of Al & other Al products & alloys (24202)

Sector Code 241	Micro		Small		Medium		Large		Total		
State	A	B	A	B	A	B	A	B	No. of Export-ing firms	Share of total Export	B
W.B.			0	0	4.62	100.0	95.42	100.0	2	6.09	100.0
Jharkhand	0	0	0	0			0	0		0	0
Orissa	0	0					0	0		0	0
Chhattisgarh			0	0			0	0		0	0
Maharashtra	0	0	0	0	62.83	100.0	37.39	100.0	11	31.71	100.0
Karnataka			0	0			100.0	100.0	1	51.62	100.0

Note: A- % of state-wise total Export; B - % of exporting firms in contractual relationship.

Source: Own estimates based on ASI, 2009-10 data

Lead, zinc and tin products and alloys (24203)

In the sector manufacture of lead, zinc and tin products and alloys (24203), the top five states in terms of GVA are Uttaranchal (now Uttarakhand), Andhra Pradesh, Kerala, D & N Haveli and J& K. The state having highest GVA share is Uttaranchal with Rs 494 crore. It is interesting to note that in Uttaranchal, only one big firm is contributing to 50% of this high GVA (Table 28). Next big state in terms of GVA share is Andhra Pradesh (with 21% share).

In occurrences of tin in primary as well as secondary forms the only workable economic deposits in the form of alluvial or placer deposits occur in Bastar and Dantewada districts of Chhattisgarh. Tin in primary form as disseminations in the gneisses and schists of Koraput district, Orissa is another source of economic importance.[15] In case of lead-zinc occurrence, Rajasthan is endowed with the largest resources of lead-zinc ore amounting to 607.53 million tonnes (88.61%), followed by Andhra Pradesh with 22.69 million tonnes (3.31%), Madhya Pradesh 14.84 million tonnes (2.16%), Bihar 11.43 million tonnes (1.67%) and Maharashtra 9.27 million tonnes (1.35%).[16]

Table 28: State wise distribution of lead, zinc and tin products and alloys (24203)											
	Micro		Small		Medium		Large		Total		
State	No. of Enterp -rises	% of total state GVA	No. of Enterp -rises	% of total state GVA	No. of Enterp -rises	% of total state GVA	No. of Enterp -rises	% of total state GVA	No. of Enterp -rises	Total GVA (Rs. Crore)	% Distribution of GVA across states
J&K	0	10.38	5	89.62	1	0.00	0	0.00	6	99.2	10.07
Uttaranchal	0	0.00	0	0.00	0	100.00	1	0.00	1	494	50.15
D&N Haveli	0	100.00	7	0.00	0	0.00	0	0.00	7	56.7	5.76
Andhra	10	9.96	0	0.00	5	3.00	1	87.04	16	206.81	21.00
Kerala	0	0.00	0	0.00	0	0.00	1	100.00	1	70.8	7.19

Source: Own estimates based on ASI, 2009-10 data

The labour productivity is highest in Uttaranchal with VAD/L being Rs 323 lakh (Table 29). This state also shows highest capital intensity of Rs 52.73 lakh per labour.

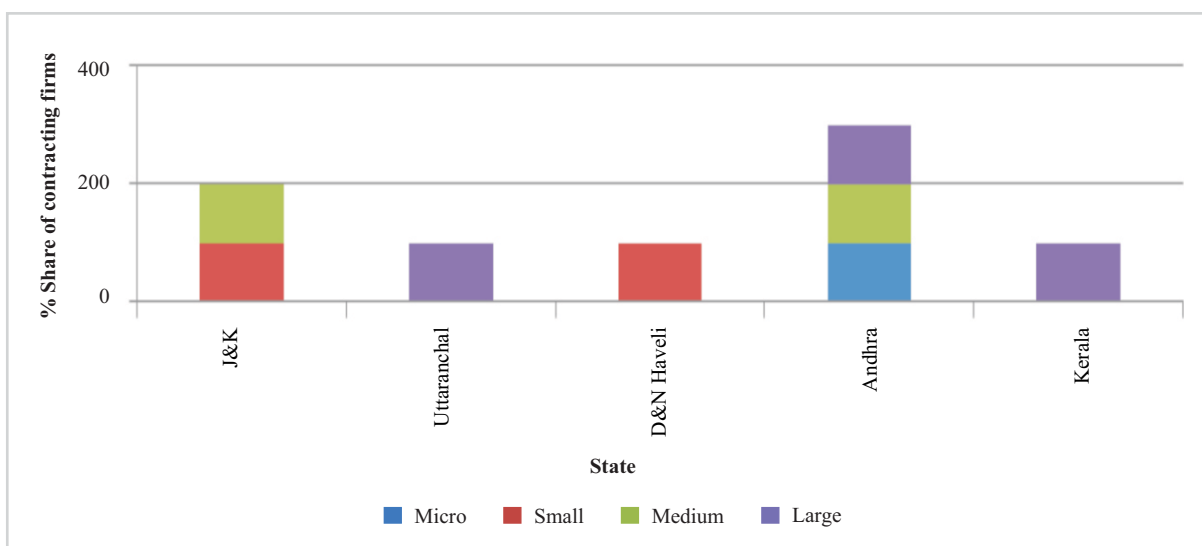
Enterprises in all the above mentioned top five states are involved in contractual relationship. Among these, only in Andhra Pradesh micro enterprises are present with 100% contractual relationship. Also in J& K and D & N Haveli, big enterprises are absent in this sector and only small enterprises are operating.

In case of exports, none of the above top five states' enterprises is involved. For this, only Rajasthan has 100% share of export, and only small sized enterprises are involved (Table 30).

Table 29: labour productivity and capital intensity in lead, zinc and tin products and alloys (24203)										
	Micro		Small		Medium		Large		Total	
State	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)
J&K	0.00	0.00	2.63	8.37	18.64	2.76	0.00	0.00	5.30	7.43
Uttaranchal	0.00	0.00	0.00	0.00	0.00	0.00	323.00	52.73	323.00	52.73
D&N Haveli	0.00	0.00	25.67	4.19	0.00	0.00	0.00	0.00	25.67	4.19
Andhra	14.88	1.69	0.00	0.00	2.00	10.10	22.36	8.34	11.33	4.73
Kerala	0.00	0.00	0.00	0.00	0.00	0.00	18.98	24.01	18.98	24.01

Source: Own estimates based on ASI, 2009-10 data

Figure 25 : State wise contractual relationship of lead, zinc and tin products & alloys Industry



Source: Own estimates based on ASI, 2009-10 data

Table 30: State wise Export of lead, zinc and tin products and alloys (24203)

State	Micro		Small		Medium		Large		Total		
	A	B	A	B	A	B	A	B	No. of export- ing firms	State share in Exp. (%)	Exporting firms in contract relations (%)
J&K			0	0	0	0			0	0	0
Uttaranchal							0	0	0	0	0
D&N Haveli			0	0					0	0	0
Andhra	0	0	0	0	0	0	0	0	0	0	0
Kerala							0	0	0	0	0
Rajasthan	0	0	100	100	0	0	0	0	5	100	100

Note: A- % of state-wise total Export; B - % of exporting firms in contractual relationship

Source: Own estimates based on ASI, 2009-10 data

Chrome, Mn & Ni products alloys (24204)

In the sector chrome, Mn and nickel products and alloys (24204), the top 5 states according to their GVA share are Maharashtra, Orissa, D & N Haveli, Rajasthan and Andhra Pradesh. Their total share in GVA is 96%. The ore of chrome is chromites. Orissa continues to be the major producing state of chromites, accounting for 99.8% production during 2010-11.[17] In Mn also Orissa tops the total resources with 44% share followed by Karnataka 22%, Madhya Pradesh 13%, Maharashtra 8%, Andhra Pradesh 4% and Jharkhand & Goa 3% each. Rajasthan, Gujarat and West Bengal together shared the remaining about 3% resources.[18] Nickel is not produced from primary sources in the country and the entire demand is met through imports. However, it is being recovered as nickel sulphate crystals, a by-product obtained during copper production. [19]

In this sector, one interesting fact is that in Rajasthan, Orissa and Andhra Pradesh, the GVA share is between 97.29 to 100% for small sector while in D & N Haveli and Maharashtra, the 100% GVA share is from medium enterprises (Table 31). Large sized enterprise is not present in any of these states.

The top states in terms of labour productivity are D& N Haveli, Maharashtra and Rajasthan with VAD/L being Rs 14, 13 and 12 lakh respectively (Table 32). All states showing high

productivity are also having high capital intensity.

Enterprises in all the above mentioned states are involved in contractual relationship except Orissa where 42% of total firms are involved in contractual relationship.

Only one small scale firm in Rajasthan and one large scale firm in Maharashtra are involved in exporting and also have contractual relation with other firms (Table 33).

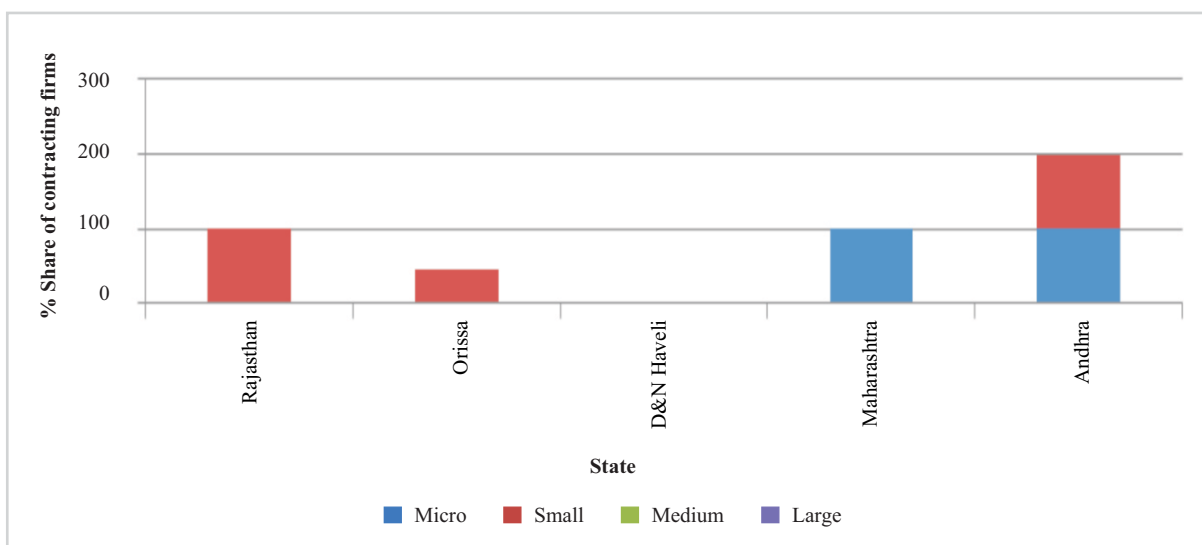
Table 31: State wise distribution of chrome, Mn & Ni products alloys (24204)											
	Micro		Small		Medium		Large		Total		
State	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	Total GVA (Rs. Crore)	% Distribution of GVA across states
Rajasthan		0.00	1	100.0		0.00		0.00	1	23.20	8.52
Orissa	2	1.13	17	98.87		0.00		0.00	19	84.86	31.18
D&N Haveli		0.00		0.00	1	100.00		0.00	1	32.80	12.05
Maharashtra	5	0.58	0	0.00	1	99.42	0	0.00	6	110.64	40.65
Andhra	5	2.71	1	97.29		0.00		0.00	6	8.59	3.16

Source: Own estimates based on ASI, 2009-10 data

Table 32: Labour productivity and capital intensity in chrome, Mn & ni products alloys (24204)											
	Micro		Small		Medium		Large		Total		
State	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	
Rajasthan	0.00	0.00	11.78	3.75	0.00	0.00	0.00	0.00	11.78	3.75	
Orissa	2.17	0.18	7.14	3.94	0.00	0.00	0.00	0.00	6.62	3.54	
D&N Haveli	0.00	0.00	0.00	0.00	13.84	6.69	0.00	0.00	13.84	6.69	
Maharashtra	12.84	5.06	0.00	0.00	12.85	22.32	0.00	0.00	12.84	7.94	
Andhra	0.23	0.67	5.47	2.42	0.00	0.00	0.00	0.00	1.10	0.96	

Source: Own estimates based on ASI, 2009-10 data

Figure 26 : State wise contractual relationship of Chrome, Mn & Ni products alloys Industry



Source: Own estimates based on ASI, 2009-10 data

Table 33: State wise Export of Chrome, Mn & Ni products alloys (24204)											
State	Micro		Small		Medium		Large		Total		
	A	B	A	B	A	B	A	B	No. of export-ing firms	State share in Exp. (%)	Exporting firms in contract relations (%)
Rajasthan			100.0	100.0					1	56.28	100.0
Orissa	0	0	0	0					0	0	0
D&N Haveli							0	0	0	0	0
Maharashtra	0	0					100.0	100.0	1	43.72	100.0
Andhra	0	0	0	0					0	0	0

Note: A- % of state-wise total Export; B - % of exporting firms in contractual relationship

Source: Own estimates based on ASI, 2009-10 data

Prod. & refining of precious metals (24205)

In the sector production and refining of precious metals (Au, Ag, Pt etc) (24205), only three states Rajasthan, Karnataka and Maharashtra figure in. In Maharashtra, the entire production is carried out by micro enterprises, while in Karnataka it is done by small enterprises. In Rajasthan, 82 % GVA share is contributed by medium sized enterprises (Table 34). Large enterprises are conspicuously absent in this sector. This sector is not much technologically advanced and capital intensive and this may be due to predominance of MSMEs.

Rajasthan and Karnataka have high labour productivity and all the firms are involved in contractual relationship (Table 35). Among these states, only Rajasthan is involved in exporting (Table 36).

Gold and silver is by-product of Copper and Zinc-lead extraction and thus that the largest share of GVA is generated by Rajasthan is no surprise as two major and big players Hindustan Copper Ltd. and Hindustan Zinc Ltd. are present here. So, there remains opportunity for MSMEs to be involved in contractual relationship with these big firms for the metal products.

[13]

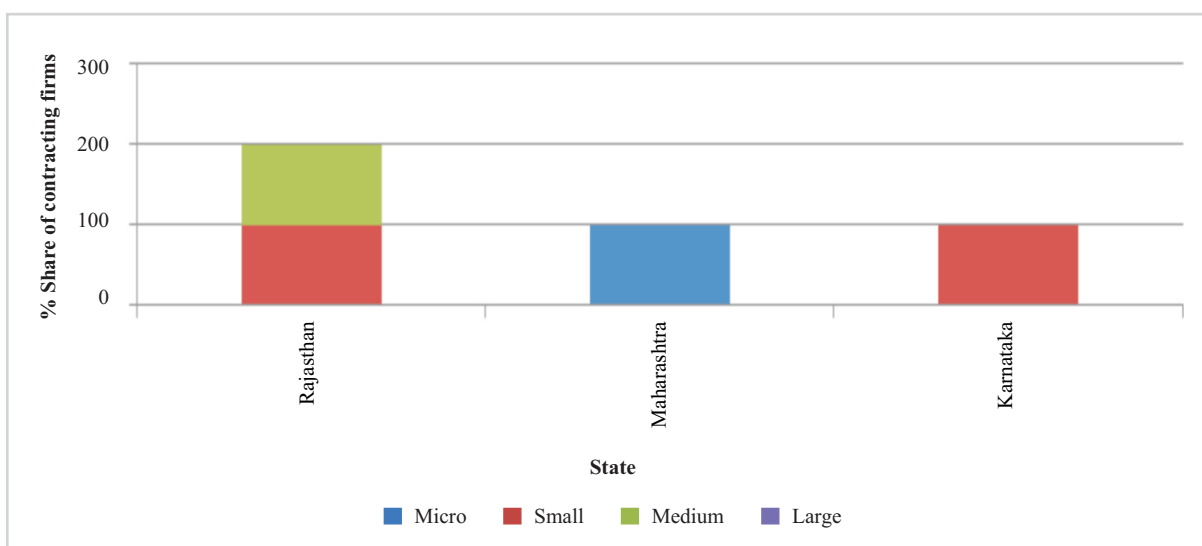
Table 34: State wise distribution of prod. & refining of precious metals (24205)											
	Micro		Small		Medium		Large		Total		
State	No. of Enterp -rises	% of total state GVA	No. of Enterp -rises	% of total state GVA	No. of Enterp -rises	% of total state GVA	No. of Enterp -rises	% of total state GVA	No. of Enterp -rises	Total GVA (Rs. Crore)	% Distribution of GVA across states
Rajasthan	0	0.00	1	17.80	4	82.20	0		5	44.16	69.46
Maharashtra	1	100.00		0.00		0.00			1	0.03	0.05
Karnataka		0.00	5	100.0		0.00			5	19.5	30.67

Source: Own estimates based on ASI, 2009-10 data

Table 35: Labour productivity and capital intensity in prod. & refining of precious metals (24205)										
	Micro		Small		Medium		Large		Total	
State	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)
Rajasthan	0.00	0.00	5.70	2.57	20.61	15.52	0.00	0.00	17.63	12.93
Maharashtra	0.10	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.38
Karnataka	0.00	0.00	7.34	1.56	0.00	0.00	0.00	0.00	7.34	1.56

Source: Own estimates based on ASI, 2009-10 data

Figure 27 : State wise contractual relationship of prod. & refining of precious metals Industry



Source: Own estimates based on ASI, 2009-10 data

Table 36: State wise Exports of prod. & refining of precious metals (24205)											
	Micro		Small		Medium		Large		Total		
State	A	B	A	B	A	B	A	B	No. of exporting firms	State share in Exp. (%)	Exporting firms in contract relations (%)
Rajasthan			16.23	100.0	83.63	100.0			5	100.0	100.0
Maharashtra	0	0							0	0	0
D&N Haveli			0	0					0	0	0

Note: A- % of state-wise total Export; B - % of exporting firms in contractual relationship

Source: Own estimates based on ASI, 2009-10 data

Other non-ferrous metals n.e.c (24209)

In this sector top five states are Rajasthan, Maharashtra, Karnataka, Andhra Pradesh and Haryana. The highest GVA share is of Rajasthan with 39% share while Maharashtra and Karnataka both have share of 18-19% (Table 37). The biggest player in this sector is Hindustan Zinc Ltd. with over 62% of total market share (CMIE data 2009-10). Its plant is also situated in Rajasthan. Also another important plant location is Andhra Pradesh. Domination of this major player is also evident from the fact that only big enterprises are involved in the entire exports from Rajasthan state.

In terms of labour productivity, Karnataka and Rajasthan are leading states (Table 38). All the enterprises in these states, except Andhra Pradesh and Haryana, are involved in contractual relationship. Andhra Pradesh is the only state among these where no firms are involved in contracting.

As regards exports, Maharashtra and Karnataka have 71% and 28% export share (Table 39). Surprisingly Rajasthan which contributes highest share in GVA has only 1.43 % export share. The reason might be the availability of port facility in Maharashtra leading to such appreciable share in export. No firm of Haryana and Andhra are involved in exporting. It might be possible that they are involved in contracting with bigger firms as there is significant number of micro enterprises in Haryana.

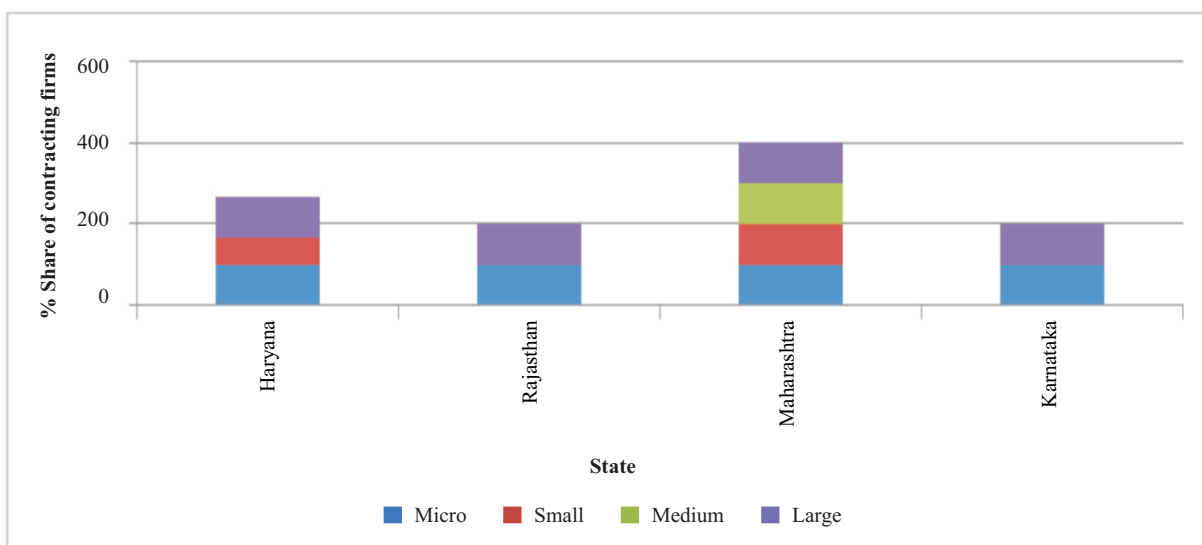
Table 37: State wise distribution of other non-ferrous metals n.e.c (24209)											
	Micro		Small		Medium		Large		Total		
State	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	Total GVA (Rs. Crore)	% Distribution of GVA across states
Haryana	24	14.90	15	14.40	0	0.00	1	70.70	40	30.27	4.40
Rajasthan	4	0.62		0.00		0.00	3	99.38	7	265.64	38.63
Maharashtra	15	10.63	13	52.03	1	10.86	2	26.48	31	128	18.62
Andhra		0.00		0.00	5	100.00		0.00	5	32.3	4.70
Karnataka	4	0.82		0.00		0.00	1	99.18	5	126.03	18.33

Source: Own estimates based on ASI, 2009-10 data

Table 38: Labour productivity and capital intensity in other non-ferrous metals n.e.c (24209)											
	Micro		Small		Medium		Large		Total		
State	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	V/L (Rs. Lakh)	K/L (Rs. Lakh)	
Haryana	1.55	0.60	1.84	3.40	0.00	0.00	5.92	3.47	1.77	1.72	
Rajasthan	2.93	3.09	0.00	0.00	0.00	0.00	6.60	6.88	4.50	4.72	
Maharashtra	2.00	0.94	3.99	2.75	3.38	1.89	2.98	14.51	2.94	2.61	
Andhra	0.00	0.00	0.00	0.00	3.75	3.15	0.00	0.00	3.75	3.15	
Karnataka	2.34	1.03	0.00	0.00	0.00	0.00	18.21	35.46	5.52	7.91	

Source: Own estimates based on ASI, 2009-10 data

Figure 28 : State wise contractual relationship of other non-ferrous metals n.e.c. Industry



Source: Own estimates based on ASI, 2009-10 data

Table 39: State wise Export of other non-ferrous metals n.e.c (24209)											
State	Micro		Small		Medium		Large		Total		
	A	B	A	B	A	B	A	B	No. of exporting firms	State share in Exp. (%)	Exporting firms in contract relations (%)
Haryana	0	0	0	0			0	0	0	0	0
Rajasthan	0	0					100.0	100.0	1	1.43	100.0
Maharashtra	0	0	16.22	100.0	83.25	100.0	0.63	100.0	8	70.84	100.0
Andhra					0	0			0	0	0
Karnataka	0	0					100.0	100.0	1	27.71	100.0

Note: A- % of state-wise total Export; B - % of exporting firms in contractual relationship

Source: Own estimates based on ASI, 2009-10 data

III. Industry structure of Casting of metals (code 243):

Metal castings are used widely for infrastructural purposes. The tubes, pipes and non-ferrous casting find application in wide range of industries from chemical to precious metal and jewelry making industry. The profundity of the casting applications in industries can be gauged from the fact that USA has roughly shipped over 14 million tons of castings worth more than \$33 billion in the year 2005. It is projected to increase to \$37.67 billion by 2008 and rise to \$42.6 billion in 2015. It is worthwhile here to mention that 90% of all the manufactured goods and all manufacturing machinery have casting applications. Casting enables pieces to be combined into a single part, eliminating, assembly and inventory. Compared to machined parts, costs of casting are much less. Castings are used virtually everywhere. The transport sector and heavy equipment is the predominant consumer (for farming, construction and mining) taking up over 50% of castings produced. A sector wise casting consumption is given below which highlights the importance of casting in any industrial set up.

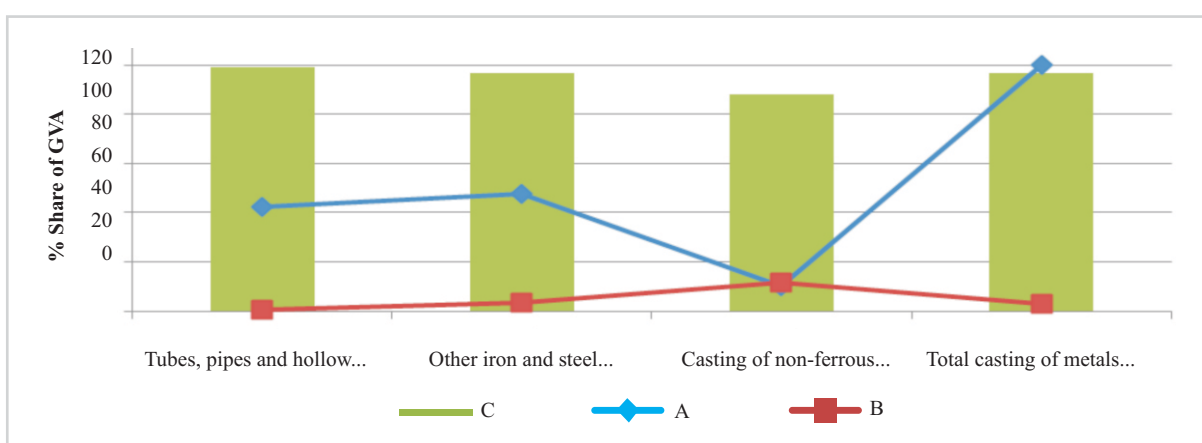
- Transport : Automobile, aerospace, railways and shipping
- Heavy Equipment : Construction, farming and mining
- Machine Tools : Machining, casting, plastics molding, forging, extrusion and forming
- Plant Machinery : Chemical, petroleum, paper, sugar, textile, steel and thermal plants
- Defense : Vehicles, artillery, munitions, storage and supporting equipment
- Electrical Equipment Machines : Motors, generators, pumps and compressors
- Hardware : Plumbing industry pipes, joints, valves and fittings
- Household : Appliances, kitchen and gardening equipment, furniture and fittings
- Art Objects : Sculptures, idols, furniture, lamp stands and decorative items [21]

Here we would see what role MSMEs can play in this regard. MSMEs are found to be involved in many ways, such as, manufacturing finished goods by using processed iron & steel produced in large firms, directly exporting their produce or indirectly through other firms, contracting-in manufacturing jobs from others as well as contracting-out manufacturing work to others. Whether these varieties of contracting relations of the MSMEs are the result of industry structure or market structure or technology or of government policy would be analysed. We shall look into the following broad themes: structure covering the relative contribution of the formal and informal sectors, their concentration, contractual relationships, productivity, capital intensity and contracting, exports, age wise contractual linkages, regional dispersions and government policies for growth.

1. Relative contribution of the formal and informal sectors to the industry

The two most important 5-digit sectors present in casting of metals (243) are (a) Manufacture of other iron and steel casting and products thereof (24319) which has GVA share in 3 digit code is 47.51%, and (b) Manufacture of tubes, pipes and hollow profiles and of tube or pipe fittings of cast-iron/cast-steel (24311) which has share of 42.49% (Figure 29). These two sectors together contribute 90% of the GVA of the ASI. The reason appears to be that these two products are of use in various infrastructural purposes.

Figure 29 : Distribution of GVA across formal & informal sectors
Casting of Metals Industries



Note: ASI data for the year 2009-10 and NSSO and CMIE data for the year 2010-11.

A: share of 5 digit group formal and informal sectors in combined GVA (ASI+NSSO) for group 243

B: Share of informal sector in combined GVA (ASI+NSSO) for each 5-digit code (%)

C: Share of formal sector in combined GVA (ASI+NSSO) for each 5-digit code (%)

(i) Presence of MSMEs in informal sectors (based on NSSO 2010-11):

The share of Informal sector in the combined GVA of ASI and NSSO for the 3-digit group is not very prominent in the two important 5-digit sectors. Only in casting of non-ferrous metals (24320) the presence of informal sector is quite significant (11.71%). The presence of informal sector in sub-sector code 24320 can be attributed to the fact that this sector is not as much technology and capital intensive as other sub-sectors are.

(ii) Presence of MSMEs in the formal sector (based on ASI 2009-10)

The two important 5-digit sectors involved in Casting of metals (243) are casting of tubes, pipes & hollow profiles (24311) having GVA share in 3 digit code is 42.49 % and other iron & steel castings & products (Figure 31). The remaining 5-digit sector casting of non-ferrous metals (24320) have GVA share in 3 digit group as 10%.

Share of micro enterprises

The share of Micro Enterprise in Casting of metals (code 243) is very low. The highest share of Micro Enterprise GVA in ASI code 243 is only 6.31% for the sector casting of other iron and steel casting and products thereof (24319). All three sectors have single digit contribution.

Share of small enterprises

The highest share of Small Enterprises in the GVA of ASI code 243 is only 52.10% which is noted for the sector casting of non-ferrous metals (24320); this is followed by the sector casting of other iron and steel casting and products thereof (24319) with 32.62% share.

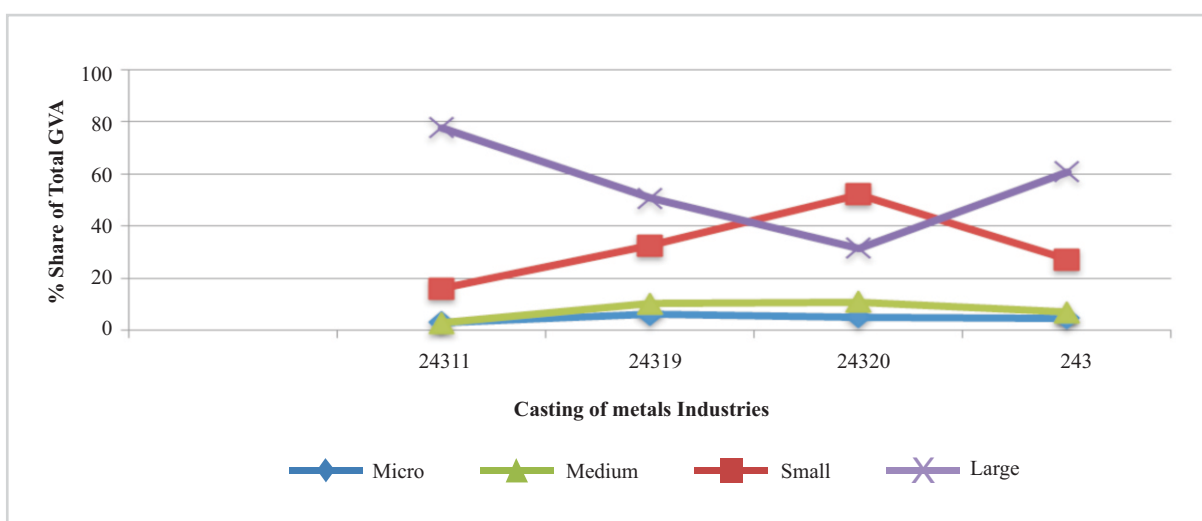
Share of medium enterprises

The share of Medium Enterprises in Casting of metals (code 243) is also very low. The highest share of Medium Enterprise GVA in ASI code 243 is 11.06% for the sector casting of Non-ferrous metals (24320) and 10.34% for the sector Casting of other iron and steel casting and products thereof (24319).

Share of large enterprises

Large enterprises are dominating in the sector. Highest is for the code 24311 where its contribution is 77.78%.

Figure 30 : Share of GVA across MSMEs and large enterprises in formal sector of casting of Metal Industries

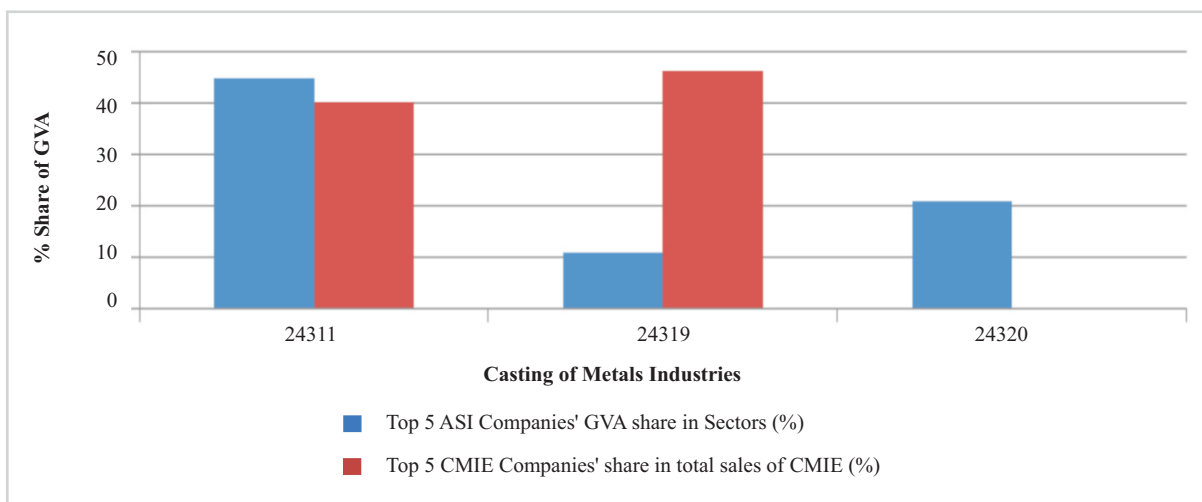


2. Large Enterprises and their concentration

Level of concentration is measured first in terms of top five firms' share in total gross value added by the industry group under ASI and then in terms of the share of top five listed companies in total sales of all the listed companies belonging to the industry group as reported in CMIE. Top 5 companies' share in GVA as per ASI data is highest in sector casting of tubes, pipes & hollow profiles of cast iron/cast steel (24311) which has top 5 companies' GVA share of 45% (Figure 31). As per CMIE data, top 5 companies' share in sales is 40% for code 24311 and 46.5% for code 24319.

The moderately high sales share of top 5 companies' (CMIE) in the sector code 24311 & 24319 indicates the fair presence of big market players. The Electrosteel Casting Ltd. has market share of 14% & Jindal Saw Ltd. has 7.4% which are private sector players. The other major players are also private firms in the product code 24311. In the product category 24319, Sujana Universal Inds. Ltd. has 20% market share and Hinduja Foundries Ltd. and AIA Engineering Ltd. have 8 % and 7% market share respectively. [CMIE report]

Figure 31 : Market concentration of firms under each 5 digit code for casting of metals



Among the MSMEs, out of 2419 enterprises, 1329 are micro sized, 888 are small, 68 are medium enterprises. The Sector code 24319 constitutes 859 Micro, 560 Small and 50 Medium Enterprises which is 60.74 % of total number of enterprises in ASI in code 243.

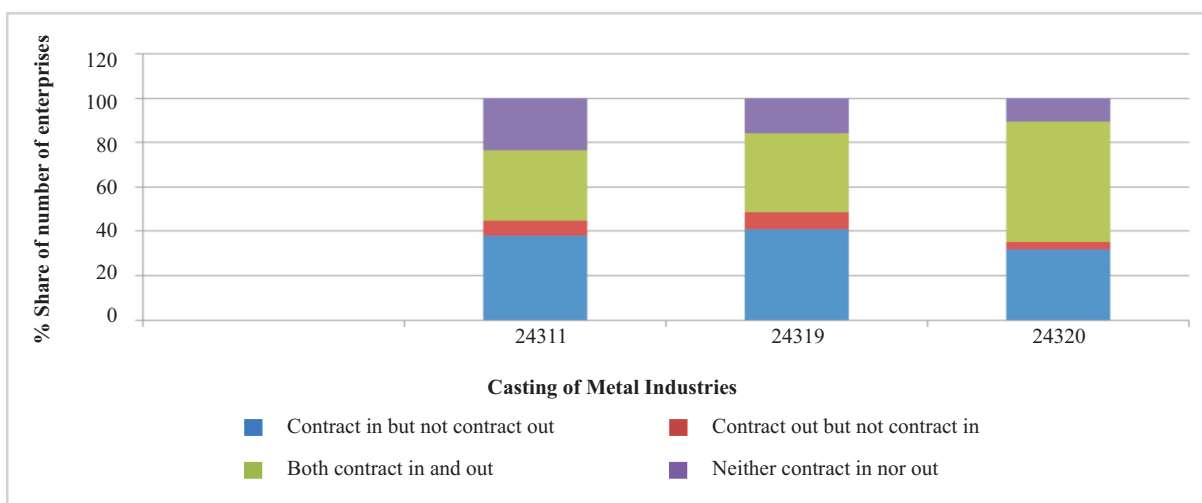
3. Contractual relations of MSMEs

As already mentioned, ASI data provides information about the firms contracting in and contracting out and volume of transaction under contract but no information about who is the transacting partner and the terms of contract.

Micro Enterprises

Incidence of the formal sector micro enterprises working on contract is very high. Excepting 17% of the enterprises who neither contract in nor out (independent), all other micro enterprises are involved in contracting some way or other – 39% contract in, 7% contract out and 36% both contract in and contract out. Majority of the enterprises are in contract in and both contract in and out (Figure 32)

Figure 32 : Contractual relations of the micro enterprises

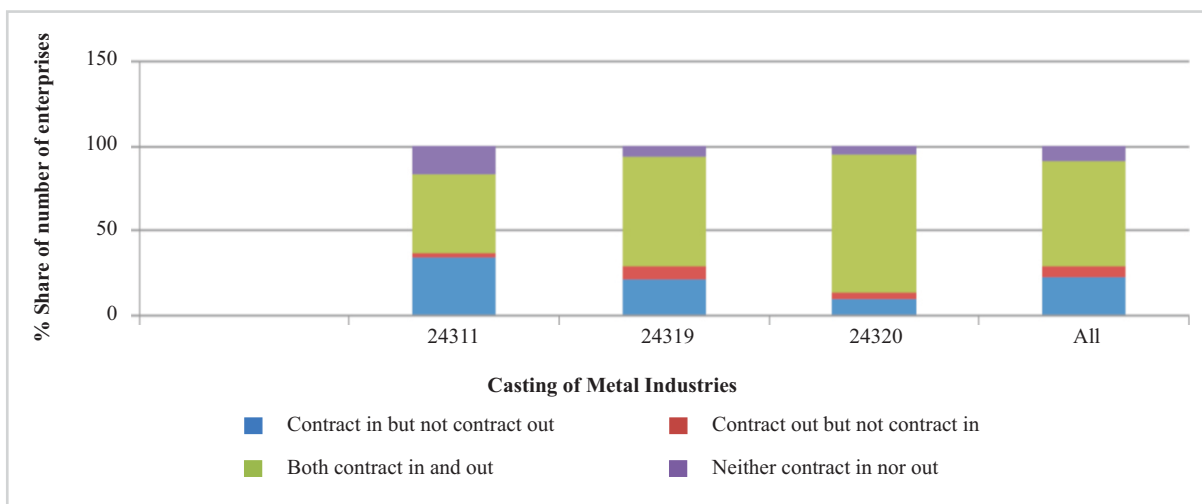


Source: Own estimates based on ASI, 2009-10 data

Small Enterprises

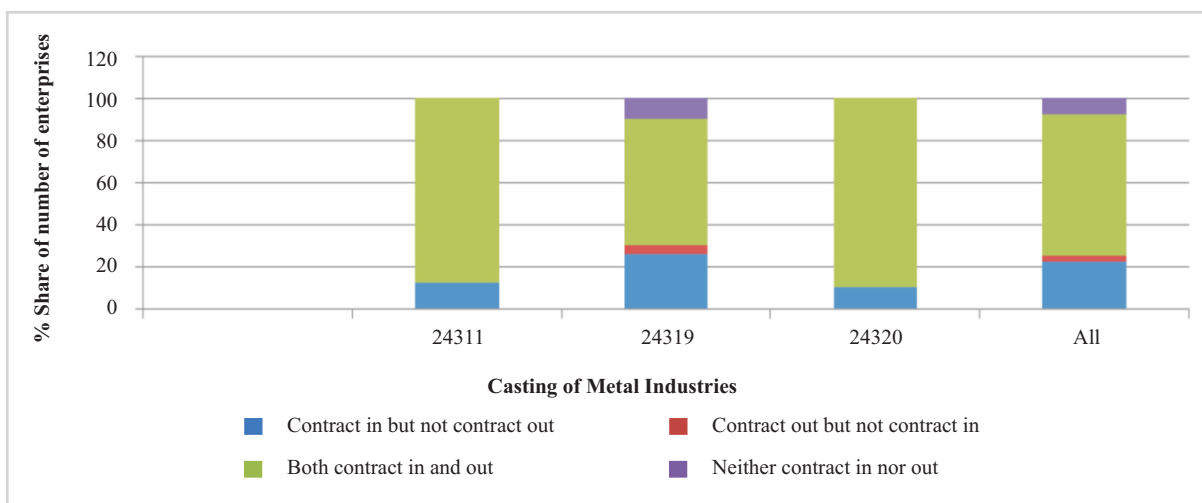
Intensity of contracting enterprises is much higher among the small enterprises. As much as 99% of the enterprises are involved in some or other form of contractual relationship – 25% contract in, 6% contract out and another 63% (Figure 33) both contract in and contract out. Proportion of both contracting in and out is higher in small category than micro ones. Among the 5-digit subgroups relatively higher proportion of both contracting in & out enterprises are found in code 24320 and 24319. High proportion of contracting in firms is found in code 24311. High contract density among the small firms reflects their dynamism and specialization and greater scope for technological progress.

Figure 33 : Contractual relations of the small enterprises



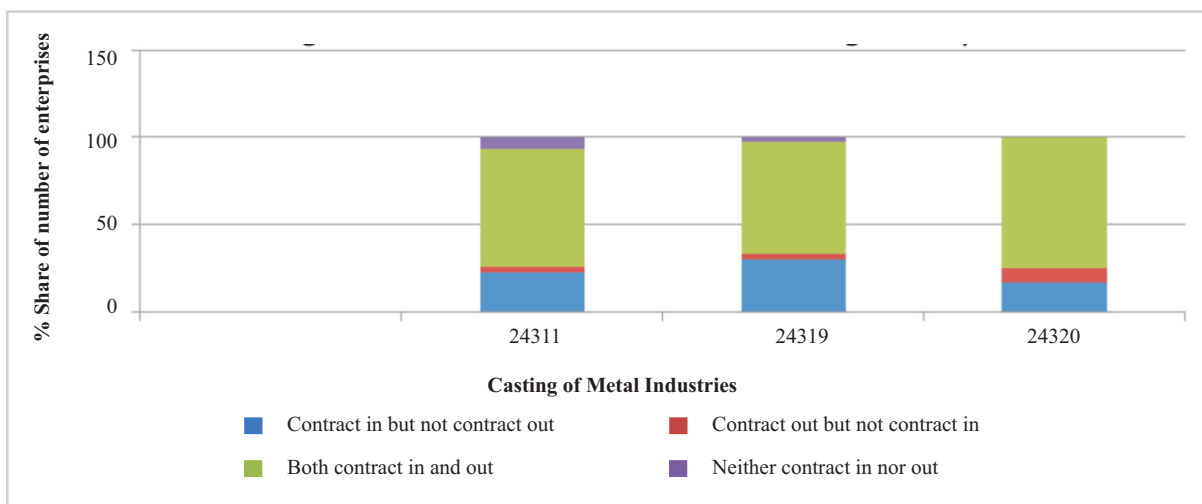
Source: Own estimates based on ASI, 2009-10 data

Figure 34 : Contractual relations of the Medium enterprises



Source: Own estimates based on ASI, 2009-10 data

Figure 35 : Contractual relations of the Large enterprises



Source: Own estimates based on ASI, 2009-10 data

Medium Enterprises

Medium sized enterprises are found to have high intensity of contracting and distributed over all the subsectors – only 7% of them are not involved in contracting, 22% enterprises are involved in contract in, 3% in contract out and 68% in both contract in and out (Figure 34). Proportion of both contracting in and out is higher in medium category than micro or small ones. 100% firms are involved in some type of contracting and for sector code 24311 and 24320. Only for sector code 24319, 10% firms are not involved in any kind of contracting.

Large Enterprises

The pattern is not different among the large enterprises. Here 3% firms are not involved in any type of contracting while 27% of large firms contract in, 4% contract out and 68.4 % both contract in & out (Figure 35).

It is yet to see whether the predominance of contractual relations help raise, productivity, innovation, capital investment, business growth or the growth of the industry in general through bringing about dynamism of product and process innovations, exploring new markets and so on. Some of these issues are raised below.

4. Productivity, capital intensity and contracting

(i) Productivity of the informal sector MSMEs (NSSO)

It is already mentioned that in the informal sector there is no medium-sized enterprises engaged in casting of metals, only micro and small enterprises are found. All the three 5-digit subsectors has almost same labour productivity among macro enterprises varying between Rs 0.72 Rs lakh to 0.99 Rs lakh (Figure 36).

For small enterprise segment, only sector other iron & steel casting & products (24319) has productivity which is highest among micro and small enterprises of informal sector (Rs. 3.41 Rs lakh).

Figure 36 : Value added per labour of micro enterprises in Manufacture of Casting of Metals Industries (NSSO 2010-11)

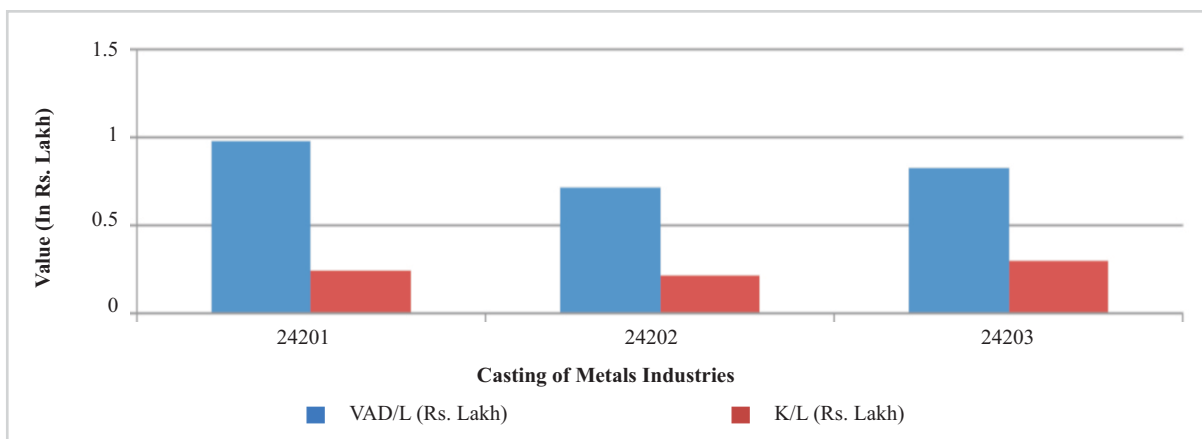
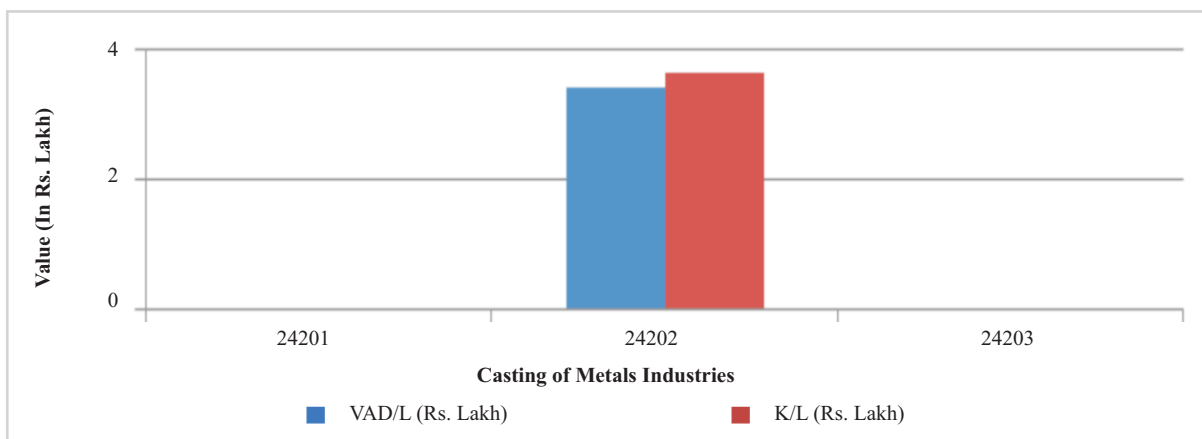


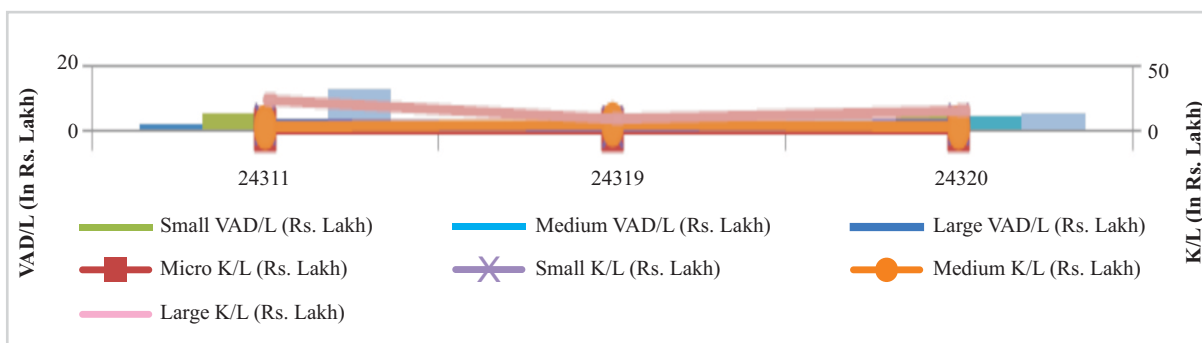
Figure 37 : Value added per labour of small enterprises in Manufacture of Casting of Metals Industries (NSSO 2010-11)



(i) Productivity of MSMEs belonging to formal sector (ASI)

Following table describes the productivity as well as capital intensity across size-classes of enterprises engaged in the casting of metals. Productivity is measured in terms value added per labour and capital intensity is measured in terms of value of fixed capital (excluding land and building) per unit labour. It may be seen in the table that there is a tendency towards rise in VAD/L and K/L with increase in size classes. However within a size class productivity variation across subsectors appears to have no direct relation with the capital to labour ratio.

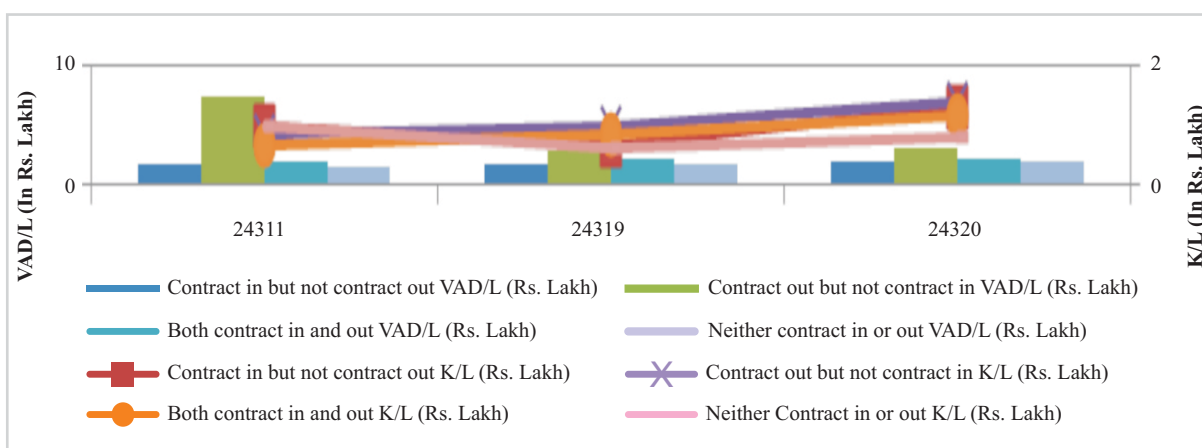
Figure 38 : Value added per labour & capital labour ratio of the MSMEs in Casting of Metal Industries (ASI-2009-10)



Productivity of Micro Enterprises

In the case of registered or formal sector highest productivity of the micro enterprises is found in the sub-sector casting of tubes, pipes & hollow profiles (24311) with the value added per labour being Rs 2.11 lakh (Figure 38). Also, this subsector has moderate capital labour ratio. A large section of these micro enterprises are found to have contracted in and productivity is found very high in case of enterprises involved in contract out but not contract in which is Rs. 7.39 lakh (Figure 38.1). For the remaining subsectors it is approximately same varying between Rs 1.95 lakh in case of sector 24319 Rs 1.99 lakh in case of sector 24320.

Figure 38.1 : Contract, value added and productivity in Micro Enterprises casting of Metals Industries

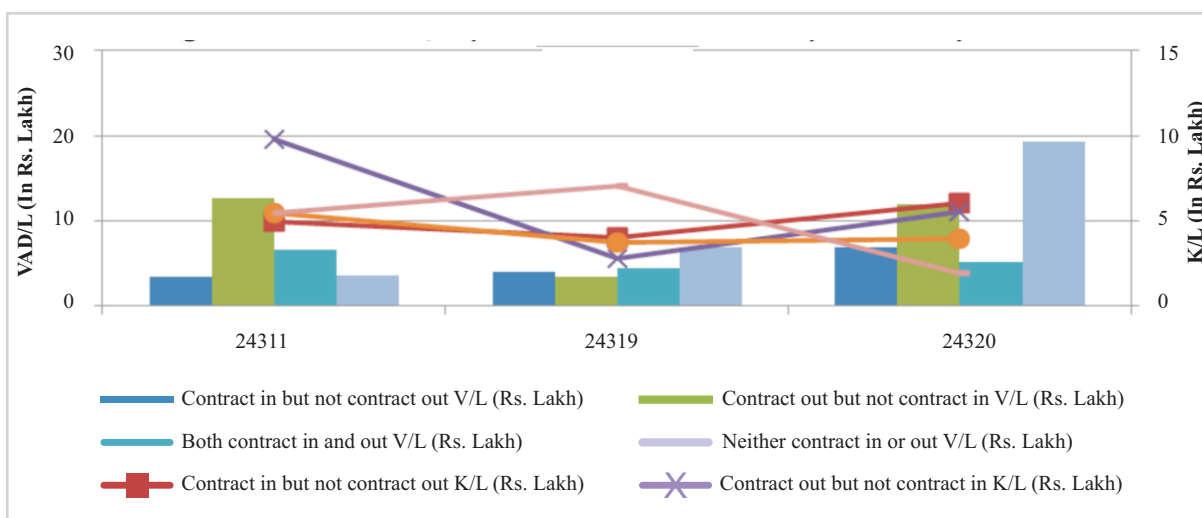


Source: Own estimates based on ASI, 2009-10 data

Productivity of Small Enterprises

Labour productivity of the small enterprises is generally quite higher than that of the marginal enterprises. The subsector having highest productivity of small enterprises is found in sector code 24320 with value added per labour being Rs 6.26 (Figure 38.2). Each sectors have significant productivity between Rs 4.22 lakh to 6.26 lakh. As mentioned earlier, higher presence of small enterprises is found in the subsectors 24319 where a large proportion of these enterprises are also involved in contracting who often have high productivity of labour as well as capital labour ratio.

Figure 38.2 : Contract, capital intensity and labour productivity in Small Enterprises Casting of Metal Industries



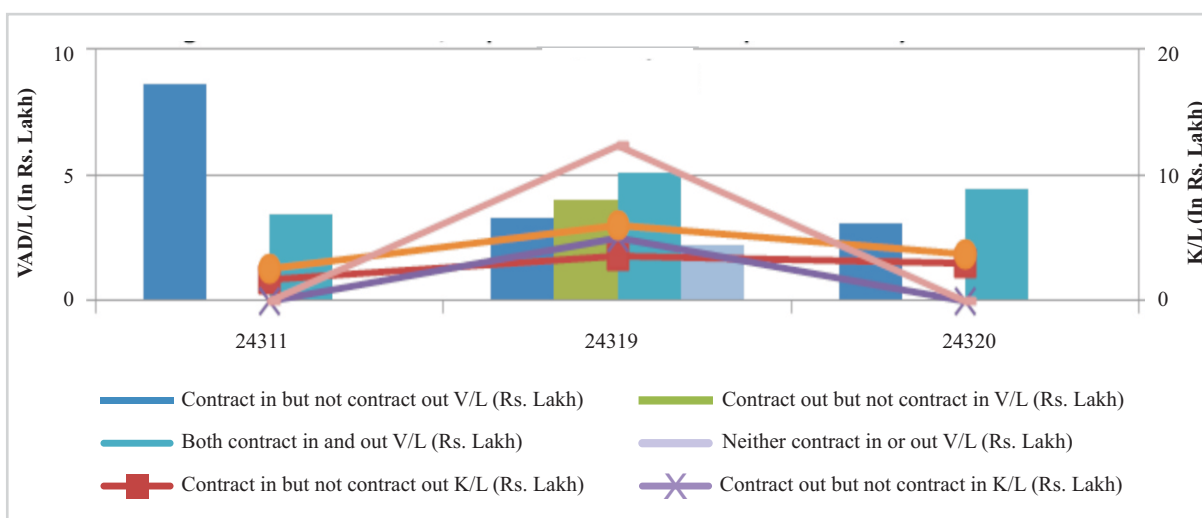
Source: Own estimates based on ASI, 2009-10 data

Productivity of medium enterprises

There is very narrow variation of productivity across subsectors among the medium sized enterprises. It varied from Rs 4.08 lakh for sector 24311 to Rs 4.29 lakh for sector 24319 (Figure 38.3). However, there is substantial variation in capital intensity which is highest for sector 24319. Among medium sized enterprises, the highest labour productivity is in case of contract in enterprises which is Rs 8.58 lakh for sector 24311.

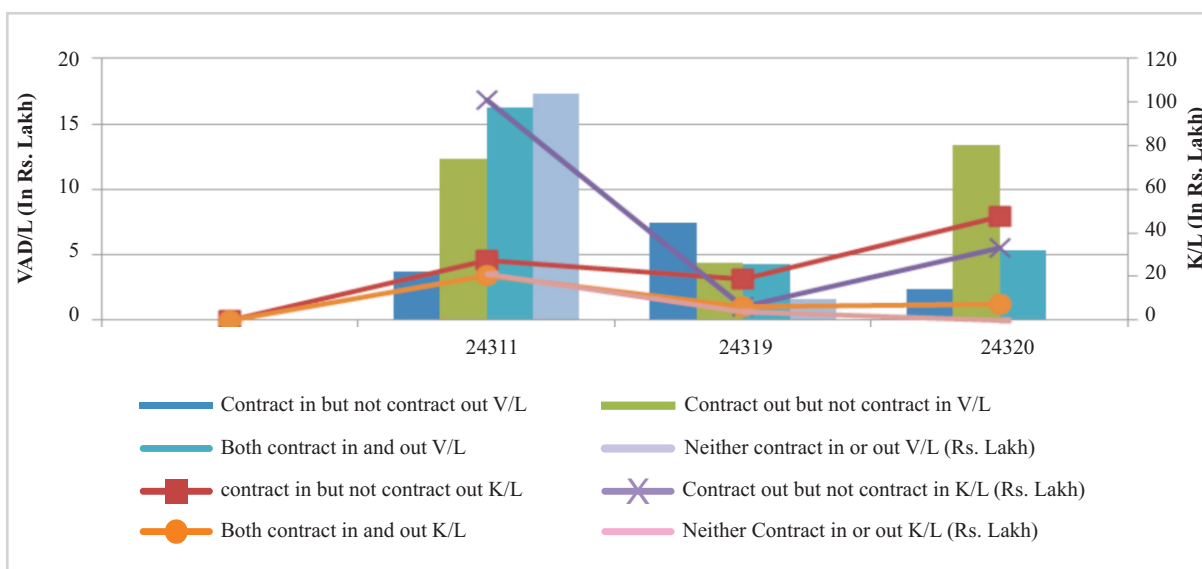
Further, among the contracting large firms, the highest productivity is of sector 24311 having Rs 13 lakh with high capital labour ratio of Rs 24.51 lakh

Figure 38.3 : Contract, capital intensity and productivity on Medium Enterprises Casting of Metal Industries



Source: Own estimates based on ASI, 2009-10 data

Figure 38.4 : Contract, capital intensity and productivity of Large Enterprises

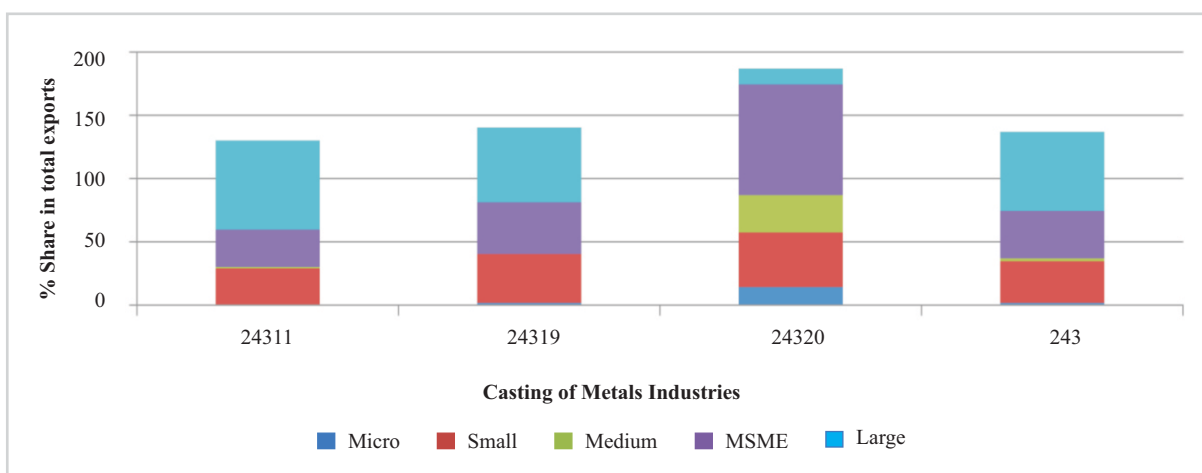


Source: Own estimates based on ASI, 2009-10 data

5. Presence of MSMEs in ASI Exports

The share of micro enterprises in total export in ASI is quite low. Only for the sector casting of non-ferrous metals (24320) has a reasonably high export share of 14.51%. The share of small enterprises in total export is significantly higher than that of the micro and medium enterprises. The highest percentage share is 42.42% for the sector casting of non-ferrous metals (24320). Other sectors' shares vary between 29 to 38%. In the case of medium enterprise, out of three sectors, only one sector has significant share in total export. The highest share of 30 % is found for the sector casting of non-ferrous metals (24320). For other two sectors it is even less than 1%. Among large enterprises, sector 24311 has the highest export share of 70.5% and next to it is sector 24319 with 59% export share (Figure 39). In brief, large sector enterprises are dominating in exports with total share of 63.12% in product category casting of metals (243).

Figure 39 : Contribution of firms in total export of each five digit code of Casting of Metal Industries



Source: Own estimates based on ASI, 2009-10 data

6. Age wise pattern of contractual linkages

On the basis of age-wise contractual linkages among micro enterprises, it can be said that almost 83% of the enterprises are involved in contractual relationship. Among these, micro enterprises are found in almost each age group starting from 1 year (Table 40). Among new enterprises, a majority of enterprises are involved in contracting.

Among small enterprises of Casting of metals (243), the majority of enterprises are in contractual relationship with other enterprises. Out of total 688 enterprises, 206 are in 'contract in but not contract out' relationship having share of 23%, while for other enterprises

majority are operating as 'both contract in and out' (556) (Table 40.1). Therefore, as much as 92% of enterprises are involved in contracting. In term of Age wise contractual relationship, small enterprises are found in almost each age group and even in age group of 1 year. Here it is interesting to note that there is 100% contractual relationship among enterprises in the age group of larger than 50 years.

Among medium enterprises of Casting of metals (243), the majority of enterprises are in contractual relationship with other enterprises as 'both contract in and out'. Almost 93% of the enterprises are in contractual relationship. Out of total 68 enterprises, 15 are in 'contract in but not contract out' relationship while 46 are as 'both contract in and out' (Table 40.2). There are least number of enterprises in 'contract out but not contract in' category. In term of Age wise contractual relationship, majority of enterprises are in the age category starting from 6 years till 50 years of age.

Out of 134 large enterprises in casting of metals, 97 are involved in contracting (Table 40.3). As regards age wise contractual relationship, large enterprises are in the age category starting from 2 years till greater than 50 years.

Table 40 : Age wise distribution of contractual linkages of Micro Enterprises in Manufacture of Casting of Metal (243)

Age	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out
	Tubes, pipes and hollow profiles & pipe fittings of cast iron/cast steel (24311)				Other iron and steel casting and products thereof (24319)			
0								
1		1	5		5	5	6	
2	2	5					9	1
3	1		5		1		15	5
4			11		6		8	
5	14		5		8		5	5
6 to 10	11	5	15		42	1	35	25
11 to 15	20	6	10	21	68	25	55	
16 to 20	21			25	55	5	50	10
21 to 30	29	5	21	14	97	11	37	41
31 to 50	23		25	10	58	15	72	40
>50			5	5	10	6	11	11
Total	121	22	102	75	350	68	303	138

	Casting of non-ferrous metals (24320)							
0								
1								
2	4							
3	5			5				
4	4							
5	5		5					
6 to 10	5			5				
11 to 15	5		5					
16 to 20	15		5	6				
21 to 30			5					
31 to 50								
>50	5							
Total	48	0	20	16				
Total Micro Enterpri- ses	519	95	486	229				

Source: Own estimates based on ASI, 2009-10 data

Table 40.1 : Age wise distribution of contractual linkages of Small Enterprises in Manufacture of Casting

Age	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out
	Tubes, pipes and hollow profiles & pipe fittings of cast iron/cast steel (24311)				Other iron and steel casting and products thereof (24319)			
0								
1	4	2			7			7
2	6	5	6		6		11	5
3	10		6	5	13	1	31	7
4	1		15	1	5		10	
5	11						33	
6 to 10	16		19	5	14	15	73	5
11 to 15	5		32	5	26	10	58	6
16 to 20	11		6	5	10	1	46	
21 to 30	8		7	15	17	8	64	2
31 to 50	1		4		11	6	31	
>50			1		13		8	
Total	73	7	96	36	122	41	365	32

	Casting of non-ferrous metals (24320)							
0								
1								
2			6					
3	5		6					
4			1					
5			10					
6 to 10	6		18					
11 to 15			13	5				
16 to 20			2					
21 to 30			24					
31 to 50		5	7					
>50	0	0	8					
Total	11	5	95	5				
Total Micro Enterprises	206	53	556	73				

Source: Own estimates based on ASI, 2009-10 data

Table 40.2 : Age wise distribution of contractual linkages of Medium Enterprises in Manufacture of Casting of Metals (243)

Age	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out
	Tubes, pipes and hollow profiles & pipe fittings of cast iron/cast steel (24311)				Other iron and steel casting and products thereof (24319)			
0								
1								5
2							1	
3					6		2	
4								
5					5			
6 to 10			1					
11 to 15			1			1	2	
16 to 20			2				5	
21 to 30	1		2				11	
31 to 50			1		2	1	3	
>50							6	
Total	1		7		13	2	30	5

	Casting of non-ferrous metals (24320)							
0								
1								
2								
3	1							
4								
5								
6 to 10			1					
11 to 15			1					
16 to 20			2					
21 to 30			3					
31 to 50			2					
>50	0							
Total	1		9					
Total Micro Enterpri- ses					15	2	46	5

Source: Own estimates based on ASI, 2009-10 data

Table 40.3 : Age wise distribution of contractual linkages of Large Enterprises in Manufacture of Casting of Metals (242)

Age	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out	contract in but not contract out	contract out but not contract in	both contract in and out	neither contract in or out
	Tubes, pipes and hollow profiles & pipe fittings of cast iron/cast steel (24311)				Other iron and steel casting and products thereof (24319)			
0								
1					3			1
2	2						2	
3	1						1	
4					1	1	6	
5			1				1	
6 to 10	1		3		11		2	
11 to 15	1	1	4	2			5	
16 to 20	1		4		1		8	
21 to 30			2		3	1	9	1
31 to 50	1		5		7	1	17	
>50			2		1		8	
Total	7	1	21	2	27	3	59	2

	Casting of non-ferrous metals (24320)							
0								
1	1							
2								
3	1							
4			1					
5			2					
6 to 10		1						
11 to 15			3					
16 to 20								
21 to 30			1					
31 to 50			2					
>50								
Total	2	1	9	0				
Total Large Enterprises	36	5	89	4				

Source: Own estimates based on ASI, 2009-10 data

1. Regional dispersion of the casting of metals industries

Casting of metals industries comprising both casting of iron & steel and casting of non-ferrous metals are not spatially dispersed all over country rather concentrated mainly in fourteen states. Out of these states, six states namely Maharashtra, Gujarat, Tamil Nadu, West Bengal, Karnataka and Andhra Pradesh, account for over 80% of GVA of the sector. The other states are Jharkhand, Haryana, Punjab, Chhattisgarh, Uttar Pradesh, Rajasthan, Uttarakhand and Madhya Pradesh. Together they share 98.44% of GVA (Table 41). Since for the casting of these products the raw material used are iron and steel metal ingots and non-ferrous metals (Al, Zn, Cu etc) ingots, it is evident that the leading states in this sector are also leading states in sector basic iron and steel industries (241) and manufacture of basic precious and other non-ferrous metals (242).

In states like Jharkhand, Chhattisgarh, Uttaranchal, Andhra Pradesh, Gujarat and West Bengal, there is domination of big enterprises in this sector and their GVA share ranges between 71 to 92%. However, out of these five states, three states Uttaranchal, Chhattisgarh and Jharkhand, the GVA share of micro enterprises is minimal ranging between 0.21 to 0.93%. The reason might be the monopoly of big public and private players in these states. In small enterprise segment, the states having fair presence are Rajasthan with 74% GVA share and Karnataka with 45% GVA share (Table 41).

Table 41: State wise distribution of Casting of metals (243)											
	Micro		Small		Medium		Large		Total		
State	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	% of total state GVA	No. of Enterp-rises	Total GVA (Rs. Crore)	% Distribution of GVA across states
Punjab	196	15.63	49	26.50	2	21.14	2	36.61	249	254	2.56
Uttaranchal	1	0.21	8	6.53	1	5.30	2	88.14	12	118	1.19
Haryana	28	3.95	26	36.84		0.00	3	59.54	57	304	3.07
Rajasthan	76	10.00	43	74.43		0.00	8	15.85	127	176	1.77
U.P.	109	8.75	36	31.29		0.00	8	59.93	153	272	2.74
West Bngal	175	10.10	47	15.00	2	3.95	8	70.90	232	780	7.86
Jharkhand	14	0.93	10	7.28		0.00	2	91.64	26	335	3.38
Chattisgarh	7	0.83	7	8.67	1	1.06	4	89.58	19	240	2.42
M.P.	9	2.49	25	20.94	1	25.30	3	51.09	38	82.6	0.83
Gujarat	306	5.65	151	15.38	9	4.51	17	74.56	483	1690	17.04
Maharashtra	121	1.81	170	29.63	17	7.77	25	60.80	333	3010	30.35
Andhra	65	6.58	37	10.26	10	4.36	13	78.87	125	459	4.63
Karnataka	83	7.23	72	45.13	10	23.78	8	23.97	173	534	5.38
Tamil Nadu	102	4.15	166	38.41	12	6.56	29	50.66	309	1510	15.22

Source: Own estimates based on ASI, 2009-10 data

Among six states with high share of GVA, Maharashtra has highest productivity (Rs. 5.12 lakh per labour) with moderate capital intensity (Rs 3.93 lakh per labour) (Table 42). The productivity of all these states vary between Rs. 2.11 lakh and Rs 5.12 lakh excepting Punjab which has productivity of Rs. 1.6 lakh. The capital intensity is highest for Uttaranchal (Rs 14.47 lakh per labour) with major contribution coming from small sectors in these states. The productivity of large enterprises is on higher side as compared to MSMEs.

The proportion of contracting enterprises in this group of industries is very high irrespective of size and location. It is 100% for medium enterprises in all 14 states except Andhra Pradesh for which it is 50%, and 100% for large enterprises for all above mentioned states except Gujarat (88%) and Maharashtra (92%). All the top six states with high GVA share, have contractual relationships varying between 87 to 99%. Among micro enterprises, 100% contractual relationship is found in states of Uttaranchal, Madhya Pradesh, Karnataka and Tamil Nadu (Table 43). Among small scale enterprises, 100% contractual relationship is found in Haryana, UP, Jharkhand and Andhra Pradesh.

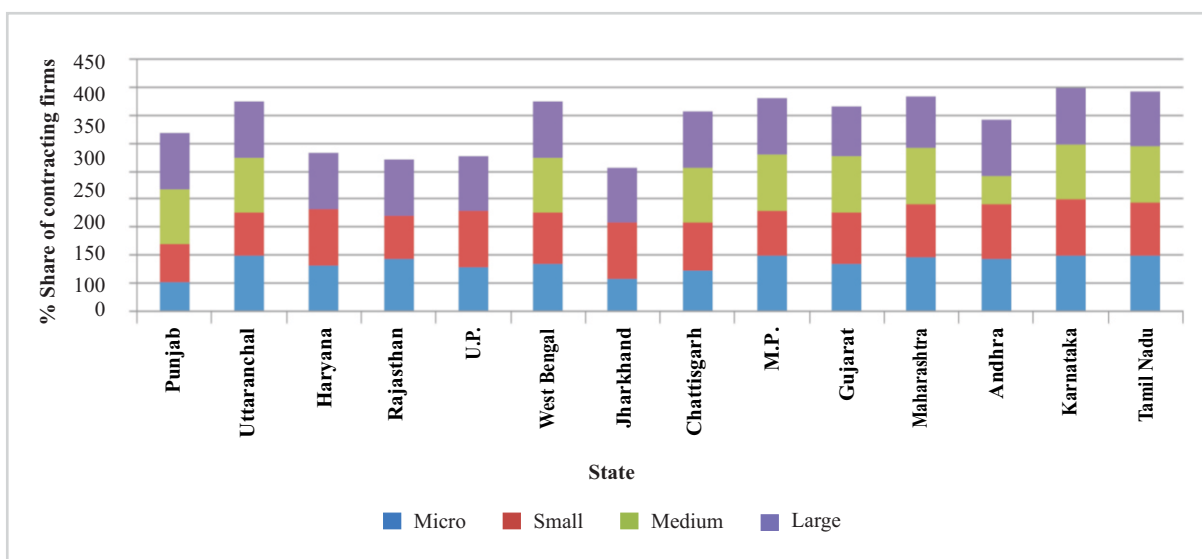
Share of export is highest for Maharashtra which is 38.62% (Table 44). The other state having significant export share is Gujarat. Remaining states have single digit export share. All firms involved in exporting are in contractual relationship.

<i>Table 42: Labour productivity and capital intensity in Casting of metals (243)</i>										
	Micro		Small		Medium		Large		Total	
State	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)
Punjab	1.44	0.95	1.94	2.29	6.53	1.69	4.39	7.43	1.60	1.27
Uttaranchal	1.74	1.50	4.17	19.48	3.09	2.93	5.73	6.69	4.14	14.47
Haryana	1.88	0.68	7.09	9.93	0.00	0.00	12.87	6.43	4.83	5.20
Rajasthan	1.60	0.65	5.26	7.58	0.00	0.00	1.17	14.05	2.82	3.84
U.P.	1.58	0.78	5.26	5.36	0.00	0.00	12.73	23.83	3.03	3.07
West Bengal	2.38	0.64	4.82	4.41	3.14	2.19	5.19	6.21	2.98	1.61
Jharkhand	1.61	0.70	5.12	7.01	0.00	0.00	10.78	6.66	3.67	3.58
Chattisgarh	2.11	0.57	3.11	1.29	1.96	16.86	7.83	3.88	3.67	2.39

	Micro		Small		Medium		Large		Total	
State	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)	VAD/L (Rs. Lakh)	K/L (Rs. Lakh)
M.P.	1.15	0.31	2.15	4.25	3.79	2.68	4.11	26.65	2.11	5.04
Gujarat	1.99	0.85	4.00	3.77	3.39	3.93	10.25	10.20	2.94	2.15
Maharashtra	1.93	0.71	6.47	3.70	5.81	3.26	10.96	21.51	5.12	3.93
Andhra	2.80	1.09	4.74	4.07	2.94	14.04	4.00	13.47	3.51	4.29
Karnataka	2.30	0.99	5.27	3.03	5.59	4.72	2.43	2.32	3.73	2.12
Tamil Nadu	2.41	0.98	4.60	4.28	2.95	3.07	5.19	10.17	3.87	3.70

Source: Own estimates based on ASI, 2009-10 data

Figure 40 : State wise contractual relationship of Casting of Metal Industries



Source: Own estimates based on ASI, 2009-10 data

Table 43: State wise contractual relationship of Casting of metals (243)					
	Micro	Small	Medium	Large	Total
State	Contractual firms as % of total firms	Contractual firms as % of total firms	Contractual firms as % of total firms	Contractual firms as % of total firms	Contractual firms as % of total firms
Punjab	51.53	67.35	100.00	100.00	55.42
Uttaranchal	100.00	75.00	100.00	100.00	83.33
Haryana	82.14	100.00	-	100.00	91.23
Rajasthan	93.42	76.74	-	100.00	88.19
U.P.	77.98	100.00	-	100.00	84.31
West Bengal	85.71	89.36	100.00	100.00	87.07
Jharkhand	57.14	100.00	-	100.00	76.92
Chattisgarh	71.43	85.71	100.00	100.00	84.21
M.P.	100.00	80.00	100.00	100.00	86.84
Gujarat	83.33	93.38	100.00	88.24	86.96
Maharashtra	95.87	96.47	100.00	92.00	96.10
Andhra	92.31	100.00	50.00	100.00	92.00
Karnataka	100.00	98.61	100.00	100.00	99.42
Tamil Nadu	100.00	93.37	100.00	100.00	96.44

Source: Own estimates based on ASI, 2009-10 data

Table 44: State wise Export of Casting of metals (243)

State	Micro		Small		Medium		Large		Total		
	% share of state in total Export	% of export-ing firms in contrac-tual relatio-nship	% share of state in total Export	% of export-ing firms in contrac-tual relatio-nship	% share of state in total Export	% of export-ing firms in contrac-tual relatio-nship	% share of state in total Export	% of export-ing firms in contrac-tual relatio-nship	No. of export-ing firms	Share of total Export	% of export-ing firms in contrac-tual relatio-nship
Punjab	73.15	100	26.64	100	0.00	-	0.00	-	10	1.10	100
Uttaranchal	-	-	-	-	-	-	-	-	0	0.00	-
Haryana	0.00	-	100.00	100	0.00	-	0.00	-	6	3.84	100
Rajasthan	0.00	-	12.12	100	0.00	-	87.88	100	2	1.22	100
U.P.	14.48	100	25.57	100	0.00	-	60.00	100	16	1.55	100
West Bengal	12.72	100	20.76	100	0.00	-	66.45	100	12	4.45	100
Jharkhand	-	-	-	-	-	-	-	-	0	0.00	-
Chattisgarh	0.00	-	100.00	100	0.00	-	0.00	-	1	0.07	100
M.P.	-	-	-	-	-	-	-	-	0	0.00	-
Gujarat	0.00	-	81.46	100	2.79	100	15.67	66.67	11	13.17	90.91
Maharashtra	0.00	-	11.86	100	1.70	100	86.40	85.71	35	38.62	97.14
Andhra	0.00	-	26.19	100	0.00	-	74.07	100	6	0.08	100
Karnataka	0.00	-	78.79	100	21.29	100	0.00	-	3	0.98	100
Tamil Nadu	0.00	-	31.89	64.29	1.54	100	66.59	100	21	34.11	76.19

Source: Own estimates based on ASI, 2009-10 data

In sum, the industry on the average has relatively high level of capital intensity, labour productivity and contract density or inter-linkages, which is quite consistent with the high shares of medium, high and advanced technology units and also may explain the growth and innovations made by the sector, as noted in term of the increase in the number of units belonging to medium, high and advanced technology groups based on composite index in Chapter 3. It is also noted in Chapter 3 that there has been substantial increase in the number of MSMEs as well as their technology levels, high and advanced technology levels, which may be explained by the inter-linkages among and large and small enterprises, exports by many SMEs, as well as high labour productivity of the SMEs in several 5-digit industry groups indicating the use of high skilled labour, facilitating innovations and growth.

Chapter 4

Technology innovations in basic metal industries

Technology innovations lead to changes in the level of technology. There are however multiple ways of measuring the technology levels; such measurement is informed by and also determined by for example, what type of machinery is being used and hence what level of embodied knowledge is employed; what are the components with which the machine as well as the product is made of, what are the material inputs, and labour inputs or the skills engaged and what kind of energy source or motive force is required to operate the machineries, and what are the outcome of the use of the technology embodied machine/product in terms of output per labour or per unit of material inputs, what is the grade of product quality, and the export performance or market share of the products or types of contractual or quasi-contractual linkages of the enterprise. Biswas and Banerjee (2014) has developed a simplified approach to measure technology levels of enterprises, distribution of enterprises across technology levels for industry, sector, region or size class of enterprises in a given year. Temporal changes in the distribution, as suggested by Biswas and Banerjee (2014), would reflect innovations. Methodology used by these authors to measure innovations is summarized as below.

The relevant parameters for identifying technology level of manufacturing units have been clubbed into three broad groups; namely (1) those related to inputs, (2) those related to capital and (3) those related to output.

(1) Input related parameters as available from our dataset, are about the extent of the use of white collar managerial and supervisory staff, contract labour, use of imported inputs and wage-rates paid to workers; (2) similarly, the capital related parameters are about the extent of land and building assets, capital per unit labour, number of manufacturing units owned by a firm and share of productive non-land assets such as plant and machinery, tools and equipment, ICT capital etc in total assets; and (3) output related parameters are about output per labour, value added per labour, contract work, export orientation of production and sale of others' products.

Each parameter represents a scale for technology commitment levels and on one such point of this scale resides the value of the particular dimension of technology of the manufacturing unit/enterprise under consideration. It is being assumed that since all parameters reflect investment, which is homogeneous and therefore scalar additive, the summation of such values of all the parameters constituting a group, for a manufacturing unit, denotes the unit's technology commitment level for the particular group of technology indicators. Thus each group of technology parameters represents a pillar of technology and the pillar is indexed corresponding to seven levels of technology, namely, very low, low, lower medium, medium, higher medium, high and advanced technologies. Combining the values of all the three pillars, namely input pillar, capital pillar and output pillar, and through simple averaging a consolidated index of technology is formed⁴. For the consolidated index also the same seven point technology scale is used. These

three pillars of technology together with the consolidated index help us to understand the status of the present level of commitment to technology and the degree of technological advancement that has happened in Indian manufacturing over a decadal period.

1. Input Pillar: This index is created taking into account the share of contractual labour, share of employees involved in managerial work and supervision, share of imported input in a factory unit and the wages per employee. For each of these four parameters appropriate scale is set denoting technology levels. A detailed description of the scaling is given below:

i. *Share of contractual workers:* It measures the percentage of total workers employed through contractor, and not directly by the factory. An index denoting technology level is assigned to a range of values. An enterprise with no contractual worker is assigned a value of 7; an enterprise with a share of contractual workers up to 15% is assigned a value of 6, in the range 15-30% is assigned a value of 5, 30-45% a value of 4, 45-60% a value of 3, 60-80% a value of 2 and more than 80% the value of 1. An enterprise with fewer contractual workers is expected to be technologically more advanced than an enterprise with larger number of contractual workers because in general an advanced technology would require machine/process specific skill/ knowledge and hence retained longer-tenured and thus more dedicated skilled workers. Often advanced technology reduces demand for labour hands while however, knowledge-intensity increases and such knowledge/skill are unlikely to be available in a local spot market readily. Shorter job duration or frequent change in job does not allow a worker to accumulate enough work experience or skills. Further, with retained long-term worker an enterprise pays for and most often, higher wages including on social security. In other words, an enterprise commits in general higher investment on regular/permanent worker. Thus higher the level of technology of an enterprise, the higher would be the percentage share of permanent employees.

ii. *Share of employees involved in managerial work and supervision:* It measures the percentage of total employees involved in non-shop floor managerial and supervisory work or the white collar jobs of a factory unit. Different indices are assigned to different range of values in this case as well. Enterprises with a share of white collar employees up to 10% of employees are assigned an index value of 1, with a share of 10-20% a value 2, 20-30% a value 3, 30-40% a value 4, 40-50% a value 5, 50-60% a value 6 and more than 60% a value 7 is assigned. An enterprise using advanced technology is likely to emphasise on design, quality control and maintenance, and marketing and distribution, servicing including provisioning for spare parts of products, accounting and finance, and thus such an enterprise employs more designers, supervisory, managerial and marketing staff. Managerial and supervisory staff are important for coordination and smooth functioning of various departments of the manufacturing unit.

iii. Share of imported inputs: It measures the proportion of imported inputs in total inputs used by a factory unit. An enterprise with a share of imported inputs up to 10% is assigned an index value 1, with a share of 10-20% a value 2, 20-30% a value 3, 30-40% a value 4, 40-50% a value 5, 50-60% a value 6 and more than 60% a value 7 is assigned. An enterprise with a higher share of imported input is more likely to produce specialized high quality product by using high technology.

iv. Wage per employee: This figure is obtained as the ratio of the total amount of wages paid in an enterprise and the total number of employees in the enterprise in a year. Indices of technology levels are assigned to enterprises corresponding to the different range of values of this parameter. An index 1 for values less than Rs 25000, 2 for values between Rs 25000-50000, 3 for Rs 50000-100000, 4 for Rs 1- 2 lakh, 5 for Rs 2 -5 lakh, 6 for Rs 5 -10 lakh and 7 for values above Rs 10 lakh. A firm which is technologically advanced is likely to employ more skilled people and pay higher wages. Higher wage also reflects higher productivity.

Input Pillar: It may be seen the four different parameters indicate technology in different ways and although all the parameters may not be equally important while denoting technology level of different size classes or industry sectors, we have combined them by taking their simple average. Combination of the four parameters, however more accurately captures the technology commitment level in so far as the use of inputs is taken into account. Thus, simple averaging the values of all the four indices for a manufacturing unit would provide the group index for the input technology commitment pillar. For convenience, we set scales from 1 to 7 as follows: average value 1 is very low technology (level 1); average value more than 1 up to 2 is low technology (level 2), more than 2 up to 3 is lower medium technology (level 3), more than 3 up to 4 is medium technology (level 4), more than 4 up to 5 in higher medium technology (level 5), more than 5 up to 6 is high technology (level 6) and above 6 is advanced technology (level 7).

- 2 Capital pillar:** This index is created taking into consideration the values of land and building assets of a firm, share of plant & machinery, tools & equipment, ICT capital etc in total asset, number of factory units owned by the firm and capital per unit labour. For each of the four parameters relevant technology scale is assigned. A detailed description of the scaling is as under:

i. Land and building assets of a firm: Possession of high valued land and building assets shows creditworthiness or solvency of the enterprise capable of installing latest machinery and equipment, and investing in R&D activities leading to modernization of technology. Thus larger the value of land and building, the larger is the probability of installing higher technology equipment. Corresponding to different ranges of values of land and building assets unique index numbers have been assigned to denote commitment to the technology level. An index value of 1 is assigned to land and building asset values less than Rs 1 lakh, 2

for values ranging between Rs 1–5 lakh, 3 for values ranging between Rs 5-25 lakh, 4 for values between Rs 25-100 lakh, 5 for values from Rs 1-5 crore, 6 for values between Rs 5-25 crore, and 7 for values exceeding Rs 25 crore.

ii. Capital per labour: Value of productive assets, consisting of plant and machinery, tools and equipment, etc, per unit of labour indicates capital intensity, and higher is the capital intensity the higher is the expected level of technology. Higher capital intensity is generally assumed to be associated with higher labour productivity. Index values are assigned corresponding to different ranges of the productive assets per labour. Index value of 1 is assigned for capital labour ratio upto Rs 25000, 2 for Rs 25-50 thousand, 3 for Rs 50-100 thousand, 4 for values ranging between Rs 1-5 lakh, 5 for values between Rs 5-25 lakh, 6 for values between Rs 25-100 lakh and 7 for values greater than Rs 1 crore. Here capital includes all the fixed assets other than land and building.

iii. Number of factory units: An enterprise with more than one operating factory units is usually large in size, and cater to several markets and therefore, in Schumpeterian sense of the technology which includes organizational and managerial knowledge, such an enterprise is likely to be committed to advanced technology. This might be also due to the fact that such an enterprise uses economy of scale with upgraded technologies and is likely to manufacture better quality and larger quantity or large varieties of products catering to larger markets facing increased competition. Index values corresponding to number of factory units have been created as follows: Index 1 is assigned if number of factory units is 1, index 2, 3, 4, 5, 6 are assigned to firms having 2, 3, 4, 5 and 6 factory units respectively and index 7 is assigned to firms with factory units equal to or greater than 7.

iv Share of non-land assets in total assets: The percentage share of non land assets in total assets also proves to be useful in assessing the technological level of a manufacturing unit. Compared to asset category of land and building whose value does not increase owing to labour or technology, other assets like plant and machinery, tool and equipment, ICT capital, and other instruments whose value can be enhanced with intensified labour and technology, the latter group of asset is industrially productive and the technology is embodied in these assets rather than in land and building. Thus a firm with a higher share of non land assets is assumed to be better off technologically than its counterpart. Different index values were assigned to the share of non land assets in total assets. An index value of 1 is assigned for the factory unit/enterprise with a share of non land assets in total assets less than 15%, 2 for the shares between 15-30%, 3 for the shares between 30-45% and 4 for with the shares between 45-60%, 5 for the shares between 60-75%, 6 for the shares between 75-90% and 7 for the shares greater than 75%.

Capital Pillar: Combining all the four indices into a single index, generates the group index relevant for the capital pillar. Here as in the input pillar, each of the four different parameters indicates technology level in a different way and all the parameters may not be equally important while denoting technology level of manufacturing units belonging to different size classes or industry sectors. But their combination captures the technology level of a manufacturing unit from multiple perspectives of technology commitment as appreciated through use of capital, such as the amount of productive assets like plant and machinery, tools and equipment used by a labour, possession of necessary mortgage-able assets like land and building to buy costly machinery, share of productive assets in total assets, etc. Simply averaging the values of all the four indices for a manufacturing unit would provide the group index necessary for the capital pillar. Similar to input pillar index, we set scales from 1 to 7 for the capital pillar index as follows: average value 1 is very low technology (level 1); average value more than 1 up to 2 is low technology (level 2), more than 2 up to 3 is lower medium technology (level 3), more than 3 up to 4 is medium technology (level 4), more than 4 up to 5 is higher medium technology (level 5), more than 5 up to 6 is high technology (level 6) and above 6 is advanced technology (level 7).

3. **Output pillar:** The level of technology used by a factory may be guessed indirectly through the outcome of the technology. Such outcome may be output per labour, value added per labour ratio of the value of goods sold at the same condition as purchased to total output, proportion of output exported, proportion of output produced under contract. Depending on the availability of information in the ASI database, following parameters are selected for the construction of the output pillar:

- i. **Value added per labour:** Higher value added per labour reflects higher level of technology commitment, such as investments made on modern machinery with latest technology or capital intensive technology. Index values corresponding to different ranges of VAD/labour are assigned to reflect technology levels as under: For the value added per labour less than Rs 25000 an index of 1 is assigned, for the range Rs 25-50 thousand index of 2 is assigned, for Rs 50-100 thousand index of 3 is assigned, for values ranging between Rs 1-5 lakh index of 4 is assigned, for values in the range of Rs 5-25 lakh index of 5 is assigned, for values ranging between Rs 25-100 lakh index 6 is assigned, and an index of 7 for values greater than Rs 1 crore.

- ii. **Output per labour:** Although this indicator is similar to value added per labour, there is a major difference for the smaller sized producers who operate with less margin but higher turnover. High competition especially from the large producers often compels them to sell their products at lower price and with lower margin of profit. But they survive with larger volume of production relative to their size. In this situation output per labour may be high despite their low value added per labour. Index values corresponding to different ranges of output per labour are assigned in order to reflect technology levels. For the output value per

labour less than Rs 25000 an index of 1 is assigned, for the range Rs 25-50 thousand index of 2 is assigned, for Rs 50-100 thousand index of 3 is assigned, for values ranging between Rs 1-5 lakh index of 4 is assigned, for values in the range of Rs 5-25 lakh index of 5 is assigned, for values ranging between Rs 25-100 lakh index 6 is assigned, and an index of 7 for values greater than Rs 1 crore.

iii. Contracting in work/work for others: An enterprise contracting in work from other enterprise probably uses a better technology than its counterpart contracting-out enterprise or from those who are not contracting-in similarly. Possibly an enterprise that regularly generates a good amount of revenue from contracting in manufacturing related activities may have set up specialized and dedicated plant and machinery to meet the quality standard of the buyer enterprise. Higher the percentage share of the revenue generated through contracting in of manufacturing activities to the total revenue, the higher would be the probability of having dedicated and specialized plant & machinery, skilled workforce, advanced process technology and other set up and so the technology level would be high. Different index values were allotted to the different ranges of these percentage shares of revenue. An index of 1 is assigned if the share is upto 5%, 2 is assigned if the share lies between 5 to 15%, 3 between 15-25%, 4 between 25-40%, 5 between 40-60%, 6 between 60-80% and 7 for values exceeding 80%.

iv. Value of goods sold in the same condition as purchased: This category of product includes the goods that an enterprise buys from a third party vendor and markets the same together with selling own products. (It also includes some raw materials sold on the same condition as purchased. All sales of a factory can be classified according as to whether the sale is (i) of the product of the factory, (ii) of goods incidental to manufacturing, and (iii) other items not connected with manufacturing. The present parameter will relate sum of the goods of (ii) and (iii) above, which are sold in the same condition as purchased, i.e., without any transformation. It further includes the value of sales of goods normally consumed by the factory when sold as purchased as well as the sale value of goods brought expressly for resale). The reselling is probably done in order to overcome diseconomies of smaller scale transactions of own goods and the enterprise is not in a position to raise own production. An enterprise which holds less share of such goods in total output is probably technology efficient; this is because an enterprise if technologically self-sufficient and advanced would seldom involve in marketing goods manufactured by other. Various index values are allotted to the different ranges of percentage share of this category of goods in total output. An index value of 7 if the share is 0%, 6 if share is up to 10%, 5 for 10-25%, 4 for 25-35% , 3 for 35-50%, 2 for 50-75% and 1 for shares exceeding 75%.

Output Pillar: Combining all the four indices into a single index generates the group index relevant for the output pillar. Here, as in the previous two cases, four different parameters indicate technology level in different ways from each other and further all the parameters may

not be equally important while denoting technology level of manufacturing units belonging to different size classes or industry sectors. But they together capture the technology level of a manufacturing unit from a variety of perspectives of output, such as the amount of output per labour, amount of value added per labour, proportion of contracting in work in relation to total output, or proportion of others' products sold to total own production. Taking average of the values of all the four indices for a manufacturing unit would provide the group index necessary for the output pillar. Similar to the previous two cases, we set scales from 1 to 7 for the output pillar index as follows: average value 1 is very low technology (level 1); average value more than 1 up to 2 is low technology (level 2), more than 2 up to 3 is lower medium technology (level 3), more than 3 up to 4 is medium technology (level 4), more than 4 up to 5 in higher medium technology (level 5), more than 5 up to 6 is high technology (level 6) and above 6 is advanced technology (level 7).

Combined Index: After obtaining the indices for input pillar, capital pillar and output pillar for each factory unit a combined index is generated by taking simple average of the index values of the three pillars of technology. The criteria of indexing technology levels is the same as used for the individual pillars: average value 1 is very low technology (level 1); average value more than 1 up to 2 is low technology (level 2), more than 2 up to 3 is lower medium technology (level 3), more than 3 up to 4 is medium technology (level 4), more than 4 up to 5 in higher medium technology (level 5), more than 5 up to 6 is high technology (level 6) and above 6 is advanced technology (level 7).

In order to get a clear idea about the technological innovation in the metal industries we have taken into consideration all the three pillars together with the combined index for different size classes of manufacturing units at 3-digit level of disaggregation. of the basic metal groups. Resultant estimates are presented in Figure 41 through 48 as displayed below. It may be seen in the figures that as much as 55% of the enterprises in basic metal industries fall under the medium level technology which is followed by the higher medium technology (41%). It is also clear that a very few enterprises under this category fall under high and advanced technology level. Nonetheless combined index suggests some improvement in technology over the decade as there was some upward movement of enterprises along the technology ladder. Now the number of enterprises in each of the medium, higher medium and high technology groups is higher whereas it is lower in the lower medium technology group. This improvement has, however, taken place across size classes of enterprises. Output pillar index as well as capital pillar index also reveals almost a similar the pattern of technology innovations. Further, there has been upward movement of the enterprises along the size ladder – the number of micro enterprises declined and that of small, medium and large enterprises increased.

In fact, most of the enterprises in Iron and steel industry belong to the medium and higher medium level technology category, and such a scenario points towards the fact the Iron and steel sector is yet to adopt high and advanced technology for production. This sort of scenario is marked in case of input, capital, output as well as the combined indices. Input index, as we have already discussed is basically a conglomeration various prime technology intensive factors used as an input of production process, shows most of the enterprises belong to lower medium to medium technology category and there has not been any significant movement in the proportion of enterprises towards higher technology levels over the decade. The inability to procure enough funds required for research and development with respect to technology and infrastructure development might have been few of the prime constraints due to which this sector has its technologies still limited to medium level. It is also observed that majority of the enterprises under the categories of ferrous metals, non-ferrous metals and casting come under medium technology level. Consequently we can hypothesize that a sizeable proportion of the basic metal industries have innovated technology and have moved up to the medium and higher medium levels of technology usage. Designing, engineering and manufacturing of the Indian Iron and steel plants is limited. As a result a major proportion of technology is being imported from the other countries. The large and integrated steel plants mainly follow this trend and in the course these enterprises incur a huge amount in importing technologies. The R&D activity for developing new technology for production of Iron and steel is yet to start on a large scale in India. Due to the high costs involved in buying technology from abroad, most of the small scale and first generation steel producing entrepreneurs adopt cheaper and inefficient methods of production. In a sense the high capital costs is a major drawback that the Indian Iron and steel industry witness. In India, R&D in iron & steel is carried out mainly by major steel companies and some of the national laboratories like National Metallurgical Laboratory (NML) Jamshedpur & Institute of Minerals and Materials Technology (IMMT) Bhubaneswar. In addition, some collaborative R&D programme is pursued by Academic Institutions. Overall, the steel companies in India invest little on R&D and actual investment varies in the range of 0.15 - 0.25% of the total turnover of the companies.

The various technology indicators based on the capital index also point towards the fact that the basic metal industries mostly fall within medium to higher medium levels in terms of technology usage. A similar pattern is also observed when we look at the various output related technology indicators of basic metal industries. We have considered various output measuring parameters such as capital intensity, value added per labour, income from contracting in activities as well as the value of goods sold as purchased. Ideally all these output related value should be higher in case of industries using high, efficient and advanced technologies of production, which in turn leads to production of high quality goods which earn a better market value and hence raises the output of any industry. But the basic metal

industries in India generate a pattern of output which when grouped in terms of technology as explained in the previous section, results in majority of manufacturing units to fall between medium to higher medium levels of technology usage.

The non ferrous metal industry is also not self sufficient with respect to technology and requires to import technology. The non ferrous metal Industry in India faces the challenge to develop indigenous technology of production as most of its technology comes from the technology imported for aluminum and steel. Majority of the enterprises belong to the medium level technology usage. In order to technology up-gradation/ scale-up the non ferrous industries need to undergo transition from being a buyer and as simulator of technology to become a developer of new and innovative technologies of production. The non-Ferrous metal Industry has gradually grown towards the medium level technology usage. Over the time a lot of process related changes have taken place in the non-ferrous metal producing industry and this step was presumably taken to increase efficiency of production and also adopt methods which are energy conserving by nature. The research activity on hydrometallurgy of extraction of non ferrous metal has been undertaken by regional research laboratory at Bhubaneswar. This technique has off late gained a tremendous attention in the copper and zinc industries and these industries have adopted such a route of production based on leaching and bioleaching followed by electrometallurgy methods. Hindustan zinc ltd, Hindustan copper ltd, National metallurgical laboratory and Indian Institute of science are few of the organization where a lot of research and development activities have been undertaken in order to move towards high and advanced technologies of production. Indian Iron and Steel industries as well as the non ferrous metal producing industries have in majority adopted medium scale of technology for production, however there are also a very few enterprises which have adopted high and advanced technology.

It is obvious that technology change not only requires rigorous research and development initiatives but also requires various collaborative projects in order to come up with newer and more efficient process of production. As a step towards such technology collaborative projects the government of India has initiated partnership between the S&T programme of Ministry of Mines and Department of Science and Technology. There are also instances of joint ventures between the Industry and R&D laboratory/ academic institution and this is basically to buttress R&D for development and introduction of new processes in such industries. A few examples of steps taken towards technological innovation in Non-Ferrous industries also include development of zinc extraction at Raipur Dariba Mines, development of energy efficient materials using advance aluminium composites for mining industry, bioreactor technology for recovery of zinc from tailings/concentrates and pilot scale demonstration for production of gallium metal among others. The casting of metals industry is one of the vital manufacturing sector within basic metal industry. However, only a small proportion of such industries fall under high and advanced levels of technology. A major

proportion of the manufacturing units use medium level of technology for production. If we look into the size related statistics we can clearly observe that most of the enterprises under each size class fall under medium and higher medium levels technology. This could probably mean that gradually the basic metal manufacturing units are moving from lower to higher medium levels of technologies. Such a scenario of technology innovation could also mean that the small scale enterprises may be involved in contracts with the large scale enterprises and hence manage to buy technology from the larger firms and in turn work for the large firms as well. An instance of technology based innovation can be marked in the steel manufacturing industry wherein the use of scrap metal rather than the virgin Iron ore has gained tremendous popularity. Such a shift would indirectly lead to positive impact on the value chain and would possibly demand for additive processes of powder metallurgy over cutting and machining techniques. This would not only lead to decrease in energy costs but would also maximize product yield.

The slow and gradual innovation of technology in basic metal industry could probably be due to lack of adequate R&D infrastructure in India. The table below provided as brief outline of the R&D investments made and the turnovers obtained across three years. From this we get a clear picture that the turnovers made by the various ferrous metal industries are substantially less when compared to the investments made. This again points to the fact that R&D opportunities are yet to start at a rigorous scale in India.

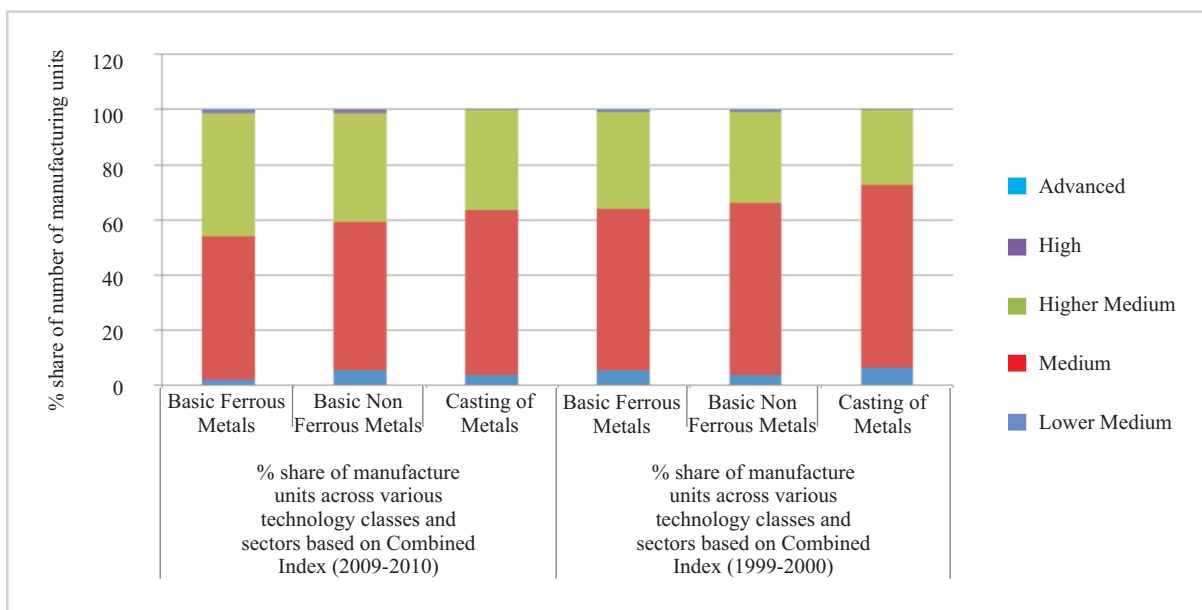
On minutely observing the data across a period of ten years that is from 2000 to 2010 (Figure 41-44) we can note that over the period of time there has been a decrease in the number of enterprises using lower level technology and a gradual increase in the number of manufacturing units deploying lower medium to higher medium technology levels in production. The eventual transition in technology usage by various basic metal industries might be due to technology import, indigenous technology innovation via rigorous R&D activities, an increase in the market demand and competition of the counterparts nationally as well as globally. Considering the size related statistics together with technology levels, a better picture may be observed regarding the scaling up of the manufacturing units as well the technology innovation that have gradually taken place in the basic metal industries. There has been an overall increase in the number of manufacturing units in the basic metal sector over the period of ten years. The number of micro and small manufacturing units was higher in 2000 as compared to 2010 and the number of medium and large units is higher in 2010 than in 2000. This indicates that the manufacturing process has scaled up since 2000. This, in fact, is an indication that the level of industrialization that has taken place over the ten years has been noteworthy. Basic metal industry is one of the prime sectors under the manufacturing industries because of the direct or the indirect dependency that the other industry has on this sector. Since industrialization has been rigorous in India it is clear that the demand for the metal industry products have also increased in the market.

The basic metal industry has scaled up from micro and small to medium and large units in order to cater to the need of the other industries. The necessity to produce high quality products which can satisfy the domestic and global demands and to deploy energy efficient techniques of production in order curtail energy related costs have prompted the basic metal industries to invest a significant proportion of their capital towards research and development. The R&D activities in India however are not at par with other countries globally but the efforts given to this sphere cannot be neglected. The joint initiatives taken by government and private labs and firms towards technology innovation is one of the vital reasons due to which the basic metal industries in India are gradually moving up in their technology level.

Table 45: R&D investment (in Rs Cr and as % of turnover) in India						
	2010-11		2011-12		2012-13	
Company	R&D investment	% of turnover	R&D investment	% of turnover	R&D investment	% of turnover
SAIL	132.14	0.28	134.45	0.27	147.63	0.3
RINL	14.34	0.12	20.29	0.14	31.13	0.23
NDMC	14.47	0.13	15.33	0.14	12.23	0.11
Tata Steel	80.57	0.27	52.98	0.15	59.73	0.15
JSW Steel	49.68	0.21	62.18	0.19	48.44	0.13
Essar Steel	24.22	0.18	25.65	0.15	28.77	0.19

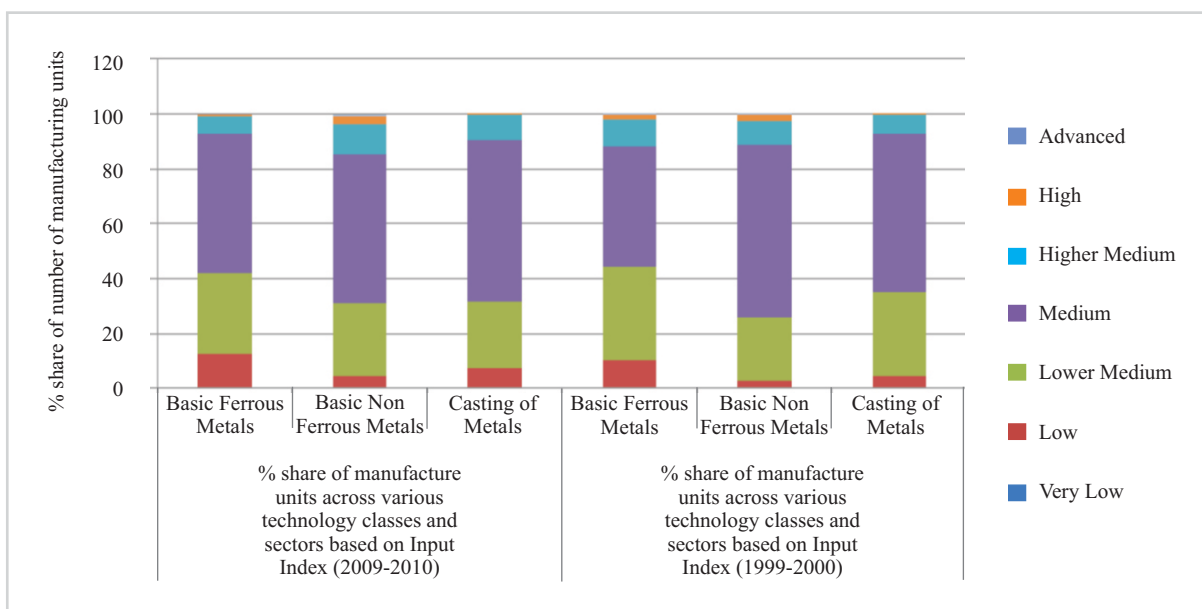
Source: Ministry of Steel

Figure 41 : Manufacture units across various technology classes and sectors based on Combined Index



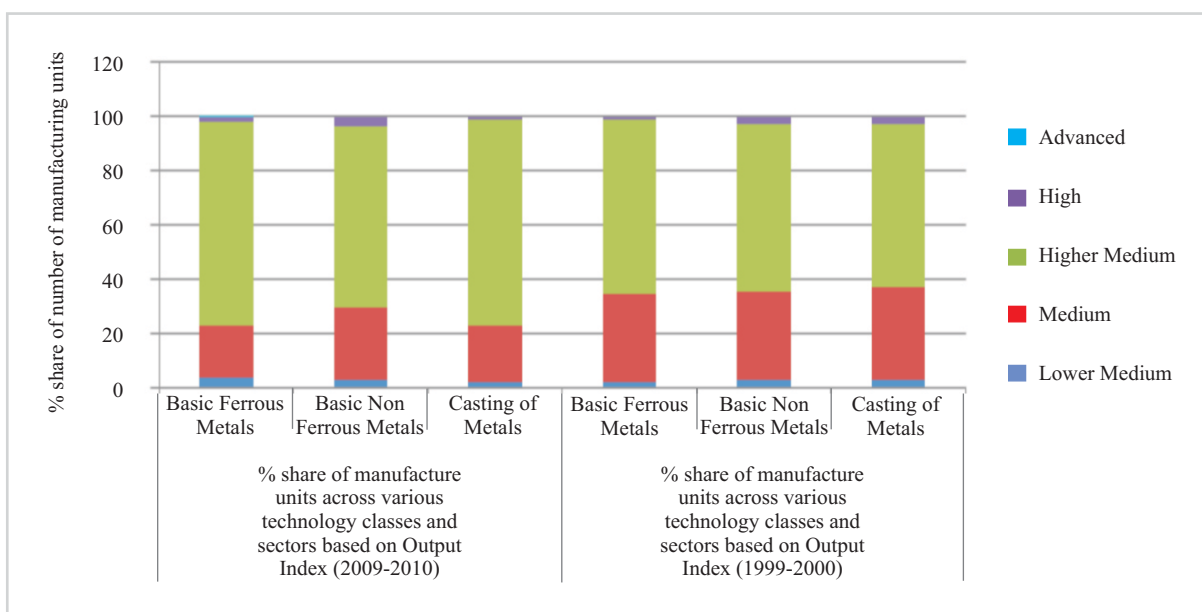
Source: Own estimates based on ASI 1999-00 and 2009-10 data

Figure 42 : Manufacture units across various technology classes and sectors based on Input Index



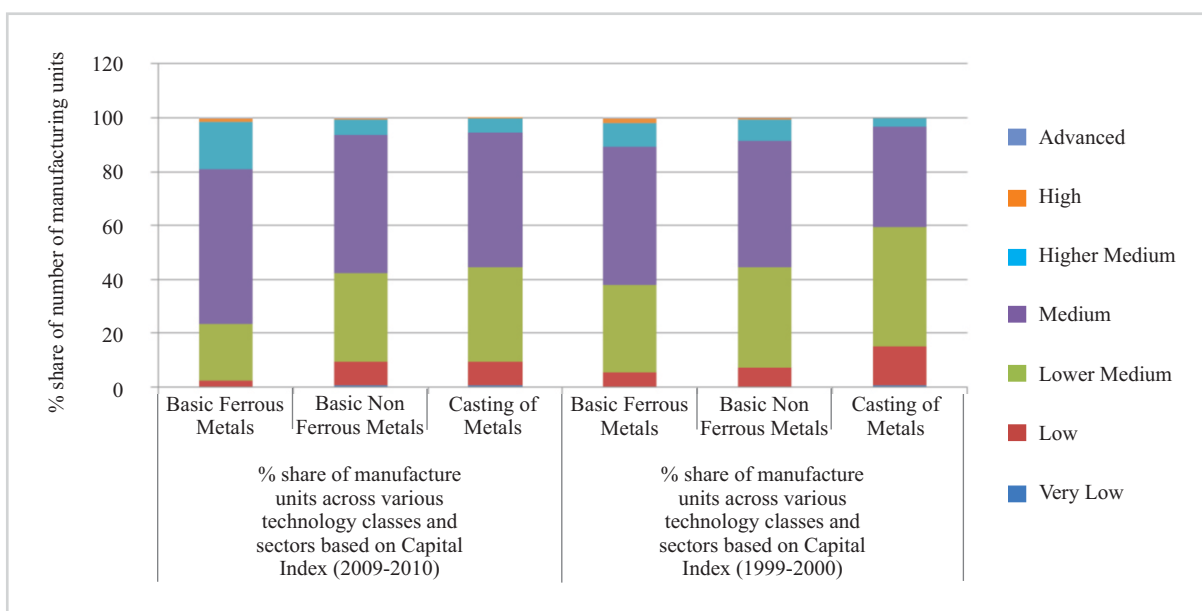
Source: Own estimates based on ASI 1999-00 and 2009-10 data

Figure 43 : Manufacture units across various technology classes and sectors based on Output Index



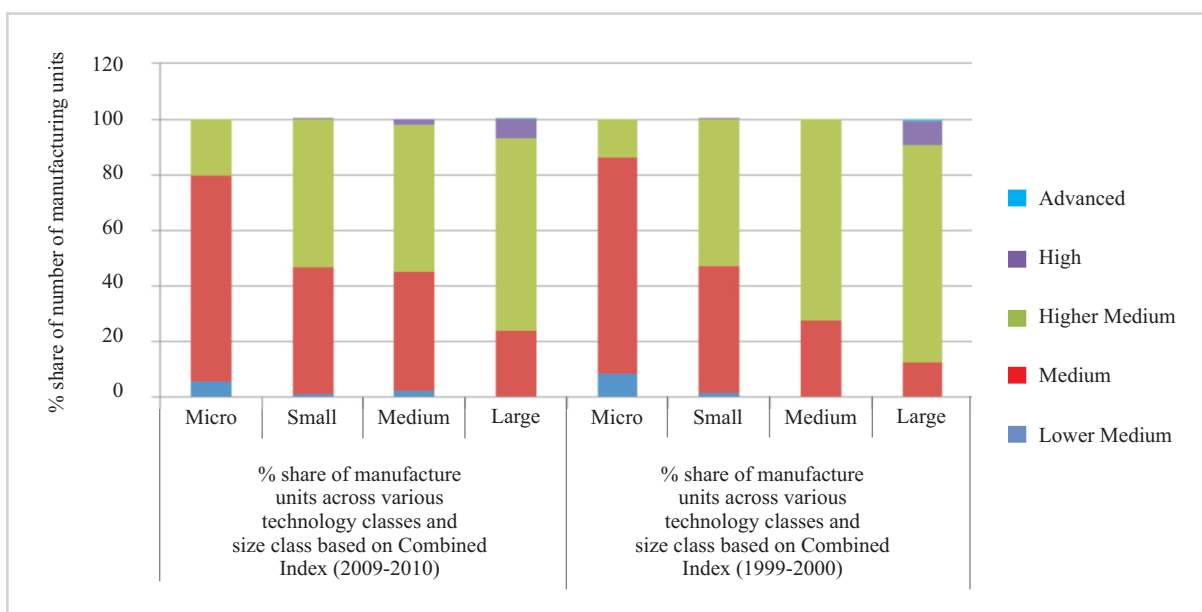
Source: Own estimates based on ASI 1999-00 and 2009-10 data

Figure 44 : Manufacture units across various technology classes and sectors based on Capital Index



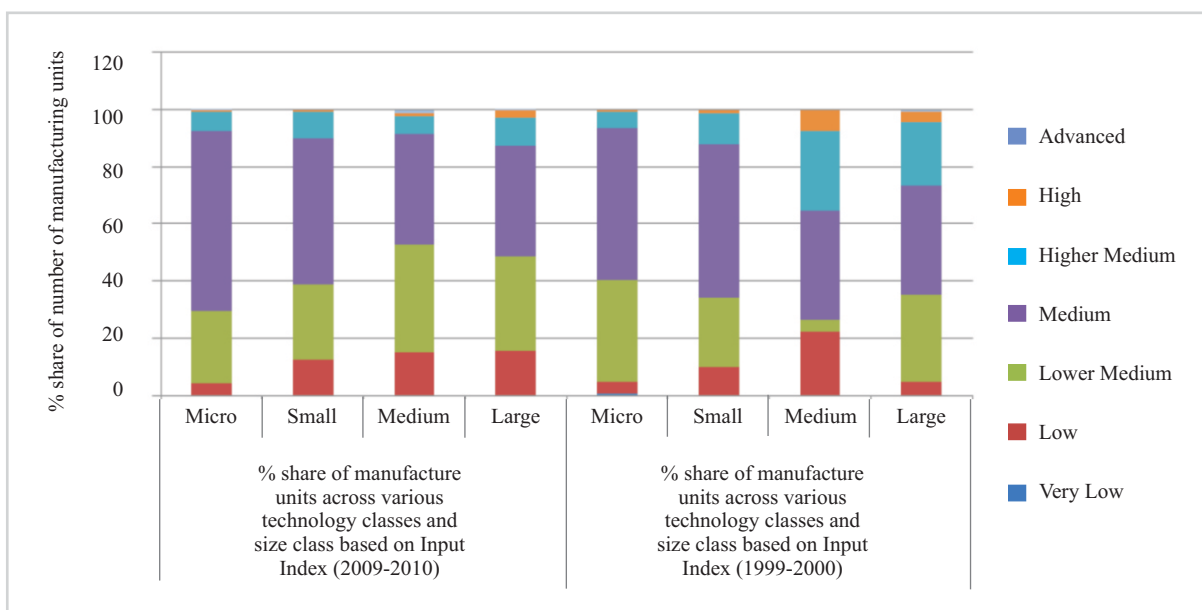
Source: Own estimates based on ASI 1999-00 and 2009-10 data

Figure 45 : Manufacture units across various technology classes and size classes based on Combined Index



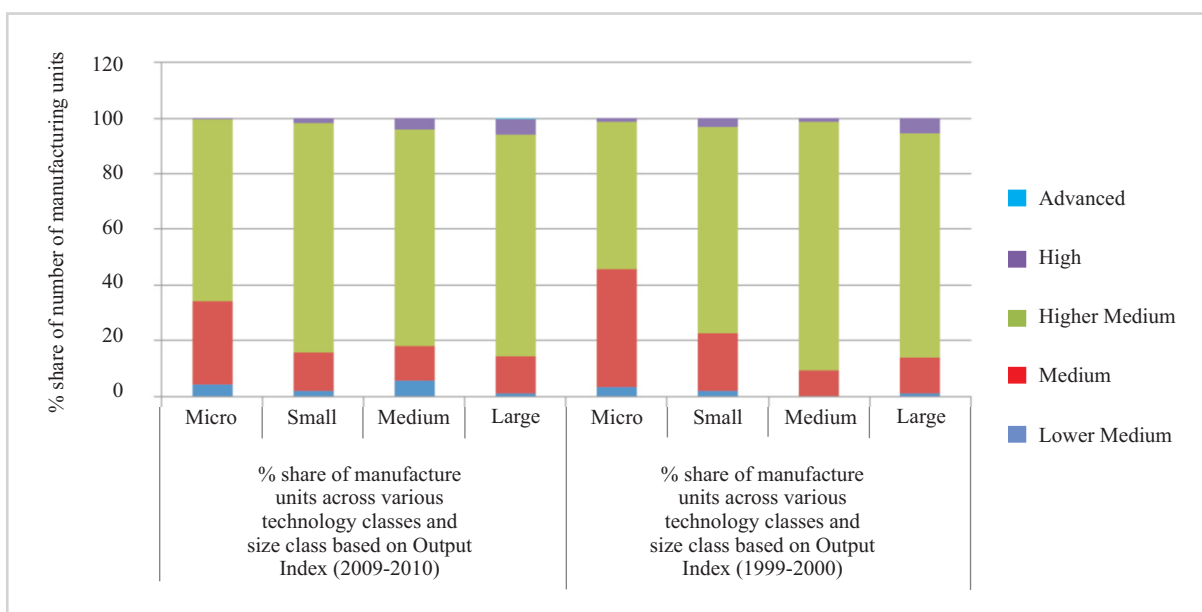
Source: Own estimates based on ASI 1999-00 and 2009-10 data

Figure 46 : Manufacture units across various technology classes and size classes based on Input Index



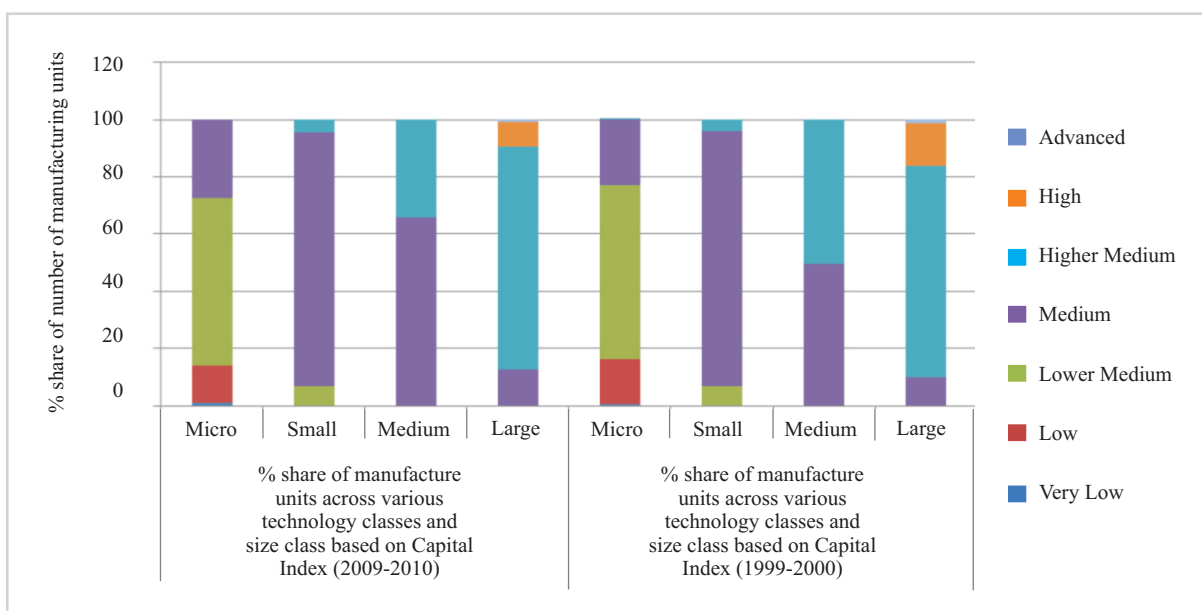
Source: Own estimates based on ASI 1999-00 and 2009-10 data

Figure 47 : Manufacture units across various technology classes and size classes based on Output Index



Source: Own estimates based on ASI 1999-00 and 2009-10 data

Figure 48 : Manufacture units across various technology classes and size classes based on Capital Index



Source: Own estimates based on ASI 1999-00 and 2009-10 data

Chapter 5

Concluding Remarks

Basic metal industry has made a slow but steady progress in terms of technology development over the ten years period, 2000-2010. This improvement has taken place across size classes of enterprises as well as across industry subgroups like iron & steel, non-ferrous metals and fabricated metals which are dispersed in different states of the country. It is noted that there are several factors like industry structure, particularly size structure, inter-relations (contractual) among size-classes of enterprises and age composition of enterprises influence adoption of technology and thus innovation.

The most important subgroups of iron and steel are steel in ingot and hot rolled and cold rolled steel which are dominated, in fact monopolized, by a handful of large producers. MSMEs of all categories are present as well as dominant in only one subsector, i.e. railway track materials of steels (24107). The other sectors with good performance of MSMEs are Ferro-alloys Tube/pipe fittings of basic iron & steel and wire of steel. The sectors with exclusive domination of large firms have poor performance of MSMEs; these sectors are pig iron & spiegeleisen (24101), direct reduction of iron (24102), steel in ingot (24103) and hot rolled and cold rolled steel (24105). The productivity, measured in terms of value added per labour is highest for the sectors code 24102 and 24103 where capital labour ratio is also very high. In these sectors, patterns of contractual linkages evidenced through the proportion of enterprises 'contract in' only increases systematically as the size-class decreases while the proportion of enterprises 'contract out' either exclusively or together with 'contract in' increases systematically as the size class increases. The number of enterprises having contractual relationship is much higher for the old group than the younger ones. It is obvious that it takes time for firms to establish credibility, trust and rapport in market and develop business linkages.

Basic iron & steel industries are concentrated more or less in eight states, namely West Bengal, Jharkhand, Orissa, Chhattisgarh, Gujarat, Maharashtra, Karnataka and Andhra Pradesh together sharing more than 85% of the GVA of the sector. Not many MSMEs are found in the core region of the iron & steel production, particularly in WB, Jharkhand and Orissa. Presence of MSMEs is more in the Western states of Gujarat and Maharashtra and in the states Punjab, Rajasthan, Uttar Pradesh (UP), with low share in total basic iron & steel production and where large units are not dominant.

The most widely used non-ferrous metals are aluminium, copper, zinc, lead, nickel and Tin. The single most important 5-digit sector is production of aluminium (24202) with 65% GVA share in 3 digit code. In the production & refining of precious metals namely Au, Ag, Pt the presence of the informal sector is found to be quite significant. Small enterprises are very important with their share varying between 7 and 45% of the GVA of the six subsectors (5-digit). The large enterprises are dominant in almost all the subsectors. Incidence of the formal sector micro enterprises

working on contract is very high. Excepting 16% of the enterprises who neither contract in nor out (independent), all other micro enterprises are involved in contracting some way or other. Intensity of contracting enterprises increases as size class increases in MSMEs. Among the large firms, almost all the enterprises are involved in some or other forms of contracting and half of them are involved in both contract in and contract out modes, signifying a great deal of interaction with the MSMEs. Business linkages of MSMEs are significantly high and increase with their age. A very large number of MSMEs with contractual relations are found in 21 to 30 years age group. High density of contractual relations of the MSMEs indicates difficulty of independent operations particularly in getting access to market and raw materials.

Innovation/technology indicator, based on combined index suggests some improvement in technology over the decade as there was some upward movement of enterprises along the technology ladder. Now the number of enterprises in each of the medium, higher medium and high technology groups is higher whereas it is lower in the lower medium technology group. The most interesting fact is that this improvement has taken place across size classes of enterprises. As much as 55% of the enterprises in basic metal industry belong to the medium level technology and another 41% belong to the higher medium technology in 2010. It is also clear that a very few enterprises in this industry fall under high or advanced technology level. Such a scenario of technology innovation could also mean that the small scale enterprises may be involved in contracts with the large scale enterprises and hence manage to buy technology from the larger firms and in turn work for the large firms as well.

The long term goal of Indian metal industry to compete with their global peers has also been an instrumental factor towards technology innovation. The pressure to cater to the increasing demands of the domestic industries, which directly or indirectly depend on the finished or semi processed product of the basic metal industries, has also been a factor for investments made towards technology development. There has also been scaling up of the manufacturing units between 2000 and 2010 in order to maintain the supply and demand balance in the global as well as the domestic market. Considering the overall scenario one may infer that in order to satisfy the demands of market there has been quite a lot of technological up gradation and advancement in this group of basic metals sector.

Over the period of ten years, 2000-2010 there has been a decrease in the number of enterprises using lower level technology and a gradual increase in the number of manufacturing units using medium and higher medium technology levels in production. The eventual transition in technology usage by various basic metal industries might be due to technology import, indigenous technology innovation via R&D activities, an increase in the market demand and competition from the counterparts nationally as well as globally. Considering the size related statistics together with technology levels, a better picture may be observed regarding the scaling up of the manufacturing units as well the technology innovation that have gradually taken place in the basic metal industries. There has been an overall increase in the number of manufacturing

units in the basic metal sector over the period of ten years. The number of micro manufacturing units declined substantially which was more than compensated by the increase in the number of small, medium and large units. This indicates that the manufacturing process has scaled up, might be to economise costs, since 2000. This, in fact, is an indication that the level of industrialization that has taken place over the ten years has been noteworthy. Basic metal industry is one of the prime sectors under the manufacturing industries because of the direct or the indirect dependency that the other industry has on this sector.

The necessity to produce high quality products which can satisfy the domestic and global demands and to deploy energy efficient techniques of production in order curtail energy related costs have prompted the basic metal industries to invest a significant proportion of their capital towards research and development. The R&D activities in India however are not at par with other countries globally but the efforts given to this sphere cannot be neglected. The joint initiatives taken by government and private labs and firms towards technology innovation is one of the vital reasons due to which the basic metal industries in India are gradually moving up in technology level. The process however needs to be further intensified. Greater incentives should be provided to the enterprises to conduct R&D and up-grade technology.

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