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Estimating urban agglomeration economies for India: a new economic geography perspective

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Abstract

The main research objective of this paper is to estimate of urban agglomeration economies for India's urban areas. For this purpose we estimate aggregate production function for urban areas in India to derive the magnitude of agglomeration economies. We use Kanemoto, Ohkawara, and Suzuki (1996) model for estimation of aggregate production function and to derive the magnitude of scale economies. Using this model we answer the important question: whether Indian industry in urban areas are operating under the decreasing returns to scale or increasing returns to scale. Scale economies are the main determinants of economic geography, pioneered by Krugman (1991a). Using the firm level data 2004-05 from the Annual Survey of Industry, our main finding is that urban firms in Indian industry operate under the decreasing returns to scale.

JEL classification: F23; R0

Keywords: Economic geography; Urban agglomeration; Firm level analysis; India; Manufacturing industry.

1. Introduction

"Step back and ask, what is the most striking feature of the geography of economic activity? The short answer is surely concentration". Krugman [3, p.5].

During the last decade or so, economists have rediscover geography. The uneven distribution of economic activity across space has received renewed attention with surfacing of the "new economic geography" literature following Krugman (1991a) which was the key part of citation for Paul Krugman's 2008 Nobel Prize. Traditional neoclassical explanations for the uneven distribution of economic activities across space are due to "first-nature- geography", which is the physical geography of coasts, mountains, and endowments of natural resources but also location-specific differences in technology or institutions have received considerable attention in the literatures. Such factors can for example explain why Singapore or Cape Town as large hubs of international trade or some countries specialize in exporting opium (Afghanistan and Maynmar). But it was most difficult assignment in explaining why two a priori similar locations can develop in totally different ways. Why did South-East Asia manage to dramatically raise its income level in the last twenty years where as most Sub-Saharan African countries (many of which are no more disadvantaged than their Asian counterparts when it comes to first nature geography) experienced decades of economic stagnation? Why did London become Europe's financial capital and not Amsterdam, Paris or Stockholm?

It was the influential paper by Krugman (1991a) who finally has given the answer of these above questions. It is due to "second nature geography" which is commonly known as New Economic Geography (NEG) or geographical economics. The second nature geography is the geographical distance between economic agents or in other words the location of economics agents relative to one another in space. The core building block of new economic geography models are product differentiation modeled through a love of variety assumption, increasing returns to scale and transport costs, which together create pecuniary externalities in agents' location choices. When combined with either factor mobility or intermediate inputs, these three building blocks give rise to forces of cumulative causation and agglomeration.

NEG combines insights from the earlier regional science and economic geography literature, most notably increasing returns to scale (so that firms have an incentive to produce in one place) and transport costs (so that it matters where you produce) into a coherent generable equilibrium framework based on imperfect competition. The trick of using market structure of imperfect competition allowed Krugman (1991) to "combine old ingredient through a new recipe" (Ottaviano and Thisse, 2004), modeling the distribution of economic activity, after controlling for first nature geography, as a trade-off of exactly those agglomeration and dispersion forces put forward in the earlier economic geography and regional science literature.

Fujita et al (1999) developed a model in which economics space is instead assumed to be continuous, and in which seamless world spontaneously organizes itself into industrial and agriculture zones because of the tension between forces of agglomeration and disagglomeration. One might expect such a model to be analytically intractable but they gain considerable insight through a combination of simulations and an analytical approach originally suggested in a biological context by Alan Turing (1952).

Increasing returns to scale (IRS) that are internal to the firm. NEG models assume a fixed, indivisible amount of overhead required for each plant. NEG models do not assume any pure technological externalities that would lead directly to external scale economies. NEG emphasized the interaction between transportation cost and firm level scale economies as a source of agglomeration.

Lietao et al (2010) empirically proves that for large automobile production countries the agglomeration effect as in Krugman and Venables (1995) for upstream firms (component supplies) by locating near downstream firms (another components suppliers or automobile makers) can be too strong to offset the benefit of exploiting factor endowment differences.

Stories about the causes of agglomeration economies are as old as the realization that such advantages exist. More than a century ago Alfred Marshal suggested a threefold classification (1920, p. 271). In modern terminology, he argued that industrial districts arise because of knowledge spillovers ("the mysteries of the trade become no mysteries; but are as it were in the air"), the advantages of thick markets for specialized skills, and the backward and forward linkages associated with large local markets. The aforementioned classic works by Smith (1776) and Marshal (1890) contain frequently cited discussions of the advantages arising from the greater specialization made possible by larger markets, from sharing intermediate suppliers, from pooling in labour markets, or from the localized transmission of ideas.

One of the fundamental results in spatial economics is Starrett's (1978) spatial impossibility theorem. This states that , once we abstract from the heterogeneity of the underling space, and without indivisibilities or increasing returns, any competitive equilibrium in the presence of transportation costs will feature only fully autarchic locations where every good will be produced at small scales (see Ottaviano and Thisse, 2004, for detailed discussion). Thus, substantial localization or spatial concentration of economic activity may be seen as a sign of agglomeration economics.

In a basic paper Krugman (1991a) has developed the model of economic geography from the perspective of intraindustry trade which commonly known as "new trade theory". In this paper Krugman suggested that international trade pattern highly depends on the concentration of economic activity trade which is commonly known as "economic geography". But international trade theory and its relation to general location theory addressed by Ohlin (1968)[1.] Unfortunately this simplifying assumption has long been considered as a handicap.

" International trade theory can't be understand expect in relation to and as a part of the general location theory, to which the lack of mobility of goods and factors has equal relevance" (Ohlin, 1968, p. 97, emphasis in the original).

This was what Ohlin (1933) first argued, thus setting the stage or the so-called 'new economic geography' (henceforth, NEG). NEG has been pioneered by three authors, namely Fujita (1988), Krugman (1991a) and Venables (1996). They all use general equilibrium models with monopolistic competition à la Dixit and Stiglitz (1977) to study the effect of different degrees of transportability of goods and factors on industry location depending on the extent of returns to scale and product differentiation.

It has been established that agglomeration economies arise from the perspective of International trade but agglomeration may also arise even when transport costs are sufficiently high for trade not to occur. Ottaviano and Thisse (2004) model has described the spatial equilibrium pattern is determined by the ratio of the mobile to the immobile factor: the larger this ratio, the larger the agglomeration [Behrens (2004)]. Hence, contrary to general beliefs, agglomeration is not a 'by-product' of trade; it may also emerge in an autarkic world.

Behrens and Thisse (2006) paper address regional economics from the perspective of new economic geography. There they have described spatial interaction in central to regional economics. In their view NEG only explains the movements of goods and agents only. World Development Report (2009) has given the insight of three dimension of development; density, distance and division which are interrelated with urbanization. In fact most of the literature in NEG pays tribute to the detailed

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[1]See, Ohlin (1967), ch. XI-XII

book, *The Spatial Economy,* by Masahisa Fujita, Krugman and Venables (1999). In this book in The Way Forward chapter in "where we stand" paragraph they have described studying of economic geography how important part of the world.

"In the end, the main justification for studying the geography of economies is that it is so visible and important a part of the world. It is hard to see any reason-other than tradition, based on analytical intractability- why interregional and urban economics should receive any less attention than international trade, why the location of production should not be as central a concern of mainstream economics as capital theory or the distribution of income" (Fujita et al, 1999, p. 349).

"New economic geography has come of age" as Neary (2001) recently wrote in a mildly skeptical review for the *Journal of Economic Literature.* While this statement seems deserved for theory, the empirical literature treating the same questions remains unsettled in both methodology and results. There is no agreed upon regression to estimate, nor even a consensus dependent variable to explain.

Given the importance of NEG, the main objective of the paper is to estimate aggregate production functions for urban areas in India to derive the magnitudes of agglomeration economies empirically to provide the answer of the main question why economics activities so spatially concentrated.

The organization of this paper is as follows. In section 2, we have described the basic framework of the new economic geography. In section 3 and 4, we explain about aggregate production functions for metropolitan areas to estimate the agglomeration economics. In section 5, we describe about availability of data and measurement of variables. In section 6 we summarize the results and in section 7 we discuss possibilities for elaboration and extension.

2. The basic framework of the new economic geography

The defining issue of the new economic geography is how to explain the formation of large variety of economic agglomeration in various geographical levels. The observed spatial configuration of economics activities is considered to be the outcome of a process involving two opposing types of forces, that is , agglomeration (or centripetal) forces and dispersion (or centrifugal) forces.

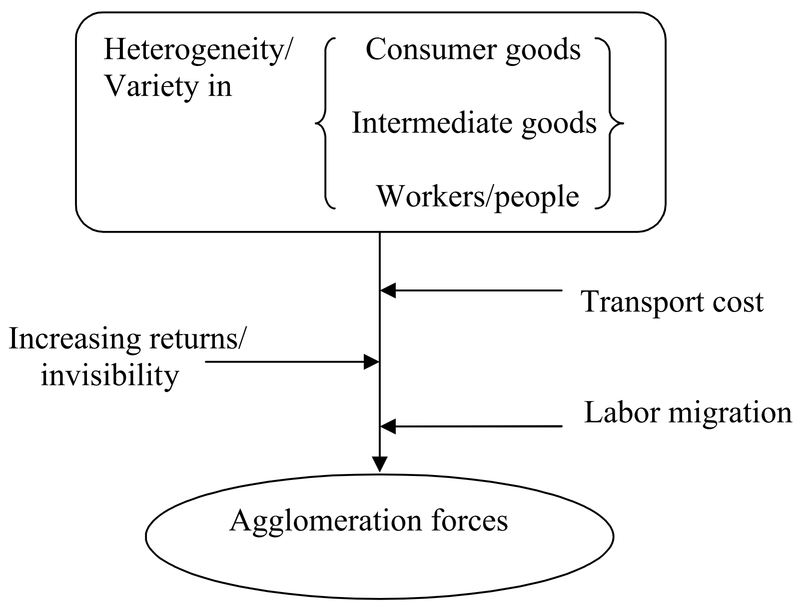
Depending on the two opposing forces, a variety of local agglomeration of economic activities emerges, and the spatial structure of the entire economy is self-organized.

Table 1. Forces Affecting Geographic Concentration

Centripetal Forces	Centrifugal Forces
Market size effects (linkages)	Immobile factors
Thick labour markets	Land rents
Pure external economies	Pure external diseconomies

Source: Krugman 1999.

Figure 1. Generation of agglomeration forces

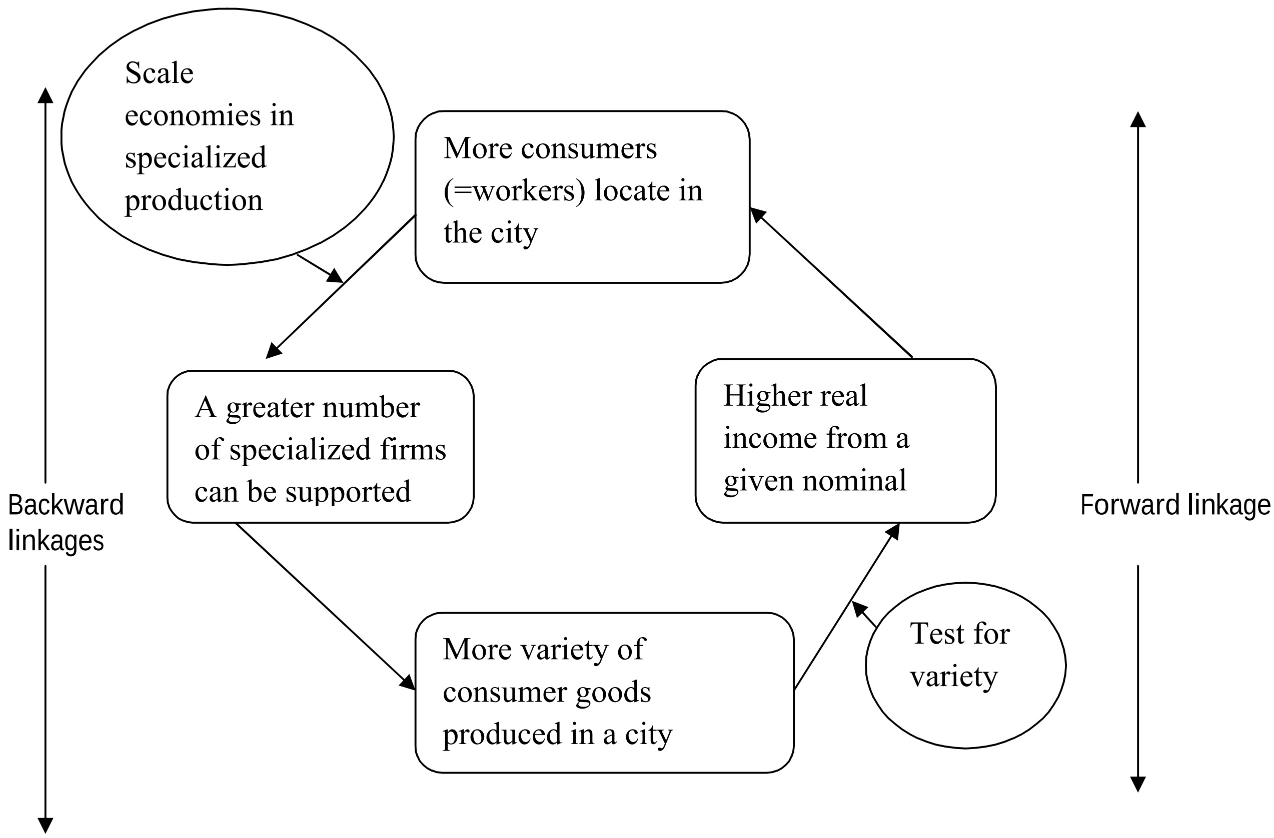


Source: Fujita, 2007.

Figure 1 presents the general principle that lies behind the economic mechanism

leading to the formation of agglomeration forces. This figure represents the idea that under the presence of a sufficient heterogeneity (i.e. differentiation) in goods or workers, the three way interaction among increasing returns (at the individual firm level), transportation cost, and migration of workers (=consumers) creates a circular causation leading to the agglomeration of both consumers (or users) and suppliers of these goods or services.

Figure 2. Circular causality in spatial agglomeration of consumer-goods producers and workers (= consumers).



Source: Fujita, 2007.

Focusing on the heterogeneity in consumer goods, Figure 2 elaborates the circular causation leading to the agglomeration of the producer goods and their consumers into city. Starting with the bottom round-square, for example, suppose that a large variety of consumer goods is produced in a city. Then, because of the transport costs, this variety of goods can be purchased at lower prices there in comparison with more distant places. Thus, given a nominal wage in the city, because of tastes for variety, the real income of workers rises in the city. This, in turn, induces more workers to migrate to the city. Then, the resulting increase in the number of consumers (=workers) creates a greater demand for goods in the city.

In the above analysis shows the circular causation is the importance of the scale economies for agglomeration[2]. The measurement of scale economies in urban industries in India is focused below.

3. Theoretical frame work

We estimate an aggregate production functions for urban India to derive estimates of the nature and magnitude of urban agglomeration economies. For this purpose we use Kanemoto, Ohkawara and Suzuki (1996) model. The model is also used by Fujita, Mori, Henderson and Kanemoto (2004) and Kanemoto, Kiagawa, Saito and Shioji (2005).

In this model, an aggregate neoclassical production function in an urban area is given by:

$$Y = F\,(N,K,G) \qquad (1)$$

where N,K,G, and Y are respectively the employment, the private capital, the social overhead capital, and the total production in an urban area. All the factors of production are finite and non-negative. Kanemoto, Ohkawara and Suzuki (1996) model it is assumed that in the absence of agglomeration economies the production function exhibits constant returns to scale with respect to labor and capital inputs. The degree of agglomeration economies can then be measured by the degree of increasing returns to scale of the estimated production function. This approach has been justified by assuming that technological externalities exist between firms in urban area. For example, suppose a firm in a urban area receives external benefits from urban agglomeration, measured by the total employment N, and social overhead capital G. Assuming that the firm uses labor n and private capital k as inputs, can write its production function as $f(n,k,N,G)$. For expositional simplicity, we assume that all firms are identical. The total production in a metropolitan area is then $Y=mf(N/m, K/m,N,G)$, where m is the number of firms in urban area. Free entry of firms guarantees that the size of an individual firm is determined such that the production function of an individual firm $f(n,k,N,G)$ exhibits constant returns

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[2] See Fujita (2007) for more details

to scale with respect to n and k. This condition determines the number of firms m as a function of other variables, m=m*(N,K,G). The aggregate production function is then

$$F(N,K,G) = m^*(N,K,G)\, f\left(\frac{N}{m^*(N,K,G)}, \frac{K}{m^*(N,K,G)}, N, G\right) \qquad \text{------(2)}$$

This aggregate production function satisfies

$$F_N(N,K,G) = m[\tfrac{1}{m}f_n + f_N] + m^*_N\,[f - nf_n - kf_k]$$

$$= f_n(n,k,N,G) + m\, f_N(n,k,N,G) \qquad \text{-----------(3)}$$

Where subscripts denote partial derivatives and second square bracket equals zero because of the constant-returns to scale condition mentioned above. The last term mf_N measures the marginal benefits of urban agglomeration economies.

The above model by Kanemoto, Ohkawara and Suzuki (1996) shows that technological externalities between firms in urban area which is behind the urban agglomeration economies.

The Krugman paper (1991) proposed an alternative approach relying on heterogeneity of final and or intermediate products. This paper showed that, if the heterogeneity is combined with transportation and communication costs, agglomeration economies emerge even in the absence of technological externalities. Our aggregate production function may be interpreted as being derived from such a model.

The functional form of (1) is Cobb-Douglas production function:

Model 1:

$$Y = AK^{\alpha}N^{\beta}G^{\gamma} \qquad (4)$$

Equation (4) is the structural form equation.

Equation (4) is estimated in per capita terms and logarithmic form,

$$Y/N = A\,(K/N)^{\alpha}\,(G/N)^{\gamma}\,N^{\beta+\alpha+\gamma-1}$$

$$\ln(Y/N) = \ln A + \alpha \ln(K/N) + (\beta+\alpha+\gamma-1)\ln N + \gamma \ln(G/N)$$

$$\text{Or,}\quad \ln(Y/N) = A_0 + a_1 \ln(K/N) + a_2 \ln N + a_3 \ln(G/N) \qquad (5)$$

Equation (3) is the reduced form equation of the Cobb-Douglas production function.

The relationship between the estimated parameters in equation (3) and the coefficients in the Cobb-Douglas production function (2) is as follows.

$\alpha = a_1$, $\beta = a_2+1-a_1-a_3$, $\gamma = a_3$.

A positive coefficient a_2 indicates the degree of increasing returns to scale in urban production and represents the elasticity of urban agglomeration, i.e., the percentage increase in urban production due to a unit increase in labor force in an urban area. In the absence of urban agglomeration economies, however, the production function is homogeneous of degree one with respect to capital and labor.

4. Estimation framework

The econometrics specification of equation (3) is the following;

$$ln(Y/N) = A_0 + a_1\, ln(K/N) + a_2 ln\, N + a_3\, ln(G/N)+\varepsilon \qquad (6)$$

We assume that *ln(K/N), lnN and ln(G/N)* are independent of ε (error term). This model predicts not just the sign of the coefficients but also the magnitudes of the coefficients on per capita private capital and per capita social overhead capital. The double-log linear specification gives the direct measure of elasticity. This version of the model is linear in parameters, and estimated by OLS.

5. Measurement of variables and data sources

We use the firm level data in 2004-05 from Annual Survey of Industries (ASI), conducted by the Central Statistical Office of the Government of India.[3] Data on output, employees, private capital, materials and energy are used in the estimation (Table 2).

Table 2

Firm level variables used in the study

Variable	Description
Output	Factory value of products and by-products manufactured as well as other receipts from non industrial services rendered to others, work done for others on material supplied by them, value of electricity produced and sold, sale value of goods sold in the same conditions purchased, addition in stock of semi- finished goods and value of own construction.
Private Capital	Our measure of private capital is the sum of total value depreciated value of fixed assets Capital owned by the factory as on the closing day of the accounting year. Fixed assets are those that have a normal productive life of more than one year. Fixed capital includes land including lease- hold land, buildings, plant and machinery, furniture and fixtures, transport equipment, water system and roadways and other fixed assets such as hospitals, schools etc. used for the benefit of factory personnel.
Labor	Total manday employees, which is the total number of days worked and the number of days paid for during the accounting year .It is obtained by summing-up the number of persons of specified categories attending in each shift over all the shifts worked on all days.
Materials	Material input for each firm is defined as the *total delivered* value of all items of raw materials, components, chemicals, packing materials and stores, which actually entered into the production process of the factory during the accounting year. This also includes the cost of all materials used in the production process of the factory during the accounting year. This also includes the cost of all materials used in the production of fixed assets including construction work for factory's own use.

Output is defined as ex-factory value of products manufactured during the accounting year of sale. Private capital is defined by net value of fixed assets owned by the factory as on closing day of the accounting year. Labor is defined as the total number of employee maydays worked and paid for by the factory during the account year (see table 4 for detailed descriptive statistics).

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[3] The ASI covers factories registered under sections 2m(i) and 2m(ii) of the factories Act 1948, employing 10 or more workers and using power, and those employing 20 or more workers but not using power on any day of the preceding 12 months.

The geographic attributes allows us to identify each firm at the state level with rural urban distinction.[4] Available information allows us to categorize firms by their location in urban area of a state as well as total urban area in the country but not in any specific urban centre.[5] The analysis is carried out for 27 states[6] in India for the entire industry sector at five-digit National Industry Classification (NIC) codes of 2004.[7] For our analysis we have considered all type of ownership of the firm, which includes wholly central government, wholly state and/or local government, central government and state and/or local government jointly, joint sector public, joint sector private, and wholly private ownership. So we have taken consideration of the firms those are getting foreign direct investment (FDI) for production. Because FDI flows is one main factor behind firm location choice for different region as well as different states.

5.1 Measurement of Social overhead capital

Construction of Social overhead capital variable at firm level is described here. Kenemoto, Ohkawara and Suzuki (1996) defined social overhead capital by allocating industrial infrastructure investment with capital stock in telecommunication and railway industries. Aso (2008), "social overhead capital development and geographical concentration" used traffic infrastructure investment which includes railroad, automobile, ship and airplane. In Indian context data for the above variables are not available for urban areas at state level as well as national level. Thus, four proxy variables are used; these are, total public sector Gross Fixed Capital Formation (GFCF) value, total public Net Fixed Capital Stock (NFCS) value, total Net Domestic Product (NDP) value, and total expenditure

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[4] While the ASI data allows the identification of the firm at the district level, and the firm address are reported in the survey, these data were not made available due to confidentially concern.

[5] Population Census of India classifies urban centres into six categories based on population size. Class I (100,000 or more), Class II (from 50,000 to 99,999), Class III (from 20,000 to 49,999), Class IV (from 10,000 to 19,999), Class V (from 5000 to 9999) and Class VI (below 5000)

[6] Although in India there are 35 states (including Union Territories), some states are missing due to unavailability of information or due to very small number of observations.

[7] National Industry Classification (NIC) codes of 2004 do not include India's best known "industrial" export-software (which embodies high levels of human capital) in the data.

for electricity by an individual firm. Total GFCF is the total value of non-departmental commercial undertaking (NDCU), department of commercial undertaking, state and local administration, central government administration and supra regional. Total public GFCF value is available for each state level as well as all India level, but total public NFCS and total urban NDP is available only at all India level. We use electricity expenditure data, because investment in electricity is one of the major infrastructure development expenditures in public sector.

Total public sector GFCF for 2004-05 is collected from the report of Government of India (2009). Total NFCS in public sector is collected from National Account Statistics (2005), which is Rs. 2909398 (Crore).NDP of urban area for the year 2004-05 is collected from National Account Statics (2010). The NDP for total urban areas is Rs. 1376653(Crore) and for total rural areas is Rs. 1269717 (Crore). Total urban NDP as percentage of total is 0.52.

Initially we allocated state level total urban public NFCS by multiplying with the share of individual firm's private capital stock to total private capital stock by all the urban firms in a state to estimate the social overhead capital. Then we face problem of multicolliearity, as correlation coefficient between private capital and social overhead capital was unity. Also we allocated state level total urban public NFCS by the ration of individual firm's output to total output by all the urban firms in a state to estimate the social overhead capital. Then again we face the same problem of multicollinearity. For that reason we have considered firm's electricity expenditure data for allocation of state public capital.

For estimation purpose we use four step procedures; first, share of state level total public GFCF has been calculated by the ratio of each state's total public GFCF to total all India level public GFCF. Second, to calculate state level total public NFCS, the share of state level total public GFCF has been multiplied by the total public NFCS at all India level. Third, to generate state level total urban public NFCS, state level total public NFCS has been multiplied by the percentage of urban NDP to total all India level NDP. Finally, we generate the state level total urban public NFCS. Fourth, the state level total urban public NFCS has been allocated by multiplying with the ratio of individual firm's expenditure for electricity to the total expenditures for electricity by all the urban firms in a state. Finally, we obtain the social overhead capital for individual urban firm for each state (see table 4 for details).

The main equation to measure the social overhead capital is the following;

Social overhead capital for an individual firm = [(ratio of state level total public GFCF to all India level total public GFCF)*(total public NFCS of all India level)*(urban as % of total NDP)*(ratio of individual firm's expenditure for electricity to the total expenditures for electricity by all the urban firms in a state)].

5.2 Importance of use social overhead capital as one of the explanatory variables

Transport infrastructure has an inherent role in improving inter-regional connectivity and access to markets. Availability of reliable infrastructure reduces unit cost of production by lowering transport costs of inputs and outputs, generates consumer surplus by reducing cost of consumption thereby improving general quality of life, and attracts private investment. Firms with good access to market centers are thus likely to be more productive than firms in relatively remote areas. Further, better infrastructure in high accessibility areas in high accessibility areas encourages interaction and spillovers between firms, as well as between firms and research centers, government and regulatory institutions, etc. Local accessibility improvements therefore increase the potential size of agglomeration.

To construct the social overhead capital we use public GFCF which includes two types of fixed assets namely construction and machinery and equipment (including transport equipment, software and breeding stock, draught animals, dairy cattle). Construction activity covers all new constructions and major alternations and repairs of buildings, highways, streets, bridges, culverts, railroad beds, subways, airports, parking area, dams, drainages, wells and other irrigation sources, water and power projects, communication systems such as telephone and telegraph lines, land reclamations, bunding and other land improvements, afforestation projects, installation of wind energy system etc. Machinery and equipments comprise all types of machineries like agricultural machinery, power generating machinery, manufacturing, transport equipment, furniture and furnishing.

For that reason this variable serves as a proxy of transport infrastructure investment, because urban agglomeration which depends on scale economies but also the transportation cost. Because the trade-off between increasing returns and transport costs is fundamental to the understanding of the geography of economic activities.

Table 3: Estimation of state wise total urban public capital

		Total public GFCF (Rs. Crores)	GFCF Share	Total NFCS (Rs. Crores)	Total urban NDP (Rs. Crores)
1	Andhra Pradesh	12675	0.06189	180058.1	93667
2	Arunachal Pradesh	2028	0.0099	28809.3	14986.7
3	Assam	6982	0.03409	99184.67	51596.3
4	Bihar	6015	0.02937	85447.69	44450.3
5	Chhattisgarh	4976	0.0243	70687.9	36772.1
6	Goa	799	0.0039	11350.41	5904.53
7	Gujrat	13658	0.06669	194022.4	100931
8	Haryana	6035	0.02947	85731.81	44598.1
9	Himachal Pradesh	3705	0.01809	52632.37	27379.6
10	Jharkhand	4374	0.02136	62136.03	32323.4
11	Jammu & Kashmir	5607	0.02738	79651.74	41435.2
12	Karnataka	11933	0.05827	169517.4	88183.7
13	Kerala	4503	0.02199	63968.57	33276.7
14	Madhya Pradesh	11194	0.05466	159019.4	82722.6
15	Maharashtra	23836	0.11638	338608.7	176146
16	Manipur	1199	0.00585	17032.72	8860.49
17	Meghalaya	779	0.0038	11066.29	5756.73
18	Mizoram	2053	0.01002	29164.44	15171.5
19	Nagaland	1115	0.00544	15839.43	8239.74
20	Orissa	6139	0.02998	87209.21	45366.6
21	Punjab	4072	0.01988	57845.89	30091.7
22	Rajasthan	6613	0.03229	93942.74	48869.4
23	Sikkim	1390	0.00679	19746.02	10272
24	Tamil Nadu	14547	0.07103	206651.3	107501
25	Tripura	1041	0.00508	14788.2	7692.89
26	Uttar Pradesh	17530	0.08559	249027.1	129545
27	Uttarkhand	4977	0.0243	70702.1	36779.5
28	West Bengal	11324	0.05529	160866.1	83683.2
29	Andaman & N.I.	237	0.00116	3366.767	1751.41
30	Chandigarh	253	0.00124	3594.059	1869.64
31	Dadra & Nagar H.	36	0.00018	511.4076	266.036
32	Daman & Diu	14	6.8E-05	198.8807	103.459
33	Delhi	9459	0.04619	134372.4	69901.1
34	Lashadweep	393	0.00192	5582.867	2904.23
35	Punducherry	64	0.00031	909.1691	472.954
Total		204804	1	2909398	1513481

Source: GOI(2009) and Author’s calculation

Table 4: Descriptive statistics

	Output(Rs.)	Labor	Social overhead Capital(Rs.)	Private capital(Rs.)
No. of observation	20497	20497	20497	20497
Mean	452010000	64593	739000000	145700000
Std. Deviation	4512960000	184069	6898830000	1912230000
Coefficient of variation	998.42	284.96	933.54	1312.44
Minimum	41.67	29.25	5797.91	120
Maximum	436000000000	13739015	636000000000	214000000000

Source: Author's calculation

We consider 55163 firms for our entire analysis. We consider four main variables for our analysis, namely, output, number of labour, private capital, and social overhead capital. Table 3 shows the descriptive statistics of the four variables. For the above table, it is clear that mean and standard deviation of output, labour, social overhead capital, and capital are Rs. 452010000, 64593, Rs. 739000000, and Rs.145700000 respectively. The coefficient of variation of output, labour, social overhead capital, and capital are 998.42, 284.96, 933.54, and 1312.44 respectively. The coefficient of variation is a pure number, it does not depend on the units of the variable, so we can use it for relative measurement. From this table we say that the coefficient of variation is highest for capital and lowest for labour. As the value of coefficient of variation is highest for private capital, we can say that the relative variability is highest in data of private capital then the other variables and it is lowest for labour.

6. Estimation Result

6.1 All India level analysis for all the industry together

The coefficient a_2 (=α+β+γ-1) measures the economies of scale in urban production. The sign and value of this coefficient explains whether the urban firms in Indian industry operate under increasing returns to scale or decreasing returns to scale.

Table 5: Estimations of Cobb-Douglas Production Function

Variables	Estimated parameter		
	Model (1)	Model (2)	Model (3)
Constant	12.11*** (0.184)	12.11*** (0.184)	9.52*** (0.192)
Private capital	0.014*** (.006)	0.014*** (0.006)	0.008*** (0.005)
Labour	-0.493*** (0.01)	0.437*** (0.013)	-0.39*** (0.014)
Social overhead capital	0.056*** (0.007)	0.056*** (0.007)	0.045*** (0.007)
Material	-	-	0.24*** (0.007)
Adjusted R^2	0.10	0.06	0.14
No. of observation	55163	55163	55163

Note: Numbers in parentheses in the second row are (Heteroskedastic-consistent for OLS) standards errors. ***, **, and * indicate that coefficient is significance at 1 percent, 5 percent, and 10 percent level, respectively.
Source: Estimated by equation (6), equation (8) and equation (11).

The table 5 reports the Ordinary Least Square (OLS) regression result of the equation (6) for all India level. This result shows that the value of a_2 is statistically significant and negative, which explains that urban firm in Indian industry operate under decreasing returns to scale. For the all India level the value of a_2 is -0.46, i.e., the 1% increase in labor force in urban area on an average is a 46% decrease in urban production. The coefficient of per capita social overhead capital and per capita private capital are statistically significant and positive. To measure the "goodness of fit" we have calculated adjusted R^2, instead of R^2. Because there are several problems with the use of R^2, in the first place, all our statistical results follow from the initial assumption that the model has been correctly specified, and we have no statistical procedure to compare alternative specifications, second, R^2 is dependent upon the number of independent variables in the regression model, if we want to only maximize R^2 we can do that by adding more explanatory variables in the model. So the difficulty with R^2 as a measure of goodness of fit is that R^2 pertains to explained and unexplained variation in dependent variable and therefore does not account for the number of degrees of freedom in the problem. For that reason, we use adjusted R^2. Form the regression result of equation (4), we find adjusted R^2 value is 0.10.

Model 2:

Now equation (4) is estimated in logarithmic form, such that, we get the following equation (7);

$$LnY = lnA + \alpha\, lnK + \beta\, lnN + \gamma\, ln\, G \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(7)$$

For estimation purpose we add error term (ε) as before, and we get the equation (7);

$$LnY = lnA + \alpha\, lnK + \beta\, lnN + \gamma\, ln\, G + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(8)$$

Table 5 presents the Ordinary Least Square (OLS) regression result of equation (8). Table 6 shows that the coefficient of employment, coefficient of private capital and coefficient of social overhead capital are statistically significant and positive. From this table it is again clear that urban firm in Indian industry operate under decreasing returns to scale, as $\alpha+\beta+\gamma = 0.51$. However, the value of adjusted R^2 remains low at 0.06. But from this model it clear that the coefficient of labour is statistically positive and significant.

Now in equation (4) we add one more variable which is material. Then we get the new Cobb-Douglas production function as follows;

Model 3 :

$$Y=AK^{\alpha}N^{\beta}G^{\gamma}M^{\mu} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(9)$$

Equation (9) is estimated in per capita terms and logarithmic form,

$$ln(Y/N) = lnA + \alpha\, ln(K/N) + (\beta+\alpha+\gamma+\mu-1)\, ln\, N + \gamma\, ln(G/N)+\mu\, ln(M/N)$$

$$Or,\ ln(Y/N) = A_0 + a_4\, ln(K/N) + a_5\, lnN + a_6\, ln(G/N) + a_7\, ln(M/N) \quad ....(10)$$

For estimation purpose we add error term (ε) in equation (10), and we get the equation (11);

$$ln(Y/N) = A_0 + a_4\, ln(K/N) + a_5\, lnN + a_6\, ln(G/N) + a_7\, ln(M/N) + \varepsilon \quad ....(11)$$

Table 5 reports the Ordinary Least Square (OLS) result of the equation (11). The coefficient of employment a_5, which measure the economies of scale, is negative and statistically significant. From this result we again draw the same conclusion that urban firm in Indian industry operate under decreasing returns to scale. The coefficient of per capita private capital, per capita social over head capital, and per capita use of material are statistically significant and positive. In this model we get the value of adjusted R^2 is 0.14 which is slightly higher than what we get in the model 1.

6.2 State level analysis for all the industry together

For the state level analysis we consider Cobb-Douglas production function, which we have described in equation (2). We estimate Ordinary Least Square (OLS) regression of equation (4) for 27 states separately. Table 6 presents the individual regression result for 27 the states of India. This result shows that the value of a_2 is statistically significant and negative for all the states, which explains again that urban firm in Indian industry operates under decreasing returns to scale. The coefficient of per capita private capital is statistically significant and positive for Andhra Pradesh, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, Uttaranchal, and Delhi. This coefficient is positive and statistically insignificant for Bihar, Chhattisgarh, Meghalaya, West Bengal, Chandigarh, and Dadra & Nagar H. It is negative and insignificant for Assam, Goa, Gujrat, Jharkhand, Jammu&Kashmir, Orissa, and Pondicherry. But it is negative and statistically significant for Maharashtra, Nagaland, Tripura, and Manipur. The coefficient of per capita social over head capital is statistically significant and positive for Andhra Pradesh, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, Uttaranchal, and Delhi. It is positive but statistically insignificant for Bihar, Chhattisgarh, Jammu & Kashmir, Tripura, West Bengal, Chandigarh, and Dadra & Nagar H. This coefficient is negative and insignificant for Assam, Goa, Gujrat, Jharkhand, Meghalaya, Nagaland, Orissa, and Pondicherry. It is negative and statistically significant for Manipur, and Maharashtra. Also the result shows that the value of adjusted R^2 is highest for Nagaland and lowest for Pondicherry among the states.

6. Estimation of Cobb-Douglas production function:

Sl. No.	Name of the states	Constant	Variables			Adjusted R2	No. of observation
			Private Capital	Labour	Social Overhead Capital		
1	Andhra Pradesh	10.92*** (0.305)	0.054*** (0.009)	-0.455*** (0.026)	0.152*** (0.017)	0.25	9548
2	Assam	17.96*** (2.305)	-0.014 (0.045)	-0.987*** (0.131)	-0.121 (0.194)	0.47	132
3	Bihar	15.96*** (2.508)	0.029 (0.083)	-0.988*** (0.187)	0.022 (0.086)	0.27	147
4	Chhattisgarh	10.85*** (0.920)	0.018 (0.044)	-0.524*** (0.065)	0.257 (0.043)	0.28	1089
5	Goa	14.49*** (2.173)	-0.076 (0.055)	-0.683*** (0.158)	-0.056 (0.095)	0.37	121
6	Gujrat	20.03*** (1.029)	-0.071 (0.032)	-1.12*** (0.068)	-0.017 (0.037)	0.40	733
7	Haryana	8.438*** (0.517)	0.121*** (0.027)	-0.232*** (0.40)	0.243*** (0.029)	0.21	2293
8	Himachal Pradesh	4.38*** (2.27)	0.214** (0.068)	-0.129 (0.149)	0.349*** (0.097)	0.25	336
9	Jharkhand	18.33*** (1.456)	-0.083 (0.048)	-1.037*** (0.112)	-0.087 (0.171)	.31	271
10	Jammu & Kashmir	15.76*** (1.905)	-0.152 (0.051)	-0.728) *** (0.146)	0.07 (0.072)	0.16	185
11	Karnataka	11.299*** (0.335)	0.093*** (0.015)	-0.461*** (0.28)	0.098*** (0.017)	0.22	6632
12	Kerala	8.344*** (0.775)	0.138*** (0.031)	-0.298*** (0.052)	0.151*** (0.036)	0.15	2170
13	Madhya Pradesh	10.6*** (0.477)	0.142*** (0.026)	-0.458*** (0.039)	0.17*** (0.027)	0.28	2750
14	Maharashtra	18.65*** (0.671)	-0.037*** (0.021)	-1.104*** (0.057)	-0.059** (0.023)	0.42	1506
15	Manipur	23.534*** (3.3328)	-0.020* (0.121)	-1.45** (0.226)	-0.25*** (0.098)	0.62	32
16	Meghalaya	21.778*** (4.553)	0.064 (0.12)	-1.475*** (0.293)	-0.089 (0.179)	0.77	13
17	Nagaland	17.112*** (2.718)	-0.30* (0.093)	-1.048*** (0.191)	-0.017 (0.90)	0.55	56
18	Orissa	18.68*** (2.20)	-0.088 (0.079)	-1.1*** (0.17)	-0.055 (0.069)	0.27	166
19	Tamil Nadu	13.132*** (0.318)	0.038*** (0.013)	-0.6363*** (0.024)	0.084*** (0.014)	0.28	13325
20	Tripura	18.716*** (3.379)	-0.203* (0.123)	-1.161*** (0.232)	0.099 (0.109)	0.46	51
21	Uttar Pradesh	9.44*** (0.314)	0.109*** (.017)	-0.3232*** (0.025)	0.194*** (0.019)	0.22	7632
22	Uttaranchal	9.262*** (1.827)	0.138* (0.078)	-0.531*** (0.122)	0.211** (0.083)	0.32	286
23	West Bengal	15.78*** (1.17)	0.14 (0.041)	-1.04*** (0.094)	0.042 (0.004)	0.32	576
24	Chandigarh	10.91*** (2.19)	0.133 (0.09)	-0.451*** (0.154)	0.091 (0.08)	0.14	200
25	Dadra & Nagar H.	19.99*** (4.6)	0.046 (0.89)	-0.1.06** (0.319)	0.163 (0.186)	0.31	45
26	Delhi	22.26*** (1.56)	0.037*** (0.044)	-1.14*** (0.095)	0.169** (0.059)	0.33	635
27	Pondicherry	12.75*** (1.82)	-0.017 (0.079)	-0.487*** (0.133)	-0.019 (0.057)	0.13	249

Note: Numbers in parentheses in the second row are (Heteroskedastic-consistent for OLS) standards errors. ***, **, and * indicate that coefficient is significance at 1 percent, 5 percent, and 10 percent level, respectively.
Source: Estimated by equation (6).

6.3 Comparison between all India and state level result

We estimate Ordinary Least Square (OLS) regression of equation (4) for all India level as well as state level. Table 5 and Table 8 report the regression result for all India level and for individual state level respectively. For this result we find that a_2 is statistically significant and negative for all India level as well as for all the states. From that result we draw the same conclusion that urban firm in Indian industry operates under decreasing returns to scale. The coefficient of private capital is statistically significant and positive for all India level and for Andhra Pradesh, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, Uttaranchal, and Delhi. But for the rest of the states this coefficient is not positive and statistically significant. It is positive but statistically insignificant for Bihar, Chhattisgarh, Meghalaya, West Bengal, Chandigarh, and Dadra & Nagar H. Among the states, this coefficient is statistically significant and negative for Maharashtra, Nagaland, Tripura, and Manipur. The coefficient of per capita social overhead capital is positive and statistically significant for all India level as well as for Andhra Pradesh, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, Uttaranchal, and Delhi. But it is positive and statistically insignificant for Bihar, Chhattisgarh, Jammu & Kashmir, Tripura, West Bengal, Chandigarh, and Dadra & Nagar H. Within the states, for two states, namely, Manipur and Maharashtra, a_3 is negative and statistically significant. This coefficient is negative and insignificant for Assam, Goa, Gujrat, Jharkhand, Meghalaya, Nagaland, Orissa, and Pondicherry. The average adjusted R^2 for the state level is higher than the adjusted R^2 for all India level. The value of adjusted R^2 for the state level lies between the ranges of 0.13 to 0.55.

6.4 All India level analysis for different industry separately

In our earlier models we have considered all the urban firms in a state for regression analysis without taking care different industry group separately. But there is a problem regarding the consideration of all industries together, as different industries operate with different technology. For that reason we estimate Cobb-Douglas production function for different categories of industries separately.

The analysis is carried out for 26 industry sectors[8], grouping firms by their two-digit National Industry Classification (NIC)-2004 codes: 14 (other mining and quarrying), 15(manufacture of food products and beverages), 16(manufacture of tobacco products), 17(manufacture of textiles), 18(manufacture of wearing apparel), 19(tanning and dressing of leather), 20(manufacture of wood and of products of wood and cork), 21(manufacture of paper and paper products), 22(publishing, printing and reproduction of recorded media), 23(manufacture of coke, refined petroleum products and nuclear fuel), 24 (manufacture of chemicals and chemical products), 25(manufacture of rubber and plastic products), 26(manufacture of other non-metallic mineral products), 27(manufacture of basic metals), 28(manufacture of fabricated metal products), 29(manufacture of machinery and equipment), 30(manufacture of office, accounting and computing machinery), 31(manufacture of electrical machinery and apparatus), 32(manufacture of radio, television and communication), 33(manufacture of medical, precision and optical instruments, watches and clocks), 34(manufacture of motor vehicles, trailers and semi-trailers), 35(manufacture of other transport equipment), 36(manufacture of furniture; manufacturing), 40(electricity, gas, steam and hot water supply), and 50 (sale, maintenance and repair of motor vehicles and motorcycles)[9].

For the industry level analysis we consider Cobb-Douglas production function, which we have described in equation (8).

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[8] Although it is possible for grouping into two digit NIC-2004 code for 61 industry sector for all India level, some of the industry sector has not been taken consideration because of either these industries sector do not operate in urban area or due to small number of observation.

[9] For detailed description for different industry group see table 7.

Table 7: Description of different Industry sectors

NIC-2004 in two digit code	Description
14	Other mining and quarrying, which includes Quarrying of stone, sand and clay, Mining of chemical and fertilizer minerals.
15	Manufacture of food products and beverages.
16	Manufacture of tobacco products.
17	Manufacture of textiles.
18	Manufacture of wearing apparel; dressing and dyeing of fur.
19	Tanning and dressing of leather; manufacture of luggage, Handbags saddlery, harness and footwear.
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plating materials.
21	Manufacture of paper and paper products.
22	Publishing, printing and reproduction of recorded media.
23	Manufacture of coke, refined petroleum products and nuclear fuel.
24	Manufacture of chemicals and chemical products.
25	Manufacture of rubber and plastic products.
26	Manufacture of other non-metallic mineral products.
27	Manufacture of basic metals.
28	Manufacture of fabricated metal products, except machinery and equipments.
29	Manufacture of machinery and equipment n.e.c.
30	Manufacture of office, accounting and computing machinery.
31	Manufacture of electrical machinery and apparatus n.e.c.
32	Manufacture of radio, television and communication,Equipment and apparatus
33	Manufacture of medical, precision and optical instruments, watches and clocks.
34	Manufacture of motor vehicles, trailers and semi-trailers.
35	Manufacture of other transport equipment.
36	Manufacture of furniture; manufacturing n.e.c.
40	Electricity, gas, steam and hot water supply.
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel.
63	Supporting and auxilliary transport activities; activities of travel agencies.

Source: Annual Survey of Industries 2004

Table 8: Estimations of Cobb-Douglas Production Functions for Different Industry

	Name of the variables						
Industry code	Constant	Private Capital	Material	Social Overhead Capital	Labour	Adjusted R^2	No. of observation
14	12.96*** (1.612)	- 0.010 (0.044)	0.155** (0.049)	0.008 (0.050)	- 0.0634*** (0.121)	0.13	379
15	10.705*** (0.536)	- 0.031** (0.016)	0.261*** (0.017)	0.018 (0.018)	- 0.485*** (0.040)	0.16	2786
16	8.894*** (1.230)	0.069** (0.036)	0.0160*** (0.046)	0.072* (0.044)	- 0.320*** (0.90)	0.11	489
17	10.164*** (0.584)	- 0.020 (0.018)	0.241*** (0.02)	0.016 (0.020)	- 0.412*** (0.043)	0.13	2405
18	11.671*** (0.815)	0.078*** (0.021)	0.204*** (0.028)	0.044* (0.025)	- 0.555*** (0.060)	0.18	1275
19	11.10*** (1.252)	0.082** (0.038)	0.143*** (0.042)	0.041 (0.036)	-0.508*** (0.092)	0.14	566
20	8.973*** (1.517)	-0.011 (0.048)	0.331*** (0.047)	0.084*** (0.056)	- 0.413*** (0.112)	0.18	370
21	13.194*** (1.273)	- 0.046 (0.041)	0.178*** (0.044)	0.027 (0.047)	- 0.657*** (0.095)	0.15	446
22	8.433*** (0.969)	- 0.004 (0.028)	0.214*** (0.038)	0.095*** (0.032)	- 0.287*** (0.072)	0.13	660
23	10.348*** (2.138)	-0.015 (0.081)	0.140* (0.107)	0.030 (0.088)	- 0.373*** (0.152)	0.11	102
24	8.77*** (0.665)	0.036* (0.019)	0.248*** (0.024)	0.108*** (0.022)	0.389*** (0.049)	0.20	1407
25	11.166*** (1.009)	0.018 (0.027)	0.135*** (0.032)	0.050 (0.032)	- 0.479*** (0.075)	0.11	808
26	10.324*** (0.937)	0.045* (0.027)	0.157*** (0.033)	0.008*** (0.031)	- 0.379*** (0.070)	0.09	865
27	9.999*** (0.813)	0.026 (0.027)	0.276*** (0.028)	0.034 (0.029)	- 0.431*** (0.061)	0.15	1017
28	9.863*** (0.894)	- 0.026 (0.024)	0.306*** (0.026)	0.023 (0.031)	- 0.429*** (0.065)	0.16	1330
29	9.211*** (0.712)	0.004 (0.017)	0.216*** (0.027)	0.049** (0.025)	- 0.370*** (0.052)	0.12	1543
30	6.722*** (2.231)	0.146* (0.085)	0.124* (0.093)	0.180** (0.081)	- 0.209*** (0.169)	0.19	81
31	9.233*** (0.939)	- 0.034 (0.024)	0.250*** (0.034)	0.107*** (0.033)	- 0.413*** (0.070)	0.17	726
32	8.058*** (1.372)	0.019 (0.034)	0.316*** (0.057)	0.054 (0.048)	- 0.294*** (0.096)	0.16	330
33	4.254*** (1.670)	- 0.002 (0.052)	0.311* (0.065)	0.165 (0.059)	-0.039*** ()	0.11	286
34	9.805*** (1.071)	- 0.006 (0.028)	0.252*** (0.042)	0.101*** (0.034)	- 0.458*** (0.077)	0.19	593
35	6.742*** (1.369)	- 0.007 (0.040)	0.299*** (0.049)	0.012 (0.049)	- 0.195*** (0.099)	0.10	519
36	10.671*** (1.113)	0.045 (0.033)	0.137*** (0.039)	0.029*** (0.036)	- 0.441*** (0.087)	0.10	580
40	10.310*** (2.893)	- 0.007 (0.074)	0.124* (0.165)	0.194 (0.126)	- 0.498*** (0.207)	0.17	67
50	9.441*** (1.239)	- 0.018 (0.032)	0.189*** (0.044)	0.053*** (0.039)	- 0.352*** (0.091)	0.10	629
63	14.776*** (2.635)	0.012 (0.066)	0.162* (0.091)	0.43 (0.084)	-0.791*** (0.186)	0.25	111

Source: Estimated by using equation (11)

Table 8 individual presents the regression result for 26 industry sectors for all India level. From this result it is clear that the coefficients of labour which measures the scale economies are statistically significant and negative for all industry groups, which explains again that urban firms in Indian industry operates under decreasing returns to scale. The coefficient of per capita private capital is statistically significant and positive for the for the industry group 16(manufacture of tobacco products), 18(manufacture of wearing apparel), 19(tanning and dressing of leather), 24 (manufacture of chemicals and chemical products), 26(manufacture of other non-metallic mineral products), and 30(manufacture of office, accounting and computing machinery). It is negative and significant for 15(manufacture of food products and beverages). This coefficient is positive but not statistically significant for 25(manufacture of rubber and plastic products), 27(manufacture of basic metals), and 29(manufacture of machinery and equipment). For all other industry it is negative and statistically insignificant. The coefficient of per capita social overhead capital is positive for the entire industry sector. But it is positive and significant for twelve industry sectors. The coefficient of per capita material use is statistically significant and positive for all the industry sectors.

From the above results it is clear that there is a significant role of social overhead capital and material use for the production of output. For a example, industry sector 20(manufacture of wood and of products of wood and cork), the 1% increase in social overhead capital on an average 8% increase in production and 1% increase in use of material on an average 33% increase in production for this particular industry sector.

In our estimation we find role of private capital is not positive and significant for all the industry. Perhaps it is due in efficient use private capital for production. In our model private capital what we have defined is basically fixed capital of the firms. In the literature of economic geography it is clearly mention that the high fixed cost favor the concentration of production in a small number of units. In the absence of fixed cost, the number of plants tends to infinity; we fall back on backyard capitalism. Our preliminary result shows that fixed cost incurs by the firms are not high enough to favour the concentration of production in a small number of units.

From this analysis it appears to be counterintuitive about the influence of increasing returns to scale for regional concentration of industries in urban sector. Our findings may also support the "folk theorem" of location theory, which says that the absence of increasing returns there will be "backyard capitalism," with production potentially locating wherever there is demand.

S.V.Lal et al. (2004) estimate the production function using capital, labor, energy, and materials find that Indian industry are operating either at decreasing returns or around constant returns to scale. There analysis carried out for 11 industry sector using plant level data for 1994-95 from the Annual Survey of Industries (ASI). In their study they find that the marginal product of labor ranges between 0.07 and 0.36, considerably lower than results of around 0.7 for industrialized nations (Englander and Gurney, 1994).

Lall and Rodrigo (2001) observe similar patterns of inefficiency for four Indian industry sectors that exibit average technical efficiency of about 50% of the domestic best practice frontier. All of these above mentioned results support our findings.

In the contrast Kanemoto, Ohkawara and Suzuki (1996) study using the same model for Japanese metropolitan area, find that there is increasing returns to scale for the urban firms. Due to lack of information for metropolitan area[10] in India we cannot compare our result with their result. But in their model they felt difficulty to define social overall capital due to simultaneous equation bias. From this perspective we can say that we are much more successful to construct the social overhead capital.

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[10]In India million-plus (Population) cities are called metropolitan cities/area.

7. Conclusion and Future Research

Several innovations are made in this paper. This is the first study to use firm level data to examine the economies of scale for urban agglomeration. The magnitude of agglomeration economies are estimated from aggregate production functions for urban areas in state level as well as all India level. Our main finding is that in Indian industry those are set up in urban area operating at decreasing returns to scale. Also we have constructed the social overhead capital for each firm which is one of the challenging works.

Theoretical work on economic geography has a long and productive history. The last decade has seen a torrent of new papers, many of which expand upon the framework developed by Krugman (1991a). But when it comes to empirical work it is not matured enough. We do hope our findings are more important in this context. Our study put a question on the first basic paper by Krugman (1991a) “Increasing returns and Economic Geography”, whether the increasing returns matters for agglomeration or if, it matters, is it for developed country or for less developed country? The better way of explanation of these questions are left for the future research.

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