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**HOW TO IDENTIFY SPECIALIZATION?
THE CASE OF INDIA'S CITIES**

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Abstract

Given that India's urban areas contribute to nearly two-thirds of its gross domestic product, even though they account for only 31% of the country's population, they have been rightly called the engines of India's growth. In this paper, I answer the following questions: What are the economic specializations of Indian cities and towns, and how have these specializations changed over time? What part of these specializations identified is due to the local advantages, and what part is due to growth of the industry or national economic growth? Answers to these questions are basic to sustaining the competitiveness of India's cities. This paper uses standard Census of India data at the level of the city, to compute location quotients for all of India's cities and towns, using the state as the reference area, and examines changes in the Indian cities' economic base over time, using an ex ante classification of states/cities. Further this paper performs shift share analyses for selected large cities of the country, to determine the country's urban specialization.

I find that on average, over 1991–2001, Indian cities' specialization in manufacturing, declined. We find that no single city holds the same competitive position in a sector during the period, which implies that there is constant competition between cities even within a state. Further, in all non-agricultural economic sectors, cities in the lagging Indian states have core competence in most sectors. Based on the shift share analyses, we bust the myths that Delhi has local competence in public administration, and Mumbai is the financial capital of the country. The paper concludes with policy implications, caveats and further steps for the research.

Keywords: Location quotients—India's cities, Shift share—India, Regional economic tools-India, Urban competitiveness-India, Economic base—India's cities

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1. INTRODUCTION

Given that India's urban areas contribute to nearly two-thirds of its gross domestic product (GDP), even though they account for only 31% of the country's population, they have been rightly called India's growth engines. In 2014, a new Make in India policy was implemented to boost the growth of manufacturing in the country. This is relevant since India leapfrogged the manufacturing revolution and made the transition from agriculture, to become a service based economy, with 60% of its GDP now being contributed by services. How do foreign or Indian firms know the comparative advantages of cities, to enable them to make certain goods/services rather than others? Further, given the cities' own role in boosting economic growth, how will the state/local government know which sectors to promote to protect and enhance their competitiveness? There should be no doubt that answers to this question are basic to sustaining the competitiveness of India's cities.

In India, successive governments have been aware of the importance of urbanization, which contributes now nearly to two-thirds of the country's GDP. Due to this recognition, successive policies contained the idea that new towns should be encouraged to come up around specific industries such as information technology, or specific themes such as education or health. Cluster development models and special economic zones (SEZs) have also been discussed that can be adopted not only to promote manufacturing but also to build new industrial townships that enjoy advantages through agglomeration of firms and share specialized infrastructure, labor markets, and services. The main objectives of SEZs are to generate additional economic activity, promote exports of goods and services, encourage investment from domestic and foreign sources, create employment opportunities, and facilitate the development of infrastructure facilities, by reducing bureaucratic procedures.

It is a good idea to build cities around specific industries or themes; in fact, the basic rationale for the development of new cities and towns is such agglomeration. The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) also required that cities come up with a City Development Plan (CDP), or a vision for themselves, which presumably depend on the cities' strengths. So it is important for every city to make an attempt to go about identifying its strengths. This way, it is possible for city governments to know the advantages of their local economies, in which areas they can compete and win the race, and their weaknesses, in which areas they need to provide incentives. But thus far, such an attempt has not been undertaken or detailed studies of cities have not been done.

There are a number of analytical tools available to help the city planner, policy maker, and firm to make an informed decision about what to make and where to make it. Dinc (2002) contains a summary of these tools. However, as Webster and Muller (2000) point out, despite the importance of urban economies in cities of developing countries, little has been done to assess their competitiveness, which should be typically the first step in the formulation of competitiveness strategies and policies. This is especially applicable to the cities of India that have now become economically and politically important.

2. RESEARCH OBJECTIVES AND SCOPE

In this paper, I examine whether India's cities promote countrywide competitiveness. In line with this broad objective, the questions I propose to answer in this paper are:

1. What are the economic specializations of India's cities and towns? How have these specializations changed over time?
2. What part of the specialization identified of the city/town is due to the local advantages, and what parts are due to growth of the industry or national economic growth?

It is believed that cities promote a country's competitiveness, but is this the case? There are no detailed studies of cities that confirm this policy direction. Hence I answer (1) with the location quotient (LQ), which is an analytical tool for comparing a city's share (of employment, value added, or output) of a certain activity with its share in the reference area, which could be the state or the country.

I respond to (2) by performing shift share analysis of employment, which is a tool to analyze relative regional and local competencies in a certain activity. This technique enables one to disaggregate employment growth (or any other parameter of interest—this could be production, value added, wages, incomes, or population) in a regional (city) economy into three components: the impacts of the growth of the national economy, the growth of the industry in which the firm is located, and the local competitive advantages, to which local employment growth can be attributed. If the local competitive advantage in an industry is high, then a major portion of employment growth in the local/regional economy will be due to this effect. Hence it will be important for policy makers to understand in which sectors local/regional economies are competent.

The policy relevance of this research is that it will provide signals to the government and firms regarding the sectors that need to be nurtured and promoted, and about what sectors do not need incentives. This is basic analysis that needs to be done if urban India is to become competitive.

3. PAPER OVERVIEW

The next section of the paper summarizes the literature on the subject in the Indian context, followed by a discussion of the methodology, which contains details of the techniques adopted. Then a section is presented in which the findings from the LQ and shift share analyses are presented. The final section of the paper summarizes the findings, presents the policy implications of the research, caveats, and further steps, and concludes.

4. LITERATURE SURVEY

The literature on regional specialization, location quotients, and shift share in the context of other countries is quite extensive. The first simple version of the LQ was used by Schaffer and Chu (1969). The subsequent empirical applications of the simple LQs were by Morrison and Smith (1974), Round (1978), Sawyer and Miller (1983), Robison and Miller (1988), and Flegg and Webber (2000).

A variant of the original LQ is the cross industry LQ (CILQ), suggested by Flegg et al. (1995), which examines the interdependence between two industry sectors, just like the input–output coefficients do. To overcome the problems of CILQ, Round (1978) suggested the use of the semilogarithmic quotient (RLQ), which not only considered the selling and purchasing industry, but also added the relative sizes of the region and nation (the reference areas), similar to a weighted average.

The shift share technique was originally developed by Dunn (1960). Given the regional share effect in this basic model could be correlated with the regional industrial mix, Esteban–Marquillas (1972) extended the original version to include an additional shift term, the allocation effect, which shows the extent to which the city is specialized in the industries in which it is competitive. Arcelus (1984) used Esteban–Marquillas' extensions, to further disaggregate the national share and industrial mix effects into *expected* and *differential* components. The *expected* component is based on the theoretical value of the variable within an industry (assuming the region has the same industrial mix as the nation), and is the effect that is not due to regional specialization. The *differential* component is the remaining effect, which is due to the regional industrial mix. Further, it should be readily recognized that the basic shift share model, with all its extensions, is basically a static one, which only considers two years in its analysis (the beginning and ending years).

Naturally there have been attempts to make the shift share technique dynamic. Barff and Prentice (1988) developed a dynamic model that utilizes every year in the study period. As is clear, the dynamic version requires more data to perform the calculations, since it takes into account continuous changes occurring in the city every year, such that the results are less impacted by the choice of starting and ending years.

Over and above the evolution of the techniques themselves, in terms of empirical applications, Leigh (1970) used location quotients in the context of the United States and Flegg et al. (1995) computed LQs in the context of England. Barff and Prentice (1988) used dynamic shift share in the context of the United States, Brownie and Dalziel (1993) used shift share analysis to understand growth in New Zealand's exports. Tohmo (2004) estimated LQs to examine regional input–output coefficients and production multipliers in the context of Finland (for the Keski–Pohjanmaa [K–P] region), to find that the semilogarithmic LQ (SLQ) and CILQ (cross-industry LQs) are misleading for regional planning. Brantingham and Brantingham (1998) compared violent crimes across cities in British Columbia using LQs and ranked them, with Vancouver topping the list of 15 cities thus ranked. Carroll et al. (2008) used LQs to identify a cluster of firms in the transportation equipment industry of four mid-western states in the United States.

There are studies that use shift share analysis to identify and disaggregate competence of regions. Esteban (2000) used this technique to understand regional inequality within the European Union to find that regional specialization has a much smaller role to play than productivity gaps. Espa et al. (2013) applied shift share to Italian data at the firm level, to understand business change, and introduced a new

decomposition to study the effect of neighborhood change. They found evidence of the effects of industrial mix only in central–northern Italy.

For India, Chandrasekhar and Sharma (2014) identified economic activities that are concentrated in various regions of India, by calculating the location quotients, at the level of the regions, both rural and urban, using data from the National Sample Survey Office. Lall and Chakravorty (2005) computed location quotients at the district level for India, and found that industrial diversity (that is, the local presence of a mix of industries) provided significant cost savings for individual firms.

While the literature in this area is extensive, in the context of India and its cities it is quite sparse, as indicated by the brief survey presented here. This paper uses standard Census of India data at the level of the city, to compute LQs for India's cities and towns, and performs shift share analyses for selected large cities of the country, to determine the country's urban competitiveness. Further, given Indian studies have not looked at changes in economic base of cities over time, that effort is attempted here. We are also not aware of Indian studies that have performed shift share analyses of employment, to understand cities' specific local competence, which is done in this paper.

5. METHODOLOGY AND DATA

Location quotients for identifying clusters of industries are computed for all sectors such as agricultural labor, livestock, mining, construction, household and non-household based manufacturing, transport & communication, and trade & commerce services employment, using data from the Census of India Economic tables 1991 and 2001. Location quotients over 1991–2001 are analyzed to understand changes in specialization among Indian cities during the period. Location quotients are very rough indicators, however, and must be carefully interpreted within the context of regional conditions and refined by the use of other analytical techniques. Hence, I use shift share analysis to understand the regional competence in the context of India's cities and towns, and disaggregate what is due to national economic growth and the part that is due to growth of the industry.

5.1 Location Quotient Analysis

The study of a city's competitiveness starts with the simple location quotient, which does not require extensive data and processing. It is a simple tool for comparing a region's share of a certain activity with its share of some basic aggregate.¹

Mathematically,

$$LQ = \frac{E_{ir}/E_r}{E_{in}/E_n} \quad [1]$$

In equation [1], E_{ir} = Employment (jobs) in sector i of city r , and E_r is total employment (jobs) of city r ; E_{in} = Employment (jobs) in sector i of the state (which is considered the reference area), and E_n is total employment in the state; In the three-tier Indian political system, a city's economy and fortunes are more closely related to that of the state

¹ A researcher can use any base s/he considers significant for the problem and region of study. Other variables of interest could be income, value added, population, or area, depending on the research problem of interest.

in which it is located; hence the state is chosen as the reference area for the city in this paper.

The advantage of the LQ method is its simplicity and that it is based on readily available data. Policy makers may be interested in how employment in industries A and B is concentrated across regions of the nation. Regional policy makers should know which industries are concentrated in their own regions.

If $LQ > 1$ export industry; $LQ < 1$, import industry. Why? $LQ > 1$ means that the industry employs a greater share of local workforce than it does nationally (or in the state), which implies that the industry is producing more than is consumed locally. If $LQ < 1$, then the good we are examining in the region would be an import industry, since it means that local residents and businesses are purchasing these particular goods and services from outside the local area.

When examining changes in LQs for the same region over time, keeping in mind its limitations which are discussed later, large declining LQs over time would indicate that the industry is important to the local economy and losing it would create problems. Small and growing LQs over time would indicate that the industry will promise future growth for the local economy, and that it should be supported. Small declining LQs indicate that they are not important to the local economy; large increasing LQs are desirable since they are the base of the local/regional economy. Analysis of the region/city's LQs for all industries would therefore send signals as to what the area's competitive advantage is and how it is changing over time.

Hence another way in which the LQ can be used is to see changes in LQ (ΔLQ) over time for a region, to understand the importance of a particular sector/industry for the local economy and how it is changing, as given by:

$$\Delta LQ = \frac{LQ_{t+1} - LQ_t}{LQ_t} \quad [2]$$

LQ_{t+1} refers to LQ for a city at time $t+1$, and LQ_t is LQ for the same city at time t . Equation [2] will indicate whether employment is concentrated, not concentrated; decreasing or increasing over time (t to $t+1$) in a particular sector of a city.

Limitations of the LQ Approach

While the advantage of the LQ tool is that it is simple, and can be computed from readily available data sources, it has limitations. The fact that a city has more or less than its proportionate share of an activity in comparison to a reference area, does not by itself tell much. The following limitations of the method have to be borne in mind in interpreting the results.

- a. Propensities to consume could be different across regions, while LQ speaks only of production. In southern regions of India, for instance, little fuel is required by HHs for air-conditioning and heating; in the north, significant amounts. This means that in the fuel manufacturing industry (electricity, gas, and water supply, in the Census of India's classification of sectors), an LQ of less than 1 for cities in southern India could be consistent with major exports of fuel oil; for the north, an LQ of greater than 1 could be consistent with major imports of fuel oil from outside the region.
- b. Income levels of households differ across regions. Paul and Sridhar (2015) find that the per capita income of southern states grew at a much higher rate for the southern Indian states post-1991, than was the case with the northern states, although both groups started off at more or less the same levels. This implies

that if a region consumes many more men's suits than does another region, an $LQ > 1$ is consistent with major net imports of men's suits. By the same token, an $LQ < 1$ can be consistent with major net exports.

- c. Labor productivity differs across regions. Some regions may use more scrap per ton steel than other regions. For the former region, the $LQ > 1$ and yet be consistent with major scrap imports.
- d. Industrial mixes vary considerably. An $LQ > 1$ could well be found for the electricity gas and water supply sector, in locations where there is a concentration of power producing activities. But it is possible that this region may not export power as the $LQ > 1$ would imply.

The above limitations of the LQ approach are to some extent overcome by shift share analysis (SS) which enables a better understanding of the competence of regions. Shift share analysis is a method which is simple, yet enables us to understand what part of employment growth in an industry during a certain period was attributable to national economic growth, what share of employment growth in the sector of a city was because of growth in the particular industry/sector, and what part of employment growth was due to the local area's specific expertise. This is useful for purposes of identifying sectors that should be promoted or discouraged.

5.2 Shift Share (SS) Analysis

SS examines economic growth or decline, measured by employment (or other indicators such as value added or output) in a city by disaggregating the change into three components:

1. National share
2. Industrial mix
3. Regional share

The measurement unit could be employment, income, output, value added, or other factors. In this paper, employment is used due to the availability of this data at the city level from the Census of India.

Formally, we define the following terms:

E_{tr} = Total employment (jobs) in city r at time t ;
 $E_{r,t+1}$ = Total employment (jobs) in city r at time $t+1$;

E_{tir} = Employment (jobs) in sector i in city r at time t ;
 $E_{ir,t+1}$ = Employment (jobs) in sector i of city r at time $t+1$;

$$gs = \frac{E_{r,t+1} - E_{tr}}{E_{tr}}$$

$$gir = \frac{E_{ir,t+1} - E_{tir}}{E_{tir}}$$

gir is the growth rate of industry i in city r during the period t to $t+1$.

E_{tis} = Employment in sector i of the state at time t .
 $E_{is,t+1}$ = Employment in sector i of the state at time $t+1$.

$$gis = \frac{E_{is, t+1} - E_{is}}{E_{is}}$$

Analogously, gis is the growth rate of industry i in state s over the period t to $t+1$; gs refers to the growth of all industries (or of total employment) in the reference area, the state, in the context of this paper.

National share (NS). This part of the shift share technique measures the employment change that occurred in the city, if its employment grew at the same rate as that of the state (which is considered as the reference area in this paper). In other words, this part shows the city's employment change during the previous period that was due to national economic growth, which invariably influences its constituent economies, here the city.

Since we are examining cities here, the state economy is a significant part of the regional economic environment the city is faced with. If the state's (reference area) economy had been experiencing high overall macroeconomic growth, the city's employment would grow as well. The national share in the technique is defined as:

$$NS = \sum E_{tir} gs$$

The NS shows how many jobs gained (or lost) in the sector during the period t to $t+1$ was due to the overall growth of the state's economy (gs), as a whole.

Industry mix (IM). This component of the shift share technique reflects the share of local economic (employment) change that is due to the city's industry composition. If the city contains some industries that are fast growing nationally, then it could experience faster employment growth in those industries. The opposite is also true. Formally, this share may be represented as follows.

$$IM = \sum E_{tir} (gis - gs);$$

where the difference ($gis-gs$) refers to the growth rate of the specific industry segment (gis) in the state, when compared with the state's overall economic growth (gs).

Positive net values for IM indicate that the industry composition of the city contains faster growing industries. Negative results indicate the opposite.

Regional share (RS). This component measures the employment change in a particular sector of the city as being the difference between the sector's growth rate (gir) in the city and the sector's growth rate in the state (which is here the reference area) (gis).

$$RS = \sum E_{tir} (gir - gis)$$

This component is the one that indicates the local area's competitiveness in producing a particular good or service. This could be a natural resource, skill availability, size of a market, local consumption, savings, institutions, governance, or local leadership. While this component helps us to identify the city's competence, we should note that SS cannot help us to identify what the local area/city's specific local advantage is, that is the basis of its competence. It only helps us to disaggregate the part of employment growth that is due to local (dis)advantages.

What is termed as the ‘total shift’ in shift share analysis is thus the sum of the three components – NS, IM, and RS – described above, and is equal to the employment change in the city over the said period for a specific sector.

The source of data for computing LQs and the shift share analyses is the Census of India economic (B) tables, since that reports information on main (as well as marginal workers for 2001) workers by industry sector at the level of the state and the Urban agglomeration (in the Primary Census Abstract [PCA]).

6. WHAT ARE INDIAN CITIES’ CORE COMPETENCIES? FINDINGS FROM LQS

For ease of analysis, cities are grouped into categories *ex ante*—based on the northern Indian states and the south Indian states (for an analysis of why such a categorization makes sense, see Paul and Sridhar [2015]). The south Indian states refer to the major states south of the Vindhya mountain ranges—Tamil Nadu, Karnataka, Andhra Pradesh (which is now further separated into Telangana), and Kerala. The northern Indian states refer to those north of the Vindhya mountain ranges, which are traditionally known to be lagging behind and consist of Uttar Pradesh, Uttarakhand, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, and Rajasthan.² This categorization of the north versus the south Indian states is the same as in Paul and Sridhar (2015) to enable the imputation of similar hypotheses—all of them summarily implying that the south is more competitive than the north.

Table 1 summarizes and presents the location quotients computed for various sectors in India’s southern and northern cities, using data from Census of India 1991 and 2001. While the northern states are traditionally known as less developed and lagging, Table 1 shows that the northern cities are more competitive in all the urban sectors, when compared with their southern counterparts.

Overall, even the maximum location quotients for agriculture-related activity (cultivators) in India’s cities are less than 1, indicating that cities do not have expertise in these sectors. This is natural to expect given the Census of India’s definition of urban areas (minimum of 75% male non-agricultural main employment).³

Most sectors, including fishing and mining, are those in which India’s northern cities have an advantage, quite contrary to what Paul and Sridhar (2015) argue. No doubt within reach of the Ganga, Dinapur Nizamat (Bihar, a ‘northern’ state) had the most advantage in fishing (with an LQ of 4.1 in 2001).

We study competence of India’s cities by sector. In non-household manufacturing, Bhilai Nagar (in Chhattisgarh, a ‘bimar’⁴ state) had the most comparative advantage (with the maximum LQ of 8.9 in 2001). This is corroborated by the presence of the iron and steel industry in that town, given the agglomeration which was possibly generated by the initial location of the steel plant during the early days of post-independent industrialization, set up during the Nehruvian period. In household manufacturing, a small town (Maunath Bhanjan) in Uttar Pradesh, another less developed ‘northern state,’ is the most competent (it has the maximum LQ of all towns, 11.8, in this sector for 2001). This finding is no surprise as this is an industrial town, located at a distance of 120 kilometers from Varanasi, which is a major center for textile weaving. With

² I have excluded the smaller northeastern states and the union territories from the analysis.

³ See footnote 5 for a definition of “main employment.”

⁴ Incidentally, the term “bimar” in Hindi refers to being sick.

respect to the concentration of manufacturing industry, it is instructive to note that Chandrasekhar and Sharma (2014) found that all top five regions of the country were million-plus cities. However, their analysis was at the regional level, consisting both of rural and urban areas.

Table 1: Summary of Location Quotients by Sector, India's Cities in the North and South, 1991–2001[□]

Sector	Mean, Southern Indian Cities, 1991	Mean, Southern Indian Cities, 2001	Mean, Northern Indian Cities, 1991	Mean, Northern Indian Cities, 2001
Cultivators	0.08	0.04	0.07	0.03
Agricultural labourers	0.12	0.08	0.18	0.08
Fishing, Hunting and allied activities	0.60	0.44	1.81	0.80
Mining and quarrying	6.20	1.54	1.16	0.79
HHI–Mfg	1.01	1.01	1.97	1.60
Non HHI–Mfg and Electricity, gas and water supply	2.38	1.82	5.12	3.39
Construction	2.62	1.93	3.47	2.46
Wholesale and retail trade; Financial intermediation, Real estate, renting and business activities + Hotels and restaurants	2.95	2.40	4.36	3.51
Transport, storage and communications	3.26	2.37	4.74	3.41
Public administration and others*	2.72	2.33	3.56	2.92

HHI = household-based industries; Mfg = manufacturing.

[□] These LQs have been computed for main workers only, in the interests of comparing them with those in 1991, since in the Census of 1991 economic tables, information on marginal workers was not available separately by industry (see footnote 5 for details). The data are based on 421 urban agglomerations (UAs) in all the Indian states for which economic tables were published in 2001, and 374 UAs in 1991.

*This includes categories such as defense, compulsory social security, education, health, and social work, other community, social and personal service activity, activities of private households as employers and extraterritorial organizations and bodies.

Source: Census of India 1991, 2001 and author's computations.

Next we turn to the silent revolution created by services in India's economy. Paul and Sridhar (2015) found that the service sector led the surge of economic growth in the southern states, consistent with trends in the country.

In wholesale and retail trade, repair of motor vehicles, motorcycles, and personal and household goods, Siwan (in Bihar) is the one with the most specialization (with an LQ of nearly 6.3 in 2001). We have reviewed and as per this city's business plan retailing of food and other consumables is particularly widespread in the town. Other commonly found service activities in this city include wholesale trading of agricultural produce and manufactured items, restaurants, food stalls, hotels, motorized and non-motorized transport, and mechanical repairs; hence its competence in wholesale/retail trade is proven.

Further, Darbanga in Bihar is the most advantaged in hotels and restaurants (with the maximum LQ of 7.8 in 2001). As per a report by the Institute for Human Development (2008), Darbhanga's literacy rate during 2008 was 55.5%, well below the all India average of 67.3% for 2005. Furthermore, the deprivation of the district with respect to female literacy was even lower, being 43.9% for 2008, when compared with an all India female literacy rate of 57.1% for 2005. However, the workforce participation rate of

the district in 2008 (being 37.8%) was more or less the same as the all India average for 2005 (which was 38%). The relatively low literacy for the district along with the relatively higher workforce participation rate strongly suggest that the jobs would be relatively unskilled or semi-skilled, which is what a specialization in hotels and restaurants would imply.

Katihar, again in Bihar, has the best comparative advantage in transport, storage and communications (with an LQ of 7.0 in 2001). Its dominance in transport and communication may be explained by the fact Katihar is a major Railway junction under India's north-east frontier railway. Further, the town has a large number of jute and flour mills, which possibly explain its position with respect to storage.

With respect to financial intermediation, one would have expected Mumbai to top the charts. What we find based on this analysis, is that Bikaner in Rajasthan (a 'bimar' state) has the most comparative advantage in financial intermediation, real estate, renting, and related business activities (with an LQ of 10.7 for 2001). Mumbai's LQ for financial intermediation is only 3.0, although well above 1, as we expect. Why is this the case?

For the biggest cities of India, the export goods which the 2001 town directory lists, their LQs for the relevant sectors, and highest LQ for any sector in the city, are juxtaposed in Table 2. What we find is that financial intermediation, real estate, and renting and business services have the highest LQ of all sectors in the selected cities. This is plausible as entrepreneurs can conduct their business only when there are financial intermediation and real estate business services households can source from.

While for most selected cities in Table 2, the LQs are fairly low for household-based manufacturing, Bengaluru's LQ for non-household manufacturing (2.9) is the highest among the largest cities, consistent with the finding by Chandrasekhar and Sharma (2014), on the concentration of manufacturing in the million-plus cities of the country.

Further, we note that there is no direct correspondence between the sectors listed as those exporting goods, their LQs, and the sector with the highest LQ. This is because of the fact that large cities are urban agglomerations, which encourages large-scale production of goods and services, which promotes the specialization of backend services such as financial intermediation.

7. CHANGES IN ECONOMIC BASE

As discussed earlier, while the location quotient for a single year indicates a snapshot of the city's competitive advantage at a single point in time, changes in LQs over time for a given city indicate substantively about its changing economic base, and their implications. Hence a disaggregated examination of Indian cities' competitive advantage over 1991–2001⁵ is what is attempted in this section, while Table 1 presents this for north and south Indian cities.

⁵ At the time of finishing this draft paper, the Census of India 2011 still had not released the data on economic tables at the sectoral and city levels that would have enabled us to compare LQs all the way up to 2011 (see Sridhar 2014).

Table 2: Comparison of Exporting Goods and Location Quotients, 2001, Selected Indian Cities

City	Exporting Goods Listed in the Census of India 2001 Town Directory	Important Goods Manufactured Listed in the Census of India 2001 Town Directory	LQ, Sector for Exporting Goods Listed in the Census of India Town Directory, 2001	Highest LQ for Any Sector, 2001
Delhi	Metal, textiles and chemicals	Textiles	3.3 (non-household manufacturing); 1.9, household manufacturing)	3.3 (non-household manufacturing)
Mumbai	Edible oil, readymade garments and electronic goods	Medicines	2.8 (non-household manufacturing); 1.2, household manufacturing)	4.0 (Financial intermediation, real estate and renting)
Kolkata	Leather, metal, iron and steel	Engineering	1.5 (non-household manufacturing); 0.4, household manufacturing)	3.5 (Financial intermediation, real estate and renting)
Chennai	Readymades, foam bed and sea food	Railway coaches	1.3 (non-household manufacturing); 0.3, household manufacturing)	3.5 (Financial intermediation, real estate and renting)
Bengaluru	Software, machinery, readymades and preserved food items	Software products	3.3 (non-household manufacturing); 0.5, household manufacturing)	3.7 (Financial intermediation, real estate and renting)
Ahmedabad	Processed cloth, chemicals and diamond	Cotton clothes	2.1 (non-household manufacturing); 1.1, household manufacturing)	2.7 (Financial intermediation, real estate and renting)

LQ = location quotient.

Source: Census of India 2001 and author's computations.

Table 3 summarizes the aggregate distribution of the changes in the Indian cities' specialization (as measured by LQs) during 1991–2001.⁶ Given the caveats of the comparison (see footnote 6), several points may be noted from this:

⁶ The data on economic tables in the 1991 and 2001 Census of India were not in consistent format across the two census years to enable comparison, but certain modifications were applied to the data. For instance, the 1991 economic tables reported data only on "main" workers (who were working for more than 6 months preceding the date of enumeration), whereas the 2001 corresponding tables reported both main and marginal workers (who were working for less than 180 days or 6 months preceding the date of enumeration). I used data only on main workers from 2001 to enable comparison across the two years.

The other factor that made comparison difficult across the two census years is that the industry classifications were different across 1991 and 2001. In 1991, below were the industrial categories used for reporting employment both at the state and city (urban agglomeration) levels: Cultivators (I); Agricultural laborers (II); Livestock, fishing, forestry, hunting, plantations, orchards and allied activities (III); Mining and quarrying (IV); Manufacturing, processing, servicing, and repairs in household industry (VA); Manufacturing, processing, servicing, and repairs in non-household industry (VB); Construction (VI); Trade and commerce (VII); Transport, storage and communications (VIII); Other services (IX). In 2001, below were the industrial categories which were used in the economic tables, both at the state and city level:

A: Agriculture, hunting and forestry

B: Fishing

1. On average, over 1991–2001, Indian cities' competence in manufacturing declined, which may be seen in the declining value of the average LQ for all non-agricultural sectors, particularly the household based ones (which declined from an average LQ of 1.5 in 1991 to that of 1.1 in 2001) and non-household based manufacturing (which declined from an average of 2.6 in 1991 to 2.3 in 2001). In non-household manufacturing, even the maximum LQ declined from 26.6 (for Begusarai (in Bihar, which is a lagging state) in 1991 to only 8.9 (for Bhilai in Chhattisgarh, also less developed and largely tribal) in 2001). While this could be genuine, this could also be related to the fact that during the decade several changes were made to industry classifications by the Census (see footnote 6). If true, this is a cause of concern, and is consistent with the evidence that manufacturing contributes only 26% to the country's GDP (compared with 60% by services). However, the exception to this declining specialization is wholesale and retail trade; this could largely explain the silent services revolution that the country experienced.
2. Second, for all urban occupations (sectors other than cultivators, and agricultural labor), either 1991 or 2001, the LQ is greater than 1, which is to be expected.
3. One way to understand if the cities with a certain core advantage had retained the same competence a decade later would be to examine the maximum LQs for a given sector, during the decade. There is not a single sector where the same city retained its core competence during the 1991–2001 decade in any sector. If we were to take the case of construction, while Petlawad (in Madhya Pradesh, a 'bimar' state) had the maximum competence in 1991, Aizawl (Mizoram, a northeastern Indian state) had taken over this lead in 2001. The same is the case for all the sectors. In mining, while a south Indian city (Neyveli in Tamil Nadu, a progressive and forward looking state in Paul and Sridhar [2015] classification) had the core competence in 1991, it had given way to an eastern city (Jamuria in West Bengal) a decade later. With respect to household

C: Mining and quarrying

D: Manufacturing (household and non-household industry were separately reported)

E: Electricity, gas and water supply

F: Construction

G: Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods

H : Hotels and restaurants

I: Transport, storage and communications

J: Financial intermediation

K: Real estate, renting and business activities

L: Public administration and defence; compulsory social security

M: Education

N: Health and social work

O: Other community, social and personal service activities

P: Activities of private households as employers and undifferentiated production activities of private households

Q : Extraterritorial organizations and bodies

Therefore for purposes of comparison of industrial categories across the 2 years, after discussions with the Census officials, the electricity, gas and water supply category (E above in 2001) was included in "Non-household industry" (VB in 1991); Categories G, H, J, and K (Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods, Hotels and restaurants, Hotels and restaurants and Real estate, renting and business activities), in 2001 were all combined into one category, which mapped into category VII (Trade and commerce) in 1991.

manufacturing, Mubarakpur (in Uttar Pradesh, a “bimar” state) had the core competence (due to its expertise in silk weaving) in 1991, but lost the advantage in household manufacturing to a different town (Maunath Bhanjan) within the state by 2001. In non-household manufacturing, Begusarai (in Bihar), which was the most specialized in 1991, lost to Bhilai Nagar (in Chhattisgarh) in 2001, but with both of them representing an old economy (steel) industry. In wholesale and retail trade, Sitamarhi (in Bihar), which was the most specialized in 1991, gave way to Siwan, both within Bihar, over 1991–2001, relocating activity within the state, as in the case of household manufacturing.

Table 3: Location Quotients, 1991 and 2001 by Sector, India’s Cities, State as Reference Region*

Sector	Mean LQ, 1991	Mean LQ, 2001
Cultivators	0.18	0.05
Agricultural labourers	0.32	0.09
Fishing, Hunting and allied activities	1.54	0.66
Mining & quarrying	4.56	1.52
HHI–Mfg	1.48	1.11
Non HHI–Mfg and Electricity, gas and water supply	2.61	2.31
Construction	2.75	2.16
Wholesale and retail trade; repair of motor vehicles, motorcycles, Financial intermediation, Real estate, renting and business activities and Hotels and restaurants	2.45	2.66
Transport, storage and communications	3.33	2.52
Public administration and others*	2.67	2.40

LQ = location quotient; HHI = household-based industry; Mfg = manufacturing.

*Note: The corresponding employment for the city of interest has been excluded from that of the state as reference region.

Source: Census of India 2001 and author’s computations.

Thus when we examine the maximum LQs for all sectors, we observe that no single city holds the same competitive position during the period in a sector, which implies that there is constant competition between cities even within a state, which is a conducive for regional development to occur (see Sridhar [2005]).

I thus note that in all non-agricultural economic sectors, cities in the states identified as BIMARU (referring to Bihar, Jharkhand, Rajasthan, Madhya Pradesh, Chhattisgarh, Uttar Pradesh and Uttaranchal) by Paul and Sridhar (2015) had the core competence in most sectors. The only exceptions to this pattern are natural resource-based activity like mining, in which a south Indian city (Neyveli in fast growing Tamil Nadu) had this advantage in 1991, which moved to West Bengal (to Jamuria) in 2001. The other exception to this pattern is construction, where a northeastern city Aizawl had the maximum specialization, when the state is taken as reference region.

Summarizing the results from the LQ analysis, Indian cities’ competence in manufacturing, has declined during 1991–2001, which may be seen in the declining value of the average LQ for all non-agricultural sectors, except wholesale and retail trade. This is a cause for concern, given manufacturing is the backbone of many industry sectors, including services.

Next, we find that no single city holds the same competitive position during the period in a sector, which implies that there is constant competition between cities even within a state, which is a conducive for regional development to occur.

Finally, states known to be traditionally laggard and slow growing, show a lot of promise for further regional development, based on their cities' specialization.

Given however the limitations of LQ analysis as discussed earlier, we next use shift share analyses to understand the competence of Indian cities, and to more generally determine if the results from the shift share confirm those from the LQ analyses, even with their limitations.

8. WHAT PART OF JOB GROWTH IS ATTRIBUTABLE TO LOCAL ADVANTAGES IN INDIA'S CITIES? FINDINGS FROM SHIFT-SHARE ANALYSIS

Using the methodology discussed earlier, shift share analysis was employed to disaggregate local economic change for selected major cities in India to understand their employment growth by sector, to study their core competence.

Tables 4–9 contain the results of the shift share analyses for Delhi, Mumbai, Chennai, Kolkata, Bengaluru, and Ahmedabad, respectively, using the respective states in which they are located, as the reference region.⁷ These were selected for the SS analyses, given these are the largest cities in the country. It must be noted that in every city, the total shift column is the sum of the NS, IM, and RS for every sector.

The major finding of interest is that while Delhi is anecdotally known as the seat of public administration, the country's political capital does not have local competence in public administration and related services (Table 4), given its regional (local) share of employment was negative in this sector during 1991–2001. In public administration and related services, overall, Delhi gained some 28,000 jobs during the period, only because of rapid overall national economic growth during the period that became free of the "hindu" rate of growth for the first time. Both the overall growth of services in the country as a whole and local disadvantage made Delhi lose jobs in this sector during the period.

Overall, agriculture related sectors (cultivators and agricultural laborers) are the only ones in which Delhi suffered employment declines during 1991–2001 (total shift column), which is natural to expect with increasing urbanization. The sector in which Delhi has the most competence is household manufacturing, where its local specialization added 19,494 of the 65,943 jobs that were created during 1991–2001 in the city. In fact, none of the cities (Tables 4–9) except Bengaluru have local competence in (non-household) manufacturing or any services. Bengaluru is the only city with core competence in non-household manufacturing, related repairs and services, trade and commerce (which includes wholesale and retail trade, financial intermediation and hotels & restaurants), and public administration (Table 8), likely due to its availability of appropriate skills. Thus I find that Bengaluru, not the country's financial capital Mumbai, is the one with a local advantage in wholesale/retail trade, financial intermediation, hotels and restaurants, and public administration.

⁷ This is done, subtracting the employment of the city of interest from that of the state, as the reference region.

While Mumbai is known as the corporate and financial headquarters of the country, Mumbai's specialization is in household based manufacturing, repair, and related services (Table 5), where its local competence contributed to nearly half of the employment increase that occurred during 1991–2001. Chennai's local competence is cultivation, where surprisingly nearly all of the increase in employment in this sector was due to the city's advantage alone. This could be attributed to urban farming which is being resorted to by the city's residents, and entrepreneurs, who have been growing vegetables and fruits uncontaminated by chemicals, since as early as 2001. The south Indian city is also specialized in household based manufacturing and repair services (Table 6), as is Kolkata, where again, nearly all of the gain in household manufacturing jobs during 1991–2001, were due to local factors (Table 7). Ahmedabad's only competence is in household based manufacturing, repairs, and related services (Table 9), which could be due to its well-known textiles and garments.

9. SUMMARY OF FINDINGS: WHAT DOES THIS MEAN FOR INDIAN CITIES?

These findings from the SS analyses are consistent with Table 2 (column 4), which summarizes the LQs for these cities. The shift–share analyses show that the competence of all the selected major Indian cities, with the exception of Bengaluru, is in household manufacturing, which is broadly consistent with the findings reported by Chandrasekhar and Sharma (2014). This makes sense because a number of Indian cities engage in making household based products such as perfumes, embroidered garments, tailoring, incense sticks, and so forth. Bengaluru has core local competence in non-household based manufacturing and services such as financial intermediation, real estate, renting, and related business services. This dispels the myth that Delhi has specialized competence in public administration, and Mumbai is the corporate and financial capital of the country. In fact, all cities have the most competence in their financial sector, since that is the backbone of all entrepreneurial activity.

In general, Indian cities' competence is declining in manufacturing (both household and non-household based). However, the competence of the cities has been changing, with the result that no single city holds the same position a decade later, which is evidence to the competition present in the industrial sector, since especially the locus of expertise appears to be moving across cities within a state.

10. POLICY IMPLICATIONS, CONCLUSIONS, AND CAVEATS

The policy relevance of the research is that we have identified core competencies of Indian cities, which should be nurtured and promoted, given the caveats of the techniques that have been discussed. Given Delhi does not have specific expertise in public administration and related services, it must be the case that it developed as the political capital and of governance given its historical significance in the country. Similarly, Mumbai must have had important corporations locating their headquarters there due to the agglomeration economies arising from the large number of firms locating there. But now that Delhi is saturated with public administration (i.e., all ministries now are presumably adequately staffed) and Mumbai has rising costs of doing business such as real estate, these cities need to do significantly more in terms of attracting public administration talent and financial expertise, respectively. Bengaluru is a rising metropolitan area as far as non-household manufacturing goes, and it

needs to provide no special incentives to attract such businesses. Finally, we note that cities in the BIMARU states hold a lot of promise based on their competence in manufacturing. They need to be promoted and further incentives need to be provided for firms to locate there.

Table 4: Shift Share Analysis for Delhi

	Delhi City Employment		Change in Employment, 1991–2001	NS	IM	RS
	1991	2001	Total Shift			
Cultivators	4,892	4,438	–454	3,696	–3,960	–190
Agricultural labourers	5,793	3,654	–2,139	4,377	–8,088	1,571
Fishing, Hunting and allied activities	10,909	14,008	3,099	8,243	7,913	–13,057
Mining and quarrying	1,256	9,528	8,272	949	–994	8,317
HHI-Mfg	30,521	96,464	65,943	23,062	23,388	19,494
Non HHI-Mfg + Electricity, gas, water supply	570,154	723,178	153,024	430,806	412,843	–690,625
Construction	170,474	197,148	26,674	128,809	–14,927	–87,209
Trade and commerce Wholesale + Retail trade + Financial intermediation + Hotels and restaurants	613,296	1,105,940	492,644	463,404	746,410	–717,170
Transport, storage and communications	190,611	271,778	81,167	144,025	32,471	–95,329
Public administration and others	706,077	734,482	28,405	533,508	–456,221	–48,882

NS = national share; IM = industry mix; RS = Regional share; HHI = household-based industry; Mfg = manufacturing.

Table 5: Shift Share Analysis for Mumbai

	Mumbai City Employment		Change in Employment, 1991–2001	NS	IM	RS
	1991	2001	Total Shift			
Cultivators	3,402	3,947	545	363	–360	542
Agricultural labourers	2,521	2,970	449	269	–473	653
Fishing, Hunting and allied activities	17,122	27,888	10,766	1,825	6,003	2,938
Mining and quarrying	5,683	9,790	4,107	606	1,142	2,360
HHI-Mfg	50,997	112,484	61,487	5,436	22,893	33,158
Non HHI-Mfg + Electricity, gas, water supply	1,212,966	1,071,980	–140,986	129,293	95,093	–365,371
Construction	145,539	239,834	94,295	15,513	98,293	–19,511
Trade and commerce Wholesale + Retail trade + Financial intermediation + Hotels and restaurants	855,297	1,363,902	508,605	91,168	622,717	–205,280
Transport, storage and communications	388,794	508,036	119,242	41,442	199,036	–121,236
Public administration and others	752,411	746,510	–5,901	80,201	–26,093	–60,009

NS = national share; IM = industry mix; RS = regional share; HHI = household-based industry; Mfg = manufacturing.

Table 6: Shift Share Analysis for Chennai

	Chennai City Employment		Change in Employment, 1991–2001	NS	IM	RS
	1991	2001	Total Shift			
Cultivators	883	15,149	14,266	29	–175	14,412
Agricultural labourers	199	5,849	5,650	6	–53	5,696
Fishing, Hunting and allied activities	9,982	14,852	4,870	324	3,775	771
Mining and quarrying	1,245	3,158	1,913	40	1,398	475
HHI-Mfg	7,683	25,884	18,201	249	3,969	13,983
Non HHI-Mfg + Electricity, gas, water supply	275,916	216,710	–59,206	8,946	75,473	–143,625
Construction	74,856	108,014	33,158	2,427	84,578	–53,847
Trade and commerce Wholesale + Retail trade + Financial intermediation + Hotels and restaurants	300,928	520,554	219,626	9,757	221,181	–11,312
Transport, storage and communications	125,853	140,046	14,193	4,080	39,911	–29,798
Public administration and others	374,194	332,276	–41,918	12,132	18,053	–72,103

NS = national share; IM = industry mix; RS = Regional share; HHI = household-based industry; Mfg = manufacturing.

Table 7: Shift Share Analysis for Kolkata

	Kolkata City Employment		Change in Employment, 1991–2001	NS	IM	RS
	1991	2001	Total Shift			
Cultivators	2,102	5,796	3,694	250	–715	4,159
Agricultural labourers	3,028	3,737	709	360	–679	1,029
Fishing, Hunting and allied activities	7,398	5,858	–1,540	879	1,911	–4,330
Mining and quarrying	2,788	3,172	384	331	–241	294
HHI-Mfg	7,014	42,350	35,336	833	4,391	30,112
Non HHI-Mfg + Electricity, gas, water supply	375,928	288,026	–87,902	44,673	35,847	–168,422
Construction	49,029	65,352	16,323	5,826	65,585	–55,088
Trade and commerce Wholesale + Retail trade + Financial intermediation + Hotels and restaurants	428,897	640,840	211,943	50,967	327,967	–166,991
Transport, storage and communications	164,558	171,288	6,730	19,555	79,005	–91,830
Public administration and others	404,226	398,392	–5,834	48,036	33,254	–87,124

NS = national share; IM = industry mix; RS = regional share; HHI = household-based industry; Mfg = manufacturing.

Table 8: Shift Share Analysis for Bengaluru

	Bengaluru Employment		Change in Employment, 1991–2001	NS	IM	RS
	1991	2001	Total Shift			
Cultivators	5,437	3,973	–1,464	546	–295	–1,715
Agricultural labourers	4,876	2,763	–2,113	490	–1,675	–928
Fishing, Hunting and allied activities	7,056	4,806	–2,250	709	3,218	–6,176
Mining and quarrying	2,031	3,080	1,049	204	152	693
HHI-Mfg	15,419	32,710	17,291	1,549	21,257	–5,514
Non HHI-Mfg + Electricity, gas, water supply	338,656	381,296	42,640	34,011	6,204	2,425
Construction	91,048	135,432	44,384	9,144	88,408	–53,168
Trade and commerce Wholesale + Retail trade + Financial intermediation + Hotels and restaurants	264,182	530,586	266,404	26,532	186,694	53,179
Transport, storage and communications	95,479	147,660	52,181	9,589	66,510	–23,918
Public administration and others	263,497	294,124	30,627	26,463	–12,674	16,839

NS = national share; IM = industry mix; RS = regional share; HHI = household-based industry; Mfg = manufacturing.

Table 9: Shift Share Analysis for Ahmedabad

	Ahmedabad Employment		Change in Employment, 1991–2001	NS	IM	RS
	1991	2001	Total Shift			
Cultivators	3,589	1,307	–2,282	735	–727	–2,289
Agricultural labourers	2,755	1,307	–1,448	564	–718	–1,294
Fishing, Hunting and allied activities	5,740	7,780	2,040	1,175	4,314	–3,449
Mining and quarrying	2,085	1,464	–621	427	480	–1,528
HHI-Mfg	6,811	22,298	15,487	1,394	2,241	11,851
Non HHI-Mfg + Electricity, gas, water supply	318,352	334,426	16,074	65,169	53,343	–102,438
Construction	38,966	91,956	52,990	7,977	55,921	–10,908
Trade and commerce Wholesale + Retail trade + Financial intermediation + Hotels and restaurants	215,950	352,522	136,572	44,207	161,284	–68,919
Transport, storage and communications	77,636	98,400	20764	15,893	25,157	–20,286
Public administration and others	182,817	159,450	–23367	37,424	–24,573	–36,219

NS = national share; IM = industry mix; RS = Regional share; HHI = household-based industry; Mfg = manufacturing.

However, some caveats of the data have to be noted. These findings are valid as of the beginning of the millennium; more recent data would be needed to assess the cities' current competitiveness.

Some areas for further research are to understand what determines a city's competitiveness in manufacturing vis-à-vis services. Some factors that determine this mix could be the proportion of female workers since dexterity determines the skills with which some household-based manufacturing products are made, but this may not be so for services. There is a body of literature regarding the determinants of diversity vis-à-vis specialization (for instance, see Meliciani and Savona [2014]; Duranton and Puga [2000]). With more recent and a wide variety of cross-sectional data, these should be the next steps for this research.

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