

Medium Size Cities

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Abstract: This paper investigates the role of medium size cities in economies, drawing on the experiences of Brazil, Japan, Korea, the USA and other countries. The paper argues that city size distributions are stable over time and that medium size cities are highly specialized, particularly in manufacturing activities, compared to metro areas. The relationship between medium size cities and metro areas is explored, examining issues of industrial suburbanization, the product cycle, edge city formation, and the advent of information technologies.

Medium-size cities as a sector of the economy

In this section, we start off by showing that the size distribution of cities may be stable over time for an economy, even a rapidly growing one. We also take a preliminary look at the types of products which medium-size cities tend to produce, in comparison with much larger cities.

The size distribution of cities

In Tables 1-3 we look at the city size distributions for the USA, Brazil, and Japan over time.

USA: Between 1970 and 1990 there was a modest reallocation of population from larger urban places (over 0.5 million) to medium-size ones (50,000 to 0.5 million).

Table 1
Changes in the urban population distribution over time: The USA

Metropolitan area population ^a			Population in urban places ^b		
(Minimum size 50,000)					
Metro area size	1970	1990	Urban place size	1970	1990
Over 1 million	66%	65%	Over 1 million	14%	13%
0.5 m. to 1 m.	12	13	0.5 m. to 1 m.	10	7
250,000 to 0.5 m.	11	11	100,000 to 0.5 m.	8	9
Under 250,000	11	11	50,000 to 100,000	12	14
			Under 50,000	45	45

^aBased on USA MSA's and CMSA definitions (contiguous urbanized counties).

^bBased on urban place definitions (local jurisdictional entities).

Brazil: The major change is a reduction in the share of metropolitan areas over 500,000, with associated gains in all other categories. Certainly rapid economic development did nothing to diminish the role of medium-size cities.

Table 2
Changes in the urban population distribution over time: Brazil

(a) Percentage distribution of urban population				
	1950	1960	1970	1980
Metropolitan areas	61.3	59.8	59.4	56.6
250,000–499,999	7.1	7.7	8.7	9.9
100,000–249,999	11.0	11.2	11.1	11.4
50,000–99,999	7.7	8.1	7.8	8.3
20,000–49,999	12.7	13.2	13.1	13.7
(b) Average annual growth rates (%)				
	1950–1960	1960–1970	1970–1980	
Metropolitan	5.0	5.2	3.9	
250,000–499,999	6.4	6.7	5.8	
100,000–249,000	5.7	5.3	4.8	
50,000–99,999	6.2	4.9	5.0	
20,000–49,999	6.0	5.2	4.9	
Total urban	5.6	5.4	4.4	
Total population	3.0	2.9	2.5	

Japan: Over 30 years, the main change is the dramatic increase in the role of medium-size cities (100,000 to 0.5 million) at the expense of smaller ones.

Table 3
Changes in the urban population distribution over time: Japan^a

(Percent of urban population in each size category)				
Urban area size	1960	1970	1980	1990
Over 0.5 million	31	34	33	33
100,000 to 0.5 million	33	38	42	43
Under 100,000	36	29	26	24

^aBased on a metro area concept incorporating populations of contiguous districts with a minimum population density.

Note: One item Tables 1-3 do not deal with concerns the decentralization of the population of very large metropolitan areas into adjoining or nearby satellite cities. Sometimes these satellite cities are represented as separate (medium-size) cities if they are far enough from the core metro area. Other times they are still within the counties of the metro area and still defined as part of the metro area. In the USA, these satellite cities are sometimes referred to as "edge cities." They are distinct from bedroom suburbs, in that edge cities are economically self-contained, providing jobs and shopping for residents.

Table 4
Decentralization of employment and population in large metro areas: 1970–1987^a (Sample: 60 largest US metro areas)

	Average Annual Growth Rates (%)			
	Population		Employment	
	1970–80	1980–87	1970–80	1980–86
Central cities	0.04	0.4	CBD	1.6
Suburbs	2.2	1.4	Rest of central city	4.1
			Suburbs	6.7
				3.7

- For both the periods 1970-1980 and 1980-1987, population growth rates in the suburbs far exceeded those in the central cities.
- As we move out from the center of the central city, employment growth rates escalate.

An example of this in a developing country context, where satellite cities are identified, is given for Seoul, Korea.

- Particularly between 1970 and 1980, the satellite cities have grown at a tremendous rate, far faster than Seoul.
- Employment overall and in manufacturing in particular also decentralized between 1970 and 1980 from Seoul to the rest of Gyeonggi Province.

Table 5
Decentralization of population and employment in Seoul metropolitan region

	(a) Population			
	Population in Thousands		Average Annual Growth Rate (%)	
	1960	1980	1970–80	1960–80
Seoul Metro Area	2445	8367	4.41	6.34
Rest of Gyeonggi Province	2750	4935	4.12	2.97
Incheon	402	1085	5.52	5.09
Suwon	91	311	6.42	6.34
Seongnam	31	376	19.95	13.29
Anyang	32	254	10.81	10.91
Bucheon	63	221	11.87	6.56
(b) Employment Shares in Gyeonggi Province				
	Total Employment		Manufacturing	
	1970	1980	1970	1980
	75	69	76	61
Seoul Metro Area	75	69	76	61
Rest of Gyeonggi Province	25	31	24	39
			23	31

Production patterns

Principle:

In general, production of standardized traditional items tends to be more heavily concentrated in smaller and medium-size cities, while production of less standardized or non-traditional items tends to be relatively more concentrated in larger cities.

Table 6
Shares of medium-size metro areas^a, USA 1987

	Share: (Total for medium-size areas)/(total for all metro areas) (%)
Population	25
Manufacturing employment	
—all industries	24
—textiles	36
—food	55
—pulp and paper	53
—computers	22
—electronic components	20
— instruments	17

^aMedium-size metro areas are metro areas under 500,000. The smallest metro area by definition must exceed 50,000. The number of medium size metro areas is 72.

- Metro areas under 500,000 have relatively bigger employment shares of traditional items such as textiles (36%), food processing (55%) and pulp and paper (53%).

Production patterns of medium-size cities

Main idea: Medium-size cities tend to be highly specialized in their production patterns, in terms of goods **exported** from the city.

With development and urbanization, many medium-size cities specialize in modern manufacturing activities, while some others continue with traditional activities. The relative shift in medium-size city activities reflects **changes in the composition of national output with economic development and urbanization**, as the economy shifts from traditional (non-durable food and textiles) to modern (durable metals and machinery) manufacturing.

This section focuses on

- the fact that medium cities are highly specialized in production;
- the reasons why specialization occurs;
- the relationship between city size and product specialization.

The degree of specialization

E.g.1 Brazil

Henderson (1988) examines data for southern Brazil for 1970. Findings:

- Out of 126 urban areas, the majority typically have absolutely zero employment in any one particular three-digit manufacturing activity and most of the rest have minimal employment in any one activity (< 150 workers).
- Significant employment in any industry tends to occur in heavy concentrations in a few locations.
- For all urban areas, employment over 3,000 occurs in only 18 instances for modern durable good manufacturing, as opposed to 25 instances for more traditional manufacturing.

E.g.2 USA

The same findings...

- Roughly half of the 243 USA metro areas as highly specialized in one particular activity. These metro areas have up to 36% of their labor forces engaged in just the one cited activity.

- Except for the above, 22 small-medium size metro areas were specialized in providing college education and state government services.

This section mainly target two industries:

- traditional textiles (excluding apparel);
- high-tech instruments.

Textiles

- Most of these textile producers are medium or small-size metro areas.

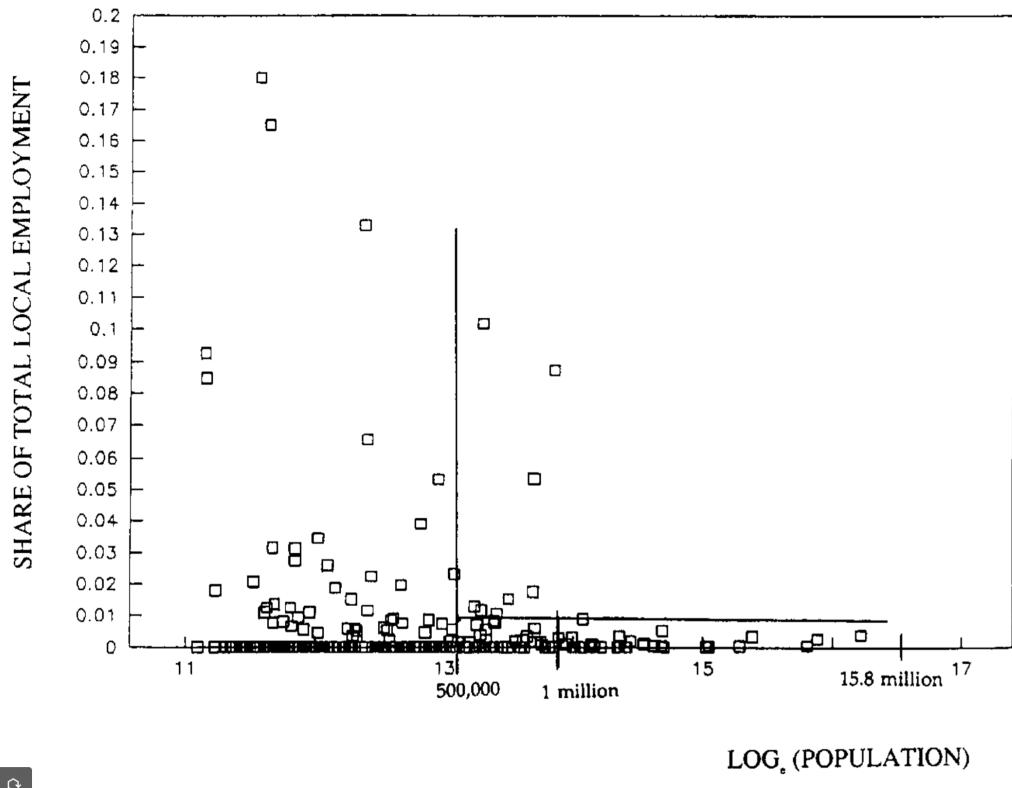


Fig. 1. Textiles.

Instruments

- Most metro areas record zero shares in instrument employment, but two cities under 1 million report very high instrument concentrations.
- Very large metro areas record small shares.

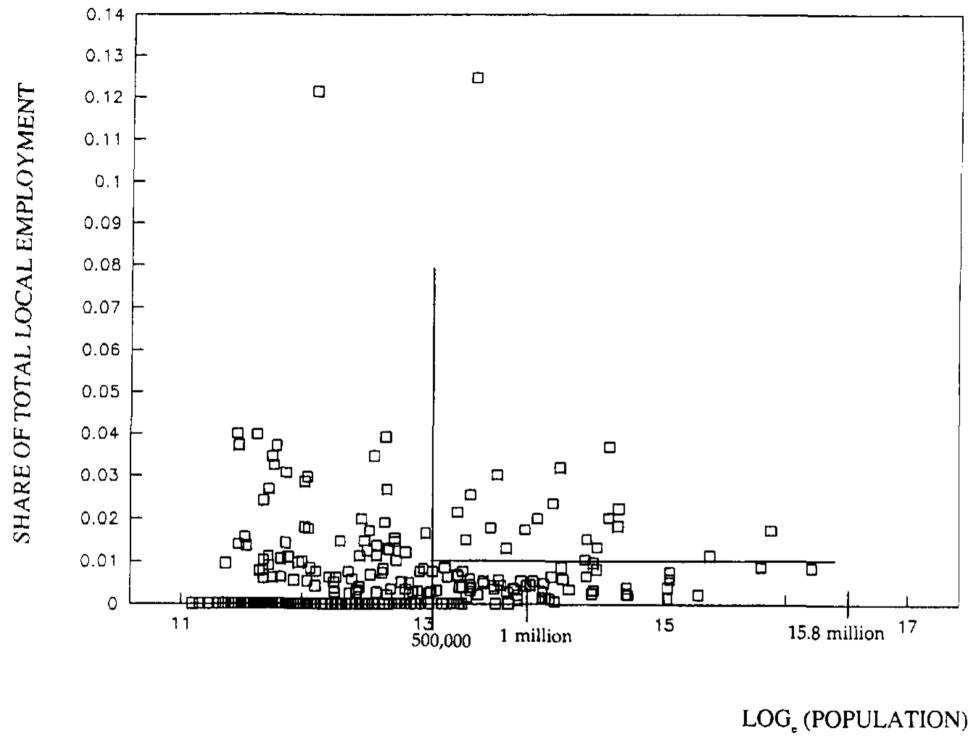


Fig. 2. Instruments. Search and navigation, measuring, guidance, medical, ophthalmic, photographic, etc.

This representation of significant employment shares in both small and large cities in a high-tech industry is typical of a **developing industry**.

- Larger cities engage in production activities related to research and development and output of more experimental lines of products.
- Smaller metro areas produce standardized, fully developed product lines.

Why is there specialization?

Ans: economies of scale at the level of the industry in a city.

- exchange of information
- a better diversity and quality of these locally provided services to an exporting industry
- efficiency of internal industry interchange

Recent empirical work suggests a further type of effect, based on the historical local environment, and labeled dynamic externalities.

- Dynamic externalities involve information spillovers among firms concerning the spread of knowledge to producers and the spread of knowledge within the research sector itself.
 - Information spillovers are very localized, diffuse slowly, and overwhelmingly occur in the same industry. That is, there is location specific knowledge--knowledge initially available only in a specific location that spreads slowly over space. To learn about the useful inventions of yesterday, firms must go to these hot spots of inventive activity.

Conclusion: cities also specialize over time. Past activity in an industry augments present activity.

Implications for urban area sizes and production patterns over time

Why do cities have stable different sizes? Economies of scale in production v.s. Diseconomies of scale in agglomerating more and more economic activity into a single location.

- Cities specialized in products with higher degrees of scale economies will be larger, "on average."

Table 7
Average sizes of different types of cities for the USA.^a

Sample	Mean	Standard	size
	(millions)	deviation	
Diverse manufacturing	2.600	2.416	6
Aircraft/weapons	0.771	0.457	6
Steel	0.426	0.625	9
Auto			
[including Detroit]	0.355 [0.660]	0.545 [1.177]	11 [12]
Service centers	0.267	0.159	7
Apparel	0.232	0.109	7
Textiles	0.213	0.103	6
College towns/ state capitals	0.164	0.163	22
Pulp and paper	0.162	0.068	6
Food processing	0.158	0.046	5

^aFigures are for 1970, based on city types classified in Henderson (1988).

The second issue concerns persistence in production patterns over time.

$$\log(1987 \text{ employ in industry } i \text{ in city } j) = \alpha + \beta \log(1970 \text{ employ in industry } i \text{ in city } j) + X_j \gamma + E_j$$

Table 8
The extent of persistence in employment patterns across USA cities, 1970–87

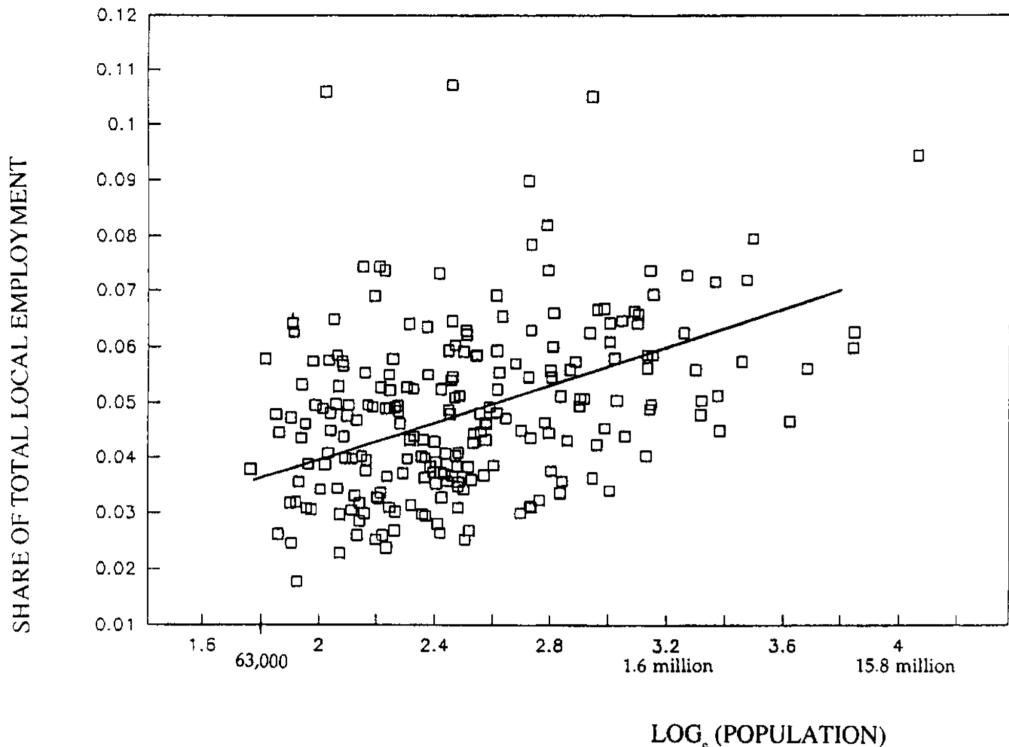
The Elasticity of 1987 Employment With Respect to 1970 Own Industry Employment	
	β^a
Total manufacturing	0.942
Machinery	0.965
Electrical machinery	0.855
Primary metals	0.960

^aFrom Henderson et al. (1995). All coefficients are statistically significant. The first is based on an OLS regression of $\log(y_{87}/y_{70})$ on $\log(y_{70})$ and other variables to get $1 - \beta$, where y is relevant employment. The others are based on Tobit regressions of $\log(y_{87})$ on $\log(y_{70})$, to deal with LHS censored variables.

Comparison with large metro areas

In the USA in 1987, none of the 25 metro areas with over 1.5 million people had 23% or more of their labor force in manufacturing. Yet of 200 metro areas smaller than 1.5 million, about 45 had at least 23% of their labor force in manufacturing with some others over 30%, or even 40%.

Large metro areas tend to be more service oriented.



data are for 1970.

Fig. 3. Finance, real estate, insurance. Data are for 1970.

- Heavy concentrations of manufacturing are in medium-size cities.

When large metro areas engage in manufacturing they tend not to concentrate but to have very diverse manufacturing bases.

Define the Herschman-Herfindahl index for metrp areas in USA

$$HHI_j = \sum_{i=1}^{20} S_{ij}^2,$$

where S_{ij} is the share of industry i in manufacturing employment in city j .

The decline in HHI, or decline in concentration as metro area size increases is obvious.

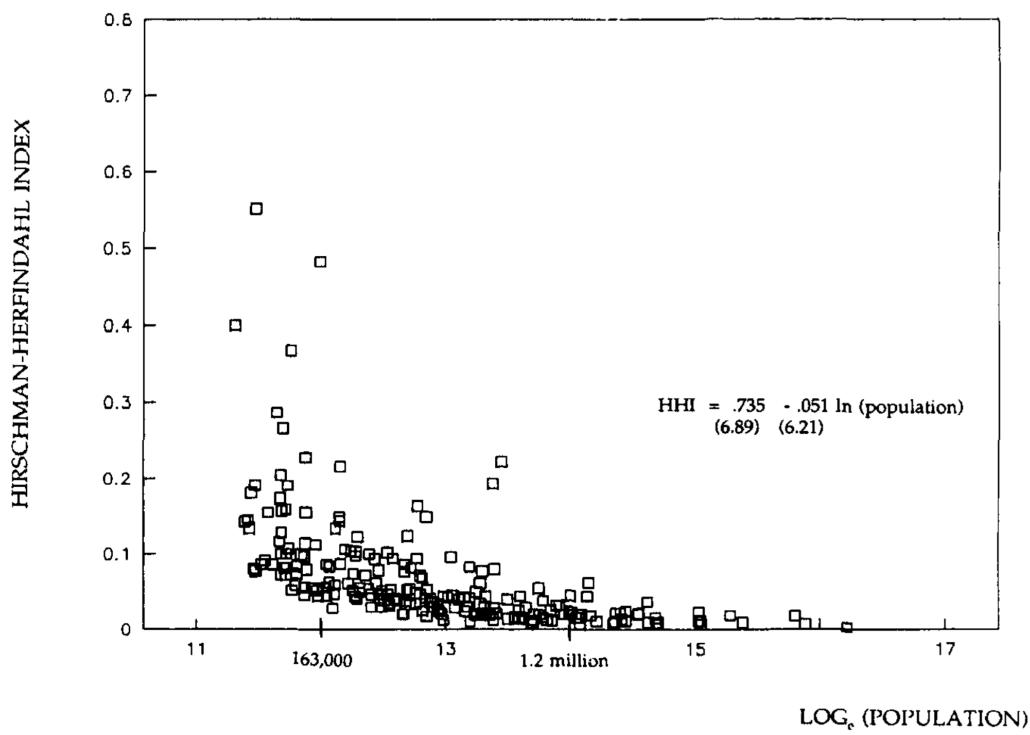


Fig. 4. Manufacturing concentration and diversification in US metro areas.

- In comparison to medium-size cities as a set, no large metro areas have a very high degree of manufacturing activity and their manufacturing bases are diverse.

Korea case

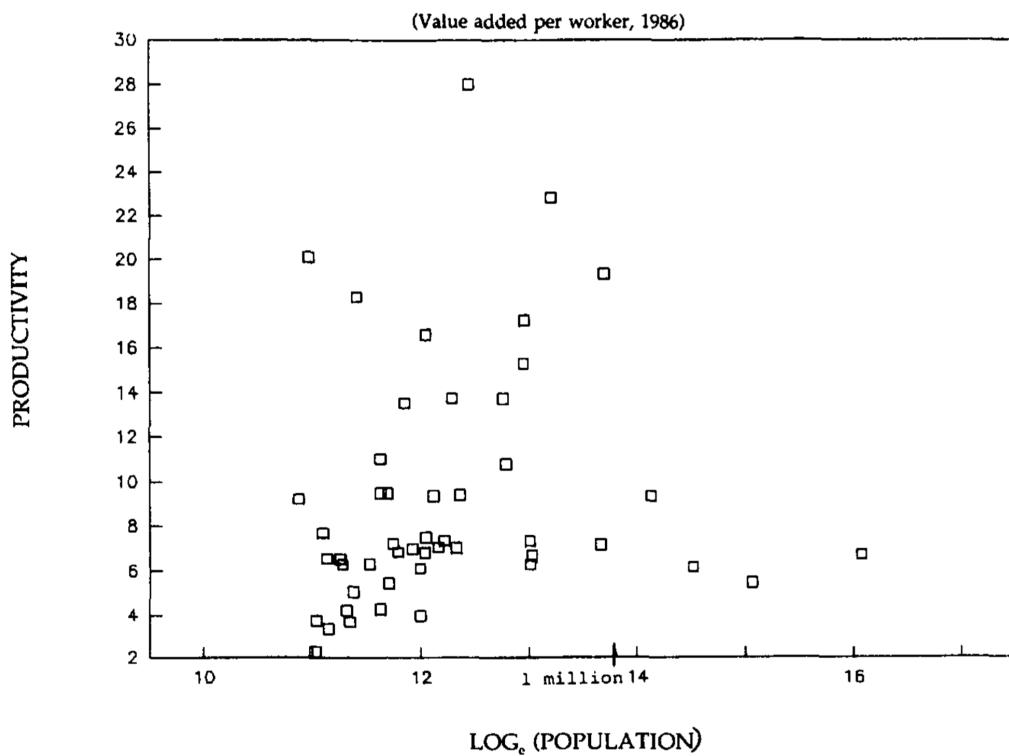


Fig. 5. Urban productivity in Korean manufacturing. (Value added per worker, 1986).

- Fig. 5 contains one visible result, the rather low productivity of manufacturing in the largest metro areas.
- Second, a review of the data indicates that high productivity figures occur in medium-size cities concentrated in manufacturing.

USA cases: textile and instrument industry

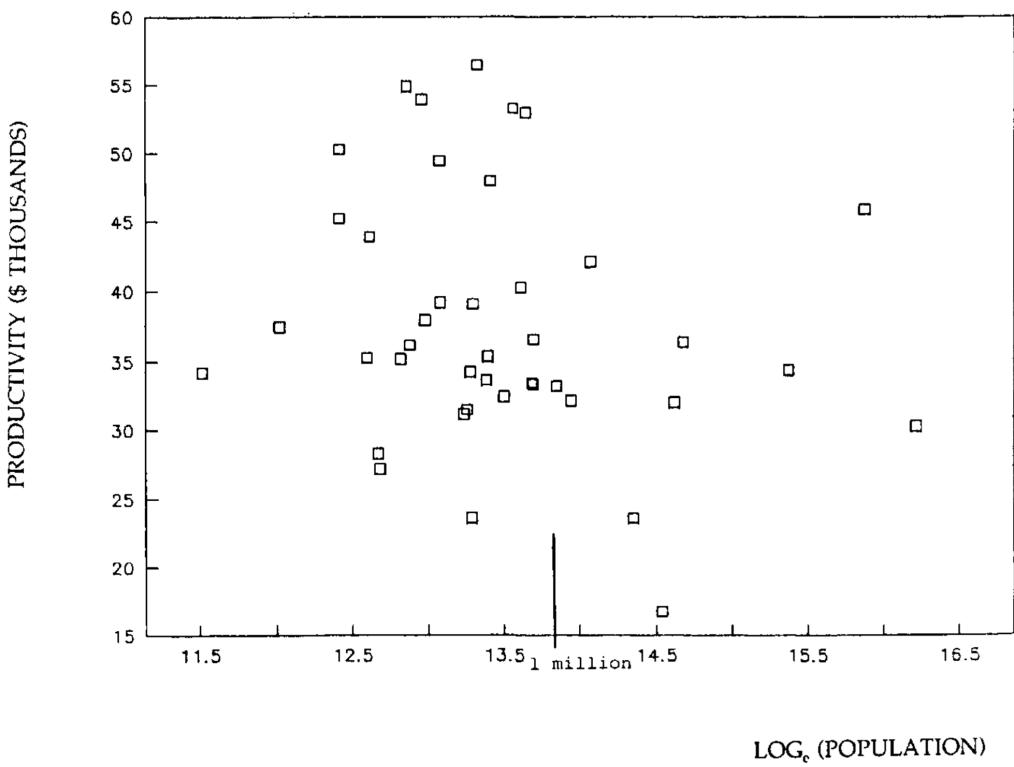


Fig. 6. Urban productivity in USA textiles. (Value added per worker, 1987).
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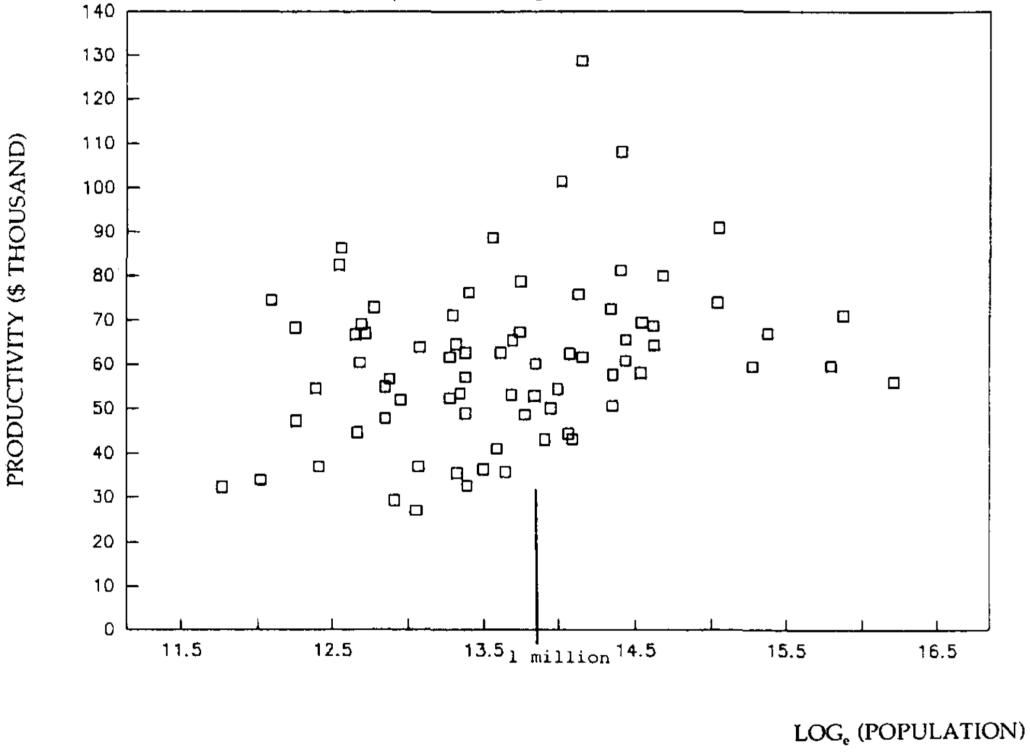


Fig. 7. Urban productivity in USA instruments. (Value added per worker, 1987).

So, the question is: why is some manufacturing still found in very large metro areas?

There are at least two general types of manufacturing activity found in large metro areas. Both require large local diverse labor and product markets to thrive.

- First a city like New York, Paris, or Tokyo contains significant employment in the arts, publishing, and high fashion apparel. These are volatile markets, where trends are set and broken, and products are tested locally. They experience significant scale economies connected with urban area size, not just industry size.

- Second, R&D activities require a very diverse and alive environment, where ideas flow freely across firms. R&D in one industry draws upon ideas in other industries, as well as in academic research environments.
- Moreover, R&D firms require very specific skilled employees for very specific developments, so they want to hire in a large diverse local labor market. Very different types of research activity agglomerate in a large metro area to cross fertilize and interact with an academic research community.

Result: corporations carry out their research activities in large metro areas, but relegate standardized production to more decentralized locations.

Relationships among cities

Satellite cities of large metro areas

Large metro areas in the last 20 years have decentralized to the extent that major satellite cities have sprung up on metro area fringes. These cities are self-contained, providing jobs, homes, and shopping for residents.

Korea case: urban decentralization into satellite cities for Seoul

Table 9
Composition of manufacturing employment^a by ring and industry in Gyeonggi Province (SMR), 1973 and 1981

1973	(Percent Distribution by Ring)							Population 1970
	Food and Beverage	Textile and Leather	Paper and Publishing	Chemical	Metal	Fabricated Metal	Other Mfg.	
Ring 1	4.9	7.6	35.0	8.7	1.9	2.6	7.7	7.8
Ring 1 & 3	69.4	62.3	42.9	69.4	53.5	72.4	69.6	62.8
Ring 4 & 5	27.7	30.2	21.9	21.9	44.6	25.1	22.8	29.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1981								
Ring 1	0.7	3.0	29.0	0.7	0.1	0.8	0.5	3.1
Ring 2 & 3	56.2	51.8	42.4	46.2	33.9	29.0	48.3	46.0
Ring 4 & 5	47.1	45.2	38.7	53.1	66.0	60.2	51.1	52.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

^aEstablishments with five or more employees.

Source: Chun and Lee (1985).

Some findings:

- First, between 1973 and 1981 there was employment decentralization from ring 1 outward for all industries, despite little or no population decentralization.
- Second, only publishing and to some extent the apparel portion of "textiles" retained significant employment in ring 1 in 1981.
- Finally, the heavier or more modern industries have much greater representation in rings 4 and 5 where the major satellite cities are located, than those rings' population shares.

While these firms had not decentralized to the rest of Korea by 1981, they had decentralized into satellite cities.

Product cycle and incubator notions

The discussions of location of R&D activities and of employment decentralization are consistent with the product cycle theory:

- New products are developed through R&D and consumer tested in large sophisticated markets, where efficient R&D activity requires a diverse sophisticated labor market.
- Once a product is fully developed and production has become standardized, then mass production is decentralized to locations with cheap land costs (for large single story continuous process factories) and cheaper labor costs.

But product cycles apply at several spatial levels---decentralization into satellite medium-size cities within metro regions, decentralization of production from metro regions to hinterland mediumsize cities, and decentralization of production from first world cities to third world cities.

Metro areas in this product cycle are viewed as "incubators," where products are born and undergo early development.

Korea case

- Relocation of production facilities occurs disproportionately in satellite cities.

Table 10
Births versus movers among manufacturing plants in Gyeonggi Province (SMR), Korea

	Ratio: Births/Movers
Ring 1 (CBD)	5.5
Rings 1–3 (Seoul metropolitan area)	2.6
Rings 4–5 (Satellite city area)	0.6

- Small firms tend to move short distances while larger plants move longer distances.

Table 11
Distance of move by employment size—the Seoul region

	(Percent Distribution of Firms in Each Size Category)		
Km	1–24 Persons	35–99 Persons	100 or more Persons
1–5	30	13	3
6–35	43	42	39
over 35	27	45	59
Total	100.0	100.0	100.0
(mean in km)	(24.5)	(33.5)	(41.5)
Number of Establishments	37	69	35

- For movers, the question is how far to decentralize.
 - The key concerns the extent to which the particular production activity is still tied to on-going product development.
 - E.g. Stages of production where components are experiencing greater product development will occur much closer to centers of R&D.

E.g. Japan's case of TV

- Headquarters and the basic consumer electronics laboratory are located in Tokyo.
- Within Japan, in other metro areas (Fukaya and Himeji), there is production of products currently undergoing major development.
- At the other extreme, production of standardized small and medium-size tubes for color TV's have been decentralized to Thailand, which exports to Toshiba plants in Singapore, Fukaya and worldwide.

Developments in information technologies

Conclusions

- Medium-size cities tend to be either service centers or manufacturing centers, in terms of goods produced for export outside the city.
 - Manufacturing centers produce standardized items.
 - Cities are highly specialized in these export products.
 - Specialization occurs because of economies of scale internal to the industry in a city.

- Large metro areas are very different.
 - First, they are more specialized in modern services.
 - Second, they are highly diversified in their remaining manufacturing bases, compared to specialized medium-size cities.
- Decentralized production patterns involve notions of product cycle and incubation.
 - How far production of components or assembly decentralizes depends on how standardized the item is and how labor intensive production is.