The Analysis of Urban Concentration and Decentralization: The Case of Brazil

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The spatial patterns of industrial and urban development in Brazil have received considerable attention in recent years. Discussions have been characterized by swings in opinion and policy focus that have ranged from the view that the increasing agglomeration of activities has been desirable to the view that the evolving spatial concentration and congestion have been excessive. The relative emphasis on these views has changed over time and has varied with the overall fortunes of the economy; concern about concentration has often diminished during times of economic difficulty.

The differing opinions draw attention to the need for an economic analysis of the forces behind the trends toward concentration and decentralization. Neither phenomenon may be undesirable in itself, but government policies may have intended and unintended impacts on industrial location, and these impacts may affect economic welfare. This chapter examines concentration as it is influenced by government policies and attempts to evaluate the desirability of such influences when the existence (or absence) of certain types of economies of scale in urbanization and industrialization is taken into account. The data base for the core of the paper relates to 1970, and much of the discussion therefore concerns the historical evolution of policies which essentially promoted concentration. In the 1970s distinct efforts were made to achieve decentralization, and some aspects of those efforts are covered in part IV. An up-to-date evaluation of the net outcome of efforts to promote concentration and decentralization is not the purpose of this chapter.

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Urban and Regional Patterns

The size and growth rates of the largest metropolitan areas, in particular the Greater São Paulo Metropolitan Area and, to some extent, Rio de Janeiro, have been matters of concern in Brazil. The annual growth rates of both urban centers have slowed: for 1970–80 Greater São Paulo had a growth rate of 4.4 percent—the same as the national average growth rate for urban areas—and Rio's rate was considerably less, 2.6 percent. Policymakers, however, continue to view the sizes and growth rates of these cities as excessive. This concern is expressed in a medium-size-cities program which is designed to attract rural migrants into medium-size rather than large cities.

Although Greater São Paulo, with 12 million people in 1980, and Rio, with 8 million, are large by international standards, they are not inordinately big metropolitan areas for a country as large as Brazil, particularly in view of the falling or stagnant growth rates of the two centers. Furthermore, the size distribution of urban areas in Brazil is similar to that of such other large decentralized countries as the United States in terms of the proportion of the total population living in big and small urban areas. Small and medium-size cities are growing at least as fast as larger cities, and there are many other flourishing metropolitan areas in Brazil in addition to Greater São Paulo and Rio.

Although the general size distribution of cities in Brazil may be reasonable by world standards, the spatial

distribution of resources between large and small cities may be less than desirable. In particular, Greater São Paulo's industrial composition is unusually concentrated in relation to that of other large diversified economies. Greater São Paulo has a great concentration of heavy industry within its boundaries compared with London, New York, Los Angeles, and Tokyo, which, in comparison, are oriented toward services, high technology, and light manufacturing. In 1970 Greater São Paulo accounted for 43 percent of value added for all Brazil in iron and steel and fabricated metals, 71 percent in transport equipment, and 35 percent in chemicals. Such concentration deserves to be explained, and its implications for the efficiency of spacial allocation of resources need to be analyzed.

Greater São Paulo and Rio are located in the South and Southeast of Brazil, a region which comprises the states of Minas Gerais, Espirito Santo, Rio de Janeiro, São Paulo, Santa Catarina, and Rio Grande do Sul. It is the most developed region in Brazil and is larger than Spain, France, the Federal Republic of Germany, and the Democratic German Republic combined. Our sample consists of the 126 urban areas in this region which had populations over 20,000 in 1970. These urban areas now contain about 40 million people.

Highly developed and industrialized, this region is crisscrossed by major modern highways and rails, and its cities offer the basic range of modern utilities and services. Most of the cities are located either in fertile agricultural areas or in areas rich in mineral deposits. The region accounts for almost all of Brazil's manufacturing, and its standard of living is high for a developing country, despite notable deficiencies.[1] The principal shortcoming is in education—in the quality of the current schooling system and in the educational attainment of adults. In 1970 less than 25 percent of adults in the 126 urban areas had more than primary school education (four to five years).

The region produces a full range of manufactured products. Its large metropolitan areas are highly diversified and produce a wide range of goods and services, while smaller urban areas (under 250,000 population) are highly specialized. Specialization—where, say, 10 percent of local employment is in only one industry—occurs in such activities as production of steel, textiles, apparel, pulp and paper, chemicals, transport equipment, and machinery, in food processing, and in services (export activities in ports and retailing and wholesaling in towns that serve as traditional agricultural service centers). Almost half of the 126 urban areas are relatively specialized in the production of one manufactured product.

Brazil is partially a state capitalist economy. Government-owned banks control investment of most domestic savings except for the investments of traditional plantation familes. The government owns almost all public utilities, 50 percent of the iron and steel industry, and 35 percent of the chemical industry, including probably most petrochemicals. The government uses its ownership to influence the location of economic activity and the spatial and intersectoral allocation of capital. In addition, tariffs and taxes have indirectly influenced location and urban concentration.

Brazil has a federal system. Because of changing institutional arrangements it is difficult to determine the degree of local autonomy at any one time. In 1970 some funding for urban infrastructure investments such as municipal roads, water, and sewers came from national earmarked taxes. Much of the funding for both capital and operating expenditures, however, was from local property taxes and user charges, and localities determined their own levels of investment and maintenance. (Except for the state of São Paulo today, state agencies have taken over much of the municipal decisionmaking, but this was not so for the period of our data.) Electrical hookups were generally available in the 126 urban areas, although the quality of service as indicated by brownouts and blackouts apparently varied considerably. Municipalities controlled their own planning, zoning, and parks but not the educational system or police and fire protection.

Thus, in 1970 localities seemed to have some degree of autonomy in determining their own physical appearance and structure, so that urban areas could compete on an equal footing for resources. Since city councils (although not mayors) were locally elected, local preferences for urban structure may have been represented and to some extent realized. It should be added, however, that discriminatory grants were made to localities, and the ability of local officials to get grants and good utility service was important.

Government Influence on Industrial Location

Under a free market situation in which localities are fiscally autonomous, certain broad production patterns for cities can normally be expected to emerge (Henderson 1982). Smaller cities serve agricultural areas, act as administrative centers (state capitals), or engage in manufacturing where processing of raw materials or use of heavy processed materials is involved, such as in production of iron and steel, transport equipment, textiles, and pulp and paper and in food processing. Manufacturing centers tend to specialize and to be located near the materials suppliers, and thus, like the natural resources they use, they are spatially dispersed. Smaller urban areas in Brazil do conform to this pattern.

Large metropolitan areas may be expected to support clusters of footloose industries—service, high-technology, and light manufacturing activities—which find it advantageous to locate in large urban market areas and are not tied to the locations of natural resources. But Brazilian metropolitan areas, in particular Greater São Paulo, do not conform to this pattern. The reasons for the difference, and its implications for efficiency of resource usage, need to be explored.

Through its control of utilities, banking, and much steel production, the national government can strongly influence and to a considerable extent even determine the location of heavy manufacturing. It appears that the government has so acted and that, within the region under study, it is strongly biased toward locating investment in Greater São Paulo and Rio or on the Greater São Paulo–Rio axis. Since the government only recently started to evaluate the overall impact of its past decisions, it is difficult to prove the above contention, but several pieces of informal evidence, some relating to the past, others to the present, indicate a governmental role in promoting concentration in the past.

First, in a number of well-known cases locational decisions were made solely on the basis of governmental decisions—for example, the location of the steel works in Volta-Redonda and of major power lines and transformers. Second, at least in the period under review, the government appears to have opposed policies that would lead to decentralization. The pollution control regulations that would force some decentralization from Greater São Paulo have only recently received strong government support. The medium-size-cities program to encourage decentralization has never been effectively implemented. Third, by offering a high real rate of return on deposits, the government banks attract a high proportion of national savings (excluding perhaps those of the plantation families). Apart from agricultural activities, banks appear to be restricted to making long-term loans only to very large firms (those with more than 1,000 employees). Applications for these loans can only be made and pursued in state capitals such as São Paulo and Rio. There is effectively no stock market. Other long-term investments come primarily from the activities of international corporations and the large plantation families.

If the above appraisal of the spatial bias of government decisions concerning industrial location is correct, there remains the question of why the government was biased in favor of Greater São Paulo. Political considerations may have been one relevant factor, but there was also a widespread belief among the authorities and their advisers that Greater São Paulo provided an economic environment that was essential to industrial development and efficiency. For example, in the 1970, Brazil's balance of payments problems caused by oil price increases were stemmed by the rapid growth of manufactured exports. The abandonment of pollution control policies and of the medium-size-cities programs appeared to have occurred in the past partly out of fear that decentralization of industry out of Greater São Paulo might lead to failure of the industries and stunt the growth of manufacturing. The same was true of longer-term goals of industrial and economic development. The strong belief in the critical role of the economic environment of Greater São Paulo persisted in spite of the success of private manufacturing enterprises in cities other than Greater São Paulo and Rio.

That belief essentially rested on the premise that metropolitan areas offer strong economies of urbanization. Economic theory holds that the agglomeration of economic activity in limited spatial areas occurs because of economies of scale in production. At the industry level there are urbanization and localization economies. Urbanization economies have to do with the scale of economic activity in cities in relation to efficiencies in urban labor markets, interindustry communication, and specialized support services and urban infrastructure. Localization economies relate to scale within an industry as a result of efficiencies in labor markets and services specific to that industry and a greater degree of interfirm specialization in detailed activity within the industry.

If the economies obtained are localization economies there is, from the production point of view, no obvious reason for encouraging the location of different unrelated industries in the same urban area, and so doing is inefficient on the consumption side (Henderson 1982). Specialization therefore occurs in smaller urban areas. Of course, if one industry uses inputs from another industry which are expensive to transport (as in the case for automobiles and steel), they will locate close together, although not necessarily in the same urban area.

Economies of urbanization do provide a basis for locating different industries together to enhance each other's level of efficiency.[2] The existence of urbanization economies as a result of the creation in Greater São Paulo of a large-scale economic environment for all kinds of manufacturing could then be grounds for promoting spatial concentration. To evaluate this issue we need to test whether the scale economies of the heavy manufacturing industries in Brazil pertain to localization or urbanization. If there are no economies of urbanization, but only economies of localization, it would appear that encouraging or forcing manufacturers to pay the relatively high wages and land rents in Greater São Paulo would yield no gain in efficiency. Concentration would be an error because urbanization economies are the rationale for encouraging, if not forcing, a con-

centration of different heavy industries in one metropolitan area. Furthermore, other considerations weigh against such concentration, as elaborated in "Conclusions and Policy Implications," below.

Sources and Magnitudes of Economies of Scale

To examine the nature of economies of scale, production functions and factor ratio equations for different industries have been estimated for the region under consideration. For each industry the unit of observation is an urban area. The production function for value added is written as

$$X = g(S)\, X\,(K, L) \tag{7-1}$$

where $X(\cdot)$ represents firms' own constant returns to scale (CRS) technology, K and L are inputs of capital and labor, respectively, and $g(S)$ is a Hicks-neutral shift factor, external to the firm, whose arguments are scale measures defined at the urban area level. Since $X(\cdot)$ is CRS, on the assumption that all firms in the city face the same technology, one can aggregate over firms and use observations on the industry and urban area levels. The external economy formulation and CRS are consistent with the assumption of perfect competition (Chipman 1970). The assumptions of Hicks neutrality and CRS to the firm have been tested, and the results are reported below.

Assuming CRS for $X(\cdot)$, equation 7-1 may be written

$$X/L = g(S)\, \tilde{X}\,(k) \tag{7-2}$$

where $k = K/L$. Taking logs, defining $\log \tilde{X}(k) = f(\log k)$, and performing a Taylor series expansion of $f(\cdot)$ about $k = 1$ yields a translog specification for equation 7-2:

$$\log (X/L) = C_0 + \log g(S) + f'(0)\, \ln(k) + \tfrac{1}{2} f''(0)\, [\ln(k)]^2. \tag{7-3}$$

The arguments in $g(S)$ relate to measures of localization economies and of urbanization economies. The localization economies are measured by levels of own-industry employment in the urban area; the urbanization economies are represented either by the urban population or by the total employment in the urban area. Among the various functional forms tried, the best one, defined informally by such considerations as low multicollinearity and high adjusted R^2s, was

$$g(S) = \exp(\alpha/L) + \beta \log P \tag{7-4}$$

where

$$\varepsilon = \frac{d \log (X)}{d \log L} = \frac{\alpha}{L}.$$

The value ε is the elasticity of firm output with respect to industry employment, holding firm inputs fixed; L is own-industry employment; P is urban population; and β is the elasticity with respect to population. The specification that ε declines as L rises is supported by a quadratic formulation. The interpretation of the ε or β elasticities is that a 10 percent increase in own-industry employment or in city population, respectively, leads to a $0.1 \cdot \varepsilon$ or a $0.1 \cdot \beta$ percent increase in output for any firm, if the firm's own inputs are held constant. That is, for the same inputs, a firm's output goes up because the external shift factor, $g(S)$, is larger.

Three other problems need to be addressed in the estimation of equation 7-3. First, both technology and labor force may vary among cities. These items are controlled by measures of labor force quality, Q, specific to an industry in an urban area. Measures of educational attainment, such as average years of schooling or percent of the labor force with three or fewer years of schooling in that industry in that urban area, and measures of experience, such as average age, were tested.

Second, $X(\cdot)$ may not be homogeneous of degree one. To test for degrees of homogeneity different from one a measure of average firm size in that industry in that urban area was used. The measure was the average number of employees per firm, FS.

Third, X should be a measure of physical output, but in our formulation the variable is expressed in terms of value. The procedure would be satisfactory if output prices were invariant among urban areas, but in reality they are not. We therefore hypothesized that received price declines with distance D from the nearest major coastal metropolitan area. Where X^* is the measure of value added and X is the true quantity equivalent, it is hypothesized that

$$X = X^* p_0^{-1} (1 - tD)^{-1}$$

where p_0 is price in coastal metro areas, t is unit transport costs, and D is distance in kilometers. On this basis it may be approximated that

$$\log X^* = \log X + \log p_0 - tD. \tag{7-5}$$

Using the above result and combining equations 7-3, 7-4, and 7-5, a final estimating equation is obtained:

$$\begin{aligned} \log(X^*/L) = {} & C_1 + \underset{(+)}{b_1} \log(k) + \underset{(-)}{b_2} (\log k)^2 \\ & + \underset{(0)}{b_3} FS + \underset{(+)}{b_4} Q + \underset{(-)}{b_5} D \\ & + \underset{(-)}{b_6} (1/L) + \underset{(+)}{b_7} \log P. \end{aligned} \tag{7-6}$$

Expected signs are noted below the coefficients. For the $\log(k)$ terms, the sign restrictions must hold in the

neighborhood of $k = 1$ to have positive and diminishing marginal products.

The remaining question is whether scale effects are Hicks neutral. Combination of marginal productivity conditions on the basis of equation 7-1 yields the general equation

$$k = k(\omega, \mu, S) \tag{7-7}$$

where ω is gross per employee costs (wages plus benefits) in an industry in an urban area and μ is the cost of capital. It is assumed that either the pretax cost of capital is the same everywhere or that it increases with distance D from the nearest major coastal metropolitan area (which will also be a state capital and the administrative center for long-term bank loans). The posttax cost of capital varies with the effective local property tax, t_p, on equipment and structures in that industry in that urban area.

If scale effects are Hicks neutral, S should in fact not appear in equation 7-7. A measure of own-industry size was inserted to test whether this is the case. A significant positive or negative coefficient would indicate nonneutrality.

Finally, when firm size and labor force quality are controlled, the estimated form of equation 7-7 is

$$\log k = C_2 + \underset{(+)}{a_1 \log \omega} + \underset{(-)}{a_2 D} + \underset{(-)}{a_3 t_p} + \underset{(0)}{a_4 \log L} + \underset{(+/0)}{a_5 Q} + \underset{(0)}{a_6 FS}. \tag{7-8}$$

Expected signs are noted below the coefficients.

Equations 7-6 and 7-8 were estimated by ordinary least squares for three major two-digit industries located in Greater São Paulo, namely, iron and steel, transport equipment, and chemicals. The variables are defined as follows:

- X Value added (value of production less total materials costs less production taxes). Production tax rates vary spatially, and their differences may not be passed on to consumers. The inclusion of production taxes in value added has a minimal impact on the results.
- L Average monthly number of employees minus (a trivial number) owners and directors. Information on hours worked is not collected.
- ω Total salaries less payments to owners and directors plus firm contributions to social security, private insurance, and pension programs, all divided by L
- K Market value of capital stock. Census question asks what the firm could sell its equipment, structures, and land for today. (Other questions ask book value and depreciated book value.)
- FS Average firm size: L divided by number of firms
- t_p Property tax rate: industry property tax payments divided by K. This varies by industry and urban area according to exemptions granted.
- Q Percentage of labor force with three or fewer years of schooling, by two-digit industry, calculated directly from 25-percent long-form sample of 1970 Demographic Census
- D Distance in kilometers to nearest coastal port. For all six ports the urban area is a major metropolitan area. There is only one major interior metropolitan area in the sample, Belo Horizonte. São Paulo is counted as a port although it is 75 kilometers from the sea and the actual port is Santos.
- P Urban population

As a check on the results, a dual form of equation 7-6 was estimated, where

$$\log (X/L) = F(\log w, D, 1/L, P, Q).$$

The scale-economy results for the dual form are indistinguishable from those for the primary form.

The sample size for the industries involved was rather small, and in the final results presented here some insignificant variables are omitted. The results for equation 7-6 are given in tables 7-1 and 7-2.

Economies of Scale

Table 7-1 provides essentially no evidence of urbanization economies, but there is strong evidence of signifi-

Table 7-1. ***Production Function: Results by Industry***

Variable	*Steel*	*Transport equipment*	*Chemicals*
$1/L$	−109.652	−68.873	−119.224
	(2.01)	(1.95)	(2.11)
log(P)	−0.019	−0.003	0.091
	(0.24)	(0.04)	(1.06)
Firm size	0.108	0.166	−0.155
	(0.65)	(1.78)	(1.09)
Education (percent low-level)	−0.390	−0.310	−0.266
	(0.41)	(0.52)	(0.48)
Log(k)	0.443	−0.024	0.160
	(3.51)	(0.23)	(1.37)
Distance to port	0.082	0.013	0.040
	(1.87)	(0.33)	(0.92)
Constant	1.677	2.654	2.854
Adjusted R^2	0.54	0.57	0.50
Number of cases	36	27	28

Note: The production function is log (X^*/L).

Table 7-2. *Own-Industry Scale Effects*

Variable	*Steel*	*Transport equipment*	*Chemicals*
ε (median)	0.129	0.153	0.264
ε (2,000 employees)	0.055	0.034	0.060
ε (5,000 employees)	0.022	0.014	0.024

Note: ε, elasticity of firm output with respect to industry employment.

cant localization economies. Table 7-2 shows that localization economies tend to peter out by the upper tails of employment (in our samples, 5,000 employees). These results indicate that probably little benefit is to be gained by encouraging the location of these different industries in the same urban area to obtain scale economies. There appear to be strong but diminishing benefits from agglomerating a particular industry's employment in the same urban area.

Other Factors

The $(\log k)^2$ term is omitted in the final results because a quadratic effect could not be isolated. Log k is generally significant with the expected sign. The labor force quality measures had the correct signs but were disappointing in their lack of statistical significance, given their considerable variability among urban areas and the fine detail of the data. It could only be concluded that labor force quality is probably not a critical factor in these industries. Firm size performed in no consistent fashion and was not significant.

Distance to the nearest coastal major metropolitan area was either insignificant or had an incorrect sign. This indicates either that output prices are essentially spatially invariant or that this effect is offset by an effect in which efficiency increases with distance from the nearest coastal major metropolitan area. For example, for steel the extent of government control over and influence on production undoubtedly declines with distance from the nearest state capital and hence efficiency may increase with distance.

Scale Biases

For steel and transport equipment, scale effects are clearly unbiased (table 7-3). For chemicals log L has a positive coefficient which is weakly significant. Even that may represent not a scale bias effect but problems in aggregating into the two-digit level the capital-intensive petrochemical industry, with its high levels of employment per urban area, and the traditionally spatially dispersed chemical sector. Examination of the latter sector showed no evidence of scale biases.

Wage levels have their expected strong impact on use of capital. The wage coefficient can be interpreted as the elasticity of substitution in production. The numbers for transport and chemicals are in the range of normally accepted values; for steel they are on the high side.

Table 7-3. *The Capital-Labor (K/L) Ratio*

Variable	*Steel*	*Transport equipment*	*Chemicals*
log(ω)	1.230	0.482	0.703
	(3.09)	(1.17)	(1.72)
Property tax rate	−0.934	−19.115	−5.098
	(1.54)	(4.07)	(1.69)
log(L)	−0.031	0.013	0.123
	(0.28)	(0.13)	(0.97)
Firm size	0.345	0.079	−0.016
	(2.02)	(0.49)	(0.10)
Constant	−0.897	1.845	1.389
Adjusted R^2	0.43	0.59	0.40

Note: The K/L ratio is ln K.

Property tax rates have unexpectedly strong impacts on use of capital, an indication that the tax significantly distorts investment decisions. The elasticities for the industries, evaluated at average tax rates, are −0.04 for steel, −0.66 for transport, and −0.10 for chemicals. Evaluated at the average opportunity cost of capital (assuming a pretax cost of 0.12), the elasticities are −0.15 for steel, −2.95 for transport, and −0.70 for chemicals.

Firm size had no impact except in steel. The results for steel may represent a state capitalism phenomenon, whereby state-owned firms are larger and have access to subsidized capital. Distance to the nearest port had the incorrect sign.

The above results indicate the absence of urbanization economies and the existence of strong localization economies. For steel, which is 50 percent state owned, there is a suggestion of general inefficiencies and distortions in use of capital. All this points to a gain from relaxation of state control over industrial location and production decisions and thus a gain from permitting decentralization.

Environmental Considerations in Decentralization

Market forces in countries such as the United States, Canada, and the United Kingdom have tended to promote the location of the heaviest polluters in smaller cities, away from the largest and most densely populated urban centers. In Brazil the worst industrial polluters remain in the largest population centers. Although air quality ought not to be the sole consideration in industrial location decisions, São Paulo's air quality is abysmal compared with that of large metropolitan areas elsewhere; residents of the area view air quality as a

Table 7-4. ***Air Pollution in Greater São Paulo, Compared with U.S. Metropolitan Area***
(micrograms per cubic meter, unless otherwise indicated)

Metropolitan area	*Number of stations*	*Sulfur dioxide*			*Particulates*		
		Worst station	*Median station*	*Days minimum standard exceeded*[a]	*Worst station*	*Median station*	*Days minimum standard exceeded*[b]
Los Angeles County	13	53	32	0	164	100	3
New York City	14	115	69	8	82	63	1
Chicago (Cook County)	44	74	28	1	201	85	53
Greater São Paulo	13	n.a.	143[c]	17	n.a.	115[c]	121

a. Minimum standard is 365 micrograms per cubic meter.
b. Minimum standard is 260 micrograms per cubic meter.
c. Average.
Sources: United States: Environmental Protection Agency, 1977 data; Brazil: Thomas, Comune, and Rizzieri (1980), 1978 data.

prime urban problem (see chapter 13). Table 7-4 presents comparable data for Los Angeles, New York, Chicago, and Greater São Paulo, with the emphasis on sulfur dioxide and particulates, which are industrial pollutants. The average value for sulfur dioxide for the thirteen stations in Greater São Paulo exceeded by far the value at the worst reporting station among U.S. cities. It would seem that encouragement of decentralization of industry outside the Greater São Paulo valley would have important benefits.

Conclusions and Policy Implications

This brief account of the Brazilian government's influence over industrial location in the past, against the backdrop of an empirical evaluation of scale economies, brings out some important conclusions. Localization economies are strong, and therefore agglomeration of firms into specialized cities to take advantage of such benefits as efficiencies in labor markets and in services specific to an industry and greater interfirm specialization within an industry is advantageous.

The results presented here do not show any significant urbanization economies at the scale of activities prevalent in the urban centers of the South and Southeast in 1970. The rationale for efforts to encourage industrialization of the largest urban areas rests on the putative net benefits for heavy industries from locating in areas with a large general scale of economic activity. The findings of this study do not, however, support this rationale. Rather, they indicate that efforts to limit or counter decentralization initiatives are not desirable.

In addition, negative externalities in the form of environmental degradation could constitute grounds for promoting some degree of decentralization. As noted earlier, however, the size distribution of Brazilian cities is by no means excessively skewed, and efforts to bring about decentralization or a different distribution of city sizes for its own sake may not be justified. The provision of more uniform incentives to middle-size cities—which could simply mean the elimination of any special incentives, direct or indirect, to larger cities in the southern region—coupled with environmental restrictions in the highly damaged and builtup areas, could lead to some economically beneficial decentralization of activities. A more detailed review of environmental policies is provided in chapter 13. The implications of various governmental policies—direct and indirect, intended and unintended—for industrial location and spatial configuration of overall economic activities are further analyzed in chapters 10 through 14.

Notes

1. I estimate that the average factory worker in this region takes home at least $250 a month (1980), plus a full set of fringe benefits. In comparing this estimate with the United States, it should be realized that the cost of nontraded goods is much less in Brazil than in the United States.

2. In fact urbanization economies that differ across industries can also lead to specialization among cities because the optimal size of city for each industry differs.

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