Spatial considerations on decentralization and economies of concentration in Indonesia

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chapter 9

Urbanization and industrial agglomeration are two fundamental characteristics in the transition of countries toward greater levels of development. Both have to do with the concept of concentration, the former with regard to the concentration of people and the latter with regard to the concentration of economic activity. While the concept of "urban" is broad and requires that a district's population also has access to a basket of basic services, a necessary first condition is that the district scores above a benchmark of population density. Concentration of production (or economic density) is driven by agglomeration economies, which result from a self-reinforcing interaction among (a) increasing returns at the plant level, leading producers to concentrate; (b) transportation costs, leading the concentration to occur close to large markets; and (c) factor mobility, making large markets even larger as producers and labor relocate to them (Krugman 2000). Concentration of production and consumption generates benefits but also costs resulting from congestion and increased interregional disparity. Governments intervene in these market-led levels of urbanization and agglomeration by promoting deconcentration through legislation and regulations as well as through economic policy making in the fiscal and monetary arenas. Fiscal decentralization has been, perhaps, the most widespread and profound type of deconcentration of the government structure in developing countries over the past two decades. Decentralization promotes fiscal structures that aim to provide local governments with adequate incentives for development and to ensure a healthy degree of equalization across local governments by addressing vertical and horizontal imbalances.

Despite the natural association among the concepts of fiscal decentralization, urbanization, and industrial agglomeration, there is scant understanding of how these issues interrelate with one another and with other geographic dimensions. Two questions are of particular importance: What is the expected effect of fiscal decentralization on patterns of urbanization and industrial concentration in developing countries? What is the expected effect of deconcentration on regional economic growth through its impact on the patterns of urban and industrial concentration? The second question is more important for policy making and flows naturally from the first.

This study focuses on Indonesia, a large middle-income country economically and demographically concentrated on the island of Java, but experiencing strong decentralization since 2001. It addresses these questions from a spatial economics point of view, by examining the ways in which the spatial distribution of districts affects their economic development. In particular, regarding urbanization, it investigates whether distance between a leading and a lagging district has an effect on the migration of citizens toward the larger district. Second, it explores whether public expenditures in a district would generate further in-migration to leading regions (or lesser out-migration

from lagging regions). Finally, based on the role of the spatial characteristics examined, this study speculates on the likely results of dispersing leading regions geographically. In regard to economic concentration, this study examines first whether the spatial distribution of districts is increasingly driven by agglomeration economies in industries at the two-digit level (where employment growth is used as the measure of growth).[1] Second, it examines whether a district's public expenditures on infrastructure or business development programs are correlated with industrial growth and, if so, whether decentralization can lead to lower industrial concentration. Third, it examines whether decentralizing public expenditures can promote development by improving efficiency through intergovernmental competition. It concludes by discussing the likely implications of policies such as fiscal decentralization for regional economic growth and for policy making.

The rest of the chapter proceeds as follows. First, it presents an overview of the patterns and trends of urbanization in Indonesia, examining the patterns and trends of natural urban population growth across "1 million plus" cities, urban fringes, and peripheries, the determinants of interdistrict net migration, and the magnitude of urban growth due to reclassification. This is followed by a discussion of the dynamics and geographic patterns of agglomeration economies that tests the existence of urbanization and localization economies and examines the patterns of spatial interdependence in regional employment growth. It then examines the role of government policy making and intervention by examining the impact of public expenditures at the subnational level on industrial concentration and intergovernmental competition for mobile factors of production. A final section concludes.

Decentralization of expenditures, urban-to-rural migration, and urban density in congested regions

From a demographic perspective, urbanization is typically measured by the urban population's proportion of the total population.[2] The distinction between urban and rural areas has declined in most regions due to a large pattern of temporary, seasonal, and weekly commuting of rural residents to urban or periurban regions, where they work in the informal sector, transportation, and minor trade. Moreover, small and medium cities are simultaneously urban and rural, with farming activities in close proximity to modern buildings and housing. This pattern, which has been referred to as *kotadesasi—kota* (city) and *desa* (village)—in Indonesian, is a common characteristic of urbanization in Indonesia (Firman 1997; Firman, Kombaitan, and Pradono 2007; Hugo 1975, 1997; McGee 1992) and in other Asian countries (Hugo 2003b; Lin 1994).

Indonesia's urbanization rate has increased significantly over the past decades, from 14.6 percent in 1960 to 42.7 percent in 2006 (see table 9.1). Urbanization in Indonesia results largely from natural population growth: Indonesia has doubled in population since the 1960s (from 94 million in 1960 to 218 million in 2005) and remains the fourth most populous nation on earth (BPS 1960, 2005b).[3] However, the annual exponential population growth rate has declined sharply from 2.34 percent during the period of 1971–80 to 1.61 percent during the period of 2000–05. The decrease in the population growth rate is, at least partially, a result of the increasing tendency to postpone marriage, growing awareness and effective use of modern contraceptives, and unsatisfactory record in reducing mortality. Urban population growth reached its peak in the 1980s, accompanied by a significantly lower rate of growth of the rural population. While the absolute percentage of urban population increased in the 1990s, the growth rate of the urban population declined, as did that of the rural population.

The pattern of rapid urbanization in Indonesia is apace with the average of other countries in the East Asia and Pacific region, but lower than the average of lower middle-income countries generally (a category in which it falls according to gross domestic product [GDP] per capita). Although the direction of causality is difficult to determine, urbanization is highly correlated with a country's level of socioeconomic

Table 9.1 Urban and rural population and population growth rate in Indonesia, 1960–2005

Year	Population (thousands)		Urbanization rate	Annual exponential rate of growth[a]			
	Urban	Rural		Urban	Rural	Indonesia	t[b]
1960	—	—	14.6	—	—	—	—
1971	20,568	99,712	17.1	—	—	—	—
1980	32,845	113,930	22.4	4.68	1.33	2.34	9
1990	55,433	123,811	30.9	5.23	0.83	2.00	10
1995	71,657	123,143	36.8	5.13	–0.11	1.66	5
2000	85,380	115,961	42.4	4.47	–0.68	1.20	9.66
2005	92,919	124,452	42.7	1.69	1.41	1.61	5

Source: Author's calculations based on BPS (2005a, 2005b).
— Not available.
a. The exponential formula is $r = \ln(P_0/P_1) * (100/t)$.
b. Intercensal period, *t* years. Rates for 2000 are from October 31, 1990, to July 1, 2000.
The figures for population growth differ from official government projections for 2005, as they are based on actual data as opposed to projections.

development. In this regard, a review of East Asian economies estimates that the elasticity of economic growth to urbanization is about 2.71 (Iimi 2005). Whether larger populations (and larger markets) generate economic activity or mobile capital is driven to larger labor markets (and so lower wages), retaining a region's population by preventing outmigration seems to be desirable if the goal is to promote economic development.

The implications of rapid urbanization for development are particular to the underlying driving factors. When urban growth is caused by natural population growth and rural-to-urban migration, it leads to higher levels of urban density. In contrast, urban growth caused by reclassification reflects a lateral extension of the urban limits due to changes in the labor market structure of previously rural villages toward nonagricultural jobs or the origination of new industrial areas. According to ESCAP–UN (1993) and Firman (2004), natural population growth accounted for only around 35 percent of urban population growth from 1980 to 1985, whereas the remaining 65 percent resulted from migration and reclassification (lateral extension). Gardiner (1997) asserts that the proportion of urban growth due to natural population growth, reclassification of rural regions as urban, and net rural-to-urban migration over the period of 1980–90 was 35, 30, and 35, respectively. As Gardiner and Oey-Gardiner (1991) report, the number of villages that changed from rural *desas* to urban areas almost doubled from 1980 to 1990. This distribution—roughly one-third for each factor—remained constant over the 1990–2000 period. World Bank (2003) estimates that 30–35 percent of urban growth in the 1990s was due to reclassification of rural to urban areas. Yet urban growth due to lateral extension increased further in 2000, as 7 percent of Indonesia's more than 65,000 villages were recoded from rural to urban. As much as 48 percent of urban population growth between 1999 and 2000 was due to reclassification (BPS various years).

Distance and factor mobility

The concentration of population in a few metropolitan areas has gone beyond the capacity of current factor markets and infrastructure facilities, and so it generates congestion costs. Rural-to-urban migration can affect urban growth in positive or negative ways, depending on the degree to which population flows are monitored and whether they are planned in ways that promote an adequate distribution of urban centers and minimize congestion costs. Urbanization is not necessarily accompanied by economic growth, and in fact concentration of urbanization (in the form of urban primacy) can generate negative growth (Ades and Glaeser 1995; Williamson 1965). Natural population growth in rural areas transforms rural regions into small urban centers or hinterlands that do not share the main characteristics of large metropolitan regions and often digress to slums, characterized by the absence of infrastructure and sanitation services, such as electricity, tap water, sewerage, and housing, and the presence of air and water pollution, crime, and heavy traffic (Iimi 2005).

In 2005, 32 million Indonesians (14 percent of the total population) lived outside their district of origin. The pattern of lifetime net migration in Indonesia reveals that large areas in Java and Bali, the eastern and southern regions in Sulawesi, and some landlocked districts in Sumatra lost the most population (see figure 9.1). Strong dynamics of population mobility are led by the attraction that regions with higher levels of urbanization exert on regions with lower levels of urbanization.[4] Urban gravity, resulting from opposing centrifugal and centripetal forces, decreases with distance. Centrifugal forces lead districts proximate to districts with a higher level of urbanization to benefit from their neighbor's economic growth, due to the deconcentration of population and employment. This usually reflects congestion in the leading region and the propensity of firms to take advantage of the lower costs of labor and land in the suburbs. Centripetal forces lead rural residences to migrate to urban centers in search of better access to employment and services.

While population growth in large cities (1 million plus population) is lower than the national average, there is a strong pattern of migration, mostly from rural districts to districts with higher levels of urbanization. What might seem to be a contradiction—high levels of in-migration and slow population growth—is explained by a significant proportion of large districts' own population that is driven to the peripheries mainly by the costs of congestion. Results from an econometric estimation of the determinants of net migration across districts shed light on the dynamic between pull forces (urban gravity) from districts with a higher level of urbanization and push forces from areas with a lower level of urbanization (see the annex for descriptive statistics and variable definitions).

On average, one rural district located in a peripheral area (that is, one standard deviation above the average *distance to a higher-tier urban neighbor* and one standard deviation below the average level of urbanization) is expected to have net out-migration that is as much as 21 percent higher than the average district: 5 percent due to distance-sensitive pull and 16 percent due to push from its own urbanization. As expected, the effect of distance is nonlinear. Districts close to the average level of urbanization and situated within a given radius (125 kilometers) of a district with a higher level of urbanization experience negative net migration. This circle of "urban gravity" is larger (with a radius of 200 kilometers) for districts with significantly lower levels of urbanization (one standard deviation below the average). This suggests that the neighbor's pull is reinforced by an additional push from the district of

Figure 9.1 Net migration of population in Indonesia, by districts, 2005

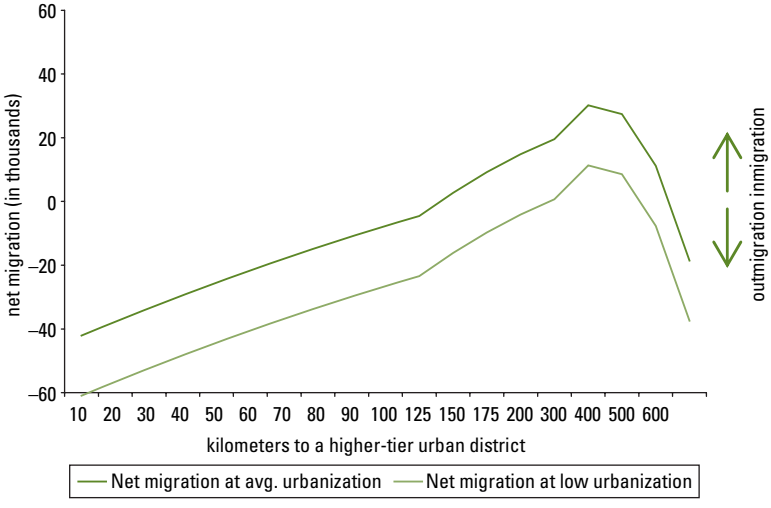
Source: Author's calculations based on net migration (in-migration minus out-migration) data from the *Supas* (BPS 2005b).

origin. On the contrary, districts within 125 to 600 kilometers of a larger neighbor tend to gain population.

Figure 9.2 presents a simulation of expected net migration patterns at increasing levels of distance between a district and its nearest neighbor at a higher tier of urbanization. Urban-gravity pull decays as distance between two districts increases until net migration reaches a positive maximum. Distances to the nearest higher-tier neighbor beyond 600 kilometers, which could be considered the limit after which a district falls into the category of "very remote area," are associated again with negative values of net migration. Suburbanization determines that, within the highest level of urbanization, fringes gain instead of lose population due to congestion costs and high-quality amenities and housing in suburban enclaves. This is reflected in the negative value of the coefficient for an interaction term defined as the product of the variable for distance to the nearest higher-tier urban neighbor and a dummy variable for fringe areas of "1 million plus cities" (see table 9.2, column 3).

One of the clearest examples of congestion costs experienced by districts at the highest level of urbanization is that of Medan and Jakarta metropolitan area, illustrated in figure 9.3. While the results of the migration model predict that cities closer to larger cities lose population (attracted by their strong urban gravity), the results reverse at the highest level (as shown by the negative sign on the fringe interaction term in table 9.2). That is,

Figure 9.2 Simulation: Urban gravity at alternative distances and levels of urbanization



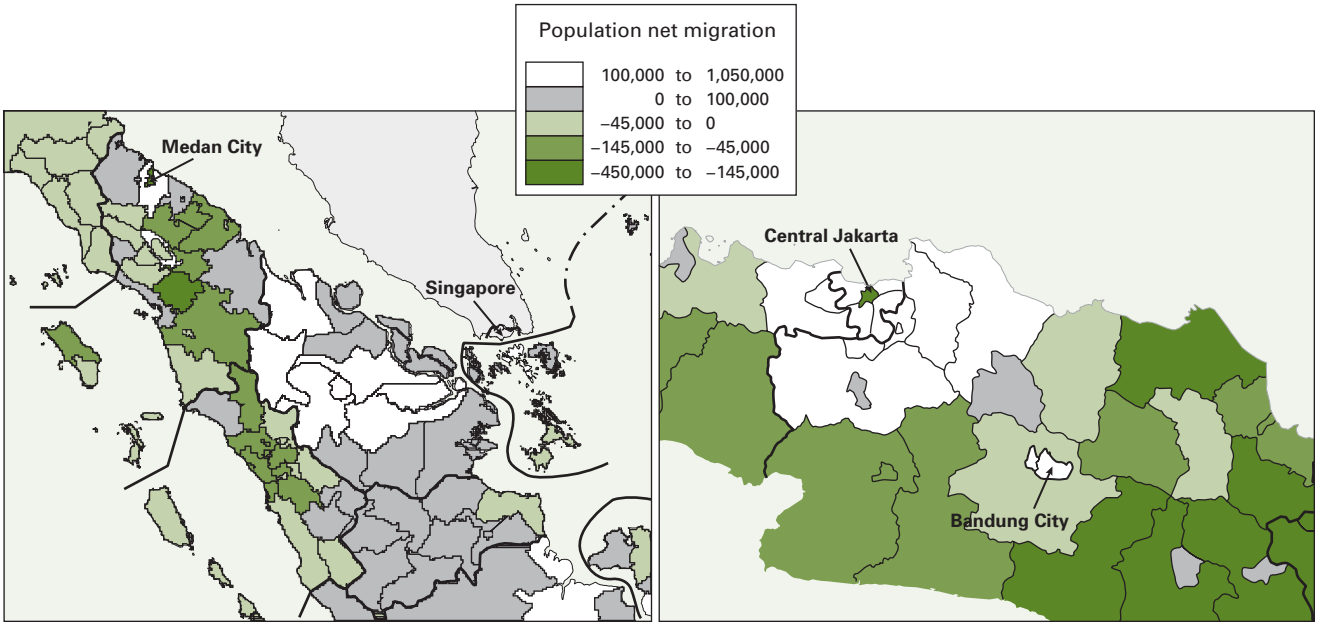
Source: Author's calculations.

Table 9.2 Determinants of districts' net migration
dependent variable: net migration (in-migration minus out-migration), thousands

Explanatory variable	(1)	(2)	(3)
Distance to higher-tier-urbanization neighbor (gravity pull)	0.153*	0.443***	0.09
	(3.04)	(3.37)	(1.75)
Distance to higher-tier districts squared		–0.001**	
		(–2.32)	
Incremental distance to urban level four			0.07
			(0.27)
Incremental distance to urban level five			0.1
			(1.64)
Urbanization	103.35	–182.76**	102.9***
	(4.36)	(–2.17)	(4.08)
Urbanization square		293.15***	
		(3.37)	
Dummy "1 million plus" cities			–46.6**
			(–2.45)
Fringe * Distance to higher-tier-urbanization neighbor			–4.1 e-3
			(–0.07)
Constant	47.80	–22.38	–36.5**
	(4.65)	(–1.48)	(–3.06)
Number of observations	371	371	371
R^2	0.07	0.11	0.10

Note: Numbers in parentheses are *t*-statistics.
*** Significance at the 1 percent level.
** Significance at the 5 percent level.
* Significance at the 10 percent level.

Figure 9.3 Out-migration from large metropolitan districts to the fringes in Indonesia



Source: Author's calculations based on data in the Supas (BPS 2005b).

fringe areas around the district of Central Jakarta, consisting of the remaining districts of province DKI Jakarta (East, West, North, and South Jakarta) and the districts of Bogor, Tangerang, Depok, and Bekasi (abbreviated usually as BOTADEBEK), experienced significant positive net migration (gained population) instead of losing population, while the district of Central Jakarta itself experienced negative net migration (−330,000).[5] Negative net migration in Jakarta metropolitan area reflects a push out of villages due to congestion, as the city attracts population from throughout Indonesia.[6] Similar cases of congestion can be seen in the city of Medan (province of Sumatra Utara) and the district of Bandung (which is now the largest district, with a population of 4.05 million) and in 8 out of 10 of the districts with a population greater than 2 million.[7]

Migration and regional fiscal structure

An examination of per capita public expenditures after controlling for the forces of urban gravity suggests that public expenditures on social services and infrastructure have an effect on household migration.[8] Public expenditures are expressed as the log of the ratio of a four-year average of nominal expenditures to total nonmigrant population.[9] Table 9.3 presents the results of three models aimed at estimating the effects of public expenditures on net lifetime migration.[10] These specifications include the following regressors: exogenous fiscal variables from the district of origin, which measure the fiscal push (or analogous fiscal pull from the district of origin when its level of expenditure is high enough to keep its population from leaving); one variable accounting for the urban-gravity pull from larger urban centers (defined as the distance to the nearest district in a higher quintile of urbanization); and a group of exogenous geographic variables. The group of geographic variables includes dummies for the main island, a dummy for isolated islands, and a variable for landlocked districts. Model 1 presents a linear regression, whereas models 2 and 3 explore further the spatial interdependence of net migration patterns by means of a spatial lag of the dependent variable and spatial error estimations.[11] Furthermore, all sectoral public expenditure variables are highly correlated with one another, and so they have not been used simultaneously in the same specification, but rather in independent equations.

Results from these estimations suggest that per capita public expenditures on

Table 9.3 Population dynamics: public expenditures and net migration in Indonesia
dependent variable: net migration

	Ordinary least squares (1)			Spatial lag (2)			Spatial error model (3)		
Variable	**Education**	**Health**	**Infrastructure**	**Education**	**Health**	**Infrastructure**	**Education**	**Health**	**Infrastructure**
Distance to district of highest-tier urbanization (gravity pull)	0.07	0.07	0.07						
	(4.91)	(4.97)	(5.00)						
Log sectoral expenditures[a]	1.61	2.52	3.31	1.76	2.29	2.97	1.30	1.74	2.63
	(2.13)	(3.33)	(3.31)	(1.58)	(1.98)	(4.3)	(1.2)	(1.56)	(3.87)
Isolated	–6.53	–7.01	–5.59	–7.39	–7.76	–6.26	–8.20	–8.39	–7.25
	(–0.98)	(–1.06)	(–0.83)	(–1.45)	(–1.52)	(–1.25)	(–1.52)	(–1.56)	(–1.37)
Landlocked	–10.71	–10.80	–10.38	–11.71	–11.81	–11.49	–9.84	–9.94	–9.84
	(–3.42)	(–3.45)	(–3.47)	(–3.65)	(–3.69)	(–3.66)	(–3.04)	(–3.07)	(–3.09)
Island Sumatra	13.01	12.82	11.45	8.66	8.71	7.87	14.31	14.64	16.52
	(3.30)	(3.29)	(2.89)	(2.19)	(2.21)	(2.02)	(1.4)	(1.45)	(1.76)
Island Kalimantan	15.11	13.89	12.31	10.31	9.66	8.94	24.53	24.27	22.50
	(3.17)	(2.93)	(2.81)	(1.97)	(1.84)	(1.74)	(1.87)	(1.87)	(1.86)
Island Sulawesi	–2.84	–3.28	–3.44	–1.24	–1.39	–1.32	–0.81	–0.46	0.91
	(–0.74)	(–0.85)	(–0.91)	(–0.26)	(–0.3)	(–0.29)	(–0.06)	(–0.03)	(0.07)
Island Nusa Tenggara and Maluku	–7.62	–8.51	–9.42	–3.65	–4.29	–4.90	–4.54	–4.71	–4.18
	(–1.85)	(–2.04)	(–2.24)	(–0.66)	(–0.78)	(–0.9)	(–0.37)	(–0.39)	(–0.37)
Island Papua	–0.83	–3.79	–6.73	18.37	16.39	14.63	78.71	76.90	72.02
	(–0.10)	(–0.48)	(–0.85)	(2.08)	(1.83)	(1.68)	(3.01)	(2.93)	(2.79)
Constant	–19.32	–25.97	–35.23	–16.84	–19.27	–27.35	–11.20	–13.90	–25.45
	(–2.09)	(–3.33)	(–3.35)	(–1.24)	(–1.59)	(–3.49)	(–0.72)	(–0.96)	(–2.34)
ρ (spatial-lag coefficient)				0.57	0.56	0.53			
				(4.99)	(4.89)	(4.53)			
λ (spatial autoregressive parameter)							0.77	0.76	0.74
							(7.99)	(7.8)	(6.92)
R^2 and square correlation[b]	0.23	0.24	0.28	0.204	0.206	0.235	0.104	0.108	0.143
Number of observations	354	354	354	354	354	354	354	354	354

Source: Author's calculations.
Note: Numbers in parentheses are *t*-statistics.
a. Four-year average.
b. Squared correlation is reported instead of R^2 in models 2 and 3. All spatial lag and spatial error regression models were computed by maximum likelihood using STATA ml routine modules (see Pisati 2001).

infrastructure and health services are positively correlated (independently) with net migration at the district level, whereas they provide no evidence of an association between net migration and education expenditures.[12] Fiscal policy—in particular, public expenditures—could be used to control the push of population from rural to urban areas and to promote faster urban development in small towns and medium-size cities. In particular, the effects of infrastructure spending are larger—and its correlation is stronger—than those of health expenditures. This is of particular importance in Indonesia, given what has been called a second "big bang" of fiscal decentralization in 2006. This substantial increase in subnational resources resulted from an increase in national fiscal space (mainly because of a reduction in fuel subsidies), increasing subnational revenues, on average, by as much as 55 percent from 2005 to 2007. If those resources are channeled toward services and infrastructure, decentralization is likely to have a large effect on the pattern of urbanization by minimizing the push effect and encouraging a more homogeneous pattern of urban development.

Alternative policy interventions to reduce urban concentration

An examination of population at an initial point in time and subsequent growth at the district level confirms the existence of a tendency for population to converge (deconcentrate), although at a very slow pace (see table 9.4).[13] The change in the pattern of urban concentration can also be seen by categorizing cities by quintile in terms of their population size and computing the percentage that each quintile represents of the total population. The 20 percent of smallest

districts increased from only 2.8 percent of the population in 1983 to 11 percent in 2005. On the contrary, districts forming the 20 percent of largest districts decreased from 49 to 44 percent over the same period. An alternative natural aggregate level of observation is the six largest islands of the country (see table 9.5). Population distribution in Indonesia, at the island level, remained almost constant over the last two decades, with 60 percent of the total population on the island of Java and in Bali and 20 percent on the island of Sumatra. The maximum-to-minimum ratio at the island and provincial level decreased slightly, suggesting that regions with the lowest population have been catching up with regions with the most population (converging). The same figure increased at the district level, at least partially, as a result of the proliferation of new districts, which have some of the smallest populations.

Table 9.4 Population convergence
dependent variable: log of population

Variable	Coefficient
Log population 1983	–0.107
	(–6.68)
	[–9.12]
Constant	1.71
	(8.33)
	[11.13]

Source: Author's calculations.
Note: Numbers in parentheses are *t*-statistics. Numbers in square brackets are *t*-statistics corrected for spatial correlation (error model).

Table 9.5 Distribution of population in Indonesia, by district, province, and island, 1983 and 2005

	District level (thousand)		Provincial level (million)		Island level (million)	
Indicator	1983	2005	1983	2005	1983	2005
Mean	531.7	496.7	4.7	6.9	24.9	36.8
Standard deviation	464.5	571.8	7.6	10.0	34.0	49.7
Minimum	14.0	12.7	0.32	0.64	1.3	2.5
Maximum	291.9	4.102	31.1	39.1	91.3	134
Share maximum (percent)	1.9	1.9	20.2	17.7	61.3	60.6
Ratio of maximum to minimum	201	323	95	65	70	53
Number of observations	281	444	31	32	6	6

Source: Computed based on information in the *Susenas* (BPS various years).

Table 9.6 Number of people relocated under Indonesia's transmigration program
thousand

Period	Number of target families	Number of families actually moved	Number of people actually moved
Pre-*Repelita* period, 1950–69	—	100	500
Repelita period[a]			
I: 1969–74	39	37	174
II: 1974–79	250	118	544
III: 1979–84	500	535	2,470
IV: 1984–89	750	230	1,062
V: 1989–94	550	110[b]	—
VI: 1994–99	600	300	1,500
VII: 1999–2000	16	4	22
Total	2,705	1,024	6,271

Source: Sri Adhiati and Bobsien (2001).
— Not available.
a. *Rencana Pembangunan Lima Tahun*: five-year economic development plan in Bahasa, Indonesia.
b. Approximation: equal to one-fifth of the target number of families, as stated by Hugo (1997).

Overpopulation and the high degree of population concentration in inner Indonesia (as opposed to the outer islands) have been widely regarded as among the most pressing problems facing the nation since the 1970s. As a result, a government resettlement program, denominated Transmigrasi, which was initiated as early as 1904, was strengthened by the late 1970s and mid-1980s under the New Order government (during the periods of the *Repelita:* five-year economic development plans III and IV; see table 9.6). These programs aimed to intervene in the patterns of population growth and to reduce concentration by resettling the landless population from areas with high population density to those with low population density. The number of families relocated decreased markedly after 1980 due to a decline in available resources; at that time, the government devised a program to encourage "voluntary" migration of people who would receive none or only partial funding. As a result, the second half of the 1980s was characterized by a large increase in the number of spontaneous (*swarkasa*) transmigrants. These reached approximately 500,000 families, twice the number of sponsored families. In all, between 1969 and 2000, approximately 1 million families—or 6.2 million people—were moved from Java-Bali to the outer islands, in particular Sumatra.

Similar types of government-financed resettlement programs were also practiced in several other countries in Southeast Asia, including Malaysia, the Philippines, Thailand, and Vietnam (Leinbach 1989). It is widely believed that the success of those programs, as well as that of Indonesia's Transmigrasi program, was, at best, mixed and controversial, because of problems including inadequate income levels, improper

site selection, poor matching of settlement models to the specific sites, environmental deterioration, difficulties of adjustment, land conflicts, and financing (Fearnside 1997; Hugo 2003a). As highlighted by Hugo (1997), however, the transmigration program was not the largest component of a substantial spontaneous migration from Java to the outer islands. This is shown by significant and increasing figures for overall lifetime migration out of Java: 2.35 million in 1980 and 2.71 million in 1990. In all, the populations of Java and Bali are growing at a slower rate than those of the outer islands. In fact, the annual population growth rate in Java and Bali over the period 2000–05 (1.47 percent) was almost half that in the outer islands (2.86; see table 9.7). A more disaggregated categorization on the basis of the initial size of districts and their spatial location can be set to distinguish among districts with a population greater than 1 million (in 2000), fringe districts (defined as all neighboring districts of districts in the previous category), and districts in the periphery (defined as all districts that do not fall into either of the two previous categories). Three results stand out. First, peripheries and fringe districts are growing faster than "1 million plus cities," with the former group experiencing the larger rate of growth. Second, outer islands are growing faster than Java and Bali. Third, within Java and Bali, "1 million plus cities" are still growing faster than the fringe and peripheries, whereas peripheral districts in the outer islands are growing significantly faster. The first and second points suggest a deconcentration of population, as both categories in which population was initially lower—peripheries and outer islands—are growing faster than those in which population was initially higher. The third point reveals that the dynamics of deconcentration are driven by growth in the outer islands and not in Java and Bali, where the trend of population growth exhibits further concentration.

Table 9.7 Population and annual population growth in Indonesia, 2000 and 2005

Area	Population		Annual growth (percent)
	2000	2005	
All areas			
Java and Bali	124.1	133.5	1.47
Outer islands	75.5	87.0	2.86
Indonesia	203.5	220.6	1.99
"1 million plus" cities			
Java and Bali	82.2	88.7	1.52
Outer islands	11.0	11.4	0.81
Indonesia	93.2	100.0	1.43
Fringe areas			
Java and Bali	27.3	29.1	1.33
Outer Islands	41.6	46.8	2.2
Indonesia	68.8	76.0	1.98
Periphery areas			
Java and Bali	14.6	15.7	1.42
Outer islands	22.9	28.8	3.52
Indonesia	37.5	44.5	3.41

Source: Author's calculations based on data from BPS (2000, 2005a, 2005b).
a. The populations of all districts in 2005 are aggregated at 2000 boundaries.

Agglomeration economies

In Indonesia, economic activity is clearly becoming more concentrated in large cities. In 2004, 66 districts (15 percent of all districts) with populations larger than 1 million accounted for 51 percent of total GDP (excluding oil and gas). From this group of districts, those classified as cities or *kotas* (13 in total) contributed 26 percent, while "non-city districts" (53 in total) contributed 25 percent.[14] Large districts generate about half of national GDP, but this does not necessarily reveal the existence of disparities in income per capita, as large districts also account for about half of the population of the country (49 percent). It is important to recognize that even largely populated districts in Indonesia have both urban and rural areas. In particular, as much as 35 percent of employment in large districts is agricultural. Disparities in productivity become more evident with a more detailed analysis of the patterns of sectoral employment (see table 9.8). In 2004, 45 percent of Indonesians worked in agriculture, which accounted for only 17 percent of national GDP (net of oil and gas). On average, residents of agricultural regions have lower income per capita than persons working in nonagricultural jobs, whether located in large cities or elsewhere. Moreover, the agricultural sector in Indonesia (together with wholesale and retail trade, hotels and restaurants, and construction) exhibits a low level of relative concentration, indicating that agricultural activity is spread somewhat evenly across

Table 9.8 Composition and concentration of employment, by sector

Sector	Composition				Index of relative concentration (employment)			
	Share, 1994	Share, 2004	Annual rate of growth [a]	Average percentage of regional GDP [b]	1994	2004	Rank 2004	Change, 1994–2004
1 Agriculture, forestry, and fishery	48.3	45.0	0.1	18.3	0.202	0.235	5	0.032
2 Mining and quarrying	1.1	0.8	–0.6	10.9	0.326	0.430	1	0.104
3 Manufacturing industry	10.5	12.7	1.2	24.6	0.297	0.312	4	0.015
4 Electricity, gas, and water	0.4	0.2	–2.4	1.4	0.372	0.395	3	0.023
5 Construction	3.9	4.5	1.0	5.9	0.233	0.225	6	–0.007
6 Wholesale or retail trade, restaurants, hotels	16.5	18.5	0.9	19.9	0.183	0.182	9	–0.002
7 Transport, storage, and communications	3.6	5.8	2.5	6.4	0.260	0.210	7	–0.049
8 Finance, insurance, real estate, and business	0.7	1.3	3.1	9.9	0.469	0.423	2	–0.046
9 Public services	14.0	11.5	–0.4	9.5	0.217	0.192	8	–0.025

Source: Employment figures are computed using data from the *Susenas* (BPS various years).
a. Of the form: (log employment 1994 – log employment 2004) / 10.
b. Excluding oil and gas manufacturing.

regions as opposed to being concentrated.[15] Although there is widespread agreement that concentration generates economies in some industries, the large majority of these results refer to industries within the manufacturing sector. The manufacturing sector as a whole accounts for only 25 percent of GDP in Indonesia, which demonstrates the importance of observing the spatial interaction across two-digit classification sectors, including services and agriculture.

The dynamics of concentration (leading to further divergence or convergence) can be examined roughly by looking at changes in the index of relative concentration. The nonservice sectors have become more concentrated, while the service sectors have become less concentrated. This is reflected in an increase in the sectors of mining; agriculture; electricity, gas, and water; and manufacturing and in a decrease in all service sectors (sectors 6 to 9 in table 9.8). However, this indicator reflects an "average," which can be biased by outlier observations and may not statistically represent the pattern of concentration in districts in Indonesia. Furthermore, the index of relative concentration provides a view of concentration by sector, but it does not shed light on the geographic patterns of distribution and does not take into account the space in which each municipality is located (Ruiz Valenzuela, Moreno-Serrano, and Vaya-Valcarce 2006). To examine the spatial dimension of economic development and concentration in further detail, the next sections present an econometric analysis of the (a) patterns of regional concentration by sectors, taking into account the strategic positioning of districts relative to neighbors in higher orders of the city hierarchy and (b) the magnitude and significance of agglomeration economies.

As outlined by the new economic geography literature (Fujita 1988; Fujita and Thisse 1996; Venables 1996), the decrease in transportation costs over time has enabled closer links between suppliers and customers and made it easier to ship agricultural goods to industrial and urban centers. At the extreme, if transportation costs and congestion costs[16] are significantly low, regional economies can be expected to converge to form unique urban centers of production that benefit from increasing returns, that ship in inputs and agricultural goods, and that distribute products across the nation. Several studies document how improved technologies have led to a pattern of decreasing transportation and communication costs over time (Cairncross 1997; Glaeser and Kohlhase 2004). Although the net effects of lower transportation costs, which lead to concentration, reduce the costs of communication, and lead, in turn, to deconcentration, cannot be determined a priori, an implicit corollary of both of these hypotheses is that interjurisdictional distance would have a smaller effect on the structure of local economies.

Homogeneous growth

Even if it is not possible to fit hundreds of millions of people into a very few regions due to congestion costs, concentrated growth can be expected to spill over across an entire region, except that growth spillovers fade off with distance. Arze del Granado and Sumell (2008) examine employment growth over a 10-year period in Indonesia and its relation to the spatial location of districts at different levels of the urban hierarchy.[17] Employment growth in lower-tiered regions can be expected to be statistically lower if the regions are subject to a "distance penalty" due to fewer opportunities to commute, less access to urban amenities and high-ordered services, fewer opportunities to earn higher salaries, less access to lower-price goods (achieved in larger districts through economies of scale), and weaker trade links in general (Partridge and others 2008). In other words, by not accruing the benefits of agglomeration economies, distant districts may experience a loss in growth, or districts close to larger ones may benefit from growth spillovers. In addition, the magnitude of the distance penalty is likely to be positively associated with the distance between lower- and higher-tier regions.[18] The positive economic value of distance to core centers of development could include higher congestion costs in the form of higher levels of crime, taxes, wages, land prices, traffic congestion, and environmental pollution (Glaeser 1997) or by the benefits of less competition from large urban centers—the new economic geography's agglomeration shadows (Krugman 1991; Dobkins and Ioannides 2001). Arze del Granado and Sumell (2008) find that employment growth is larger in districts geographically proximate to a higher-order urban center. In particular, the incremental distance coefficients indicate that increasing the distance from a district to the nearest district of a higher tier by one standard deviation decreases its expected employment growth by 0.49 percent.[19] This is a significant figure, considering that the mean annual employment growth of Indonesia's districts is 1.1 percent. This result is consistent with the findings of Partridge and others (2006) based on U.S. data at the county level, which show that closer proximity to a nearby urban center has a positive effect on employment growth and that this effect is growing over time.

Where decentralization provides additional resources to lagging regions, as is the case in Indonesia (World Bank 2007), small and medium-size cities are likely to experience accelerated growth, increasing the scope for economic spillovers. The appropriateness of the fiscal structure in a decentralized country depends essentially on its geography. Hence the most direct effects of decentralization policy should be examined in terms of the potential benefits of deconcentrating economic activity across subnational territorial units. Decentralization entails the delegation of decision-making authority to a large number of subnational governments over resources previously allocated by the federal government. This is often coupled with larger amounts of public spending per capita at the subnational level in targeted sectors such as education and health (Arze del Granado, Martinez-Vazquez, and McNab 2005). A direct consequence would be the more homogeneous development of new centers of economic activity across the national territory as opposed to the complete centralization in one unique mega urban center. In turn, this implies a decrease in the average distance between lagging regions and the nearest leading region, which, as mentioned in the previous section, increases the scope for economic spillovers.

Urbanization and diversity

A wide array of empirical evidence suggests that regional economic growth is affected by agglomeration economies in the form of urbanization and localization economies. The former is usually proxied either by the overall size of a local economy or by an indicator of sectoral diversity, whereas the latter reflects sectoral gains from concentration of a specific industry. In a recent study of agglomeration economies in Indonesia over the period of 1994–2004, Arze del Granado and Sumell (2008) study the relationship of economic structure and growth, controlling for spatial characteristics such as distance to the nearest urban center and employment

growth in the surrounding regions (to correct for spatial autocorrelation). This study concludes that lagging regions seem to be catching up in terms of overall employment growth, led mainly by agriculture and mining. This is reflected in a negative coefficient on districts' total employment and employment density in the initial year of the period examined. Having controlled for sectoral effects—both localization and diversity—employment density reflects the potential effect of the size of local markets, sometimes considered part of urbanization economies. It can also capture negative externalities such as pollution or high rents for land (see Combes 2000). Because of transportation cost savings and increasing returns, firms find it profitable to locate in large input and output centers. In addition, industries might benefit from knowledge spillovers across industries due to higher communication among people in cities or due to supply-demand linkages. Yet when markets are saturated with an excessive number of suppliers, output prices tend to fall and input prices tend to rise. In addition, an urban area's capacity to absorb land-intensive industries, such as in agriculture and mining, is physically constrained. Therefore, these land-intensive industries seem to be less prone to achieving the benefits of agglomeration economies.[20]

Arze del Granado and Sumell (2008) find evidence of a pattern counter to that expected from the presence of localization economies. That is, the coefficient of localization or specialization is statistically significant and negative in all sectors. The estimated localization elasticities range from −0.1 to −0.01 and are significantly larger for the service sector (from −0.1 to −0.04) than for the nonservice sectors, agriculture being the lowest (−0.01). These results suggest that employment in all sectors became distributed more equally across districts over the period of analysis, as opposed to a pattern of increased clustering of sectoral employment. Furthermore, these results are consistent with the theoretical conclusions of Jacobs (1969) and the empirical findings of Glaeser and others (1992), among others, which suggest that urbanization, and not localization, contributes to economic growth. Combes (2000), in a study covering 341 local areas in France from 1984–93, also finds negative specialization effects in sectors in which employment is growing at the national level. This would also be the case in Indonesia, where employment is growing in 7 out of 10 main sectors (exceptions being electricity, mining, and public services). Combes attributes this result to a pattern in which sectors "first develop in a few places and then develop across space." Unlike results previously found in the United States and Europe, Combes's findings can be explained partly by the fact that France has significantly lower levels of labor mobility. This is likely also the case in developing countries and, in particular, in Indonesia, which has a territory fragmented into more than 13,000 islands, with more than 700 living languages spoken across its regions (Gordon 2005). However, these results are based on a two-digit level of aggregation in which all manufacturing industries are aggregated into one sector, and so they do not shed light on the patterns of industries within the infrastructure sector.

Room for further decentralization and policy implications

It is too early to examine the full impact of decentralization in Indonesia, but it is still possible to infer some of its likely effects on local economic development based on an analysis of two additional dimensions: (a) the extent to which decentralized expenditures generate new centers of industrial activity and (b) the extent to which decentralized public expenditures can enhance efficiency by generating intergovernmental competition. Fiscal decentralization—perhaps the most widespread and profound type of transformation of the government structure in developing countries over the past two decades—has significantly transformed Indonesia since 2001 (Alm, Martinez-Vazquez, and Indrawati 2004; Bahl 1995; Fengler and Zaini 2006; Lewis 2005). Public policy at the subnational level can affect the migration of firms and individuals through the regulation of licensing, zoning, and the provision of various types

of subsidies, tax exemptions, industrial parks, and so forth. The regional allocation of subnational expenditures across sectors is just one of several factors that affect the mobility of production factors in a country, but an important one. The determinants of firm location have been widely examined in Indonesia (Deichman and others 2005; Kuncoro 1994; Kuncoro and Dowling 2007; see also Kuncoro in chapter 10 of this volume), and this topic is not considered further here. Instead, this section examines the effects of public expenditures on industrial concentration, defined as the percentage of manufacturing in total regional GDP. The theoretical justification for this type of empirical model is discussed in Chen, Jin, and Lu (2005) and Wen (2004). The main variables of interest in this section are public expenditures on infrastructure and on other sectors related to business development.[21]

There is no evidence that decentralization is generating new centers of industrial activity. In particular, decentralized expenditures over the period of 2001–04 are not statistically correlated with the level of industrial concentration in Indonesia.[22] Results from a linear regression reveal a significant relation between the degree of industrial concentration and expenditures on infrastructure, yet these results lose their significance once a spatial lag is included in the model to correct for spatial autocorrelation. This indicates the existence of spatial correlation in the sense that other types of spatial characteristics might be leading to industrial clustering. It is still too early to find an effect from local public expenditures over the period examined, given that public investments may take several years to generate results.

An additional channel by which a decentralized government structure can enhance economic development is by increasing the efficiency of public spending. Yet districts in Indonesia seem to possess insufficient fiscal autonomy to generate efficiency gains from interregional competition. The current extent of competition can be examined in the form of spatial interdependence in discretionary public expenditures (largely expenditures other than personnel). If local governments compete for mobile labor and capital, the composition of their public expenditures should exhibit a systemic pattern of spatial interaction.[23] Indonesia is among the most decentralized developing countries in the world, with a ratio of subnational to total expenditures of 40 percent (World Bank 2007). Yet, in 2004, as much as 48 percent of expenditures at the subnational level were de facto nondiscretionary.[24] The current decentralized structure increased significantly the overall level of expenditures transferred from the central government that could be used, in principle, to attract mobile private investments. On the revenue side, the ability of a district to compete is almost nil, as most important taxes, such as property and income taxes, are administered by the central government and subsequently shared with provinces and districts, whereas the corporate income tax is still under the complete jurisdiction of the central government. The lack of subnational tax autonomy in Indonesia is reflected in the distribution of revenue by source, with own revenue sources accounting for as little as 8.8 percent of total revenues in 2005 (World Bank 2007).[25]

There is evidence that fiscal decentralization can increase interjurisdictional competition in developed countries, but there has been little research on these effects in the developing world. Arze del Granado, Martinez-Vazquez, and Simatupang (2008) examine the expenditure patterns of districts in Indonesia, finding evidence of spillover effects in expenditures on administration, but failing to find a similar effect in expenditures on other sectors.[26] This is of particular interest, as expenditures in the government sector account for the largest share of subnational expenditures in Indonesia. The estimated spatial elasticity for subnational administrative services is almost twice as large as that for discretionary total expenditures. Some sort of an imitation effect, and not necessarily of the good kind, appears to occur among Indonesia's local districts: spending by neighboring districts on local buildings, cars, and so on leads to imitation by other districts. On the contrary, Arze del Granado, Martinez-Vazquez, and Simatupang (2008) find evidence of the existence of yardstick competition (spatial interaction on the quality of services). This is of particular significance because accountability

mechanisms in decentralized developing countries may be reinforced through the presence of interjurisdictional competition in terms of local government performance.

The constraints on the expenditures of subnational governments are now weakening as the amount of intergovernmental transfers from the central government is increasing in what has been referred to as Indonesia's second "big bang" (World Bank 2007). Hence greater autonomy on the expenditure side may be generating stronger intergovernmental competition across districts, but this will only be shown when new budgetary data become available in the coming years.

Conclusions

This chapter suggests that gravity forces from districts in higher tiers of the urban hierarchy pull population from nearby districts in lower ranks of the hierarchy. This pattern reverses for districts at the highest levels of urbanization, which repel population toward their fringe areas due to the costs of congestion. Higher urbanization rates do not imply greater urban concentration. The level of urban concentration in existing urban areas does not increase as a result of the reclassification of regions from rural to urban, as this is a lateral extension of the urban boundaries. On the contrary, rural-to-urban household migration does lead to higher urban concentration. An examination of rural-to-urban migration patterns in relation to urbanization reveals that a district's own level of urbanization and level of public expenditures on social services and infrastructure determine its migration gravity. The higher these levels, the lower the outflow of population toward larger districts. If a district's own migration gravity is sufficiently weak, residents are pushed outward toward districts with better services or employment opportunities. Fiscal decentralization could serve to curtail rural-to-urban migration, whether this is desired or not, to the extent that decentralization increases per capita spending in sectors such as infrastructure and health services. Moreover, anecdotal evidence on the Transmigrasi program suggests that explicit policy interventions that resettle population can cause several secondary problems.

In relation to the effects of government intervention on industrial concentration, the results of an empirical model on the determinants of industrial concentration do not support the existence of a significant relation between industrial concentration and public spending on infrastructure or on "business development." This result is in line with studies finding that, while natural advantages and production externalities affect the location decisions of firms, the effects of government intervention on location patterns, through investments on infrastructure in lagging regions, are not effective (Deichman and others 2005). Wells and Allen (2001) find that special tax incentives and tax holidays aimed at developing local industry are not likely to develop sustainable growth, as these incentives attract mostly footloose industries that leave soon after the policy is over.

Whether further concentration in Indonesia is desirable or not is a topic that requires further debate. The benefits of deconcentration in reducing congestion costs and regional disparities should be weighed against the potential losses it could generate from agglomeration economies. Results from the examination of employment growth across two-digit sectors reveal that higher concentration of overall economic activity—as measured by employment density—does not generate productive externalities in most sectors, including manufacturing (encompassing all industries as a whole) and, in fact, is correlated with lower rates of growth in total employment.[27] On the contrary, these results suggest that economic growth is positively associated with sectoral diversity (urbanization) and negatively associated with sectoral concentration (localization) at the two-digit level of aggregation. These results do not pertain to the dynamics of growth in industries within the manufacturing sector, which could be benefiting from economies of localization or urbanization. Likewise, these results should not be interpreted as suggesting that Indonesia has reached an intrinsic stage of excessive concentration leading to congestion costs. On the contrary, it is more likely that Indonesia has not yet received the benefits that other more developed

countries have accrued from agglomeration economies and that further efforts should be directed to improving the productive environment in ways conducive to achieving these benefits. Deconcentrating policies such as fiscal decentralization, discussed in relation to agglomeration economies, are likely to enhance growth in nonmanufacturing sectors, to strengthen industries that have settled in leading regions outside Java, and to further develop some industries across the country that do not exhibit strong gains from agglomeration (see Deichman and others 2005; Kuncoro in chapter 10 of this volume; Kuncoro and Dowling 2007 for a review of agglomeration economies by industry in Indonesia). The potential gains from developing nonmanufacturing sectors should not be taken lightly, particularly considering that nonmanufacturing sectors account for 75 percent of Indonesian GDP.

Distance matters, and so does the homogeneous distribution of economic activity. This chapter finds that employment growth is inversely related to the distance between a district and its nearest higher-order urban center. The more disperse leading regions (districts of higher urban hierarchies), the lower the average distance from lower- to higher-ranked districts and, in turn, the higher the expected level of overall employment growth. This suggests that fiscal decentralization, as far as it relates to the spatial distribution of growth and growth spillovers, could generate more homogeneous levels of growth across the country. However, these results do not lead to conclusions on whether more homogeneous levels of growth at the subnational level translate into higher levels of national economic growth, which is a topic worthy of further research.

Notes

Francisco Javier Arze del Granado is technical assistance advisor with the International Monetary Fund. This study was conducted within the Poverty Reduction and Economic Management Unit of the World Bank, Jakarta. The author would like to thank Yudha Permana for his remarkable research assistance; Sukmawah Yuningsih and Fitria Fitrani for their inputs and data; Albert J. Sumell, Yukon Huang, and Alessandro Magnoli Bocchi for their inputs; and Wolfgang Fengler, task team leader, for his inputs and guidance. Also beneficial were discussions with Jorge Martinez-Vazquez, Renata Simatupang, Sebastian Eckardt, Ignacio Navarro, Bambang Suharnoko, Neil McCulloch, Elif Yavuz, and Timothy John Bulman.

1. Most studies in the literature focus on the dynamics of sectors within the manufacturing sector, whereas this study explores the intersectoral dynamics between two-digit sectors, including agriculture, services, and manufacturing.

2. The Indonesian Bureau of Statistics (BPS) defines a locality as "urban" if it satisfies three conditions: (a) a population density of 5,000 people or more per square kilometer, (b) 25 percent or less of the households working in the agricultural sector, and (c) eight or more types of urban infrastructure and facilities. These facilities include a primary school or equivalent, a cinema, a hospital, a maternity hospital or mother-child hospital, a primary health care center or clinic, a road that can be used by three- or four-wheel motorized vehicles, a telephone or post office agency, a market with buildings or a shopping center, a bank, a factory, a restaurant, public electricity, and a party-equipment rental service (Firman 1997).

3. Data from *Supas* 2005 were complemented with data from the Aceh Census post-tsunami (BPS 2005a, 2005b).

4. Figures for net migration (in-migration minus out-migration) and urbanization are drawn from the Intercensal Population Survey (*Supas*) for 2005, which allows the identification of important patterns of interdistrict rural-urban migration, yet does not allow the study of intradistrict migration from rural to urban areas (BPS 2005b). Migration patterns are examined in the economics literature by "gravity models" that consider the characteristics of origin and destination districts as well the distance ("friction") between them (Sen and Smith 1995).

5. After a pronounced increase from 100,000 in 1900 to approximately 9.1 million in 1995 (Han and Basuki 2001), Jakarta's population decreased to 8.4 million in 2000, as recorded by the census, but increased again to 8.82 in 2005 (BPS 2005b).

6. According to the *Supas*, in 2005 only 68 percent of the city's population was born in the city (BPS 2005b).

7. These districts are Cianjur, Cirebon, Garut, Jember, Malang, Medan, Sukabumi, and Tasikmalaya, with the district of Tangerang and city of Surabaya being the exceptions.

8. Expenditures on services such as education and health, police, and parks and recreation

tend to improve the welfare of most individuals, and so they can be expected to increase the likelihood of a district being chosen as a migrant's destination. Infrastructure expenditures can be expected to be positively correlated with net migration as the development of infrastructure enhances the productivity of existing firms in several ways (for one, by decreasing transportation costs) and attracts additional firms to the region, which in turn increases employment opportunities and wages.

9. This is because net migration is clearly correlated with total population in a district, and so any "per capita" measure would be endogenous to the model.

10. The 2005 *Supas* provides data on lifetime migration, which are used here to construct the dependent variable. Lifetime migration is defined by where individuals were born and where they currently live. This is suboptimal, as migration that occurred before the fiscal period being observed may distort the results. Yet data on 5-year migration are only available every 10 years, the next one being in 2010, and fiscal data at the subnational levels are available only since 2001.

11. This is important given that the units of observation are likely subject to spatial correlation, as migration is without doubt defined by geographic proximity.

12. This is inconsistent with other studies, which have found that in-migration is positively associated with education expenditures, but not with health expenditures (Clark and Hunter 1998; Conway and Houtenville 1998). The common argument suggests that some segments of the population, such as the elderly, do not benefit directly from education and that higher expenditures on education may be associated purely with higher local taxes. Yet the association between taxes and expenditures is weak in Indonesia, which raises a question regarding the true reason for this relation.

13. This is revealed by a negative correlation between initial population and population growth (or population convergence).

14. All cities (regardless of their population) account for 43 percent of GDP.

15. This index varies between 0 and 1 and measures, for each sector, the aggregate difference between a district's share of total employment in that specific industry and the district's share of employment in total national employment. A value of 0 denotes the absence of regional concentration (for example, the share of a district's employment in a specific industry is the same as its share of employment in total national employment).

16. Congestion costs in the form of higher wages and land prices tend to disperse manufacturing activities to less-congested regions.

17. Districts are categorized into one of five tiers based on their degree of urbanization. See the annex for details on the definition of the urban-tier categories and also of the control variables used in this study.

18. This refers to a negative-effect "penalty," as this is the sign found in their empirical analysis. A positive distance effect could be interpreted as a "distance benefit" for more regions distant to urban centers, as they benefit from lower competition with their larger neighbors (Partridge and others 2006).

19. The coefficient for distance against total employment as the dependent variable is negative and statistically significant, indicating that an additional kilometer of distance between a district and a higher-tier urban center decreases the district's employment growth by −0.002 percent.

20. None of the remaining sectors has a significant elasticity for initial levels of employment density, whereas all sectors experienced positive intersectoral effects from diversity (the coexistence of various sectors in a given locality benefiting from supply and demand linkages).

21. Infrastructure expenditures are defined as regional development, housing, and settlement sector; water resources, irrigation, and transportation sector; telecommunication subsector; energy subsector of mining and energy sector (World Bank 2007).

22. Reverse causality could lead to inconsistent estimates of the coefficients. Yet this estimation initially sought to find the mean of the dependent variable conditional on the potentially endogenous variable, abstracting from the sign of causality. The resulting coefficients of interest are not statistically significant, and thus no further estimations with instruments were deemed necessary.

23. Brueckner (2003) and Revelli (2006) distinguish among at least three types of government interaction: expenditure spillovers, tax competition, and yardstick competition.

24. To identify the presence of expenditure spillovers, it is necessary to assume that subnational governments have discretion regarding how to spend their resources. This assumption is not always met in developing decentralized countries. In the case of Indonesia, despite the devolution of public spending in 2001 a large portion of the General Allocation Fund (*Dana Alokasi Umum)* is used to cover the full amount

of the district's civil service wage bill, while the central government has retained the authority to manage the subnational civil service. In practice, district governments have circumvented this by hiring contractual employees to cover additional needs in different sectors. Unfortunately, the current budget classification does not allow the separation of those expenditures from civil servants salaries. To test the predictions of the expenditure spillover model, discretionary expenditures are separated from nondiscretionary expenditures at the subnational level. Nondiscretionary expenditures are defined as capital expenditures plus routine expenditures other than for personnel (goods and materials, operations and maintenance, other routine expenditures, and others).

25. In turn, taxes on hotels and restaurants account for 75 percent of own-source revenues.

26. The lack of statistical significance of the coefficients for the remaining sectors is not surprising, as many of the studies conducted in other countries have failed to find a spatial interdependence on expenditure estimations based on distance weight matrixes (Case, Rosen, and Hines 1993). These authors do not find evidence of the presence of tax competition.

27. The lack of evidence of production externalities in manufacturing suggests only that there is no evidence of production externalities at this level of aggregation. Studies of industries within the manufacturing sector find effects of agglomeration economies in determined industries (Deichman and others 2005; Kuncoro in chapter 10 of this volume).

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Annex *Definition of the variables and estimation results*

This annex provides details regarding the definition of variables and econometric model specifications. Further details and descriptive statistics are available from the author upon request.

Definition of the variables

Results reported here are drawn from a minimum least squares regression. The variables and their sources are defined as follows.

Net migration is the number (thousands) of lifetime in-migrants minus out-migrants from the Intercensal Population Survey (*Supas*) for 2005 (BPS 2005b). Net out-migration is used instead of an "allocation rate" (net migration as a percentage of the total number of out-migrants from the place of origin), as recent studies prove that using "allocation rates" as dependent variables is valid only with a very narrow interpretation when origin variables are included in the model (Cushing 1989).

Urbanization is the district's urban population as a percentage of total population from the *Supas* (BPS 2005b).

Incremental distances are computed following a methodology similar to the one used by Partridge and others (2006). The variable *minimum distance to urban center* is the distance from a district to a district at a higher tier of urbanization. The tiers are defined by quintiles relative to the percentage of urban population in the district. The location of districts is not necessarily sequential, so a district in the top quintile could be the closest district to one in the bottom quintile. In this case, all variables of incremental distance to levels three, four, and five would be 0. Yet if a district in the bottom quintile is closest to a district in the second quintile, the incremental distances three, four, and five would record the "additional" distance needed to reach a district at those levels. For example, if a district in category one is 50 kilometers from a category-two district and 110 kilometers from a category-three district, the incremental distance to category three would be 60 kilometers. Incremental distances are computed based on geographic coordinates exported from MapInfo. Incremental distance three was dropped because it did not have enough observations.[1]

1 million plus cities is a dummy variable with a value of 1 for districts with population greater than 1 million in 2005 and 0 otherwise, based on population data from the *Supas* 2005 (BPS 2005b).

Fringes areas is a dummy variable with a value of 1 for all districts adjacent to a "1 million plus" city and 0 otherwise.

Estimation results

Specialization or localization is defined as $S=emp_{s,d}/emp_s$, where $emp_{s,d}$ is employment in sector s in districts d, and emp_s is total national employment in sector s. *Employment density is* $E = emp_{d,t_0}/a$, where employment in district d in time t_0 = 1994, and a is district d's area. This variable is a proxy for the size of local markets, which are quasi-proportional to the size of the local economy. *Diversity,* defined as $div_{s,d} = 1/\sum_{\substack{s'=1 \\ s'\neq s}}^{S} [emp_{d,s'}/(emp_{d-}emp_{d,s})]^2$ is the inverse of a Herfindahl index. This variable reaches a maximum when all sectors except the sector being studied have the same size in district d (see Combes 2000; Henderson, Kuncoro, and Turner 1995). *Nearest urban* (distma) *and incremental distances* (inchigherma) are in line with the incremental distances described earlier, but the definitions are slightly different. Each district is categorized either as "mainly" urban or as rural, based on both the total population and the population density of the district. Urban districts are then categorized into tiers according to total population. That is, districts can be categorized as either rural or as one of three categories of urban (with category three being the largest). Specifically, a district is classified as urban if it has a population greater than 100,000 and a population density greater than 100. The reason for using both population and population density in categorizing districts is that several geographically large districts have a substantial, but sparse, total population without a significant urban center. If the population is above 100,000 but below 400,000 with a population density above 100 or if the population is above 400,000 with a density below 100, it is a category-one urban district; if the population is between 400,000 and 700,000 with a density above 100, it is a category-two district; and if the population is above 700,000, it is a category-three district. The categories are based on 1994 population figures. All districts with a population above 500,000 have a population density above 100. Of the 286 districts included in the analysis, 133 qualify as urban: 18 in category three, 4 in category two, and 74 in category one.

For rural districts, estimations include the distance to the center of the nearest urban district regardless of category and incremental distance to the center of the nearest higher-category district. For urban districts, the distance to the nearest urban district equals 0, but other values are assigned to incremental distances of the nearest higher-category district. All category-three urban districts have a value of 0 for both nearest urban district and incremental distances. However, a category-one urban district that is 20 kilometers away from the nearest category-two district and 50 kilometers away from the nearest category-three district will have a value of 0 to the nearest urban district, an incremental value of 20 to the nearest category-two district, and an incremental value of 30 to the nearest category-three district. As a final example, assume that a rural district is 40 kilometers from the nearest category-one district, 80 kilometers from the nearest category-two district, and 60 kilometers from the nearest category-three district. If the distance to the nearest urban area equals 40, then the incremental values to the nearest category-two and category-three districts would equal 0 and 20, respectively.

The specification is estimated as follows:

$$y_{s,d} = \alpha + \beta_1 D + \beta_2 L + \beta_3 E + \phi_1 Dist + \phi_2 IncPop + \phi_3 G + \phi_4 PopCat + u_{s,d}, \quad (A.1)$$

where $y_{s,d}$ is employment growth in district d and sector s, D is diversity, L is specialization or localization, E is employment density, *Dist* is distance to nearest urban center, and *IncPop* is incremental population to category-four and category-five districts, G is a matrix of geographic and ethnolinguistic variables (including landlocked, island district, remote district, ethnolinguistic fractionalization, longitude, latitude, and regional dummies for Sumatra, Kalimantan, Sulawesi, Nusa Tenggara and Maluku, and Papua), *PopCat2–PopCat5* are dummies for population categories, and u is the error term. ρ is an autoregressive parameter, which takes the form of a mixed regressive spatial autoregressive process

corresponding to the following spatial regression model: $Y = \rho WY + X\beta + \mu$. See Arze del Granado and Sumell (2008) for further details and a complete set of results.

The specification is estimated as follows:

$$Y_i = \rho \sum_{j \neq i} w_{i,j} y_j + \beta_1 E + \beta_2 I + \beta_3 S + \beta_4 Geog + u_{i,t}, \quad \text{(A.2)}$$

where Y_i is district's i share of manufacturing in total regional GDP (as a proxy for regional industrial concentration), ρ and $\beta_1 - \beta_5$ are parameters to be estimated, $w_{i,j}$ are weights defined according to a predefined criteria of neighborliness (district with a centroid within a band of five digitizing units, using spawmat in Stata software), y_j are expenditures of district i's neighboring districts, and *E, I, S,* and *Geog* are explanatory variables corresponding, respectively, to public expenditures (infrastructure and expenditures in industry and business development sectors), relative income per capita, average years of schooling, and a set of district i's geographic characteristics, including the inverse distance to the closest port, landlocked, isolated island, and main island dummies.

Two more specifications (which include a spatial lag of the dependent variable) are computed by maximum likelihood using STATA ml routine modules developed by M. Pisati (see Pisati 2001). The full set of results is available upon request.

Note

1. By definition, the incremental distance to the third quintile (incremental distance three) is 0 for all districts in quintiles four and five. In addition, for districts in the second quintile, the *minimum distance to larger urban center* variable is actually the distance to the nearest third quintile, and so values for the incremental distance to the third quintile are also 0.