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An Inquiry into Cities and Their Role in Subnational Economic Growth in South Africa

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Abstract

South Africa is characterized by significant inequality in spatial economic activity. Whether future growth and development on a subnational level in South Africa will be such as to reduce this inequality may depend on the economic growth and development of South Africa's largest cities. Our local economic growth empirics show some indications of conditional convergence in output between poorer towns as well as overall between all cities and towns. Between 1990 and 2000 some limited sigma convergence was found but this was driven by declines in the standard deviation of per capita income amongst the poorest quintile of towns. An estimate of conditional beta convergence of 1.2 percent over the period 1990-2000 confirms that overall.../…

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convergence has been taking place. From an estimation of the determinants of economic growth on a local level, using a dataset on 353 local areas in South Africa between 1990-2000 we found the most significant determinants to be stocks of human capital and distance from harbours and markets. The effect of human capital on economic growth was strongly associated with the presence of large cities, as one would predict from endogenous growth theory.

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1 Introduction

The location of production in space is a central part of the process by which economic prosperity and trade is created (Krugman 1991; Martin and Sunley 1996). It is a particularly noticeable feature of economic growth that the location of production in space tends towards agglomeration in a few places. The resulting prominence of cities and towns as a feature of the economic landscape has caused Hanson (1998:1) to remark that 'most of the United States produces very little'. The development of cities and towns and their subsequent fate is therefore important for economic growth and development. Puga and Venables (1999:292) recognise that 'economic underdevelopment is a manifestation of the spatial pattern of agglomeration'.

During the past five years there has been a significant increase in concerns about spatial economic development in South Africa (Bloch 1999:1). This has largely been motivated by the fact that past social and political policies had worsened spatial inequalities in South Africa. Through the notorious homeland policy of 'grand' apartheid, and the 'Group Areas Act', the natural growth and development of South Africa's cities and towns was artificially, and at great economic costs, curtailed. Reducing spatial inequality in an economy that has embraced globalization[1] will not be easy, especially since 'South Africa has no navigable rivers, there are long distances inland between raw material sources, manufacturing facilities, and harbours, and there are long distances between the harbours and airports and the places of consumption overseas' (Dehlen 1993:x).

As in the US, most of South Africa's cities and towns produce very little. This is most apparent in the rural-urban divide and the concentration of more than 80 percent of the economy's manufacturing in six urban metropolitan regions (Naudé et al. 2002a:407-30). Overall, only 20 percent of places (towns and cities) produce 82 percent of South Africa's GDP. The richest 20 percent of places had an average per capita income in 2000 of R25,277 compared to an average per capita income of R5,452 of the poorest 20 percent of places.[2] Whilst most places in South Africa produce very little, the transformation of South Africa's system of local government (see Naudé 2001; and Naudé et al. 2002b) has resulted in local authorities which are constitutionally responsible for local economic development of their areas. Will these local authorities, newly elected in December 2000, be able to generate local economic growth and development that will lead to a reduction in the inequality currently characterizing South Africa's spatial economy?

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[1] The South African government's 'GEAR' macroeconomic strategy adopted in 1996 is characterized by outward-oriented trade policy and an apparent abandonment of industrial policy (which was in the past synonymous with the regional policy of apartheid that largely failed). It is argued by Naudé et al. (2002) that this has particular implications for spatial development in South Africa; moreover, it may re-enforce the current patterns of agglomeration.

[2] Authors' own calculations based on the PIMSS database.

In this paper it is argued that the answer to this question depends on the future economic growth and development of South Africa's largest cities and the manner in which their further agglomeration and interaction with smaller cities and towns will unfold. Using a new dataset known as PIMSS (Planning and Implementation Management Support System) compiled for the South African national Department of Provincial and Local Government (DPLG) by the CSIR[3] we investigate the extent of convergence (or divergence) between cities and towns across South Africa and estimate the determinants of economic growth on a local level in South Africa using data on 353 magisterial districts[4] over the period 1990-2000. In this analysis we ask what the relationship between larger (huge urban agglomerations) and smaller cities and towns are in the factors determining local growth rates, and we derive the possible policy implications that could contribute towards the most efficient spatial distribution of economic activity in South Africa.

The paper is structured as follows: Section 2 provides the theoretical points of departure by highlighting the economic understanding of the role of cities. Section 3 presents a profile of South Africa's cities and towns focusing on their size and distribution as well as subnational growth patterns. In Section 4 local economic growth empirics are explored, looking at the determinants of local economic growth and convergence. Section 5 provides a number of conclusions.

2 The economic importance of cities

One of the salient facts of international economic development has been of a spatial nature, namely the persistent urbanization across countries over the last 200 years (Zhang 2002:91). In most cases urbanization has been accompanied by sharp declines in fertility and unprecedented increases in the growth of per capita output (see e.g., Chenery and Syrquin 1975). Henderson (2000:1) reports that the simple correlation coefficient across countries between the level of urbanization and GDP per capita is about 0.85. Persistent urbanization has led to the formation of huge concentrations of people and economic activity in cities and towns. This high density of people and firms can promote economic efficiency through information spillovers amongst producers, more efficiently functioning labour markets and savings in the transport costs of inputs and final products (Henderson 2000:1).

A noticeable feature of urbanization is that urban agglomeration seems to be a prerequisite for industrialization.[5] Murphy et al. (1989) explain the process of industrialization in a

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[3] See www.pimss.net.

[4] Before 5 December 2000 local government in South Africa consisted of 353 magisterial districts. Following a new process of demarcation they were replaced by 284 municipalities after 5 December. Throughout the paper the term 'local authorities' is used to refer to the magisterial districts in the PIMSS database.

[5] The importance of cities in economic growth has recently lead some authors to remark that economic growth may not be primarily national in character with the growth of certain cities as a mere derivative.

manner that is consistent with the contributions from Marshall and the new economic geography on the determinants of firm location. The explanations emphasize market size, spillovers, and imperfect competition. Henderson (2000:2) points out that a high degree of urban concentration is essential for a country to kick-start industrial development.[6] He states (p.2) that 'By spatially concentrating industrialization, often in coastal cities, the economy conserves on economic infrastructure–physical infrastructure capital (transport and telecommunications) and managerial resources'.

In the literature, a great deal of effort has gone into explaining and understanding the determinants and consequences of urbanization. This provides many insights into the determinants of local economic growth. Key contributions are the Harris and Todaro (1970) rural-urban migration model that predicts equilibrium in rural and urban (un)employment rates and the Bencivenga and Smith (1997) model where rural-urban migration can be in equilibrium despite higher urban wages. Eaton and Eckstein (1994) develop a model of the growth of cities that predicts that cities will have higher levels of human capital, higher rents, and higher wages per worker, even though urban and non-urban workers are homogenous and free to migrate. The benefits of being located in a city are due to localization economies and urbanization economies. Localization economies refer to the benefits a firm receives from being with other firms in the same industry and is said to give rise to internal economies of scale. Urbanization economies refer to the benefits of overall scale and diversity and is said to give rise to external economies of scale (Henderson et al. 1995:1068). Apart from these static externalities there are also two types of dynamic externalities, namely Jacobs externalities and so-called Marshall-Arrow-Romer externalities, the latter due to knowledge sharing, learning and imitation in a particular area (Glaeser et al. 1992). In the endogenous growth literature, cities are important for economic growth precisely because they provide these dynamic information externalities that are important for innovation (as per Romer 1986; and Lucas 1988).

Economists were early to point out that once a city had become established through the process of urbanization, it would tend to become a self-reinforcing growth centre through a process called cumulative causation (see Myrdal 1957). The new economic geography emphasises the role of agglomeration and cumulative causation. In the words of Krugman (1995), 'activities tend to cluster where markets are large and markets become larger there where activities cluster'. The following section presents a profile of South Africa's cities, detailing the size and distribution of the cities as well as subnational economic growth patterns.

Instead, the process of economic growth may be better understood by focusing on the city (Eaton and Eckstein 1994:3). The latter will be the case if cities are largely self-reliant in terms of their growth—i.e. different cities in a country are not highly interconnected.

[6] These requirements are often frustrating attempts by smaller towns or localities to generate local economic growth through growth of higher value-adding industries. Indeed many localities are 'seeking to sell themselves as suitable locations for industries' (Neil and Tykkyläinen 1998:15).

3 South Africa's cities and towns and subnational growth patterns

According to the UN, the rate of urbanization in South Africa is currently around 57 percent. Moreover, the rate of urbanization in South Africa is high, and urban growth has been predicted to be around 2.09 percent per annum over the period 2000-05. Indeed Southern Africa has one of the world's highest rates of urbanization (United Nations 2001). As was indicated in the previous section, cities and towns can play an important role in economic growth by providing economies of scale through the advantages of agglomeration. Given the huge backlogs in basic service provision in South Africa, agglomeration and its resulting higher population density, might also provide economies of scale in the provision of basic goods and public goods. However, in light of the possibility of diseconomies of scale as a result of congestion, the extent to which further agglomeration will be good for economic growth may depend on the current levels of agglomeration in South Africa. This section presents a profile of South Africa's cities, examining the size and distribution of the cities as well as subnational economic growth patterns.

3.1 The size of South Africa's cities

South Africa has six 'large'[7] cities namely Johannesburg, the East Rand Metropole, Durban, Cape Town, Pretoria (Tshwane metropole) and Port Elizabeth (Nelson Mandela metropole). Three of these cities—Durban, Cape Town and Port Elizabeth—are seaports through which much of South Africa's international trade moves. Durban is also close to the port of Richardsbay, and Cape Town close to the port of Saldanha. These two ports are important for South Africa's exports of coal and steel, respectively. The importance of three port cities amongst South Africa's largest cities is due to the importance of sea transport for South Africa's international trade. Approximately 98 percent of South Africa's exports are conveyed by sea.[8] Johannesburg and the East Rand Metropole, although for administrative (legal) purposes two entities, form one large urban agglomeration. The 40 largest cities in South Africa all have populations of 250,000 or more, but apart from Greater Johannesburg (including the 'East Rand area'), less than 5 million. Thus, South Africa is a country with a peculiar spatial distribution of economic activity and population: the cities tend overall to be 'small', with six 'large' cities and no 'mega' city. The cities and their populations in 2001 are depicted in Table 1.

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7 The World Bank (2000:128) distinguishes between small cities (less than 0.5 million people), large cities (between 1 million and 5 million people) and mega-cities (over 5 million people).

8 In this, South Africa is very similar to most developing countries. Sachs and Warner (1997:339) note that '… only certain goods can be economically shipped by air, and most countries still import and export the majority of goods by sea'.

Table 1: Contribution of South Africa's six metropolitan areas to total GDP, 2000, 1996 and 1990

City	Population 2001	2000 (%)	1996 (%)	1990 (%)	Coastal city with port	Average annual population growth rate, 1996-2001 (%)
Johannesburg	2,962,759	14.98	14.16	14.22	no	1.02
Cape Town	2,858,743	14.01	12.82	11.90	yes	1.01
Durban	2,981,237	7.77	8.06	8.18	yes	0.96
Pretoria	1,454,290	8.55	7.88	9.06	no	1.03
East Rand	2,054,133	7.78	8.00	8.67	no	1.01
Port Elizabeth	1,015,334	2.46	2.31	2.58	yes	1.02
TOTAL	13,326,496	55.6	53.2	54.5		1.5

Source: PIMSS (2001).

Table 1 above shows that South Africa's six major cities with 31 percent of South Africa's total population, contribute, in total, 55 percent of South Africa's GDP. Since 1990 the share has increased slightly from 54 percent to 55 percent. The ranking of Johannesburg and Cape Town as the two largest cities in economic terms, has remained unchanged since 1990. Indeed, both these cities have enlarged their share of total GDP, in particular Cape Town. In contrast, the share of all other cities declined since 1990, most notably that of Durban (the largest single city) and the East Rand.

The primacy ratio

The table above shows that in 2000, the city with the largest single contribution to South Africa's GDP was Johannesburg, with 14.98 percent (although in terms of population Johannesburg has been overtaken by Durban). If one includes East Rand as part of the City of Johannesburg, then the dominance of Johannesburg as a 'primate' city in South Africa becomes clear—it then produces 22.8 percent of South Africa's GDP. In this respect then, South Africa does have a primate city, unlike other former British colonies such as Australia and Canada.

The primacy ratio gives an indication of the dominance of the primate city (the city ranked number 1 in terms of population) in the urban system of a country (see Rosen and Resnick 1980). The so-called primacy ratio[9] for South Africa, calculated on the basis of the data in Table 1 above, is 24 percent if Johannesburg and the East Rand are treated as two separate urban agglomerations. However, with Johannesburg and East Rand as one urban agglomeration, the primacy ratio increases to 38 percent. According to Henderson, Shalizi and Venables (2000) (cited in Brakman et al. 2001) the 'optimal' degree of primacy that maximizes economic growth for middle-income countries such as South Africa, is 25

[9] Following Rosen and Resnick (1980) we calculate the primacy ratio as the size of the largest city as a percentage of the sum of the sizes of the five largest cities.

percent. This could suggest that South Africa's primate city (Johannesburg-East Rand combined) is larger than what is optimal.

The rank-size distribution of South African cities[10]

The rank-size distribution of cities throughout the world follows a law that states that the number of cities with a population larger than S is approximately proportional to S^{-q} (Gabaix 1999). In other words, rank times population size is approximately the same constant for all cities. If q is equal to or close to 1 it is also known as 'Zipf's Law'. A log-linear regression of the 123 largest cities and towns in South Africa (we took a population of 100 000 as cut-off) (S) and its rank (N) based on the population in 2001 finds that

$$\underset{\text{(s.e. = 0.009)}}{\text{Ln(S)} = 6.6 - 0.75\text{Ln(N)}} \qquad (1)$$

with $R^2 = 0.98$.

Thus, in the South African case the coefficient q=0.75. Fujita et al. (1999:216) report a coefficient of 1.004 for 130 large USA cities. Thus, whilst the rank-size rule applies to South Africa (its explains 98 percent of the variance in city sizes) Zipf's Law does not hold for South Africa. What are the implications of q=0.75 for evaluating the sizes of South Africa's cities?

According to Brakman et al. (2001) if q<1 then a more even distribution of city sizes results than if Zipf's Law holds, and in the limiting case where q=0 all cities would be of the same size. Therefore we may conclude that South Africa's cities tend to be more evenly spread. Gabaix (1999) shows that Zipf's Law would hold if cities were characterized by either constant returns to scale or by external economies of scale where positive and negative externalities cancel out. In light of the discussion in section 2 this could be interpreted where the agglomeration forces and congestion (dispersion) forces cancel out (see also Brakman et al. 2001). Brakman et al., Garretsen, van Marrewijk and van den Berg (1999) support this notion and calculate q for the Netherlands for the periods 1600, 1900 and 1990, and note that 'industrialization lead to an increase in q'. By 1600 the value for q was much lower than 1 (0.55) and it subsequently rose as city sizes increased.

Bearing in mind the challenge that 'nobody has come up with a plausible story about the process that generates the rank-size rule' (Fujita et al. 1999:225), the implications from the Gabaix (1999) and Brakman et al. (1999) explanations would suggest that South Africa's cities (urban agglomerations) are too small and that these cities are still predominantly offering urbanization economies rather than localization economies (see Henderson et al. 1995).

[10] This section draws on Naudé and Krugell (2003).

Subnational growth patterns

Between 1990 and 2000 the South African economy, in aggregate, grew, on average by 1.9 percent per annum. Given that there were 353 magisterial districts in South Africa during the period, it is clear that the 1.9 percent growth rate obscures potentially interesting subnational patterns in economic growth. When considering the role cities and towns play in economic growth, the PIMSS data shows that subnational growth rates (unweighted) in South Africa averaged at around 3.8 percent per annum over the period 1990-2000. As is shown below, the smaller, poorer localities grew substantially faster than the larger localities. In fact the dispersion of subnational growth rates is large. The slowest growth (shrinkage) was -4.2 percent and the largest 27 percent on average per annum (a small village in the Eastern Cape).

Table 2: Fastest growing cities and towns in South Africa, 1990-2000

Place	Average annual growth	Economically active population in 1990	Share in SA GDP, 1990 (%)	Households in poverty, 1996 (%)	Share of primary production in GGP, 1990 (%)
Moutse	27.12605	19547	0.0001276	78.1	17.9
Ubombo	20.21462	16532	0.0002419	90.3	11.02
Theunissen	20.07156	22065	0.0005561	76.6	66.8
Soshanguve	17.14193	54059	0.0008037	48.8	0.01
Willowvale	14.91464	11123	0.0003123	88.6	14.6
Pearston	14.8979	1551	0.0000552	86.4	55.2
Kentani	14.50441	8247	0.0001562	90.8	1.2
Tsomo	14.26707	7123	0.0001505	92.3	10.1
Kudumane	13.49104	31889	0.0004933	80.1	27.4
Qumbu	13.39218	13781	0.0002533	86.2	6.8
Ngqueleni	13.31916	17926	0.0002457	89	3.9
Cala	12.98029	7232	0.0001847	88.9	2.1
Chatsworth	12.7115	71456	0.0012417	30.5	0.1
Aberdeen	12.00584	2767	0.0001486	75.7	55.1
Herbert	11.56726	9513	0.0003657	67.2	44.8
Botshabelo	11.24888	71019	0.0005466	76.8	4.5
Willowmore	11.04109	2894	0.0001524	76.6	50
Mossel Bay	10.8112	28241	0.0015503	43.3	5.5
Mt Frere	10.70119	17303	0.0003238	84.8	2.9
Mqanduli	10.5295	14620	0.0002171	92.3	13.2
AVERAGE	14.3	TOTAL 428888	0.008126	77.2	19.7

Source: PIMSS (2001).

The twenty fastest growing cities and towns in South Africa over the period 1990-2000 are summarized in Table 2. This table shows the average annual growth rate of real gross geographic product (GGP) as well as the size of the economically active population in

1990, the percentage share the locality contributed to South Africa's total GDP in 1990, the percentage of households that were living below the minimum living level (MLL) in 1996 and the percentage share of primary production in the locality's GGP in 1990. Table 2 shows that the smaller rural towns in South Africa grew rapidly between 1990 and 2000.

Table 3: Slowest growing cities and towns in South Africa, 1990-2000

Place	Average annual GGP growth	Economically active population in 2001	Share in SA GDP, 1990 (%)	Households in poverty, 1996 (%)	Share of primary production in GGP, 1990 (%)
Mbibana	-4.24872	14057	0.04057	53	2.8169
Mthonjaneni	-4.00436	23427	0.02609	72.9	23.35766
Ndwendwe	-3.32551	105270	0.05523	87.4	11.03448
Paulpietersburg	-3.04866	14720	0.02781	83.6	19.17808
Hoëveldrif	-3.04145	80599	1.38306	43.2	51.68375
Virginia	-2.81595	52996	0.379	62.3	75.8794
Weenen	-2.76697	6318	0.00609	83.1	37.5
Dannhauser	-2.75377	22370	0.04438	85	44.20601
Kriel	-2.69355	10185	0.3929	31.2	25.98158
Vryheid	-2.55508	35010	0.13446	69.1	20.11331
Madikwe	-2.53912	34507	0.23064	76.4	12.79934
Mpofu	-2.27829	2954	0.00838	80.7	50
Zwelitsha	-2.15608	69267	0.35576	76.3	2.30193
New Hanover	-1.93298	96463	0.0897	69.6	33.54565
Estcourt	-1.87772	39510	0.15484	63.5	8.61009
Babanango	-1.7693600	5940	0.00552	92.4	13.7931
Oberholzer	-1.46937	121986	1.53276	52.8	87.18936
Stutterheim	-1.35941	14530	0.032	81.6	16.66667
Pietermaritzburg	-1.34547	172636	1.40973	51	2.33721
Moretele	-1.321	13343	0.06037	69.6	4.10095
AVERAGE	-2.46	TOTAL 936088	6.36929	69.2	27.2

Source: PIMSS (2001).

Table 2 shows that amongst the top 20 fastest growing cities and towns in South Africa between 1990 and 2000, with growth rates higher than 10 per cent, the average annual growth rate was 14.3 percent. However, in all cases this was from a very low base of GGP. Column 4 suggests that these cities and towns do not even contribute in total 0.1 per cent of South Africa's total GDP. Also, these places are small in terms of population, with a total population of 428,888 people residing in these places. Moreover, in 1996 (mid period) about 77 per cent of households on average lived in poverty. The share of primary production in the overall production structure of these places ranged from 1.2 per cent to 55.2 per cent, with an average of about 20 per cent (significantly higher than the South African average of 6 per cent). In contrast with the fastest growing places in South Africa,

Table 3 summarizes the slowest growing places between 1990-2000. Apart from the 20 slowest growing places shown in Table 2, 45 places in South Africa registered negative annual growth rates on average between 1990 and 2000. These 45 places contributed 20.5 per cent to South Africa's total GDP in 1990 and had almost 3 million inhabitants in 1990. Also, in contrast to the fast growing places, the percentage of households in poverty is lower, at 66 per cent. The primary sector contributed on average 24 per cent of the slow growing places' GGP (about 4 per cent higher than that of the fast growing places).

Taken together, Tables 2 and 3 may suggest that smaller and poorer places in South Africa achieved higher growth rates than larger and more well-off places. This observation is consistent with growth theory predictions of convergence between poorer and richer regions. The question that the next section will therefore ask is: are South African cities and towns converging, and if so, how fast?

4 Convergence amongst South African cities and towns

The literature on the convergence or divergence of per capita income levels between regions derives from the neo-classical growth model. This model predicts that poorer countries (or regions, cities) will grow faster than richer ones. There is a distinction between so-called beta-convergence and sigma-convergence.

The most common approach to studying the convergence hypothesis is the beta-convergence exercise. This amounts to verifying whether the neo-classical (standard Solow (1956) or augmented endogenous growth) model is a good description of a country's development experience. Beta-convergence occurs when poor countries/regions/ localities grow faster than rich countries/regions/localities (Rey and Montouri 1999). A further distinction between absolute and conditional beta-convergence is typically made. If economies vary in their savings rates and initial capital stock, then the neo-classical model predicts conditional convergence—per capita incomes converge conditional on each economy's steady state. Thus, among economies that are similar in preferences, technologies, savings rates and other structural characteriztics, the lower the initial levels of output per capita, the higher the growth rates (Aziz and Duenwald 2001). Beta-convergence has primarily been the focus of macroeconomists and is normally expected to eventually lead to sigma-convergence. Sigma-convergence has attracted attention in regional science and economic geography literature. It occurs within a group of countries/regions/localities when the variance of their per capita GDP levels tends to get smaller over time, thus the poor countries/regions/localities catch up to the rich countries/regions/localities in per capita terms (Rey and Montouri 1999).

Overviews of the convergence literature are found in Durlauf and Quah (1999) and Temple (1999). Barro (1991) and Barro and Sala-i-Martin (1992) are some of the first authors who report evidence of convergence across countries. However there are still noticeable differences in income levels and growth rates among regions, even within economically

integrated parts of the world, such as the European Union. According to a recent survey by De La Fuente (2000) convergence is by no means a foregone conclusion. As far as within-country studies are concerned, recent work by Ferreira (2000), Nagaraj et al. (2000), and Pekkala (2000) find evidence of regional (within country) convergence in Brazil, India and Finland, respectively.

4.1 Beta-convergence and determinants of subnational economic growth rates

The approach taken here is based on the standard empirical growth model (see e.g. Barro 1991; Glaeser et al. 1995). Thus, output in any particular town or city is produced according to an aggregate Cobb-Douglas production function of the form:

$$Y = K_t^{\alpha}(A_t N_t^{1-\alpha}) \qquad (2)$$

Where K_t = capital, N_t = labour, and A_t = the level of technology. Labour and technology grows at rates n and g, so that $\frac{dN}{N} = n, \frac{dA}{A} = g.$ Capital depreciates at rate δ and the fraction of production saved and invested is s. Following standard growth theory we denote output and capital per effective unit of labour as

$$\hat{y} = \frac{Y}{AN}$$

and

$$\hat{k} = \frac{K}{AN}$$

The steady-state value of $\hat{k}$ is: $\hat{k}^{*} = \frac{s}{(n+g+\delta)^{\frac{1}{(1-\alpha)}}}$

An estimating equation can be derived from a linear expansion in natural logs (ln) of the equation of motion about its steady state (see Henderson 2000:8). For the sake of brevity the resulting formulations for estimating the determinants of growth rates (y) reduces to the following:

$$\ln y_{i(t2)} - \ln y_{i(t1)} = -(1 - e^{-\beta\tau}) \ln y_{i(t1)} + \mathrm{X}_{i(t1)}\gamma + \varepsilon_i \qquad (3)$$

Where y = per capita income of a particular place; $X_{i(t1)}$ = a vector of determinants of local economic growth rates. These will include, following growth theory[11] a measure of human

[11] Modern research into the determinants of growth and convergence at a subnational level is largely based on Alfred Marshall's analysis of local external economies. In the Marshallian tradition, localized growth is driven by a thick labour market, a market large enough to support efficient-scale suppliers of intermediate goods and the information exchange that takes place when firms of the same industry cluster together. This influenced Hirschman's (1958) identification of the demand-pull effects of (unbalanced) backward linkages

capital, a measure of initial unemployment, a measure of market access and distance and indicators of investment.[12] In equation (3), initial per capita income enters on the right hand side. The parameter β can then be interpreted as the rate of convergence to the steady state, with $\tau = t_2 - t_1 > 0$. The initial share of manufacturing in output serves as a proximate measure of investment. Glaeser et al. (1995) argues that localities follow the fortunes of the industries that they were initially exposed to. This view is linked to a vintage capital model where areas that invest in older types of capital do not replace the capital as it becomes obsolete. This may be because (i) existing capital presents a sunk investment, and (ii) the pre-existing capital 'crowds out' newer capital (scarce resources such as land are used with the older capital). As the capital becomes more out of date, the marginal product of labour, wage rate and income fall. Thus, a negative coefficient is expected.

The share of the population with tertiary education in 2000 is used as a measure of human capital. The importance of human capital for growth builds on the spillover models in the spirit of Lucas (1988) and its significance has been shown by international and intranational studies. A positive coefficient is expected.[13] Population density and city status variables measure market access and are expected to be positively related to growth. This stems from the arguments for growth through agglomeration from Section 2. Distance from main markets and harbours is accounted for by a weighted measure of the distance of a particular locality from Johannesburg, Durban, Cape Town, Pretoria and Port Elizabeth. Greater distance from markets and harbours are considered to be detrimental to growth through agglomeration, as described in Section 2. A negative coefficient is expected. Finally, the initial unemployment rate is used to capture excess capacity. There are however two views to this. The first is that if convergence does take place, the poor localities with greater excess capacity, would grow faster. In this case a positive coefficient would be expected. The second view is that unemployment in South Africa is largely structural in nature and the long-time unskilled unemployed have become unemployable and, thus, unlikely to drive or benefit from growth during a period of integration into the world economy (Nattrass 2000). In this case a negative coefficient would be expected.

The error term (ε) will here include unmeasured attributes affecting local growth rates such as global shocks, climate, etc. The potential for spatial autocorrelation is possible, since the

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in industrial development, as well as the Linder (1961) model where tastes and demand patterns in the local market determines the composition and exports of local production.

[12] The 'new' or 'endogenous' growth theory emphasises the importance of economies of scale, agglomeration effects and knowledge spillovers as determinants of economic growth and convergence (Button 1998). It suggests that economic growth tends to be faster in countries (but also localities) that have a relatively large stock of capital, a highly educated population and an economic environment favourable to the accumulation of knowledge. The latter is especially relevant when production/activity is information-intensive, highly differentiated and dependent on reciprocal specialization.

[13] The inclusion of the share of the population with tertiary education in 2000 might cause problems of endogeneity. Unfortunately there is no other information on human capital available at magisterial district level and no useful and valid instruments present themselves in the PIMSS database. Block (2001:449) suggests that the prudent interpretation of non-IV growth regressions is that they reflect associations between dependent and independent variables, yet fall short of implying causation.

growth rate of any place might depend significantly on the growth rate of another. For instance, the dominance of the six large cities in South Africa was seen to be such (Section 3) that shocks suffered by these large economies might reverberate throughout the economies of many smaller cities and towns. For this reason equation (3) is also estimated with the output of the large six cities as exogenous.

The data used was obtained from the PIMSS. It contains cross-sectional data for local authorities on a number of variables for 2000, and on per capita incomes, GGP, sectoral shares of GGP and unemployment for 1990, 1996 and 2000. This allows estimation of a cross sectional regression equation using the difference between per capita incomes in 2000 and 1990 (in natural logs) as the economic growth rate to be explained by the variables described above.Where possible, the natural logs of variables were taken. Regressions were estimated using Stata 7.0.

Before setting out the regression results a caveat should be noted. The results are fragile for well known reasons. First, the theoretical framework is of the informal type that Temple (1999) calls 'Barro regressions': the growth model can be interpreted in terms of the Mankiw et al. (1992) framework, but the explanatory variables are included on an ad hoc basis, broadly drawing on economic theory and previous results from the literature. The potential problem is that the additional variables may be correlated with initial efficiency. Cross-section OLS regression analysis does not account for this. Initial efficiency is an omitted variable and the data is pooled without allowing for unobservable time- and locality-specific effects. A panel data framework would make it possible to control for this, but there are difficulties in this case. Simple fixed-effects and random-effects models would not be a solution. Fixed-effects models condition out the unobservable individual effects and leave unexplained exactly the long-run cross-locality growth variation that is of interest. Furthermore, the distance variable and market size variables, that are the focus of the growth-through-agglomeration arguments at *intra*national level, would be eliminated in a fixed effects specification. They are either time invarient, or fairly constant over time or affect growth only with a long lag and would fall away along with the initial values of the share of manufacturing in output and unemployment. On the other hand, the assumption of random-effects models, that the unobservable individual effects are uncorrelated with the right-hand side variables, is also not appropriate. The best would rather be a dynamic panel regression using a GMM estimator, as proposed by Bond et al. (2001). That would however require a longer time series.[14] The results of estimating equation (3) above are contained in Table 4.

[14] An econometric extension that is currently feasible would be to use the 'convergence clubs' framework that Rey and Montouri (1999) recommend to allow for spatial heterogeneity. This is left as a topic for future research.

Table 4: Regression results for determinants of GGP growth at local level in South Africa, 1990-2000

Income growth	Coefficient estimate (OLS)	Student's t-ratio
Initial income per capita in 1990	-1.206	-8.56*
Share (%) of manufacturing in 1990	-0.021	-0.36
Human capital as measured by the share of population with tertiary education in 2000	0.4	2.80*
Population density as measured by the population per km^2	-0.101	-1.77
Distance from main markets and harbors as measured by weighted distances from Johannesburg, Durban, Cape Town, Pretoria and Port Elizabeth[15]	-1.046	-3.92*
City status (more than 1 million inhabitants)	0.392	1.53
Initial unemployment rate (%) in 1990	-0.397	-3.70*
Constant	8.885	3.70
Summary statistics:		
Adjusted R^2 = 0.31		
F (7,272) = 17.42		

Source: Regression results, thus original findings reported.

In Table 4 all the coefficient estimates save initial unemployment are of the expected sign. The significant coefficients (at 5 percent level) are indicated with an asterisk. It is clear that initial income per capita, human capital and distance (market and transport effect) are the significant determinants of local economic growth across South African cities and towns between 1990 and 2000. The negative sign on the initial unemployment coefficient seems to confirm the structural unemployment arguments made above. Thus, cities and towns with low income per capita in 1990 grew, on average, faster. From the coefficient on initial per capita income the rate of conditional beta convergence implied over a ten-year period is 1.2 percent per year. This compares favourably with the 1.4 percent convergence rate that Henderson et al. (1995) report based on data from the Penn World Tables. Cities with higher levels of human capital (inhabitants with tertiary education) and closer access to the six large cities and harbours also grew faster than those without. Market access and transport therefore seems to be important.[16] When we split the distance variable into distance to Johannesburg (inland) and distance to Durban (harbour) and re-ran the regression, the coefficient on the latter was significant and much larger than that on

[15] The distance variable was calculated as a locality's weighted distance from the five large cities. The share of each large city in the total value of production of large cities was used as a weight. Distances were calculated using the *SA Explorer* Software from the South African Demarcation Board (see www.demarcation.org.za).

[16] This is consistent with Naudé et al. (2000) who find the regional (spatial) impact of international tourism to be fairly uneven in South Africa.

Johannesburg. This would suggest that transport costs and access to external (export) markets might outweigh the effect of internal market access.

Estimating equation (3), but without the large cities (Johannesburg-East Rand, Cape Town, Durban, Pretoria and Port Elizabeth) allows one to focus on their importance for economic growth. The regression results in the case without the six cities lead to two significant changes in the findings above. First, the coefficient on human capital becomes insignificant. This finding is consistent with explanations in the theoretical literature that emphasises the importance of human capital in the setting of large urban centers (see e.g., Lucas 1988). The regression results of the sample without the five cities also seem to re-enforce the significance of distance from the cities and harbours for growth, as the coefficient on distance increases from -1.046 to -1.235. When the largest cities are excluded from the sample, but their weighted income growth between 1990 and 2000 are added as explanatory variables, we find that the overall results change little, and that only the coefficient on changes in Durban's per capita income between 1990 and 2000 is significantly (and positively) associated with economic growth rates outside the large cities.

4.2 Sigma convergence

Tentative results on sigma convergence may be obtained from calculating the changes in the standard deviation of per capita income and population across cities and towns between 1990 and 2000. These results for the years 1990, 1996 and 2000, for which data on 353 magisterial districts in South Africa is available, are contained in Table 5.

Table 5: Sigma convergence amongst South African cities and towns, 1990–2000

Year	Standard deviation of log of real per capita income: all cities and towns	Standard deviation of log of real per capita income: richest 20% of cities and towns	Standard deviation of log of real per capita income: poorest 20% of cities and towns	Standard deviation of log of real GGP for all cities and towns
1990	0.6147	0.3229	0.2379	1.52
1996	0.5258	0.2944	0.1063	1.51
2000	0.5466	0.3153	0.1082	1.55

Source of data: PIMSS 2001.

From Table 5 it can be seen that there may be evidence of sigma convergence amongst South African cities and towns. The standard deviation of log of real per capita income for all cities and towns declined from 0.6147 in 1990 to 0.5258 in 1996, after which it increased again slightly to 0.5466 in 2000. This amounts to an almost 13 percent decline in the standard deviation over a 10-year period. The slight increases in divergence after 1996 coincide with the period of trade liberalization and the adoption of the Growth, Employment and Redistribution (GEAR) macroeconomic strategy. The results are consistent with the view that globalization would favour the larger urban areas where economies of scale and agglomeration advantages can be more readily obtained. The

Bartlett test shows these changes to be significant at the 5 percent level. The results in Table 5 also show that the convergence was much stronger amongst the 20 percent poorest towns between 1990 and 2000 (a 50 percent decrease in dispersion of per capita incomes) whilst there is not really strong evidence of sigma convergence amongst the richest 20 percent of cities and towns. This could suggest an overall reduction in the dispersion of per capita incomes.

5 Conclusions

Whilst most places in South Africa produce very little, the transformation of South Africa's system of local government has resulted in local authorities that are constitutionally responsible for local economic development of their areas. To say whether these local authorities will be able to generate local economic growth and development that will lead to a reduction in the inequality currently characterizing South Africa's spatial economy, should be an ongoing concern.

This paper has shown that some conditional convergence has already occurred. The major determinants of local economic growth rates over the period 1990-2000 were found to be initial income per capita, human capital, and distance (market and transport effect). Thus, cities and towns with low per capita income levels in 1990 grew, on average, faster. Cities with higher levels of human capital (inhabitants with tertiary education) also grew faster than those without. Human capital has also been found significant in other studies on local economic development. For instance Clarke (1993:87) finds that 'Most recent economic analyses indicate that local economic development policies may have some short term impacts on locational choices, but that long-term developmental patterns are shaped by human capital policy choices.' Moreover, this result was found to be strongly associated with the six large cities in South Africa and suggests, in line with the view from endogenous growth theory, that cities matter for growth through human capital as they allow the reaping of dynamic externalities associated with learning and information. Market access and transport was also established to be important for economic growth of localities. This suggests a self-re-enforcing effect of economic growth rates. Results were found to suggest that transport costs and access to external (export) markets might be outweighing the effect of internal market access (economies of scale imperatives). In particular, the harbour city of Durban's growth between 1990 and 2000 was most strongly and positively correlated with the growth of localities outside South Africa's big cities.

There is scope for further research. The analysis still lacks a measure of capital or infrastructure and one would like to see geography variables added. A better understanding of South Africa's spatial economy would eventually also require analysis beyond growth, looking at the spatial side of poverty and inequality.

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