Chapter 1
A growing but polarised city-region

This chapter provides a profile of the Gauteng city-region's leading economic and demographic trends and offers an analytical framework for policy recommendations. The chapter begins with a definition of the city-region and then offers a critical assessment of its economic performance, innovation potential and environmental constraints. Considerable achievements in public service delivery and education are highlighted. The chapter also explores the legacy of apartheid spatial patterns on mobility, local economic development and land use patterns. The question of adequate housing receives particular attention, given its potential as a catalyst of economic development and a primary vehicle for socio-economic integration. Trends in population growth, provincial R&D expenditure, employment, patenting levels, air quality, poverty, household income distribution and transport access are reviewed. For a comparative analysis sensitive to the global nature of the economy, key indicators are benchmarked with the 90 OECD metro-regions of more than 1.5 million inhabitants that are included in the OECD Metropolitan Database.

Introduction

South Africa's economy has undergone radical changes since the fall of apartheid and the first democratic elections in April 1994. Growth performance has improved thanks to a better macroeconomic policy framework. Prudent fiscal, trade and monetary policy stabilisation programmes have normalised the economic and investment environment. As a result, the national economy has fared relatively well, with a healthy national budget and relatively low inflation and interest rates since 2000. Flows of foreign direct investment (FDI) have been instrumental in building up capital, increasing by almost tenfold (from USD 9.2 billion in 1990 to USD 87.8 billion in 2006) (OECD, 2009a). Productivity gains also explain consistent growth in South Africa; growth rates in labour productivity in the manufacturing sector more than doubled, from less than 2% per year between 1976 and 1980 to around 4.5% since 1986 (Aghion et al., 2008). Thanks to this strong economic performance, remarkable progress has been made in alleviating poverty and increasing personal income levels.

While growth has increased steadily both in real and per capita terms, South Africa's economy has not, however, performed as well as initially expected. Real gross domestic product (GDP) grew by 3.8% per year from 1995 to 2007, while GDP per capita increased by 1.2% during the same period.[1] Growth in GDP has consistently outpaced population growth since 1994. Real GDP grew by 56.4% between 1995 and 2007, while the total population grew by 18.7%. This resulted in GDP per capita growth during the same period of 31.8%. However, growth performance was not sufficient either to offer enough employment opportunities to absorb the young and growing population or to close the aggregate income gap with OECD member countries. Job creation and productivity growth have remained too low to underpin sustained and rapid growth in GDP per capita. Extreme and persistent low employment is complicated by other economic and social problems, such as inadequate education and poor health, which especially affect Black African youth. Finally, economic growth has not been equitably distributed throughout the population, and the per capita figures do not accurately reflect the well-being of the poorest segments of the population. While there has been some improvement in measured poverty over the post-apartheid period, inequality has worsened. With a 2004 Gini coefficient of 0.70, South Africa's inequality is more than double that of the OECD average (0.31) and is higher than the most unequal country in the OECD, Mexico (0.47).[2]

South Africa experienced a sharp deceleration of growth during the global economic crisis. GDP was more than 5% in 2007 but fell into negative territory, -1.8%, in 2009. In light of this downturn, relaxing constraints on economic growth would seem to be in order, while ensuring a wider distribution of growth yields. As highlighted in the *OECD Economic Survey of South Africa* (2010a), much effort should be made to expand the export-led sector, making better use of South Africa's resources to increase investment levels. South Africa has been moving towards a very unusual economic structure, in which the contribution of services is considerably higher than in emerging-market economies and arguably more resembles the structure of developed economies (Fedderke, 2010). Value-added in primary activities fell from 4.5% in 1990 to 3.2% in 2007 as a proportion of the total. Similarly, secondary activities' proportion of value added fell from 36.8% to 29% in the same period (OECD, 2009a). Services are becoming the core activity in South Africa. One important consequence is that job creation has shifted from unskilled labour-intensive agriculture and mining to relatively less unskilled

labour-intensive services and skill-intensive financial services. Too few manufacturing jobs have been created to compensate for the loss in the primary sector. Other important reasons for the failure to absorb labour in sufficient quantities include a declining share of output for tradables and weak export performance.

The effects of refining macroeconomic policy and implementing structural reforms to improve the functioning of labour markets will inevitably be felt in the Gauteng city-region, which contributes over one-third of national GDP and half of national exports. Encompassing a series of connected cities including the major metropolitan areas of Johannesburg, Tshwane and Ekurhuleni and many small and medium-sized towns, it has around 11 million inhabitants (roughly 22% of South Africa's total population) and several sectors that drive national economic growth, innovation and education. This has made the province a magnet for domestic and international migrants. Gauteng's exports, however, are heavily related to natural resources, and manufacturing exports remain a challenge. Gold and platinum mining remain economically important, along with energy, and iron and steel production. Advanced manufacturing is underdeveloped and the relative lack of university-linked technological innovation makes it difficult to move up the value chain. Second, deficiencies in the education system, patterns of spatial development and transport mobility have left inequality in Gauteng deeply entrenched. The richest centre, the city of Johannesburg, is itself considered the most unequal city in a global sample of 100 cities, with a Gini coefficient of 0.73 (UN-HABITAT, 2008). However, inequality is lower if measured at the Gauteng city-region level, standing at 0.64 in 2008 (Gauteng Provincial Government, 2010). Serious spatial and skill mismatches may hold back employment and growth. Finally, strong negative externalities of uncontrolled urbanisation, as well as an economic structure heavily based on resources extraction and fossil fuels, have compromised environmental quality in the city-region.

Keeping in mind the goal of a refined economic, environmental and governance strategy, this chapter provides a profile of the Gauteng city-region's leading trends and offers an analytical framework for future policy recommendations. After defining the city-region and critically assessing its economic performance, skills and innovation potential, as well as environmental constraints, the chapter reviews the inequalities that throw doubts on the sustainability of the current model. Next, the state of the formal and informal labour markets is discussed. Given the importance of apartheid spatial patterns, the spatial mismatch hypothesis is explored and put in historical context. Particular attention is paid to the state of housing, public service delivery, infrastructure and interconnectivity between the municipalities within the city-region. For a comparative analysis sensitive to the global nature of the economy, key indicators will be benchmarked with the 90 OECD metro-regions of more than 1.5 million inhabitants that are included in the *OECD Metropolitan Database*.

Throughout this Review, the argument is made that an a-spatial approach to the great challenges facing the Gauteng city-region is inappropriate. Gauteng's spatial pattern not only reinforces extreme inequalities, but also generates high economic and environmental costs. This underscores the arguments made in the "National Spatial Development Perspective 2006", a policy document that interpreted the spatial realities and implications for government intervention. The Review shares its argument that "[s]patial marginalisation from economic opportunities and social amenities continues to be a significant feature of the space economy and must be addressed in order to reduce poverty and inequality and to ensure shared growth" (Presidency of the Republic of South Africa, 2007).

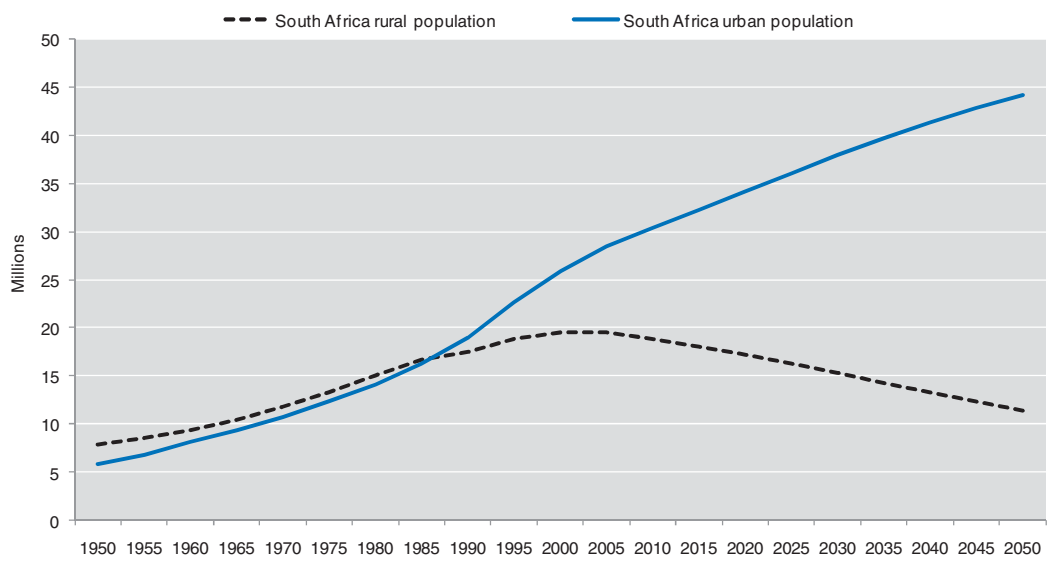
1.1. The demographic and historical context of the Gauteng city-region

The emergence of a mega city-region in an urbanising country

In a context of slowing population growth, South Africa has seen heavy migration to the cities. Its total population growth was elevated until the late 1970s, fuelled mainly by fertility rates at 5.65, more than double the OECD average (2.7 in 1970). Fertility rates decreased to 2.7 in 2006, and total population growth rates fell from 2.6% in 1994 to 0.6% in 2007 (OECD, 2009b). However, the urban population trends are somewhat different. Urban areas have been experiencing a net population gain at the expense of rural areas. The number of people located in urban settlements in South Africa has been growing over the past 60 years. In 2000, rural population numbers reached a peak, and have been waning since then. UN population data projections show that this process is likely to continue at least until 2050, while the rural population shrinks (Figure 1.1).

Figure 1.1. **Urban and rural population in South Africa**

Absolute population numbers



Source: OECD calculations based on data from the *UN Population Database* (2009).

Rather than an exclusively rural-to-urban migration, population trends show circular migration and the development of a rural-urban interface. Often, rural migration "first takes place to the nearest large town or city, or to a 'stand' along a major regional road to tap into the buying power of passing traffic and to gain a foothold in the urban, more cash-based economy, while still retaining a link to a rural economy" (Presidency of South Africa, 2007). Subsequently, migrants may plan moves to larger cities. If successful, they may acquire employment and transfer remittances to their kin in rural areas. In less successful cases, they leave for a city and return home dependent on the care of family members (Box 1.1).

Box 1.1. **"Tenuous urbanisation" and rural-urban linkages**

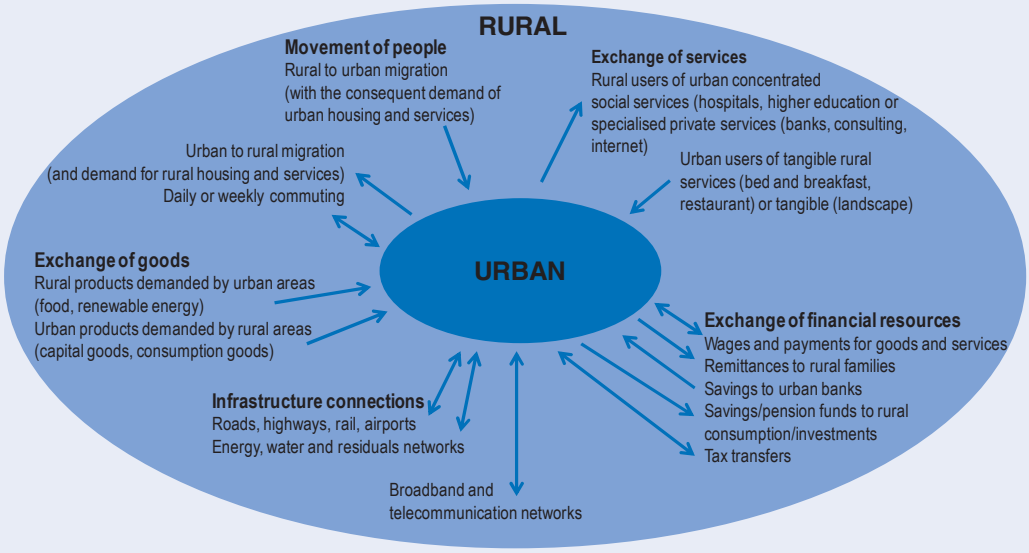
Rural and urban areas tend to develop along a continuum, interacting in spaces as well as in functions. Rural areas in close proximity to urban areas can provide easy access for nearby urban residents to environmental and recreational goods. On the other hand, in many countries, a large part of the rural territory is within easy reach of urban workers, who commute daily to work from a rural residence. These flows of people between rural and urban areas are just one component of a more complex set of functional interactions. Other relevant forms of linkages are exchanges in commodities (and other industrial linkages generated by inter-linkages between sectors, i.e. urban processing of rural raw materials), financial flows, shared or competitive use of amenities, environmental goods (land, water) and public services. Statistics South Africa (2006) suggests that "dynamic ties … keep the rural areas linked to the cities, both the former homeland areas and formal agricultural areas. … The ties between urban dwellers and the rural population may ensure the sustained existence of rural settlements, despite poverty and out-migration".

Trends in household behaviour in Gauteng show signs of "tenuous urbanisation" (City of Johannesburg, 2006). One such sign is the significant number of locked but unoccupied shacks in informal settlements surveyed across Gauteng in 2005. The City suggests that the locked structures may belong to circular migrants, who for the most part live in one or other rural area, or to families that have other accommodation in backyard dwellings or inner-city flats. Both groups may be trying to hedge their bets by keeping a structure in an informal settlement in case other options fail. The phenomenon is not insignificant. Up to 30% of the structures in Johannesburg's informal settlements appear to have no households resident on a full-time basis (City of Johannesburg, 2006, cited in Charlton, 2010).

The question of Gauteng's position in a rural-urban continuum has not been adequately researched in South Africa. Additional research is merited, especially on the question of the linkages between rural evictions and the growth of the Gauteng city-region. Indeed, one report found that some 2.4 million people were displaced from farms between 1994 and the end of 2004, of whom 942 303 were evicted. These numbers were higher than in the 1984-93 period, when 737 114 Black Africans were evicted from farms, and a total of 1.8 million were displaced (Social Surveys and Nkuzi Development Association, 2005). Other research indicates a declining number of farm units, an increase in the size of farms, and an amalgamation of plots into private game reserves and game farms, which may contribute to metropolitan concentration (Mabin, 2011).

Movement between urban and rural populations includes rural-to-urban migration, urban-to-rural migration and commuting. Service delivery is an important consideration in discussions of the inter-connectedness of rural and urban areas. It includes the exchange of services (rural users of services and public goods concentrated in urban areas, and urban users of services and public goods in rural areas), the exchange of goods (rural products demanded in urban areas and urban products demanded in rural areas), the exchange of financial resources (wages and payments for exchange of goods and services, remittances and savings/pension funds sent to rural areas, rural savings in urban banks and tax transfers), and the infrastructure that connects rural and urban areas (roads, highways, rail, airports, energy, water, broadband and telecommunication connections, etc.) (see figure below). Public service delivery strategies must take better account of the cascading effects of policy decisions that link rural and urban regions (OECD, 2010). People, food, energy, water, landscape and biodiversity are only a few of the assets rural areas can use to compete in national and international markets and rebalance the urban-rural relationship. Further study of these elements within the context of South Africa would be useful.

Box 1.1. **"Tenuous urbanisation" and rural-urban linkages** *(cont'd)*

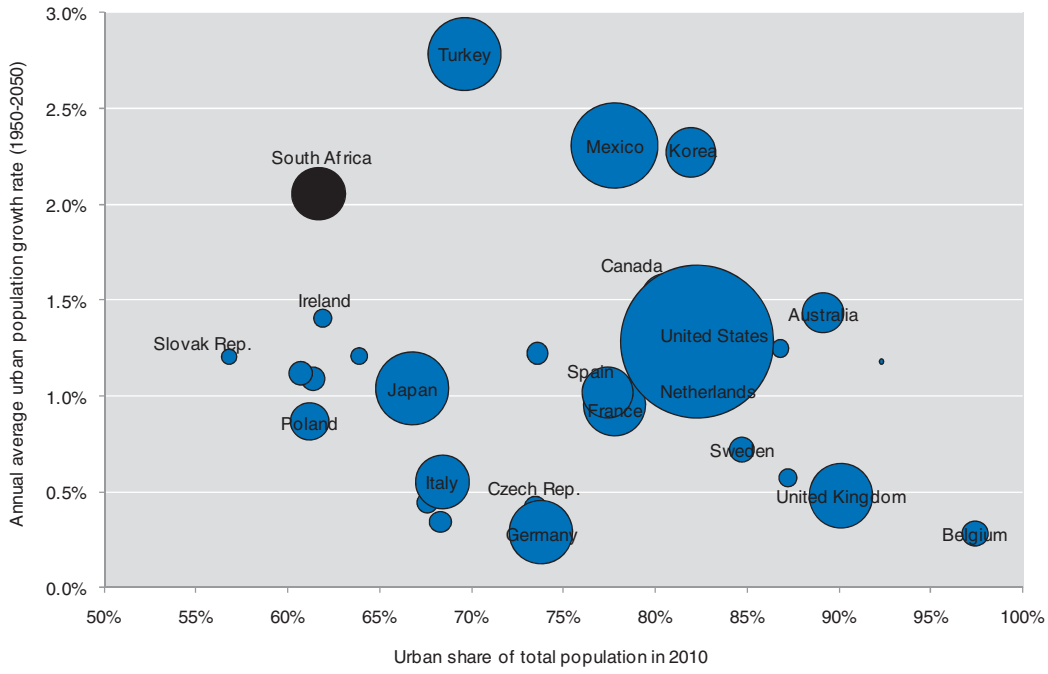


Sources: Charlton, S. (2010), "Inclusion Through Housing: Limitations and Alternatives in Johannesburg", *Urban Forum*, 21(1): 1-19; City of Johannesburg (2006), *Growth and Development Strategy,* City of Johannesburg; Mabin, A. (2011), "Transformation of the Land Question? A Reflection on 'Preparing to Negotiate the Land Question' 21 Years Later", *Transformation* 75; OECD (2010), *OECD Rural Policy Reviews: Strategies to Improve Rural Service Delivery*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264083967-en*; Social Surveys and Nkuzi Development Association (2005), *Still Searching for Security: The Reality of Farm Dweller Evictions in South Africa*, Johannesburg, *http://nkuzi.org.za/images/stories/evictions_Survey.pdf*; Statistics South Africa (2006), "Migration and Urbanisation in South Africa", Report no. 03-04-02, Statistics South Africa, Pretoria, *www.statssa.gov.za/publications/Report-03-04-02/Report-03-04-02.pdf.*

It is projected that by 2030, rural areas in South Africa will lose 5 million people. In other words, compared to 2000, forecasts indicate that South Africa's rural population will be halved by 2050.[3] Conversely, urban dwellers will steadily increase and population in urban centres will almost double by 2050. If UN datasets and forecasts are taken into account, urban population growth between 1950 and 2050 in South Africa is projected to be similar to the high-population-growth countries in the OECD, such as Mexico, Korea or Turkey (Figure 1.2). Growth rates for the urban population are thus projected to be four times higher than the rates for total population growth has been in recent years.

Figure 1.2. **Trends in urbanisation by OECD country and South Africa**

Urban population and growth (1950-2050)

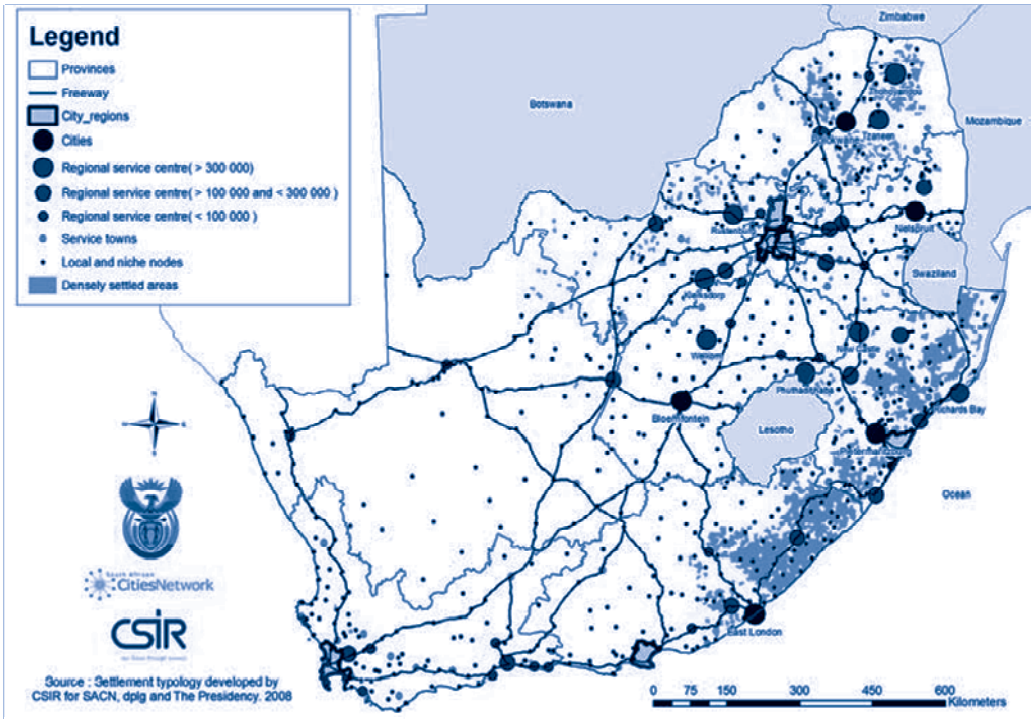


Note: Bubble size represents population forecast to 2050 according to the *UN Population Database*.

Source: OECD calculations based on *UN Population Database* (2009).

South Africa's functional urban areas have yet to be satisfactorily defined. Among the limiting factors are the lack of a methodology and the paucity of relevant data. Dense (and often large) settlements were created in rural areas through processes of resettlement from African freehold land and displacement from commercial farms in areas defined for white occupation. The 2003 National Spatial Development Perspective admitted that "[o]ne of the key insights of the NSDP is that the categories 'urban' and 'rural' as used in South Africa have little meaning." The Municipal Demarcation Board (MDB) has identified eight metropolitan municipalities in South Africa, namely those of Johannesburg, eThekwini (Durban), Cape Town, Tshwane, Ekurhukeni, Nelson Mandela Bay , and, introduced in 2011, Mangaung and Buffalo City. The eight metropolitan municipalities in South Africa are part of what has been identified as the country's functional urban areas (Figure 1.3). According to the "National Spatial Development Perspective 2006", these 26 functional urban areas produce 96% of the total national gross value added (GVA). Nevertheless, these functional areas are defined according to criteria that are often subjective or qualitative, which differs from the OECD's definition, which is based on density and commuting areas (Box 1.2).

Figure 1.3. **South African urban structure**



Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: CSIR, Built Environment and EconRise (2008),"A National Overview of Spatial Trends and Settlement Characteristics", South African Cities Network (SACN),the Department of Provincial and Local Government (DPLG), and the Presidency, *http://stepsa.org/resources/shared-documents/summary-overview-national-spatial-trends-jan09-pdf*.

Box 1.2. **The demarcation of metropolitan municipalities in South Africa**

The Municipal Demarcation Board (MDB) has been required by the Local Government Municipal Demarcation Act No. 27. of 1998 to determine all municipal boundaries throughout South Africa, among other responsibilities. This act determines that an area must be declared a metropolitan area (which grants it exclusive authority for executive and legislative purposes) in the case that area is:

- a conurbation featuring: *i)* areas of high population density; *ii)* an intense movement of people, goods and services; *iii)* extensive development; and *iv)* multiple business districts and industrial areas;
- a centre of economic activity with a complex and diverse economy;
- a single area for which integrated development planning is desirable; and
- having strong interdependent social and economic linkages among its units.

Source: Cameron, R. (2006), "Local Government Boundary Reorganisation", in U. Pillay, R. Tomlinson and J. du Toit (eds.), *Democracy and Delivery: Urban Policy in South Africa*, HRSC Press, Tshwane, South Africa.

Although defining the extent and limits of the Gauteng city-region is not an easy task, it is possible to say, from several sources including the OECD methodology based on commuting data and density, that the functional city-region is largely coterminous with the administrative borders of the Gauteng Province. The Gauteng Province, which is the most densely populated province in South Africa, is characterised by a series of connected cities, such as Johannesburg and Tshwane and small towns functioning as a single, integrated urban region (Box 1.3 and Figure 1.4). Nevertheless, the OECD methodology is limited in excluding wider economic linkages that transcend labour force commuting. Some linkages are self-evident – the oil from coal produced at Sasolburg is primarily exported north to Gauteng rather than south to the provincial capital, Bloemfontein. Rustenburg is a fast-growing population centre close to Gauteng, with regular transport and economic links. The Mpumalanga mines and power stations (fired by nearby coal mines) export primarily to Gauteng. Moreover, the demarcation of Gauteng Province sliced off all areas to the north of Tshwane. Many of these dense populations are in former homelands or "*bantustans*" established under apartheid to corral black citizens in economically unviable areas. This forced the black residents to migrate to cities to sell their labour, although they had no residential rights in those cities. Many are more closely linked to the Gauteng city-region, to which they commute daily, than to outlying towns nearer to their homes.[4] Finally, the OECD methodology does not employ satellite imagery, which has been used to show the urban structure and land-cover in Gauteng (Figure 1.5).[5]"

Box 1.3. **Defining the Gauteng city-region**

The OECD has been using a definition of a metropolitan region that tried to capture functional economic areas based on large building blocks, such as TL3 regions.[1] However, where possible, the OECD definition has been applied to cities using small building blocks. In this regard, municipalities have been selected as territorial units of analysis. In order to define the metropolitan areas among OECD member and non-member countries, the OECD has established a multi-criteria approach that involves two main steps: *i)* the definition of a core area, based on the population density of small building blocks; *ii)* the identification of a grouping of contiguous small building blocks that capture the area with significant commuting to the core (OECD, 2009).

i) Regarding the definition of the core area, a density threshold has not been set up, due to the high-density differentials across the country. The city of Johannesburg has been considered as the core area, since it is the municipality with the highest population density in the country. In 2009, the City of Johannesburg Metropolitan Municipality registered a density of 2 362 inhabitants per square kilometre, which is far higher than the average at national level (91 inhabitants per square kilometre) as well as the average for the Province of Gauteng (507 inhabitants per square kilometre). In the Province of Gauteng, only the Ekurhuleni Metropolitan Municipality, the City of Tshwane Metropolitan Municipality, as well as the Emfuleni Local Municipality (1 427, 1 082 and 680 inhabitants per square kilometre respectively) have a density higher than the provincial average.

Box 1.3. **Defining the Gauteng city-region** *(cont'd)*

ii) A self-contained labour market area is defined as a zone in which the bulk of the resident population also works. Commuting data from the *Gauteng Travel Survey* (2004) were used in order to identify the group of municipalities that should be added to the functional area. A commuting rate was calculated computing the ratio between employment at the place of work and employment at the place of residence. A threshold of self-containment has been established at 10%. Thus, if the commuting rate of the core region identified in the previous steps is below the fixed threshold, it is considered to be self-contained. Conversely, if the commuting rate is above the threshold, then the metropolitan area has significant labour force exchanges with other regions. The aggregation of neighbouring regions has been continued until the threshold of self-containment is achieved.

According to the OECD definition of a metropolitan area, the proposed boundaries of the Gauteng city-region include almost the whole of Gauteng Province. The municipality of Randfontein is not included as part of the functional area, possibly because the analysis of this territory was missing some values. Moreover, and following the methodology proposed by the OECD (2009), the functional area should include areas surrounded by municipalities which are part of the functional system and thus, Randfontein should be included as part of the functional area (Figure 1.4).

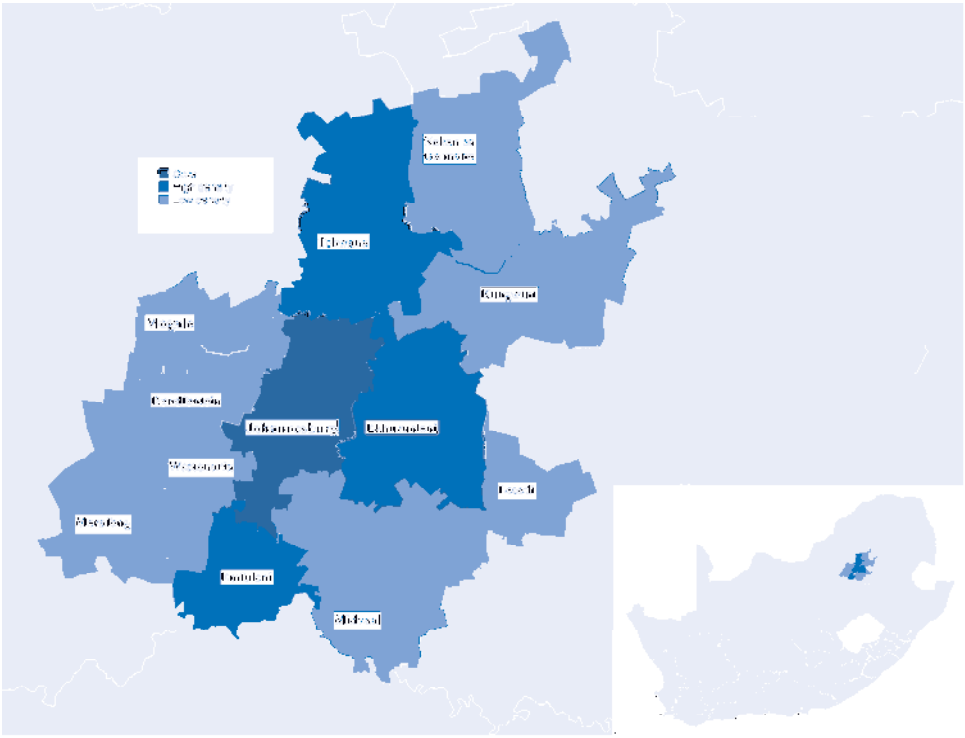
Overall, the most significant flows across the province are into the centres of Johannesburg and Tshwane and between the centres of Johannesburg, Tshwane and Ekurhuleni. Another key yet smaller flow is into Johannesburg from various points on the West Rand, most notably from Krugersdorp and surrounding areas in Mogale City, and to a lesser extent from Randfontein, Westonaria and Merafong City.[2] There are also increasing flows of freight and commuter traffic between the core cities in Gauteng and outlying cities such as Rustenburg, which is growing rapidly as one of the world's most important sources of platinum group metals. The commuting is contained within the Gauteng Province: only 1% of all trips in the area originated from or ended in zones outside the province (Gauteng Department of Roads and Transport, 2006).

1. There are other commuting dynamics at play. While there is a noticeable flow from the cluster of nodes historically known as the Vaal Triangle – Vereeniging, Vanderbijlpark and Sasolburg – towards Johannesburg, the internal connections in this area are more significant. Particularly noticeable is the commuting from the Vaal townships of Sharpeville and Sebokeng into the industrial areas of Vereeniging and Vanderbijlpark. There is also commuting into the core from outlying parts of the province, and also from across the provincial boundary, but these connections are far less significant than those in and between the central areas of Gauteng.

2. The classification is based on two territorial levels. The higher level (territorial level 2 – TL2) consists of 335 large regions, while the lower level (territorial level 3 – TL3) is composed of 1 681 small regions. All the regions are defined within national borders and in most the cases correspond to administrative regions. Each TL3 region is contained within a TL2 region (except in Germany and the United States) (OECD, 2009).

Sources: Gauteng Department of Roads and Transport (2006), *Gauteng Transport Study 2000*, Gauteng Provincial Government, Johannesburg; OECD (2009), *Regions at a Glance 2009*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/reg_glance-2009-en*.

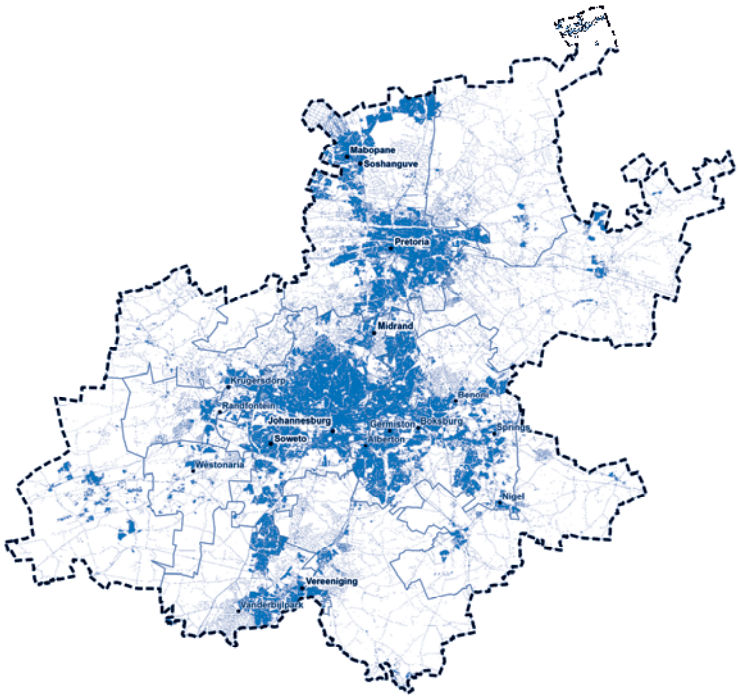
Figure 1.4. **Population density in the Gauteng city-region**



Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: OECD based on Quantec data.[6]

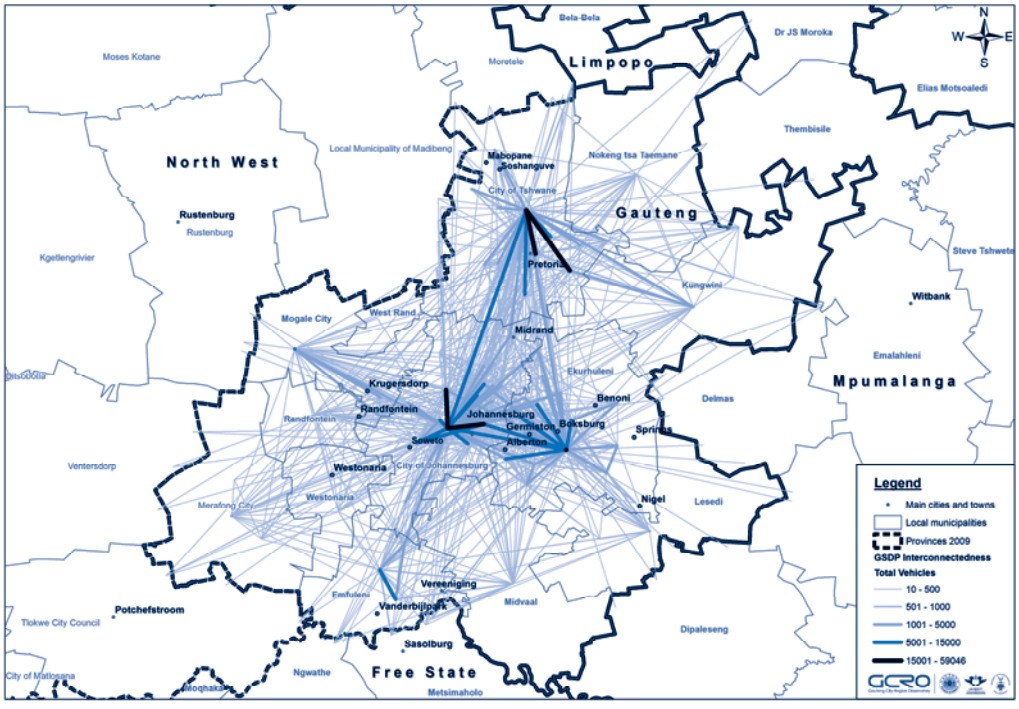
Figure 1.5. **Urban land-cover in the Gauteng city-region**



Source: Gauteng Provincial Landcover (10m) © GeoTerraImage – 2009.

Gauteng accommodates an intense flow of intra-metropolitan commuting. This creates a complex multi-nodal structure in which neither of the two major centres, Johannesburg or Tshwane, dominate or have their own self-contained labour market. There are three major foci in Gauteng: *i)* the central area of Johannesburg, including the old Johannesburg Central Business District (CBD) and the area in and around the new edge-city central business district of Sandton; *ii)* the Pretoria city centre in the municipality of Tshwane; and *iii)* a cluster of nodes in the municipality of Ekurhuleni – Germiston, Kempton Park, Alberton, Boksburg and Benoni – roughly centred on Oliver Tambo International Airport, which receive flows from smaller nodes such as Springs and Nigel and the major townships of Katlehong, Thokoza and Vosloorus (Figure 1.6).

Figure 1.6. **Home-to-work commuting in Gauteng**



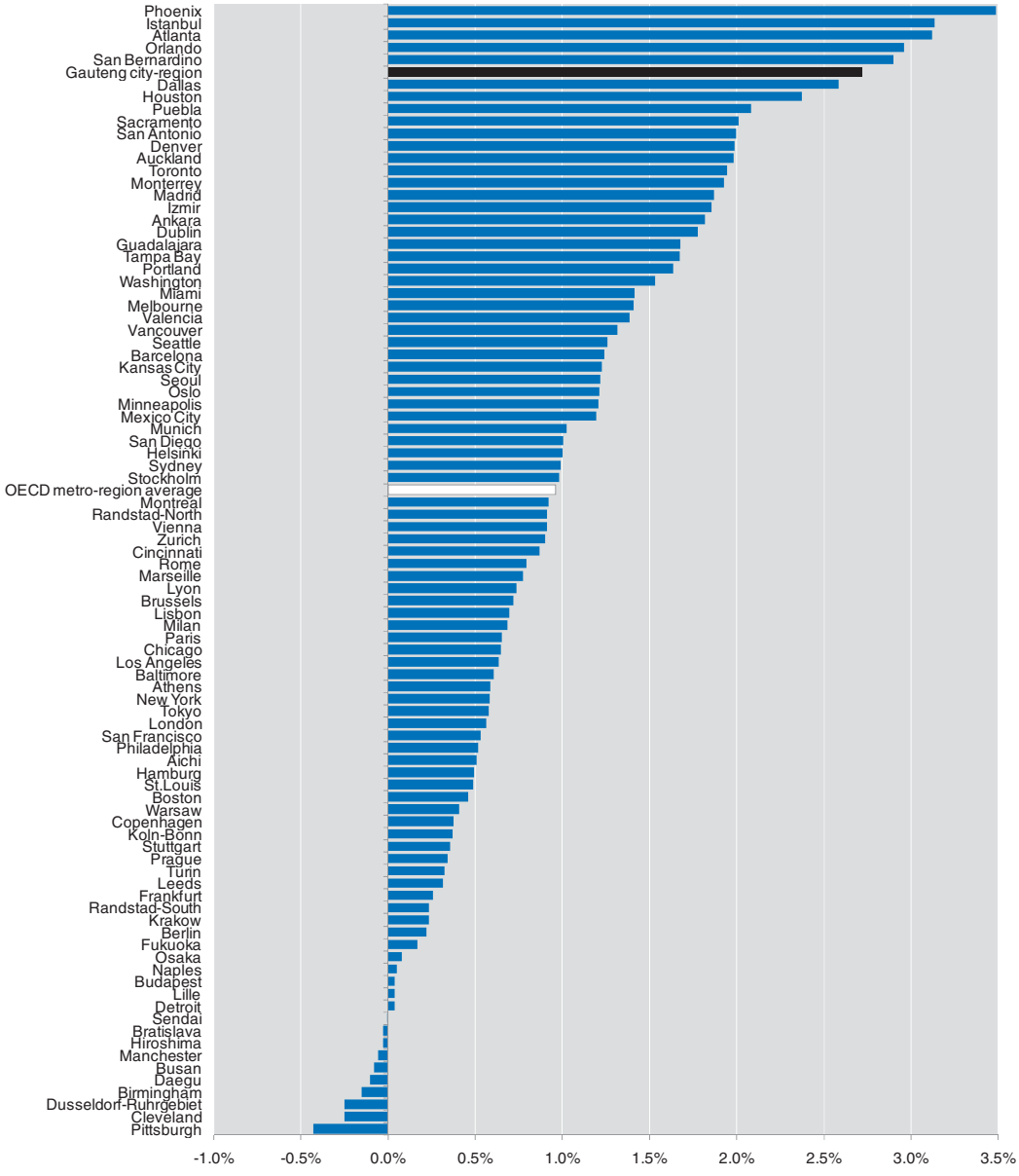
Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map. The Gauteng city-region has recently seen a new demarcation of some municipal boundaries for the local government elections in May 2011. With these boundary changes, the District Municipality of Metsweding, and its local municipalities of Kungwini and Nokeng tsa Taemane, ceased to exist, and its area was incorporated largely into Tshwane, with a small portion merged into Ekurhuleni. Since the bulk of the data collection for this Review occurred during 2010, the analysis here refers to the separate municipalities that existed at the time.

Source: Gauteng City-Region Observatory (2010), "Background Report for OECD Gauteng Territorial Review", 25 October version, based on source data from the *Gauteng Spatial Development Perspective 2007*.[7]

With a population of about 11 million inhabitants (22% of the total population of the country), Gauteng has been one of the fastest-growing city-regions in South Africa and has consistently absorbed the highest numbers of domestic migrants. The population has been growing rapidly, faster than that of the country as a whole increasing by 3.2 million between 1995 and 2009, i.e. 2.6% annually *vs*. 0.6% at the national level. As compared to the 90 OECD metro-regions, the Gauteng city-region features as having one of the most

dynamic population growth rates: more than 2.7% per year between 1997 and 2007, against 0.96% for the OECD average (Figure 1.7). This population increase is due largely to the high level of in-migration. This is not a new phenomenon; Gauteng has always been an area of heavy in-migration.[8] Official estimates suggest that the population increased by 13.6% between 2001 and 2007, and this is surely an underestimate. In 2007, the *Community Survey* found that only 58% of Gauteng residents were born in the province (Statistics South Africa, 2008). Gauteng received the most migrants in South Africa, followed by the Western Cape.[9]

Figure 1.7. **Average annual population growth rate in OECD metro regions and in the Gauteng city-region, 1997-2007**



Note: Data period varies depending of the location of the metropolitan region. Belgium, Germany, Netherlands, Poland (2000-07); Denmark (2006-07); Turkey (1997-2006).

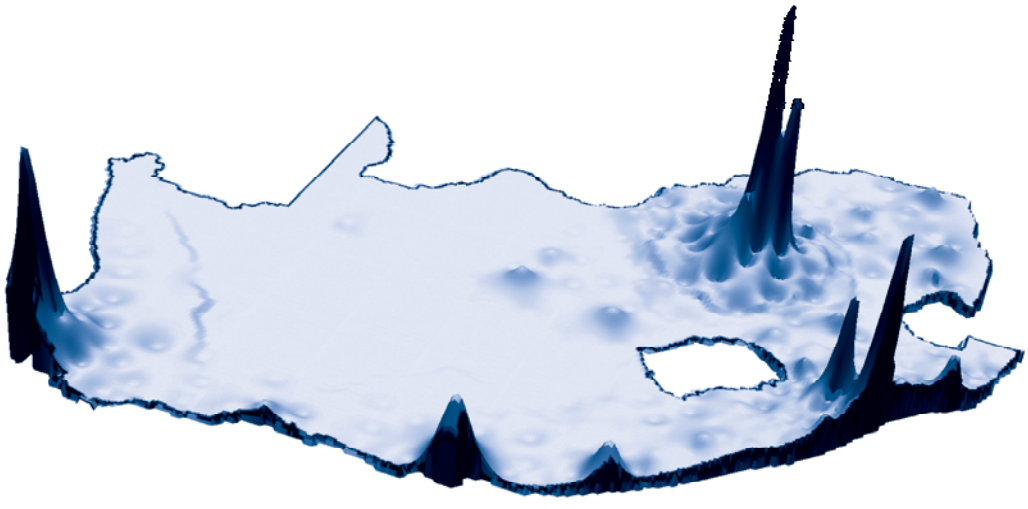
Source: *OECD Metropolitan Database* (2010).

As Gauteng's economy has grown, it has attracted the greatest number of foreigners in South Africa. Data in this area are notoriously weak and unreliable, and the figures given here should be regarded as indicative at best. The 2007 *Community Survey* found that Gauteng included 578 387 migrants born outside South Africa, although information on their countries of origin is not available from the released findings. Across South Africa, the survey found 1 268 324 non-South African migrants, indicating that Gauteng is the home of nearly half (45.6%) of migrants from outside the country's borders. Gauteng is a major attractor for international migrants, especially from the African continent, and increasingly from Pakistan, Bangladesh and China. Though a skills profile of immigrants has not been undertaken, anecdotal evidence suggests that a range of skills and talents are offered to Gauteng's economy by immigrants. The picture of a city of heavy in-migration – even if for many it is only a "transit station" – is likely to be an important, and perhaps the most important, factor influencing how Gauteng is perceived as an international location for business and development.[10]

Urbanisation trends in South Africa and in Gauteng have also been accompanied by increasing concentration in a few locations (Figure 1.8). A handful of very dense urban areas in South Africa are increasingly accounting for a greater share of population. For instance, the Johannesburg Metropolitan Municipality accounted in 2009 for the highest density in South Africa, with 2 362 inhabitants per square kilometre, followed by eThekwini (1 547 inhabitants per square kilometre). The Cape Town Metropolitan Municipality is the third city in terms of density, followed by the cities of Tshwane and Ekurhuleni – both in Gauteng, and both with a density higher than 1 000 inhabitants per square kilometre. Within the Gauteng city-region, population growth is concentrated in only a few municipalities. The city-region includes three municipalities with very large populations, and ranges from the tiny West Rand District Management Area, which accounts for only 0.03% of the city-region's population, to Johannesburg, which includes more than one-third. Across municipalities growth rates ranged widely. While Johannesburg and Kungwini grew annually by 3.1%, Westonaria grew annually by only 0.2% and Merafong and Lesedi by 0.8%.

Figure 1.8. **Population density in South Africa, 2009**

Population per square kilometre



Source: OECD calculations based on Quantec data.

An urban form shaped by history

The Gauteng city-region has considerable spatial challenges, some inherited from apartheid and some amplified by current trends supporting urban sprawl. Under apartheid laws, a highly unequal and fragmented urban form was created, and efforts over several decades to build a more spatially integrated metropolis have been frustrated. Urban sprawl and a discontinuous urban form with interspersed brownfields and unbuildable land prevail. Today, the poorer African townships are still located far from centres of economic opportunity and urban amenities.

The policies of apartheid distorted property markets, instituting an inefficient spatial structure with high density levels in the periphery and low overall levels of density. The apartheid policy of locating Africans in decentralised dormitory "townships" extended Gauteng's urban form farther than if the cities' property markets had functioned normally and workers had been permitted to cluster closer to nodes of employment. A series of laws encouraged the growth of residential areas of two types: those exclusively owned by whites and those inhabited by the victims of apartheid (Mabin, 2007). "Grand apartheid", intent on separating the races on a large scale by forcing them to live in separate places defined by race, removed many black South Africans from cities and sent them to largely rural homelands (*bantustans*). Within the Gauteng city-region, this ultimately created a discontinuous urban pattern and an expanded urban footprint. These measures created unusual settlement patterns, in the form of high-density clusters on the Gauteng city-region's northern edge. In the *bantustan* of Bophuthatswana and the homeland of KwaNdebele, around Tshwane, an array of discontinuous and disconnected "villages" was laid out. Many of these were on an initial urban grid pattern, without transit connections, which then bled off into more rural forms with small agricultural plots.

Though the Gauteng city-region is known for the corridor connecting Johannesburg and Tshwane, it is a polycentric metropolis, as distinct from the classic land use model of monocentric development documented in urban economics. Its polycentric structure was initially due to the discoveries of gold along a broad axis running east and west known as the Witwatersrand[11] reef, which spread mining and, later manufacturing, outside Johannesburg. The growth of coal-mining in the east, and the emergence of smaller industrial centres such as Vereeniging-Vanderbijlpark, Sasolburg, Benoni and Nigel, all of which in one way or another connect into mining-supply chains, led to a metropolitan region with a polycentric spatial structure. Germiston, located directly to the southeast of Johannesburg, emerged as the largest railway junction of South Africa, further reinforcing a multi-polar model.

Mono-functional zoning laws enacted during apartheid exacerbated urban sprawl and excessive commuting times. Historically, African townships had no commercial zoning, since the Native Urban Areas Act was intended to ensure that the Black African population funded its own urban development through municipal monopolies on retail and brewing. A series of zoning laws enacted during apartheid instituted a division between commercial, residential and office areas throughout Gauteng that was originally stipulated in mono-functional zoning regulations from the 1930s. Only in the 1980s did city authorities begin to encourage mixed-use zoning. These laws in essence helped create a polycentric cluster of commercial property nodes, a number of which are recognisable as city-centres in their own right, separated by a virtually continuous low-density sprawl, and interspersed with patches of high-density mono-functional townships into which poor, ethnically identified populations were forcibly moved. By preventing mixed-use

zoning, the apartheid reforms resulted in higher commuting times in areas without sufficient public transit.

Strict apartheid control measures prevented non-whites from entering cities and created a legacy of massive under-investment in public transport and higher commuting costs for the poor. Laws such as the Group Areas Act of 1950 and the Population Registration Act of 1950 introduced strict "influx control" measures that prevented people from entering the city unless they had a pass.[12] The scant public transport to non-white areas isolated a large part of the population and reduced mobility. A fairly comprehensive passenger rail network was introduced to transport African workers to their places of employment during apartheid, but the province's passenger rail network, along with the national rail-freight network, began to decline in the 1970s. Without adequate public transport, the population in non-white areas shifted to minibus taxis. In 1975, 50% of lower income commuters used rail to get to work, and only 5% used taxis, but by the early 2000s, this split had been reversed: only 15% of lower income commuters used rail, and 53% used taxis.[13] The taxi industry was "one of the largest privately owned public transport systems in the world" (City of Johannesburg, 2006b). The consequent lack of a unified fare system and the higher costs of privatised public transit raised the commuting costs for the inhabitants of poorer neighbourhoods (see discussion on transport below).

Apartheid's suppression of township economies left a legacy of job-poor, capital-deprived neighbourhoods. Townships were deliberately configured without, or with little space for, economic activity. Master planning and "spatial engineering" under apartheid stripped non-white areas of their financial capital, denying them the right to live in central areas and to own businesses and property. Infrastructure, especially the provision of electricity, was also deliberately limited in the townships. At the same time, strict control on the inflow of "African" and "coloured" people was enforced, linked to a series of legal and financial instruments that, in practical terms, suppressed the economic development of townships by obliging non-white communities to shop in white central business district (CBD) areas.

Gauteng's low-density, polycentric form is further complicated by mine-dumps that have hindered post-apartheid spatial integration. Strips of mining land polluted by industrial cyanide and other chemicals historically used to extract gold from ore-bearing rock have limited expansion and/or redevelopment. Spatially, these brownfields have created a dividing line between the wealthier northern part of the city-region and the poorer south, where townships such as Soweto and large informal settlements such as Orange Farm are located. In the eastern municipality of Ekurhuleni, old coal mining reaches have also limited spatial reintegration of the city-region.

1.2. Socio-economic and environmental trends in the Gauteng city-region

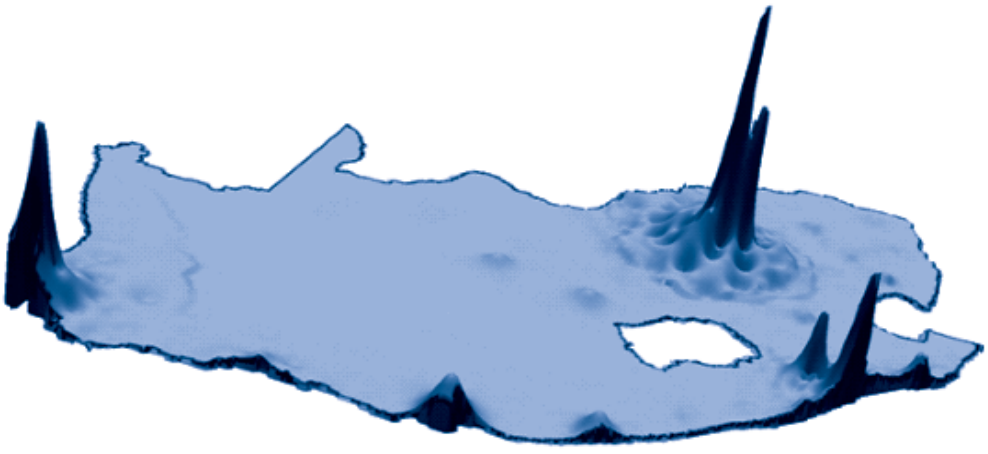
Gauteng: a driver of national growth constrained by subpar productivity levels

Gauteng is not only the most urbanised but also the wealthiest province in South Africa. Spatial lumpiness is characteristic of economic activity in South Africa (Figure 1.9). Economic concentration in the Gauteng city-region is disproportionate to its population size. This trend is common in OECD member countries where urbanisation and economic concentration are generally associated with higher income and productivity levels (OECD, 2006). Generally, agglomeration economies in large urban centres result

in higher productivity that allows firms to pay higher wages, in turn attracting yet more workers and producing a centripetal effect. In South Africa, the Gauteng Province had the highest per capita GVA (ZAR 67 000) in 2008, followed by Western Cape (ZAR 57 000), while the national average stood at ZAR 42 000. With relatively higher GVA figures, Gauteng Province has the largest share of national GDP (33.9%) far ahead of the next in line, KwaZulu-Natal, which includes the metropolitan area of eThekwini, around Durban (Figure 1.10). When compared to the other 90 OECD metro-regions, Gauteng ranks 14th in terms of its contribution to national GDP (Figure 1.11). Gauteng's economic importance for South Africa is similar to Auckland's to New Zealand and is even larger than that of Tokyo, London and Paris in their respective countries. The Gauteng city-region's GDP per capita is comparable to that of Mexico City and Istanbul, but the South African national average is more than a third lower than the national averages of Turkey and Mexico.

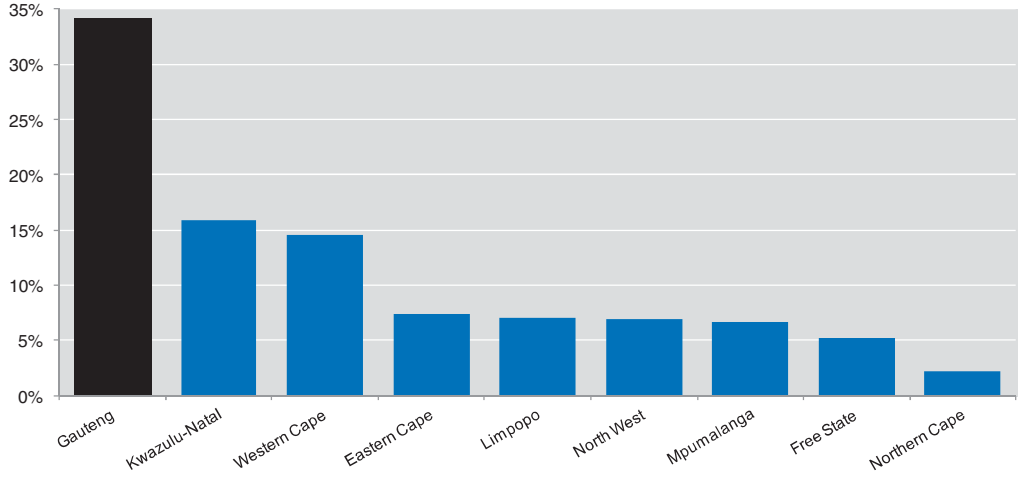
Figure 1.9. **Economic density in South Africa, 2008**

GVA per square kilometre



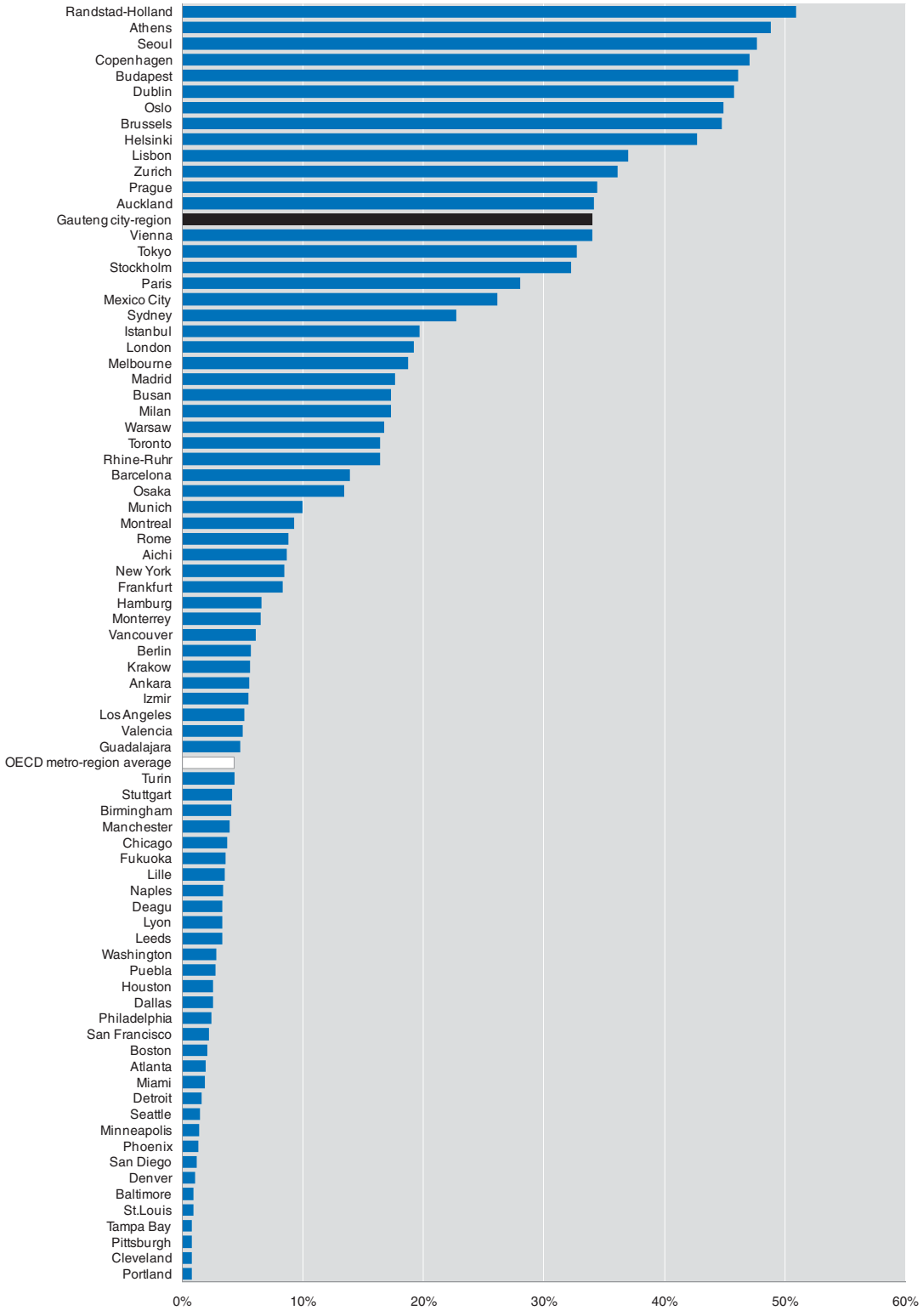
Source: OECD calculations based on data from Quantec.

Figure 1.10. **Provincial share of national GDP, 2008**



Source: OECD calculations based on data from Quantec.

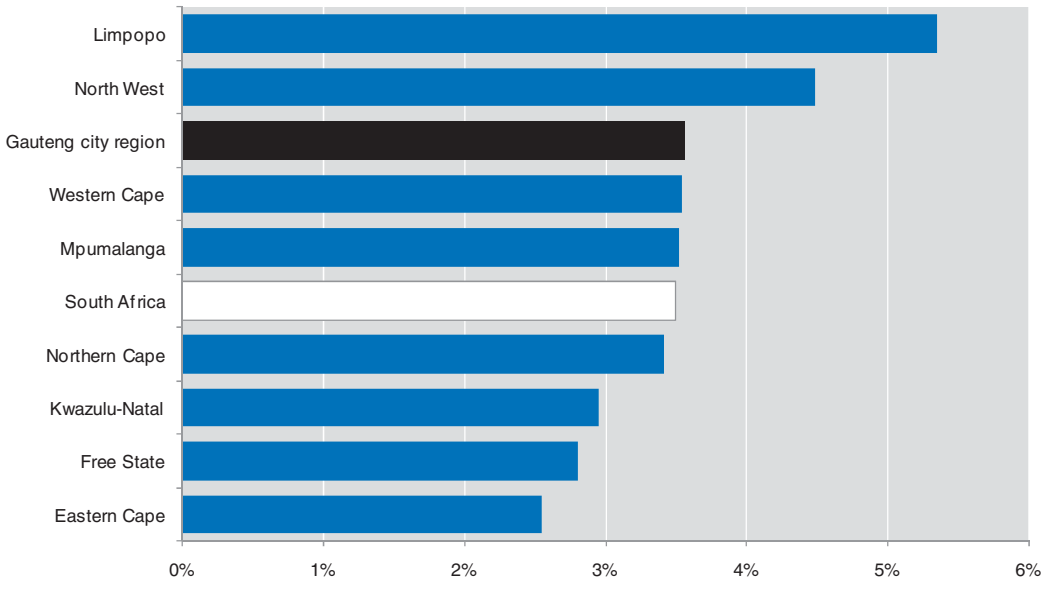
Figure 1.11. **Metropolitan GDP as a share of national economy, 2007**



Source: *OECD Metropolitan Database* (2010).

Gauteng is South Africa's engine of growth. Many OECD metro-regions are drivers of national growth, and often national rates and those for the metro-regions are similar. The Gauteng city-region is no exception. Its GDP grew at an annual average rate of 3.6% over the 1995-2008 period, with growth in some years, such as 2006 and 2007, exceeding 6%. The 1995-2008 average of 3.6% is slightly above the national average of 3.5% (Figure 1.12). The province contributed more than one-third of national economic growth between 1995 and 2008. Gauteng's contribution to national growth exceeds its population share. In terms of a ratio between a province's contribution to national growth and its share of national population, Gauteng comes in first in the country (Figure 1.13), at 1.6. This means that for every 1% of the province's population share, 1.6% is added to its contribution to national growth. Agglomeration economies, such as linkages among suppliers and buyers, the pooled labour market and knowledge spill-overs, probably make Gauteng's residents more productive than other South Africans. However, it is possible that productive linkages with other provinces have made growth possible in Gauteng. At the same time, Gauteng's performance is dependent not only on productivity but on a growing labour market. Between 1995 and 2008, productivity continued to drive GDP per capita in the province, but its contribution to performance declined, while its contribution to expansion in the labour force increased (see Figure 1.17).

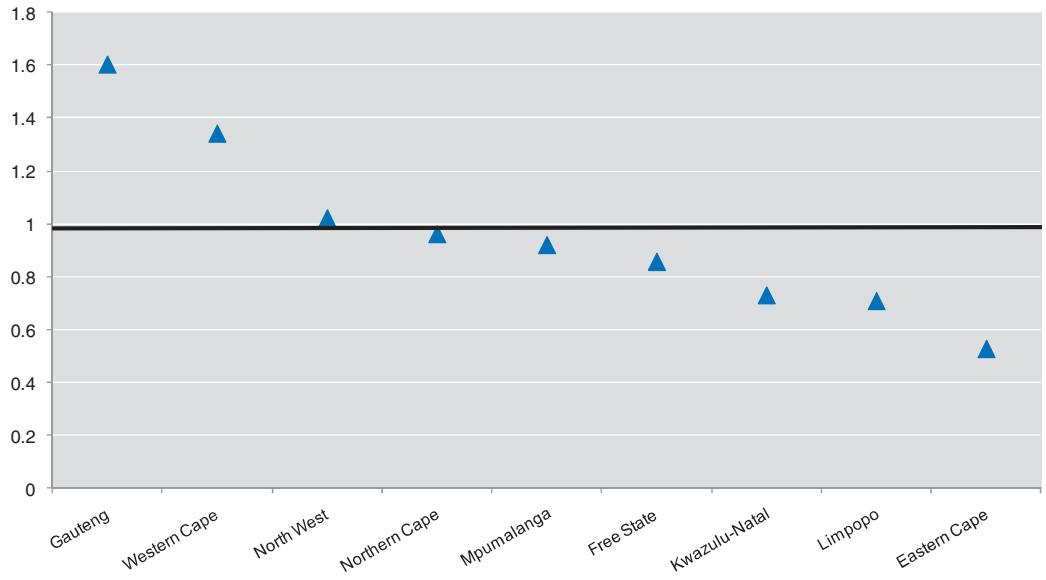
Figure 1.12. **GDP annual average growth rate, 1995-2008**



Source: OECD calculations based on Quantec data.

Figure 1.13. **Regional contribution to national performance**

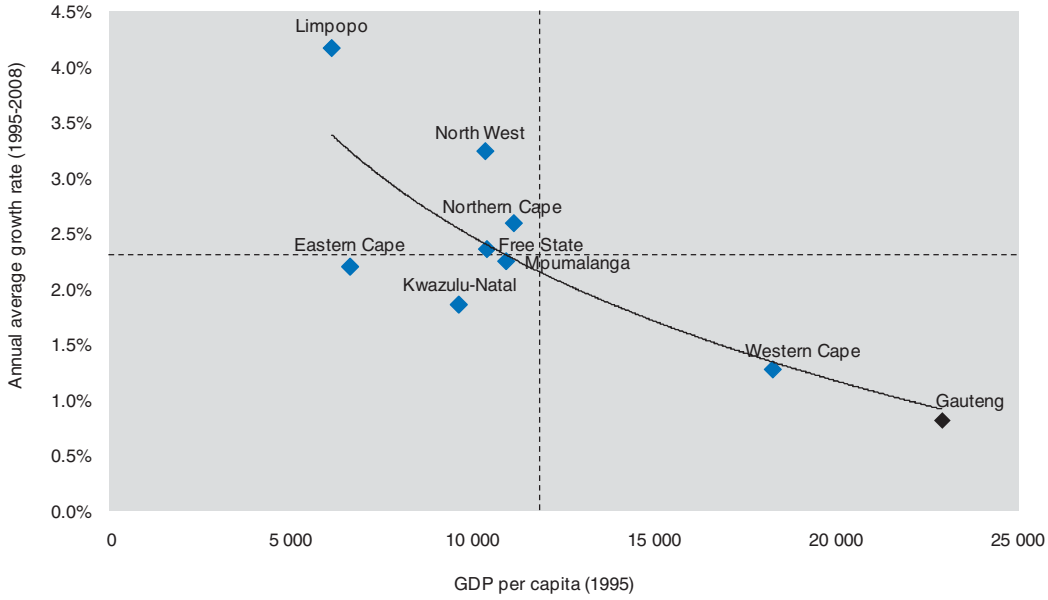
Ratio of regional contribution to national growth and regional share of national population



Source: OECD calculations based on data from Quantec.

However, Gauteng's economic growth still needs to improve by addressing lingering productivity levels and valorising the input of migration in the labour force. Although Gauteng's contribution to national growth is the most important and it performs well in terms of GDP, it shows the lowest average annual growth rate (0.8%) in terms of per capita GDP of any of South Africa's provinces between 1995 and 2008 (Figure 1.14). The low figures, however, are probably affected by its population growth and its ability to absorb a large number of domestic and international migrants. Gauteng's unimpressive performance for this indicator is a result of sluggish growth in some of the city-region's municipalities. Except for West Rand, Lesedi and Nokeng tsa Taemane, all municipalities in the city-region are growing at lower than average levels (Figure 1.15). Compared with OECD metro-regions, Gauteng is also underperforming in terms of per capita GDP growth. Growing annually at an average of 0.8% between 1997 and 2007, the Gauteng city-region's growth rate is close to that of Ankara and Naples, ranking 71 out of 91 (Figure 1.16). This is half the average for OECD metro-regions. In the case of Gauteng, the low economic growth stems chiefly from low productivity between 1995 and 2008, which did not increase in proportion with the growth of the labour force (Figure 1.17). Falling productivity impinges on per capita GDP growth rates, and the expanding labour force has not been able to compensate for a loss in productivity. Although migration and its growing labour force are assets, Gauteng's productivity needs to be addressed.

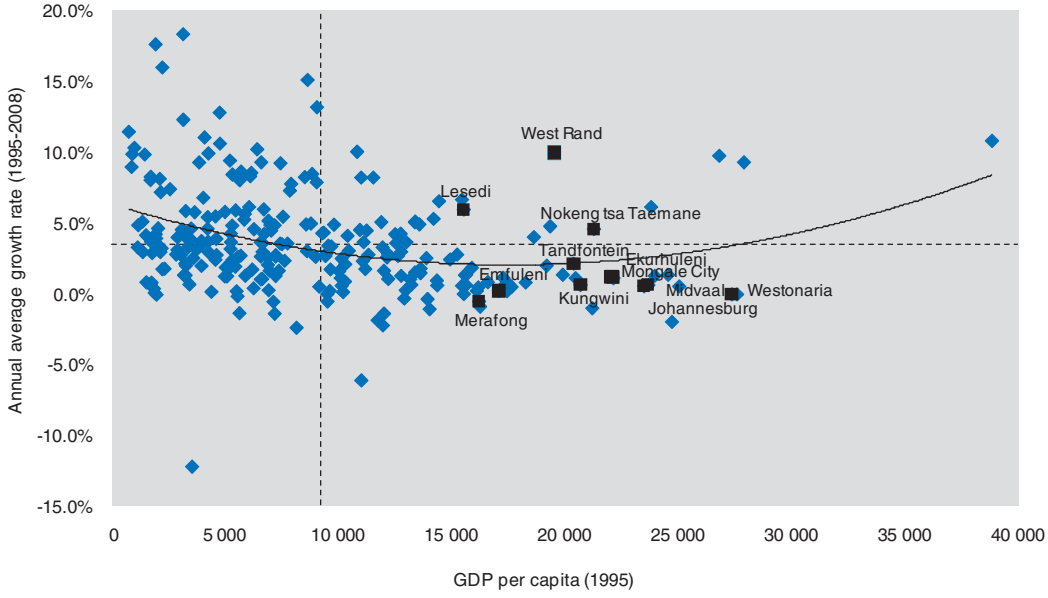
Figure 1.14. **GDP per capita annual average growth rate, 1995-2008**



Source: OECD calculations based on Quantec data.

Figure 1.15. **Municipal per capita GDP growth in the Gauteng city-region**

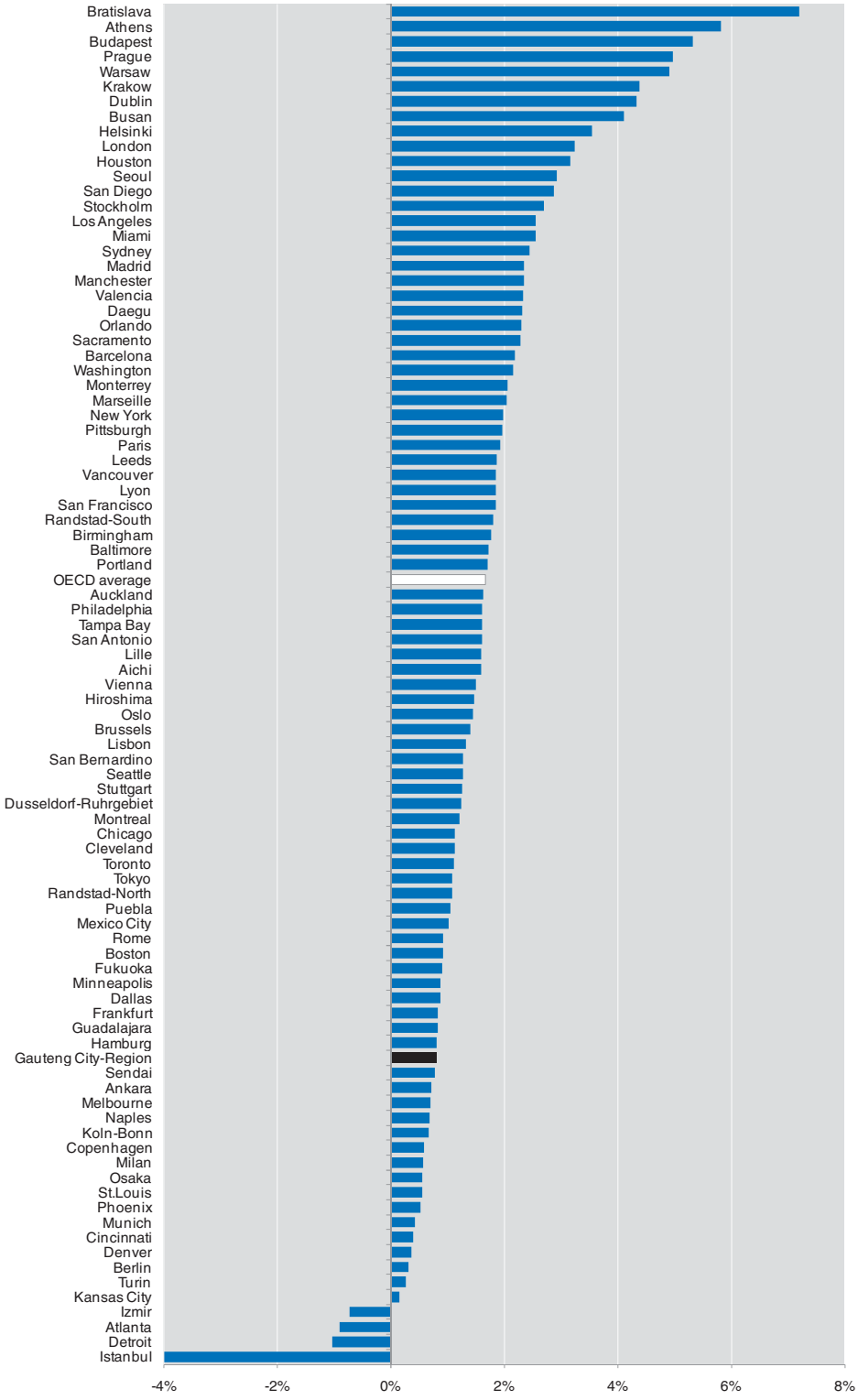
Average annual growth rates between 1995 and 2008



Source: OECD calculations based on Quantec data.

Figure 1.16. **Economic growth among OECD metro-regions**

Average annual growth rates for GDP per capita values (1997-2007)

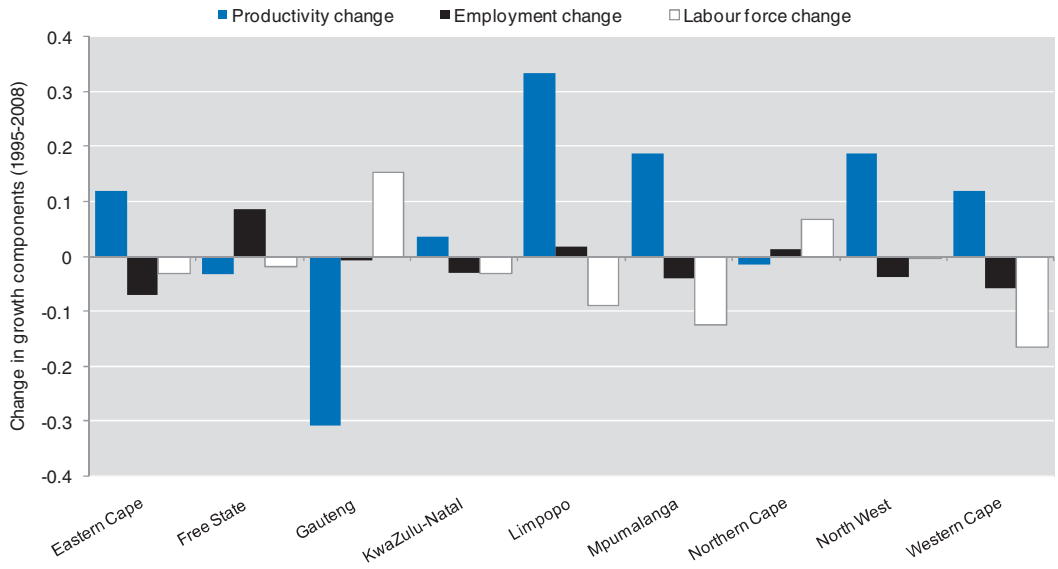


Note: Data for Gauteng refers to 1995-2008.

Source: *OECD Metropolitan Database* (2010) and Quantec.

Figure 1.17. **Decomposition of regional GDP per capita in South Africa**

Change in values for GDP per capita components (1995-2008)



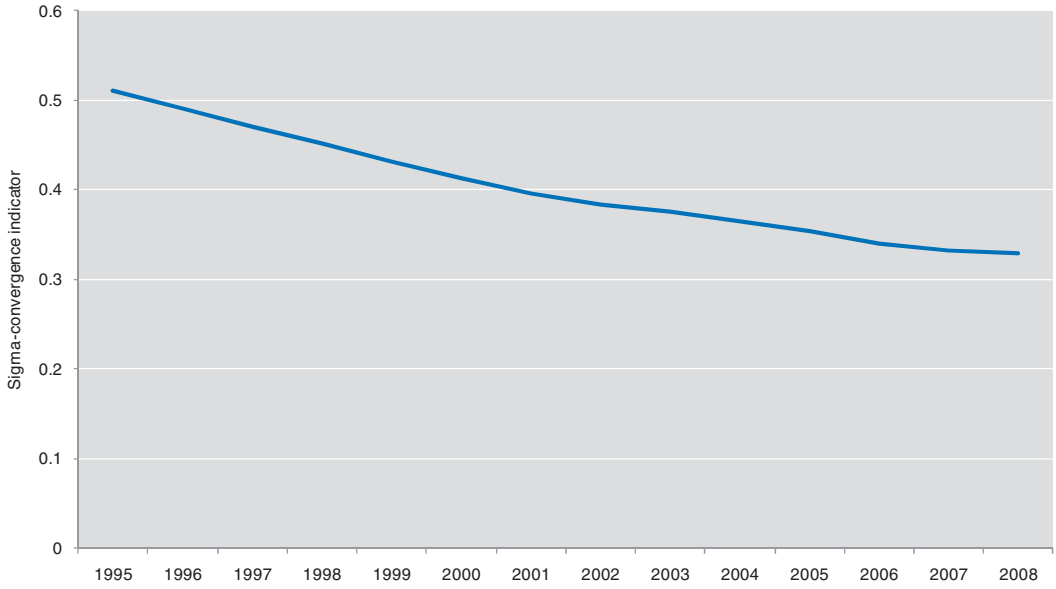
Notes: Decomposition is based on the equivalence between per capita GDP and three of its components: productivity, employment rate and participation rates. The change in values for components refers to the change between 1995 and 2008 for each province and each component. Decomposition is based on log values of the quotient of regional in respect to national figures for each variable.

Source: OECD calculations based on data from Quantec.

However, it is likely that low per capita GDP growth performance in Gauteng is also part of a pattern of regional convergence in South Africa. Regional disparities in Gauteng were in fact reduced over the 1995-2008 period. A traditional measure of territorial inequality is the Sigma-convergence indicator, which, as applied to South Africa, shows that the gap between South Africa's richest province (Gauteng) and its poorest (Limpopo) has narrowed from 0.51 to 0.33 over that 13-year period (Figure 1.18).[14] While disparities among provinces have consistently been falling, those among municipalities nationwide have been increasing, perhaps as a result of further concentration in urban centres outside Gauteng and the Western Cape (Figure 1.19). A similar trend of increasing concentration and falling disparities can be found in OECD member countries such as Belgium and Spain. Both countries have shown a decrease in disparities since 1980 (OECD, 2009a) while their concentration indicator has kept growing (OECD, forthcoming). A possible explanation of this effect is that while people may be continuing to concentrate in large and medium-sized cities and thus increase urbanisation, congestion costs as a part of centrifugal forces in the main economic centres might be resulting in a relatively better performance of medium-sized cities.

Figure 1.18. **Regional disparities in South Africa, 1995-2008**

Sigma-convergence indicator for provincial per capita GDP values

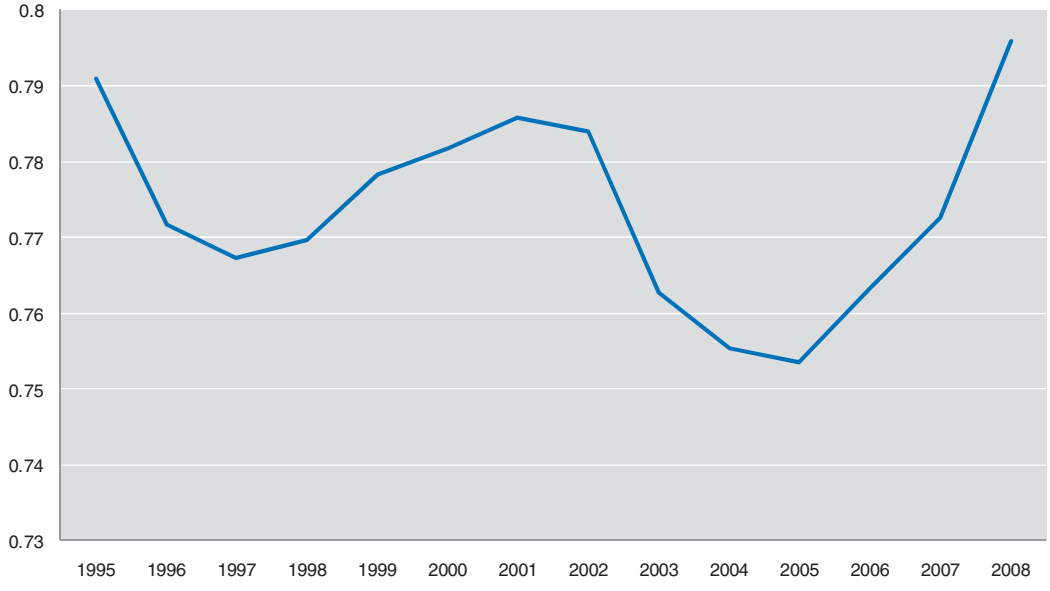


Note: The Sigma-convergence indicator is calculated using a standard deviation of logged values for the regions in a country.

Source: OECD calculations based on data from Quantec.

Figure 1.19. **Regional disparities at municipal level in South Africa, 1995-2008**

Sigma-convergence indicators using per capita GDP values at municipal level



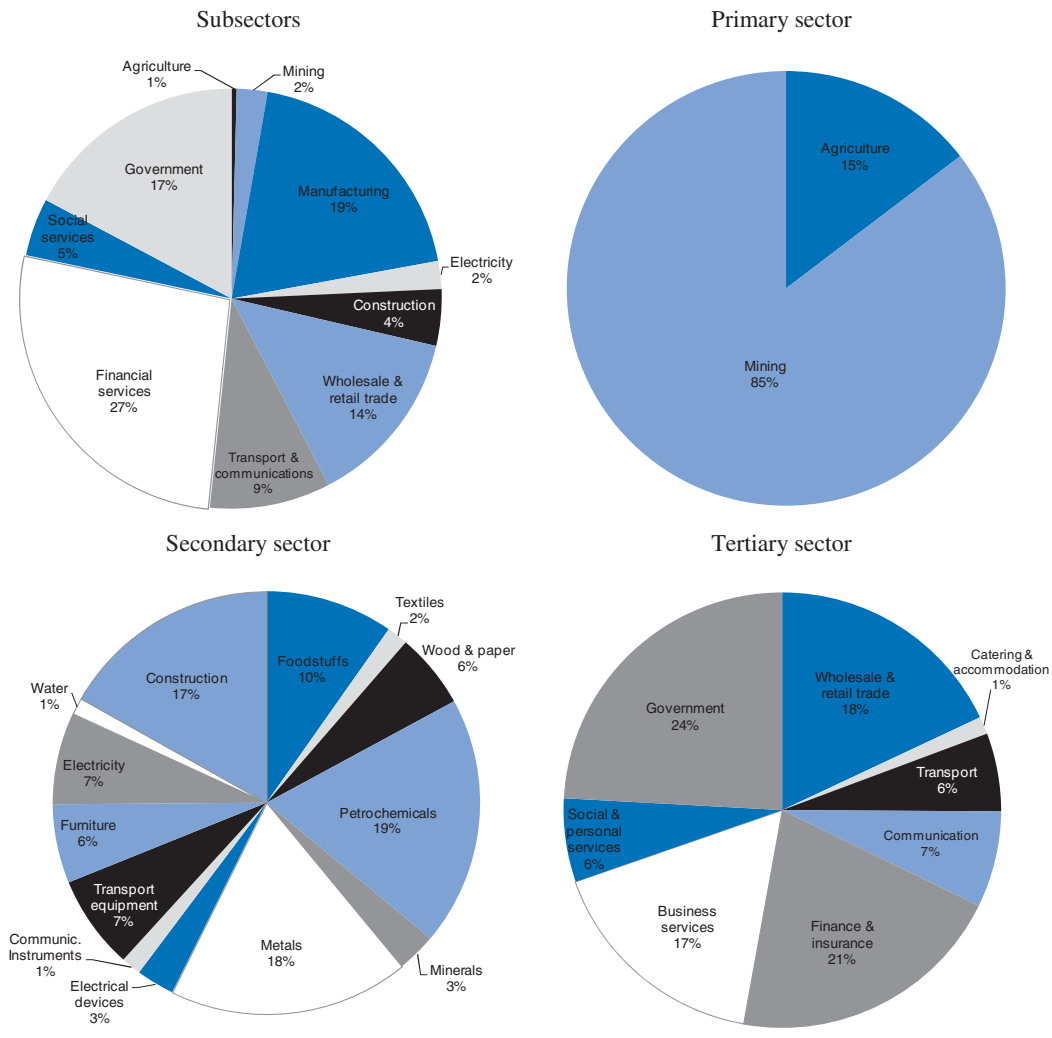
Note: The Sigma-convergence indicator is calculated using a standard deviation of logged values for the regions in a country.

Source: OECD calculations based on data from Quantec.

A diversifying economic structure concentrated in three cities

South Africa has undergone a dramatic structural change. Although Gauteng grew because it was one of the world's most important gold-mining centres, the tertiary sector now dominates the metropolitan economy, contributing 70% of GVA in 2009. The secondary sector contributed 25.3% in the same year, with construction in particular growing quickly, albeit off a small base. The relative growth of the tertiary sector has been accompanied by a steady decline in the weight of the primary sector. In 2009, mining and agriculture represented just over 3% of Gauteng's gross value-added (Figure 1.20). In the same period, almost 20% of GVA was in manufacturing, while financial services represented 27%. As the share of the economy going to finance and businesses services grew between 1995 and 2009, mining and agriculture have been relative losers over this period.

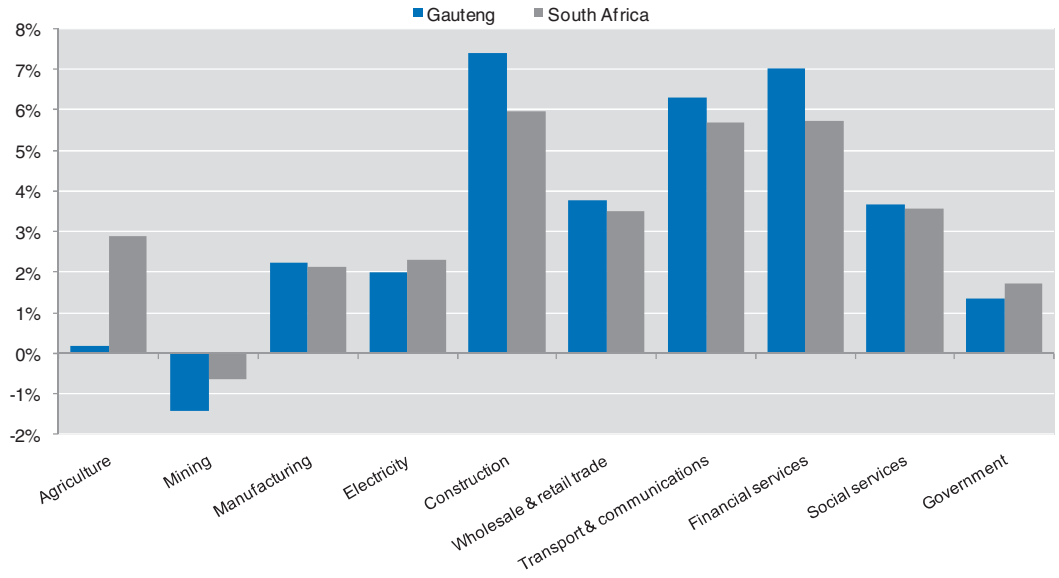
Figure 1.20. **Percentage of gross value-added by sector and subsector in Gauteng city-region, 2009**



Source: OECD calculations based on data from Quantec (2010).

Mining has radically declined in South Africa and Gauteng. While in 1990, gold represented 31% of South Africa's exports, by 2010 this had declined to 7%. Likewise, the number of gold miners declined from 481 178 to 159 745 over the same period. South Africa's share of world gold production has also fallen precipitously, from 67.7% in 1970 to 7.7% in 2009 (Nicol and Leger, forthcoming). Within Gauteng, the gross value added of mining fell at an average of 1.5% per year from 1995 to 2009, while GVA for agriculture remained stalled (Figure 1.21). Even while some subsectors such as manufacturing, electricity and government continue to grow in absolute terms, their expansion lags behind construction, as well as financial and business services. In fact, Gauteng has a higher than national-level GVA growth rate in all subsectors except for mining, agriculture, electricity and government.

Figure 1.21. **GVA annual growth rate for Gauteng and South Africa by subsector, 1995-2009**



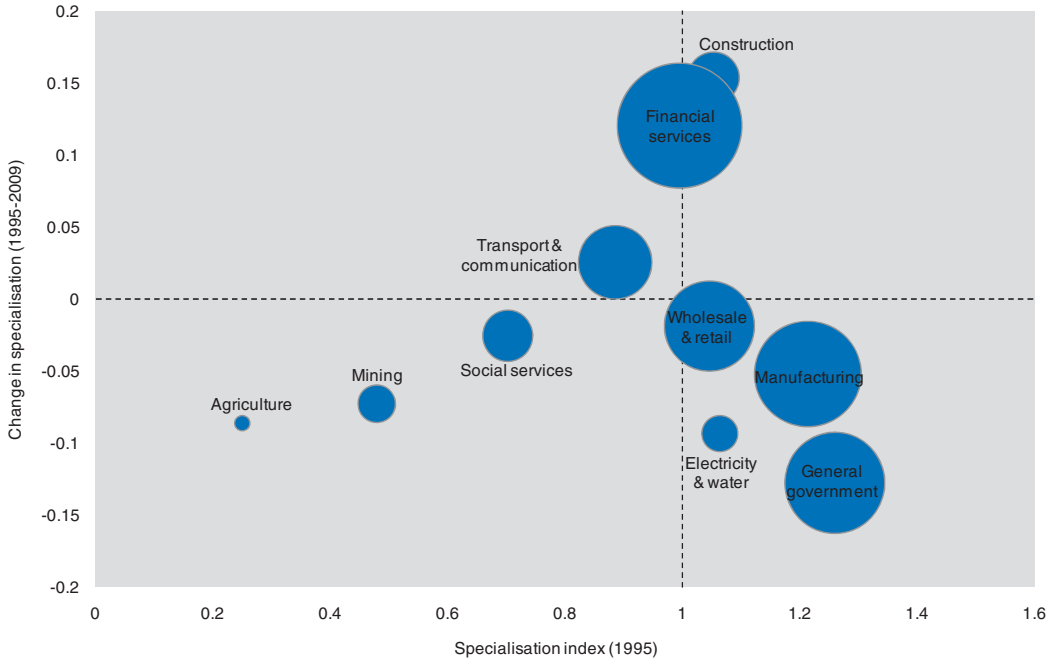
Source: OECD calculations based on data from Quantec (2010).

Such structural change has been fuelled by falling relative prices in manufacturing and international competition on tradables. As relative prices in manufacturing fell around 30% between 1970 and 2004, so did profits, and consequently incentives for firms to further invest in manufacturing. After the new democratic government took office and tariff barriers and trade embargoes were lifted, international competition intensified, leading to import competition and a decline in market shares by local companies.[15] As a result, manufacturing has increasingly been geared towards more capital-intensive activities, in which less unskilled and semi-skilled employment is needed. Consequently, in terms of employment, South Africa seems to have de-industrialised prematurely (Rodrik, 2006), and this has led to a dramatic change in its economic structure. By 2009, services contributed to 65.8% of GVA, followed by manufacturing (15.1%), and agriculture, forestry and mining (12.8%) (Figure 1.22). According to Golub (2000), South Africa's wage costs were competitive internationally but higher than most developing countries with which it competes for FDI and which are major exporters. By 1998, South Africa's wages stood at around one-fifth of those in Germany, Japan, the United Kingdom and the United States. Contrastingly, they were almost three times those in Indonesia, four times those in India and almost 50% higher than in Malaysia and Mexico (Golub, 2000). Although South Africa's wages are not growing as much as those

in other emerging economies, such as China, they are still accelerating more than in Mexico (Figure 1.23). High wages relative to competitors might have produced two non-mutually exclusive effects. First, they may deter investors from setting up operations in South Africa. Second, high wages might force companies to undertake capital deepening. As a result, workers may be required to attain upgraded skills that may not only push wages up but will require less workers. Alternatively, South Africa may not have de-industrialised prematurely, as Rodrik (2006) argues, but might have jumped a previous phase in industrialisation based on labour-intensive processes that help boost employment.

Figure 1.22. **Sectoral GVA dynamics in Gauteng, 1995-2009**

Change in GVA specialisation by sub-sector



Note: Bubble size denotes subsector size in terms of GVA. Specialisation is measured as $(lijt/Ljt)/(lit/Lt)$ where l is employment, i is industry, j is region and t is time. Thus, specialisation is the outcome of measuring employment shares in one industry i in region j compared to national industrial shares as a proportion of total national employment. Changes in specialisation refer to the percentage change in the value of specialisation in 2006 compared to that in 2000.

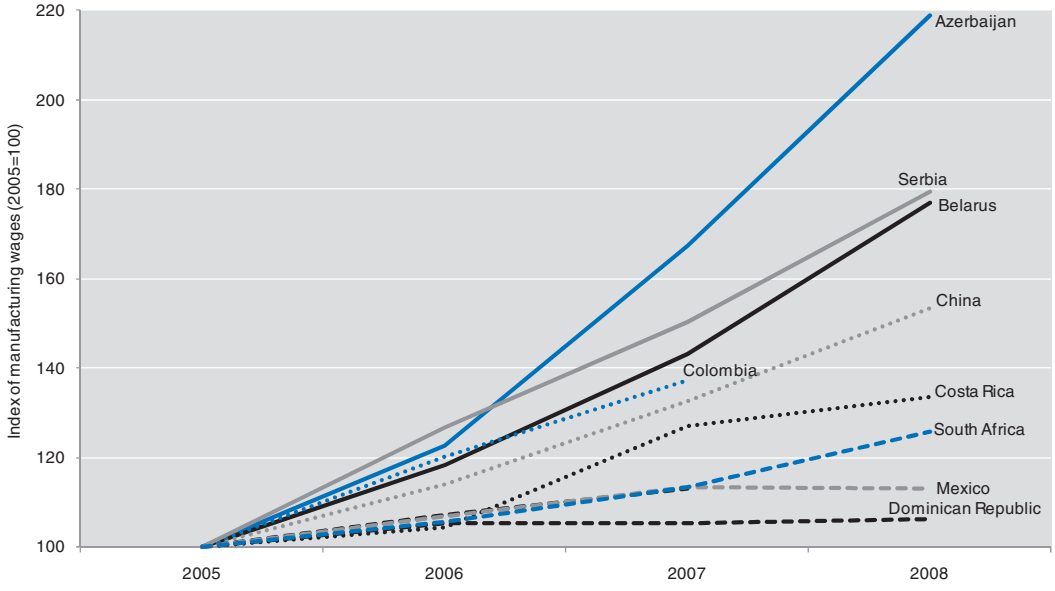
Source: OECD calculations based on data from Quantec.

However, the industrial shift has also brought about some diversification in the regional economy. Though the trade restrictions imposed during apartheid seem to have favoured a bias towards capital-intensive primary and manufactured commodities, the South African economy has slowly diversified and become less dependent on primary commodities. Diversification came rather late. In the early 1990s there was some re-orientation of South Africa's export basket, which created opportunities for further structural transformation (Hausmann and Klinger, 2006). After apartheid was dismantled, South Africa developed a comparative advantage in various iron and steel products, textile-related products, non-metallic mineral manufactures, specialised machinery,

organic chemicals, articles of pulp and paper, vegetables and fruits, petroleum products, metalliferous ores and metal scrap, oils and light perfume materials, and leather materials (OECD, 2008c). South Africa, however, has managed to create an economy where the structure of resource-based production is much more deeply embedded. Mining companies, for example, are active in creating new manufacturing technology and are supported by a vast number of companies in the services sector. In this sense, the South African resource-based economy appears to have more in common with earlier stages of the Scandinavian model of resource-intensive industrialisation than with Latin American and especially other African models (OECD, 2008c).

Figure 1.23. **Growth in manufacturing wages in South Africa and other emerging economies**

Manufacturing wages index (2005=100)

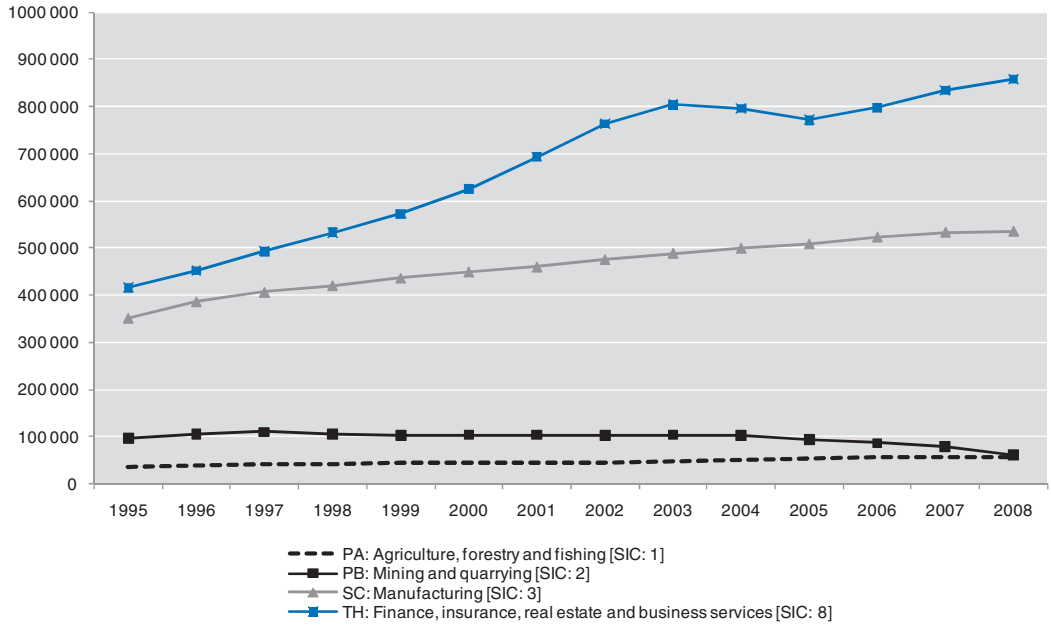


Source: International Labor Organization (2011).

This more diverse regional economy has at the same time become more concentrated in three municipalities within Gauteng. Johannesburg has contributed the most in all sectors, followed by Tshwane and Ekurhuleni. Economic output is overwhelmingly concentrated in these three metro-regions: in 2007, 88.6% of GVA resided in the three metropolitan municipalities, with its largest portion contributed by the city of Johannesburg, at 38.5%. The concentration level is up from 84.6% in 1995, illustrating a further agglomeration of productive capacity in the city-region's core. The city of Johannesburg contributed most in all of the sectors, with its tertiary sector making the largest contribution to the provincial economy at 50%. This is related to the fact that Johannesburg hosts the head offices of most of the major financial institutions, including the country's four main commercial banks. Ekurhuleni's largest contribution was in the secondary sector (driven by manufacturing) at 26.2% of the Gauteng city-region total. While Tshwane contributed 28.8% of the overall provincial tertiary sector, West Rand dominated in the primary sector because the district was historically the centre of mining in the province. Exports from the province are also concentrated in the city of Johannesburg and Ekurhuleni, which together made up more than 80% of total provincial exports for the period 1995-2008 (Gauteng Provincial Government, 2010).

Gauteng is consolidating its specialisation in financial services but its employment seems to be growing at a slower pace than national rates. Despite the fact that Gauteng is the financial centre of the country and employment in that sector is booming, the city-region is becoming less specialised in those activities because the activity is also thriving elsewhere in the country and Gauteng has increased its economic diversity. Nevertheless, provincial employment numbers in financial services doubled between 1996 and 2008, with particularly intense growth rates up to 2003. While there were an additional 442 084 jobs in financial services in 2008, other sectors contracted, most notably mining and quarrying which lost 36 756 jobs between 1996 and 2008 (Figure 1.24).

Figure 1.24. **Total employment evolution in Gauteng in select sectors, 1995-2008**



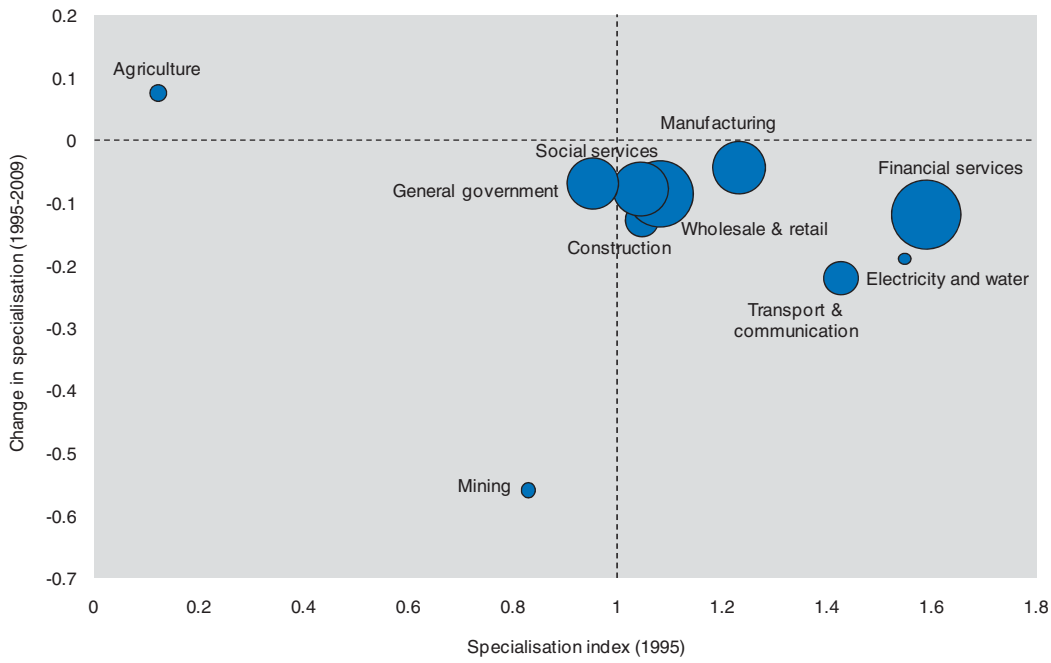
Source: OECD calculations based on data from Quantec.

Manufacturing employment has only recently grown and remains a key opportunity to boost employment, skills and equity in the province. In terms of GVA, Gauteng has been specialising in construction, financial services and transport (Figure 1.25). Other sectors have seen a decline in GVA specialisation indices, most notably in manufacturing, mining and government. Similarly, specialisation based on employment seems to be lagging behind growth at national level in almost all sectors (Figure 1.25). As specialisation indicators are measured in proportion to the national level, the fact that employment specialisation in almost all sectors has been slightly declining in Gauteng may signal the opening of new manufacturing and financial services centres elsewhere in South Africa. Manufacturing is an opportunity for Gauteng, as it can absorb labour supply, and the employment it provides given the technological level in the province could provide income for semi-skilled and unskilled workers. As jobs bring higher incomes, it becomes an equity-promoting tool for the unemployed and at the same time enhances skills through on-the-job training. Construction used to be an economic specialisation of Gauteng, but employment in the sector has grown less rapidly than national rates. A similar process has taken place in wholesale and trade. Specialisation changes in terms of both GVA and employment may well signal faster growth elsewhere

in the country. However, it may also signal a structural change in terms of the industrial processes being located in Gauteng. As every process becomes relatively more capital intensive, the use of unskilled and semi-skilled workers drops and thus specialisation indices fall. Such a change may also entail a spatial restructuring of the national economy, in which labour-intensive processes that yield greater job creation figures and boost employment-based specialisation indices relocate in less developed regions. Conversely, capital-intensive activities are being hosted in and around large metropolitan areas. As a result, employment absorption shrinks.

Figure 1.25. **Sectoral employment dynamics in Gauteng, 1995-2008**

Change in employment specialisation by sub-sector



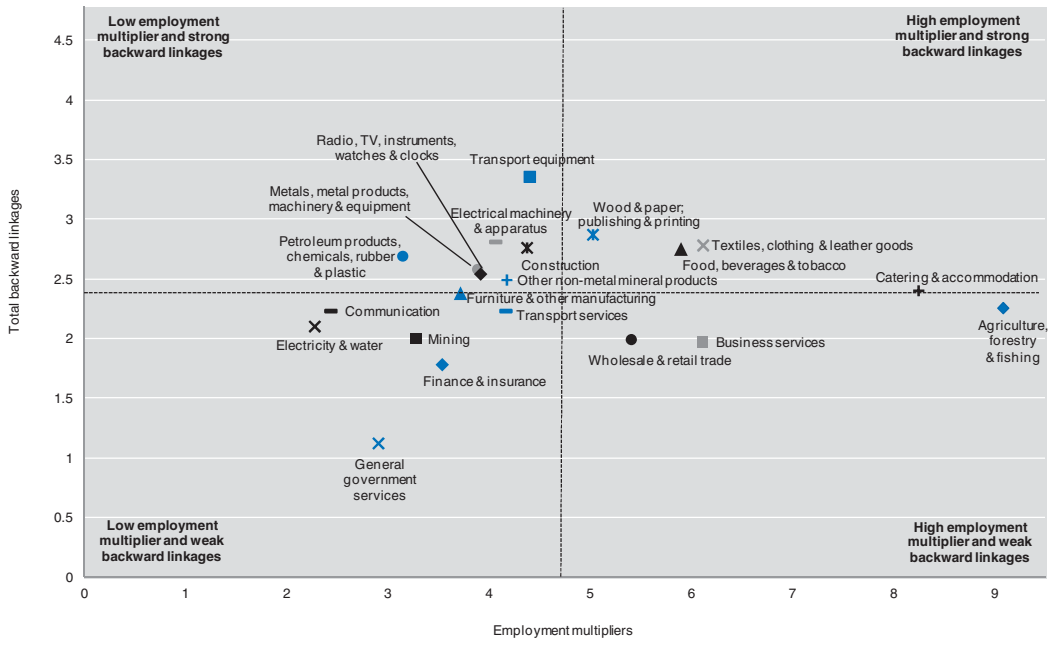
Note: Bubble size denotes subsector size in terms of employment. Specialisation is measured as (*Lijt*/*Ljt*)/(*Lit*/*Lt*) where *L* is employment, *i* is industry, *j* is region and *t* is time. Thus, specialisation is the outcome of measuring employment shares in one industry *i* in region *j* compared to national industrial shares as a proportion of total national employment. Changes in specialisation refer to the percentage change in the value of specialisation in 2006 compared to that in 2000.

Source: OECD calculations based on data from Quantec.

In addition to manufacturing, agriculture, services and construction can also contribute to job creation. According to the Corporate Strategy and Industrial Development Programme (CSID) study (2010), a ZAR 1 million increase in final demand for community, social and other personal services would generate 11 new jobs in activities that provide inputs for such services. This is followed by agriculture (9.08); catering and accommodation (8.25); textiles (6.12); business services (6.11); food, beverages and tobacco (5.90); and wholesale and retail trade (5.41). However, CSID (2010) notes that caution is warranted when interpreting these figures. An analysis of the institutional environment is needed taking account of factors that can limit the expansion of sectors owing to upstream restrictions and the lack of sensitivity to spatial factors, i.e. issues of transport and infrastructure.

The manufacturing sector has the largest backward linkages in the Gauteng economy and thus the potential for greater multiplier effects. Manufacturing, more than any other sector, is connected upstream to suppliers and thus facilitates a high number of backward linkages. For instance, an increase in manufacturing output will generate varying degrees of demand from the input of different sectors for use in their production processes. Sectors depend more on manufacturing demand for inputs than services. For example, value chain analysis suggests that a 1% increase in manufacturing's final demand for inputs stimulates the tertiary sector's intermediate output by 16.46%. Likewise, a 1% increase in manufacturing's final demand for inputs is correlated with a 35.86% increase in the intermediate output of the manufacturing sector itself and a 12.95% increase in intermediate output from the mining sector (Table 1.1). Accordingly, manufacturing has been referred to as "the centre of growth generation within the Gauteng economy" (CSID, 2010). It can also have effects in boosting exports and absorbing unskilled workers from agriculture and social services. Within the manufacturing sector, six sectors have both high employment absorption and high stimulatory power with respect to output, given their capital intensity. These high employment absorption/high output sectors include: transport equipment; wood and paper; publishing and printing; textiles, clothing and leather; food, beverages and tobacco; and other non-metal minerals (Figure 1.26).

Figure 1.26. **Backward linkages and employment multipliers in the Gauteng city-region, 2007**



Source: Corporate Strategy and Industrial Development Programme (2010), "The Development of an Industrial Policy for Gauteng Province", School of Economics and Business Sciences, University of the Witwatersrand, Johannesburg, preliminary report.

Table 1.1. **Direct backward linkages in Gauteng, 2007 (%)**

	Agriculture	Mining	Manufacturing	Electricity, gas, water	Construction	Tertiary
Agriculture	3.06	0.02	6.56	0.03	0.01	0.10
Mining	0.89	0.51	12.95	15.50	6.08	0.25
Manufacturing	29.39	14.53	35.86	7.31	0.29	10.81
Electricity, gas, water	0.98	2.46	1.22	15.49	0.29	0.90
Construction	0.26	0.31	0.00	3.17	18.25	0.95
Tertiary	16.35	24.32	16.46	9.37	13.42	31.38

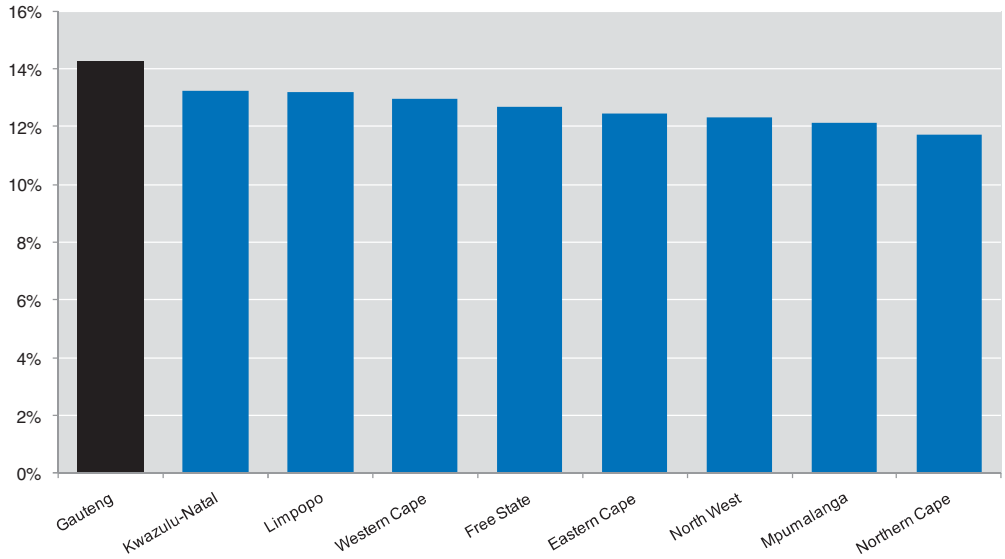
Source: Corporate Strategy and Industrial Development Programme (2010), "The Development of an Industrial Policy for Gauteng Province", School of Economics and Business Sciences, University of the Witwatersrand, Johannesburg, preliminary report.

Progress achieved and remaining gaps in education

Gauteng has increased its share of the number of adults with formal schooling and tertiary education and is the South African province with the highest share of high-skilled workers. High-skilled workers[16] in Gauteng represent 14% of all employed workers (Figure 1.27). This proportion rose in the period 2000-09 from 14.7% to 19.4%. According to the *General Household Survey* (2010), the proportion of adults lacking any formal schooling in Gauteng almost halved between 2002 and 2010, dropping from 4.5% to 2.9%. This is much lower than the national average, which dropped from 10.9% to 7.0% over the same period.[17] These figures suggest that the huge investment in education by the post-apartheid government has been paying off, although concern remains as to the quality of the education and the results achieved. Those who have completed schooling rose from 22.3% of the population aged 25 and over in Gauteng in 2000 to 30.7% in 2010. This compares with 25.4% of the national population 25 and over in 2010, according to the *Labour Force Survey* (2010).[18]

However, from an international perspective, South Africa is still far from OECD standards and ranks relatively low by comparison with successful emerging economies. Three international learning achievement assessments, namely, the Monitoring Learning Achievement (MLA) project, Trends in International Mathematics and Science Study (TIMSS) and the Southern and Eastern African Consortium for Monitoring Educational Quality (SAQMEC), indicate that South African children performed exceptionally poorly by comparison with those of the other countries that participated.[19] The MLA project was conducted in several African countries in 1999 and measured the competencies of Grade 4 learners in numeracy, literacy and life skills. Of the 12 participating countries, South Africa scored the lowest average in numeracy, the 5th lowest in literacy and the 3rd lowest in life skills (Table 1.2) (OECD, 2008c).

Figure 1.27. **Proportion of employed with higher education in South African provinces, 2008**



Source: OECD calculations based on data from Quantec.

Table 1.2. **Monitoring learning achievement scores for numeracy, literacy and life skills, 1999 (%)**

	Numeracy average	Literacy average	Life skills average
Botswana	51.0	48.0	56.0
Madagascar	43.7	54.7	72.1
Malawi	43.0	35.0	77.0
Mali	43.6	51.8	56.9
Mauritius	58.5	61.0	58.0
Morocco	56.4	67.6	62.3
Niger	37.3	41.1	44.7
Senegal	39.7	48.9	45.7
South Africa	30.2	48.1	47.1
Tunisia	60.4	77.9	74.7
Uganda	49.3	58.7	66.8
Zambia	36.0	43.0	51.0

Source: Chinapah, V. (2000), *With Africa for Africa: Towards Quality Education for All*, Human Sciences Research Council, Pretoria; Strauss, J. and M. Burger (2000), *Monitoring Learning Achievement Project*, Department of Education, Pretoria, cited in OECD (2008), *OECD Reviews of National Policies for Education: South Africa 2008*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264053526-en*.

Gauteng's relatively poor performance compared to similar economies lies in a polarisation of educational opportunities. Only 11.8% of Black Africans 25 years and older attained tertiary education in 2010, while for whites, the proportion was some four times higher, at 42.2%. While 61% of Gauteng's Black Africans had some secondary schooling or had actually completed secondary education in 2004, the best hope one-third of them could have was to complete primary schooling. The problem is most acute in the Metsweding municipality, where around one-third of the population aged 20 and over had either no formal schooling or incomplete primary education. Desertion after completing primary education also undermines educational attainment. Only between 4.2% of students (Tshwane) and 7.4% (West Rand) completed primary and did not attain further

education in 2001. In Gauteng, 11.2% of the population over 20 had some primary education, but did not complete primary school (Statistics South Africa, 2006, based on *Statistics South Africa, Population Census 2001*).

The problem in Gauteng is not only insufficient tertiary education, polarised opportunities for higher education and the absence of or incomplete primary schooling, but also the skills mismatch in the labour market. Deficiencies in education and training contribute to this problem. As in many other countries, years of education and the probability of being unemployed are highly correlated in South Africa, but the discrepancy between employment probabilities for those at the lower and upper ends of the skill distributions is particularly large. A common thesis is that in a world of skill-biased growth, South Africa has failed to improve education and training sufficiently to allow the skills of the labour force to keep pace with demand. At the same time, Gauteng residents are probably not equipping themselves with the skills demanded in the marketplace. According to the Gauteng Provincial Government (2009a), in 2008, almost 30% of the demand for skills in South Africa was in mining, construction and engineering, and only 12% of degrees in Gauteng were in those fields (Statistics South Africa, 2006). In contrast, demand for banking and finance skills dropped between 2005 and 2008 from 16% to 12%, but Gauteng students still favour business and management degrees (which account for 23.3% of all provincial degrees). The greatest increase in demand was experienced in IT and telecommunications, rising from 4% to 17% of skills demand over the same period (Gauteng Provincial Government, 2009a). Yet, only 8% of all provincial degrees are related to IT (Statistics South Africa, 2006). Nevertheless, the gaps in high-level skills do not take into account skills that will address the high unemployment rate that the country and the province faces, such as welding, plumbing, building, etc. Data are not currently available to show skills by occupation, especially in medium- to low-skilled jobs.

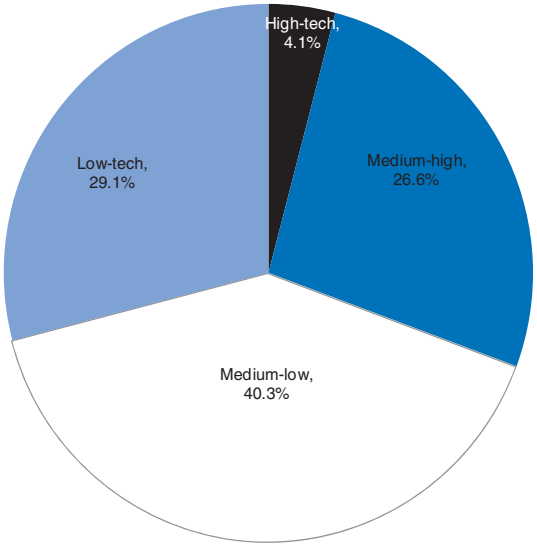
Africa's manufacturing and innovation hub despite low entrepreneurship and SME activity

Mining and natural resources' contribution to South Africa's GDP has dropped in the past two decades, but the Gauteng city-region has developed assets in manufacturing and a large services sector that require research and development (R&D) and innovation in its broadest sense. This section will first review the city-region's diverse asset base in manufacturing and innovation capacity. In light of its need to create and exploit new products, processes and services in order to become a competitive, socially cohesive, global player (Gauteng Provincial Government, 2009c), the second part of the section will present a number of deficiencies of its innovation and R&D systems. Gauteng's technological structure does not appear to be moving fast enough towards forms of production that are knowledge intensive, raise productivity and generate higher income. This is exacerbated by low levels of entrepreneurship by comparison with both advanced and developing countries. South Africa's National Research and Development Strategy (Government of the Republic of South Africa, 2002) identified key weaknesses in the national innovation system, all of which apply to Gauteng. These include: *i)* the need to maintain a super-critical R&D community, in support of strategic needs and to generate national absorptive capacity; *ii)* a failure to renew human resources for science and technology, as the predominantly white male research community is ageing and not being replaced in sufficient numbers; and *iii)* declining investments in formal R&D by South African companies.

Gauteng's manufacturing assets

The Gauteng city-region has a manufacturing profile of medium-high, medium-low, and low-tech industries, without much capacity for high-tech. Applying the OECD classification of manufacturing industries based on technology, Gauteng's industry is led by medium-low tech (ZAR 33.06 billion or 40.3% of total) and followed by low-tech (ZAR 23.8 billion or 29.1%), medium-high (ZAR 21.8 billion or 26.6%), and lastly, high-tech (ZAR 3.3 billion or 4.1%) (Figure 1.28). At 41%, Ekurhuleni has the highest manufacturing turnover overall (ZAR 33.4 billion) as well as the highest medium-high tech (ZAR 10.6 billion) which represents 48% of that technological segment. Located in the centre-west part of the province, Ekurhuleni also accounts for 46% of all medium-low tech (ZAR 15.3 billion) manufacturing turnover in the Gauteng region and ranks second in high-tech (26%) (Table 1.3). With 35% of the provincial total, the Johannesburg municipal area has Gauteng's second-largest turnover in manufacturing, but with nearly half of all turnover in the high-tech segment, it has become the greatest high-tech concentration in the province (ZAR 1.6 billion). Paradoxically, Johannesburg also has the largest share of low-tech manufacturing (ZAR 1.4 billion or 48%) in the province. Tshwane has ZAR 740 million in high-tech manufacturing turnover, comparable with Ekurhuleni's ZAR 885 million. Tshwane, however, has roughly only one-third of total manufacturing turnover of either Johannesburg or Ekurhuleni. Four municipalities have between ZAR 25 million and ZAR 45 million in high-tech turnover (Emfuleni, Kungwini, Midvaal and Mogale City), while five municipalities register no high-tech manufacture at all (Lesedi, Merafong, Nokeng tsa Taemane, Randfontein and Westonaria). High-tech manufacturing only generates 4.1% of the total turnover in Gauteng (Figure 1.28).[20]

Figure 1.28. **Share of manufacturing in Gauteng by technological level, 2008**



Source: OECD based on AfriGIS and Matrix Marketing Bizmaps/Prospector Database & CeSTII, compiled in Rumbelow, J. et al. (2010), "Background Report on Innovative Capacity and R&D for Gauteng Region OECD Territorial Review", mimeo.

Table 1.3. **Manufacturing turnover by technology class in Gauteng municipalities, 2010**

(% share)

	Manufacturing technology class (OECD)			
	High-tech	Medium-high	Medium-low-tech	Low-tech
Ekurhuleni	2.56	31.64	45.68	20.12
Emfuleni	1.06	17.55	61.52	19.87
Johannesburg	5.65	24.32	30.40	39.64
Kungwini	3.65	9.49	42.34	44.53
Lesedi	0.00	20.27	35.14	44.59
Merafong City	0.00	55.36	35.71	8.93
Midvaal	3.36	18.28	60.82	17.54
Mogale City	0.82	21.35	55.34	22.50
Nokeng tsa Taemane	0.00	4.76	52.38	42.86
Randfontein	0.00	18.22	49.80	31.98
Tshwane	7.11	23.16	37.15	32.58
Westonaria	0.00	16.00	60.00	24.00

Source: AfriGIS and Matrix Marketing Bizmaps/Prospector Database & CeSTII (May 2010 release), compiled in Rumbelow, J. et al. (2010), "Background Report on Innovative Capacity and R&D for Gauteng Region OECD Territorial Review", mimeo.

In terms of employment generation, data suggests relative manufacturing strength in generating turnover per employee in medium-low-tech manufacturing industries.[21] High-tech manufacture supplies only 4.29% of manufacturing jobs in Gauteng, while medium-high (33.63%), medium-low (29.57%) and low-tech (32.51%) supply the lion's share of the 844 000 manufacturing jobs. No Gauteng municipality draws the majority of its manufacturing employees from high-tech manufacturing (as per the OECD definition of high-tech) (Table 1.4). Interestingly, medium-low-technology manufacturing generates substantially more turnover per employee (ZAR 133 000) than any other OECD manufacturing technology class. In fact, all other tech classes are below the average (ZAR 97 000). Gauteng has relative manufacturing strength in generating turnover per employee in medium-low-tech manufacturing (Table 1.5). This particularly includes the following industries: rubber and plastics products, coke and refined petroleum products, other non-metallic mineral products, and basic metals and fabricated metals products.

Table 1.4. **Gauteng municipal manufacturing employees by OECD technology class, 2010**

	Manufacturing technology class (OECD)				
	High-tech	Medium-high	Medium-low	Low-tech	All manufacture
Ekurhuleni	14 098	47 712	99 469	128 041	289 320
Emfuleni	84	1 648	2 580	23 834	28 146
Johannesburg	17 271	193 707	85 192	83 345	379 515
Kungwini	87	1 104	567	2 102	3 860
Lesedi	0	593	267	370	1 230
Merafong City	0	95	531	362	988
Midvaal	116	1 579	1 115	5 253	8 063
Mogale City	91	3 376	3 124	10 283	16 874
Nokeng tsa Taemane	0	104	5	161	270
Randfontein	0	5 780	1 286	2 710	9,776
Tshwane	4 416	27 948	55 225	17 184	104 773
Westonaria	0	80	70	597	747
Total	36 163 (4.29%)	283 726 (33.63%)	249 431 (29.57%)	274 242 (32.51%)	843 562 (100.00%)

Source: AfriGIS and Matrix Marketing Bizmaps/Prospector Database & CeSTII (May 2010 release), compiled in Rumbelow, J. et al. (2010), "Background Report on Innovative Capacity and R&D for Gauteng Region OECD Territorial Review", mimeo.

Table 1.5. **Turnover per employee per OECD manufacturing class, 2010**

Manufacturing technology class (OECD)				
High-tech	Medium-high	Medium-low	Low-tech	Manufacturing average
92 220	76 869	132 562	86 912	97 260

Source: AfriGIS and Matrix Marketing Bizmaps/Prospector Database & CeSTII (May 2010 release), compiled in Rumbelow, J. et al. (2010), "Background Report on Innovative Capacity and R&D for Gauteng Region OECD Territorial Review", mimeo.

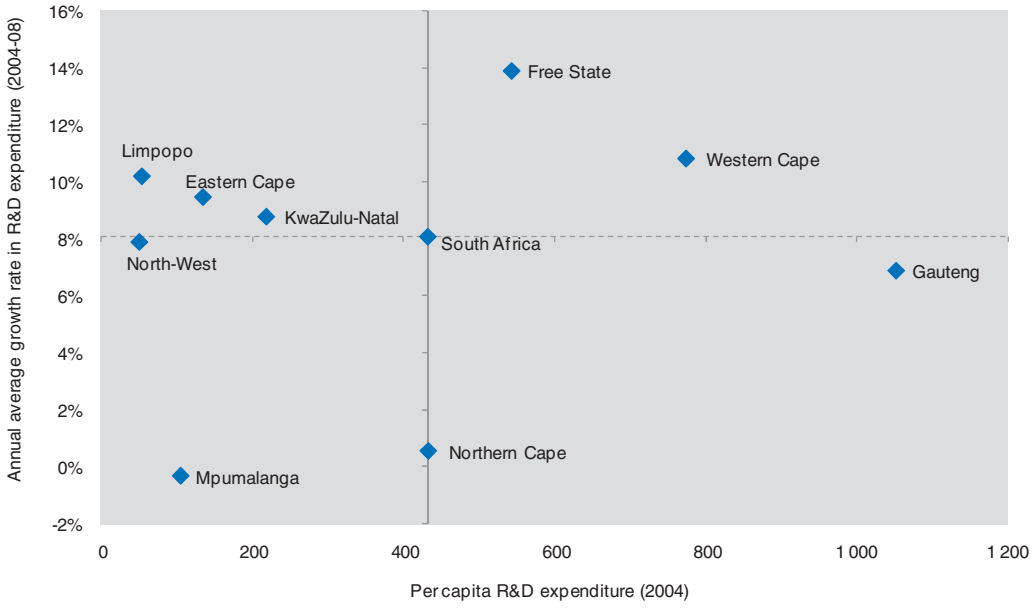
Gauteng's R&D profile

Although Gauteng is South Africa's innovation hub, recent growth in R&D expenditure shows a slowdown compared to the national level. The Gauteng city-region is South Africa's leader in R&D, accounting for 52.2% (ZAR 11 billion) of the total national R&D expenditure in 2008-09.[22] Trends are also positive in growth of R&D expenditure, though they are slightly behind the national rates. On average, Gauteng's real annual growth rates stood at 6.8%, slightly lower than the 8.1% achieved nationally from 2004-08 (Figure 1.29). In 2008, Gauteng's R&D as a percentage of GDP rose from 1.42% to 1.45%, which compares with the OECD regional average of 1.58%, a figure nonetheless below the 3% target set by the European Union in the Lisbon Agenda.

Within South Africa, considerable R&D infrastructure is concentrated in Gauteng, though the contribution from higher education is low when compared to OECD regions. In 2008-09, Gauteng was the province with the highest per capita R&D expenditure. At ZAR 1 051, Gauteng's per capita expenditure in R&D was more than double the South African average (ZAR 432), far above the next in line, the Western Cape (ZAR 773) (for Science, Technology and Innovation Indicators, 2010 National R&D Survey). In 2009, the business sector[23] in Gauteng was the leading contributor to R&D (64.9%), followed by science councils (18.1%), higher education (13.4%), government (2.4%), and the not-for-profit sector (1.1%) (Table 1.6). The large share of R&D provided by businesses places Gauteng in the category of entrepreneurial Catalonia (65.0%),

Ontario (62.0%) or New York state (67.1%). Between 2008 and 2009, business services that included engineering services drew the largest share of R&D (ZAR 892 million or 39.2%) in the high-tech services sector, with computer and related services (26.6%) and financial services (23.7%) following thereafter. Gauteng's infrastructure includes eight universities, nine science councils and considerable private sector infrastructure.[24]

Figure 1.29. **Provincial R&D expenditure, 2004-08**



Source: Centre for Science, Technology and Innovation Indicators (2004), *South African National Survey of Research and Experimental Development (R&D), 2001/02*, Department of Science and Technology of South Africa, Pretoria; Centre for Science, Technology and Innovation Indicators (2010), *South African National Survey of Research and Experimental Development (R&D), 2008/2009*, Department of Science and Technology of South Africa, Pretoria; Statistics South Africa (2004), "Mid-year Population Estimates", GDP, Statistics South Africa, Pretoria.

Table 1.6. **Distribution of R&D by sectors: Gauteng (2009) and OECD regional average (2007)**

	Business enterprise	Government and science councils	Higher education	Not-for-profit
Gauteng	64.9%	20.5%	13.4%	1.1%
OECD regional average	59.4%	14.4%	24.8%	1.3%

Note: Government contribution includes Gauteng's science councils. These include nine statutory bodies: the Africa Institute of South Africa, the Council for Minerals Technology (Mintek), the Agricultural Research Council (ARC), the Human Sciences Research Council, the National Research Foundation, the Medical Research Council (MRC), the Council for Geoscience, the South African Bureau of Standards and the Centre for Scientific and Industrial Research. Science council R&D infrastructure is made up predominantly of the CSIR (1 071.4 FTE researchers in 2008-09), the ARC (111.6), the MRC (99.6), Mintek (69.2) and the Council for Geoscience (54.4) sharing the majority of full-time-equivalent researchers in 2008-09.

Source: Department of Science and Technology of South Africa (2010), *South African National Survey of Research and Experimental Development (R&D) 2008/9*, Human Sciences Research Council, Pretoria. Conducted by the Centre for Science, Technology and Innovation Indicators (CeSTII) within Human Sciences Research Council (HSRC), compiled in Rumbelow, J. et al. (2010), "Background Report on Innovative Capacity and R&D for Gauteng Region OECD Territorial Review", mimeo.

Gauteng is a centre of higher-level education in the country, and higher education R&D infrastructure is concentrated at the University of Pretoria, the University of the Witwatersrand, the University of South Africa, and the University of Johannesburg.[25] The University of Witwatersrand and the University of Pretoria are the two leaders in terms of full-time researchers and total R&D expenditure (Table 1.7). Gauteng's universities attract a considerable number of students from within South Africa and from other African countries. After migrating to South Africa for their studies, many students stay on afterwards. Overall, Gauteng provides over 40% of tertiary education in South Africa.

Table 1.7. **Total R&D expenditure and researcher full-time equivalents (FTEs) at Gauteng-based higher education institutions, 2007 and 2009**

Universities	Student enrolment	Total R&D expenditure (ZAR)		Researcher FTE only	
	2009	2009	2007	2009	2007
University of Pretoria	57 409	551 344 000	333 265 000	360.1	540.02
University of the Witwatersrand	28 204	616 702 000	534 984 000	263.8	248.0
University of Johannesburg	55 700	128 455 000	148 781 000	147.3	150.2
University of South Africa	250 000	146 730 000	131 405 000	235.2	259.1
Tshwane University of Technology	60 000	55 076 000	74 439 000	70.5	91.5
Vaal University of Technology	17 000	19 113 000	16 128 000	29.0	22.0
Monash University (private)	59 925	13 358 000	9 210 000	21.2	20.4
Total	528 328	1 530 778 000	1 248 212 000	1 127.1	1 151.6
Other[1]		73 066 730	77 582 060	64.4	96.6

Notes: Not including postdoctoral and PhD students. Researchers do not include technicians and other personnel directly supporting R&D.

1. Denotes collective R&D of other HEIs in Gauteng, where institutions are not predominantly Gauteng-based. Provincial R&D expenditure is used to approximate FTEs in the category "Other". 2. This FTE outlier is revised to 360.4 FTEs when contributing to the total and can be ascribed to a change in the survey respondent at the institution and where the following year measurement was correct.

Source: Department of Science and Technology of South Africa (2010), *South African National Survey of Research and Experimental Development (R&D) 2008/9*, Human Sciences Research Council, Pretoria. Conducted by the Centre for Science, Technology and Innovation Indicators (CeSTII) within Human Sciences Research Council (HSRC), compiled in Rumbelow, J. et al. (2010), "Background Report on Innovative Capacity and R&D for Gauteng Region OECD Territorial Review", mimeo.

The expansion of innovative capacity throughout the economy would benefit from a considerable expansion of university research, given the ageing of university researchers and the limited ability of the human resource pipeline to deliver replacements for them. Though South Africa's Department of Trade and Industry has recognised the need to develop a new SME-centred mechanism in universities, non-university higher education institutes and polytechnic research institutes have played a less important role. This runs counter to the experience of many OECD member countries, where non-university centres provide hands-on training in production and business administration required to tackle the needs of small firms (OECD, 2007).

The effectiveness of the overall innovation system over the next decade will depend on the depth and diversity of innovation capabilities that are accumulated by, and deployed in, business enterprises. Over-emphasis on the public contribution to innovation should be avoided, given that the business sector has been the highest performing sector for R&D in the Gauteng city-region. Business enterprises play major roles in turning knowledge into improved livelihoods, higher incomes and public services delivered, but

also in generating the knowledge and human capital to undertake those tasks (OECD, 2007). Between 2008 and 2009, business sector R&D expenditure in Gauteng amounted to ZAR 7.1 million, 57.8% of the national business sector R&D. The highest share of business sector R&D in Gauteng (2008-09) was carried out by the electricity, gas and water supply sector (31.6%), followed by financial intermediation, real estate and business services (28.4%). Manufacturing came in third (25.6%) (Table 1.8).

Table 1.8. **Gauteng business expenditure on R&D by SIC code, 2008-09**

SIC classification	ZAR (thousands)	%
10000 Agriculture, hunting, forestry and fishing	33 518	0.5
20000 Mining and quarrying	361 209	5.1
30000 Manufacturing	1 828 150	25.6
Manufacture of food products, beverages and tobacco products	71 948	1.0
Manufacture of textiles, clothing and leather goods	1 134	0.0
Manufacture of wood and products of wood and cork, except furniture Manufacture of articles of straw and plaiting materials Manufacture of paper and paper products Manufacture of publishing, printing and reproduction of recorded material	58 012	0.8
Manufacture of refined petroleum, coke and nuclear fuel Manufacture of chemicals and chemical products (including pharmaceuticals) Manufacture of rubber and plastic products	581 146	8.1
Manufacture of non-metallic mineral products	102 288	1.4
Manufacture of basic metals, fabricated metal products, machinery and equipment Manufacture of office, accounting and computing machinery	138 754	1.9
Manufacture of electrical machinery and apparatus	145 995	2.0
Manufacture of radio, television and communication equipment and apparatus Manufacture of medical, precision and optical instruments, watches and clocks	228 241	3.2
Manufacture of transport equipment	444 079	6.2
Manufacture of furniture, recycling, manufacturing not elsewhere classified	56 555	0.8
40000 Electricity, gas and water supply	2 252 374	31.6
50000 Construction	2 746	0.0
60000 Wholesale and retail	92 148	1.3
70000 Transport, storage and communication	367 810	5.2
80000 Financial intermediation, real estate and business services	2 023 904	28.4
90000 Community, social and personal services	169 551	2.4
Total	7 131 411	100.0

Note: In data collected for this table, a single firm can assign its R&D to several industrial codes according to the R&D performed.

Source: Department of Science and Technology of South Africa (2010), *South African National Survey of Research and Experimental Development (R&D) 2008/9*, Human Sciences Research Council, Pretoria. Conducted by the Centre for Science, Technology and Innovation Indicators (CeSTII) within Human Sciences Research Council (HSRC), compiled in Rumbelow, J. et al. (2010), "Background Report on Innovative Capacity and R&D for Gauteng Region OECD Territorial Review", mimeo.

Though businesses' contribution to R&D is high in Gauteng, the innovative activity of business enterprises does not rest solely on R&D. Various kinds of design, engineering and associated management activities are critically important, and in many firms, it is these resources alone that support innovation and form the base from which more formally organised R&D emerges. Business enterprises are important as creators of human capital for the innovation system, not simply as employers of human resources.

An important locus for the creation of such human resources is in association with imports of technology for large projects and foreign direct investment (FDI).[26]

Though the bulk of R&D is performed by the business sector, public R&D is substantial in Gauteng and includes higher education, national and provincial government departments, public research institutions, museums and science councils. In 2008-09, the total R&D expenditure by the science councils in South Africa amounted to ZAR 3.13 billion, and the portion spent in Gauteng amounted to 61.2% of the national total. The science councils had a total of 1 476.2 researcher FTEs, which is a higher number than the figure recorded for FTE researchers in Gauteng's universities (1 126.5). Though total R&D expenditure in Gauteng's universities rose by 22.7% between 2007 and 2009,[27] the number of FTEs in Gauteng increased only marginally (2.2%) over the same period when compared to the 34.9% increase in FTEs at science councils (Centre for Science, Technology and Innovation, 2010). Recent initiatives point to collaboration between science councils and universities through the establishment of centres of excellence (CoE) based in Gauteng universities (Box 1.4).

Box 1.4. **Centres of excellence in Gauteng: collaboration between universities and public science councils**

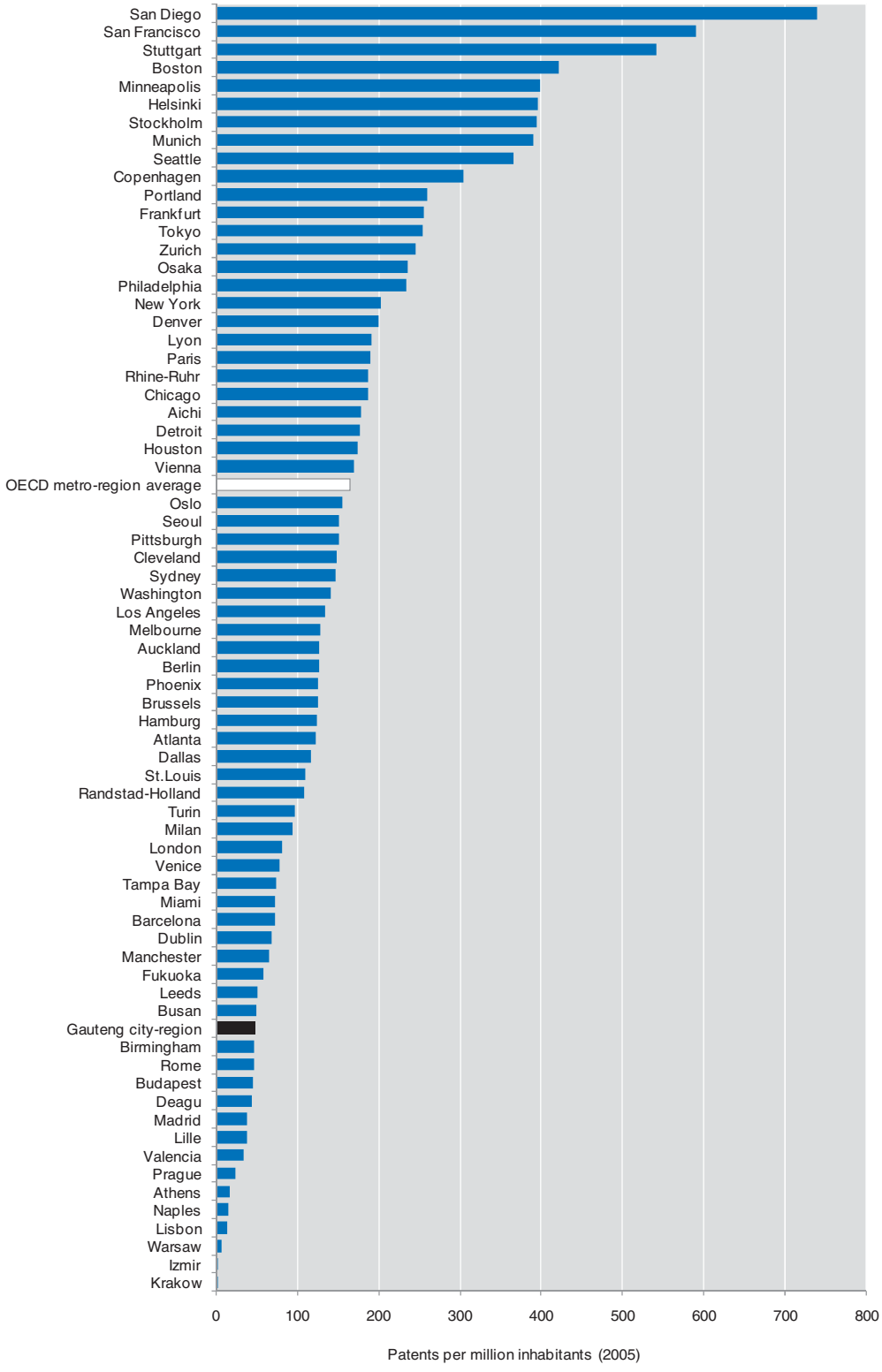
The Department of Science and Technology/National Research Foundation (DST/NRF) Centre of Excellence in Strong Materials (CoE-SM) is a major South African Research Network hosted by the University of the Witwatersrand, in partnership with the Nelson Mandela Metropolitan University, the Universities of Johannesburg, KwaZulu-Natal and Limpopo, the Council for Minerals Technology (Mintek) and the Nuclear Energy Corporation of South Africa (NECSA). The focus of this initiative is to enable researchers to collaborate across disciplines on long-term projects that are locally relevant and internationally competitive. There are more than 30 researchers and over 80 postgraduate students active in the centre from a number of disciplines, including physics, chemistry, ceramics, metallurgy, chemical and mechanical engineering. The focus of the centre is on propulsion, aerostructures, platforms to stimulate the development of breakthrough technologies and concepts enabling step changes in aviation.

The Centre of Excellence in Tree Health Biotechnology (CTHB) at the Forestry and Agricultural Biotechnology Institute (FABI) represents one of seven designated science centres supported by the DST/NRF. CTHB research concentrates on the health of native trees, particularly those in forests, and it has both a national and international perspective. A core focus is to provide the highest possible quality of postgraduate education in fields such as plant pathology, entomology, biochemistry, genetics, molecular biology, biotechnology and ecology.

Source: Gauteng City-Region Observatory (2010), "Background Report for OECD Gauteng Territorial Review", 25 October version.

As a result of the investment in R&D, the Gauteng city-region generated the majority of patents in South Africa (57% in 2004), although it ranks in the bottom quartile of OECD metro-regions. Gauteng's leading patenting sectors were machinery and equipment (171 patents), furniture (60 patents), fabricated metal products (45 patents) and chemicals (39 patents). Gauteng's level of patent applications per million inhabitants stands at approximately 49 patents, placing it in the league of Leeds, Busan, Birmingham, Rome and Budapest (Figure 1.30).

Figure 1.30. **Patents in OECD metro-regions and in the Gauteng city-region, 2005**



Source: *OECD Metropolitan Database*. Data for the Gauteng city-region derives from Lorentzen, J. (2007), "Regional and Local Innovation Systems", unpublished study for the National Advisory Council on Innovation.

Obstacles to innovation in the Gauteng city-region

Given Gauteng's dual position as the innovation hub of South Africa and the host of the largest concentration of informal settlements and impoverished residents in South Africa, the innovation system could better meet the needs of low-income earners. Additional attention could be focused on the needs of small and medium-sized enterprises (SMEs), especially those in low-income and migrant communities. Overall, the innovation system has not adequately addressed a series of items that interface with this Review, namely affordable and environmentally friendly building designs, affordable and adequate public transport, more extensive services, and improved waste management. While it is generally understood that scientific excellence in universities, alongside strong innovative activity in larger firms, is an important basis for vibrant sectors of knowledge-intensive activities operating at the technological frontier, it is less clear how Gauteng's innovation system can contribute to the aims of widespread black economic empowerment and massive expansion of employment, especially for unskilled and semi-skilled workers.

Innovation in South Africa is hampered by low levels of entrepreneurial activity, when compared to both advanced and developing countries. The low level of start-up and survival of firms, particularly SMEs, in South Africa stems from a combination of lack of access to commercial finance, high interest rates and under-developed skills. In particular, the highly concentrated market structure dominated by established businesses tends to be associated with lower output and employment and higher prices in the affected sectors. The Global Entrepreneurship Monitor (GEM), an international survey of business start-up activity, reports that South Africa's total early-stage activity rate was 5.9% in 2009. In other words, 5.9% of South African adults between the ages of 18 and 64 own and manage a start-up business (less than 3.5 years old). This rate compares poorly with Brazil (15.3%), Uganda (33.3%), Peru (20.9%), Algeria (16.7%), China (18.8%), and the average for low- to middle-income countries (14.8%). The prevalence rates for established business owner-managers are particularly disturbing. In terms of established business activity, i.e. the ownership and management of an established business that has survived for more than 3.5 years, South Africa ranked last out of the 54 countries, with an established business rate of only 1.4%. The average for all GEM countries is 7.7% while that for all efficiency-driven countries is 7.9%, almost six times the rate for South Africa (Herrington et al., 2010). Equally disturbing, this number has dropped from a rate of 2.3% in 2008, which "reconfirms that the prognosis for survival and sustainability of early-stage businesses in South Africa remains poor" (Herrington et al., 2010).

Innovation research in South Africa and Gauteng illustrates a growing, though still insufficient and highly domestic number of partnerships and inter-firm linkages. Partnerships often help companies take more significant innovation risks, for example by providing them with an initial customer or a "beta-test partner" for an innovation. The degree to which firms innovate in partnership with other companies is an indicator of the extent to which they are embedded in supply chains. In South Africa, innovators responding to the 2001 survey[28] (Oerlemans et al., 2003), had domestic company partners in only 18% of cases (compared with 26% in the European Union), but had foreign partners in 26%. This reinforces the impression that much technology is acquired from abroad. It suggests scope for increasing the number and quality of inter-firm linkages within as well as outside South Africa (OECD, 2007). The only information available for firms collaborating on the Gauteng city-region level is a sample of 65 R&D performing companies in the *National R&D Survey 2008-09*. The count of firms collaborating with South African partners on R&D indicated that pharmaceutical manufacture (7) and

business and financial services (5) had the highest number of local R&D collaborations, followed by the manufacture of food and beverage products (4). This information, however, is probably not representative of the economic complexity of the Gauteng city-region, given the low sample size.

As perceived by business leaders, the failure of firms to innovate in South Africa stems from a combination of lack of funding, qualified personnel, and a market dominated by established businesses. According to the results of the *National Innovation Survey 2002-04*, 26.2% of all enterprises indicated that developing innovative activities within their enterprises was hampered or restrained because the market was already dominated by established enterprises. The second most cited factor was a lack of funds within the enterprise (25.3%), and the third was that the costs of innovation were perceived to be too high (20.4%) (Table 1.9). The responses to the South African survey are again in some ways stereotypical: small firms are always short of money, though many South African firms may be particularly so. Small firms are normally under pressure and lack the capacity to devote time, funding and staff to urgent projects. However, the lack of capacity suggested by the "shortage of staff" responses points to a need to raise the number and proportion of innovation-capable people in the population of predominantly small firms responding (OECD, 2007).

Table 1.9. **Highly important factors that hampered innovation activities of all enterprises, 2002-04**

(% of enterprises)

	Industry (total)	Services (total)	Total*	Innovative	Non-innovative
Cost factors					
Lack of funds within the enterprise or group	26.0	24.8	25.3	29.1	21.3
Lack of finance from sources outside the enterprise	16.6	14.4	15.4	18.7	11.9
Innovation costs are too high	18.1	22.2	20.4	22.8	17.7
Knowledge factors					
Lack of qualified personnel	16.9	16.9	17.0	20.4	13.2
Lack of information or technology	8.3	1.0	4.3	3.5	5.1
Lack of information of markets	5.2	2.8	3.8	3.3	4.4
Difficulty in finding co-operation partners	11.2	5.6	8.1	4.0	12.5
Market factors					
Market dominated by established enterprises	20.5	30.7	26.2	23.2	29.3
Uncertain demand for innovative goods or services	6.5	12.6	9.9	9.5	10.3
Reasons not to innovate					
No need due to prior innovations	5.1	3.3	4.1	3.0	5.2
No need because of no demand for innovations	4.3	12.9	9.0	0.7	18.0

* The sample size was 2 627 enterprises; the results of the survey were extrapolated to the target business population of 31 456 enterprises based on the weights of 120 strata.

Source: Blankley, W. and C. Moses (2009), *Main Results of the South African Innovation Survey 2005*, HSRC Press, Cape Town.

Large firms have been more effective in accumulating knowledge resources and investing in training than South Africa's smaller firms. A recent study of manufacturing firms in South Africa's Ekurhuleni district found that, compared with small firms, "large and medium firms were much more likely to train, and more likely to use outside training providers". In South Africa, large firms are also the major players in accumulating

knowledge resources through R&D. Drawing on the latest R&D survey, Kahn (2006) has indicated that large firms account for a high proportion of business enterprise R&D: the top 12 R&D performing firms account for 58%, and the top quintile for 86%. Though a significant number of these firms are parts of the economy's resource-based nexus, many develop knowledge bases across a much wider range of technologies than those directly involved in their core production activities. They do so primarily to support the management of their key supply chain interfaces, i.e. those industries from which they purchase inputs of materials, components, assemblies, engineering and other knowledge-intensive services, and capital equipment, and also those to which they sell, or might sell, their products (Patel and Pavitt, 1997; Granstrand et al., 1997; Brusoni et al., 2001; cited in OECD, 2007). This capability stimulates inter-firm interaction in innovation and provides a basis for diversification of the firm's own production activities. Such a dynamic role appears to have been important, for instance, in the emergence of diversified structures of production around resource-based industries in countries like Finland and Sweden, and in the evolution of individual firms into different industries (OECD, 2007).

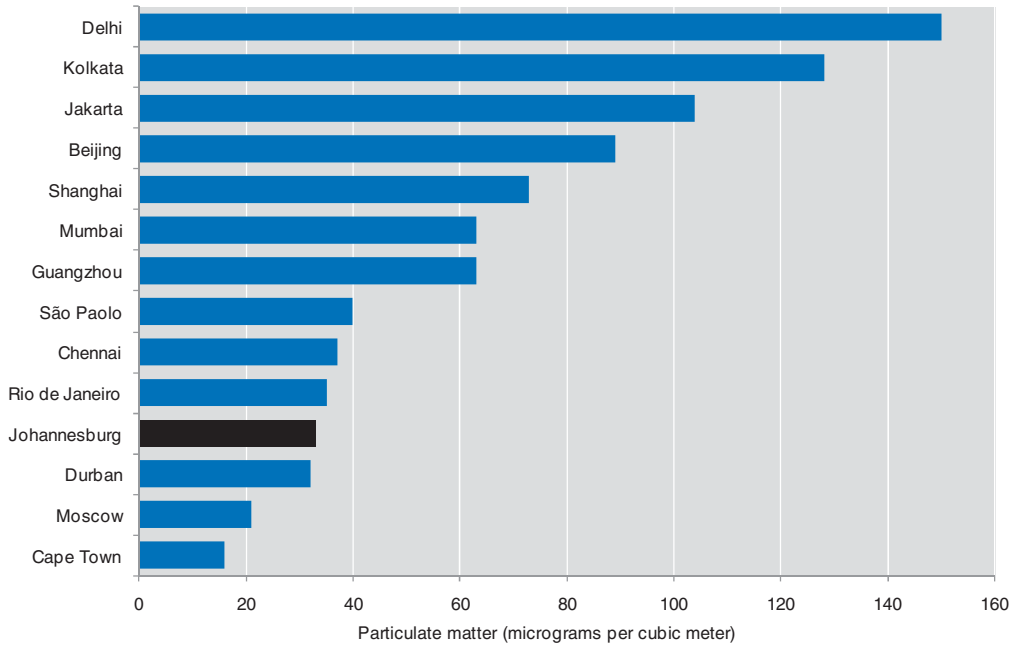
Environmental challenges to economic competitiveness

Gauteng's accelerated population growth, increasing motorisation, sprawling urban growth and legacy of mining have put immense pressure on the environment. Public service systems have struggled to meet increasing demand, resulting in water contamination in some areas, sewage overflows in others and unmanageable levels of waste going to landfills. While the vast majority of households use electricity for cooking, heating and lighting, approximately 5% of household energy usage in the city of Johannesburg is derived from coal (City of Johannesburg, 2008a). This increases greenhouse gas emissions per capita. Urban sprawl due to the fast pace of growth on the city outskirts also contributes to greenhouse gas emissions, particularly because car-related commuting accounts for over 80% of trips. Although the region has made great strides in ensuring high-quality potable water delivery and investing in public transport, four key challenges still threaten economic competitiveness and social development: *i*) air pollution; *ii*) fossil-fuel energy sources; *iii*) surface water contamination; and *iv*) waste disposal.

Air pollution limits economic competitiveness by reducing an area's attractiveness to firms and individuals and imposing high health costs. Upper respiratory problems related to air quality issues have resulted in estimated expenditures of ZAR 280 million per year in Johannesburg (City of Johannesburg, 2008a). Air pollution from vehicle emissions and domestic fuel combustion is a key contributor to respiratory hospitalisations and leukaemia cases in Gauteng (Scorgie et al., 2004 in Gauteng City-Region Observatory, 2010a; Gauteng Provincial Government, 2010). Attractiveness is associated with population growth, firm creation, higher incomes, productivity and wages. Results of an OECD computable general equilibrium model shows that by 2030, cities that could become more attractive will do so while also curbing local pollution (e.g. Ankara, Auckland, Barcelona, Krakow, Lille, Melbourne, Montreal, Monterrey and Toronto). It also highlights that some metropolitan regions risk losing economic attractiveness if their current pollution trends continue (e.g. Chicago, Los Angeles, New York, Osaka, Paris, Philadelphia, Seoul and Tokyo) (OECD, 2010b). Damage to local health also imposes economic costs.

In Gauteng, particulate matter (PM) levels pose a particular threat, as they frequently exceed national and international air quality standards. Particulate matter negatively impacts human health more than most other forms of air pollution and is linked to deaths from cardiovascular disease, respiratory disease and lung cancer (OECD, 2008a). The World Health Organization (WHO) recommends decreasing air pollution targets for particulate matter particles of 10 micrometres or less (PM_{10}), from 70 microgrammes per cubic metre (μ/m^3) to 50μ/m^3 to 30 μ/m^3, to reach the WHO guideline of 20 μ/m^3 for PM_{10} (OECD, 2008a; WHO, 2006). Even though Johannesburg had lower PM_{10} levels (as of 2005) than most major cities in India, Brazil, China and Indonesia, the levels were higher than in Cape Town and in eThekwini, and well exceed international standards in pockets of the Gauteng region (Figure 1.31). In Johannesburg PM_{10} concentrations across the city frequently exceed national air quality standards of 50 μ/m^3, reaching as high as over 400 μ/m^3 (City of Johannesburg, 2008a; Gauteng Provincial Government, 2009d). Across the province, 57% of PM_{10} emissions stem from industrial, commercial and institutional sources, with domestic fuel burning causing 20% of emissions (Spencer et al., 2010). In Soweto, domestic coal combustion has contributed to approximately 70% of the area's PM_{10} levels, and in the Vaal Triangle, it has contributed to approximately 65% of that area's PM_{10} levels in winter, when pollutants stagnate at higher levels due to temperature inversions and calm winds (Gauteng Provincial Government, 2009d; City of Johannesburg, 2008a; Annegarn et al., 1998 and Engelbrecht et al., 1998 in Gauteng City Region Observatory, 2010c; Gauteng Provincial Government, 2010).

Figure 1.31. **Particulate matter (PM_{10}) levels in select BRIICS cities, 2004**



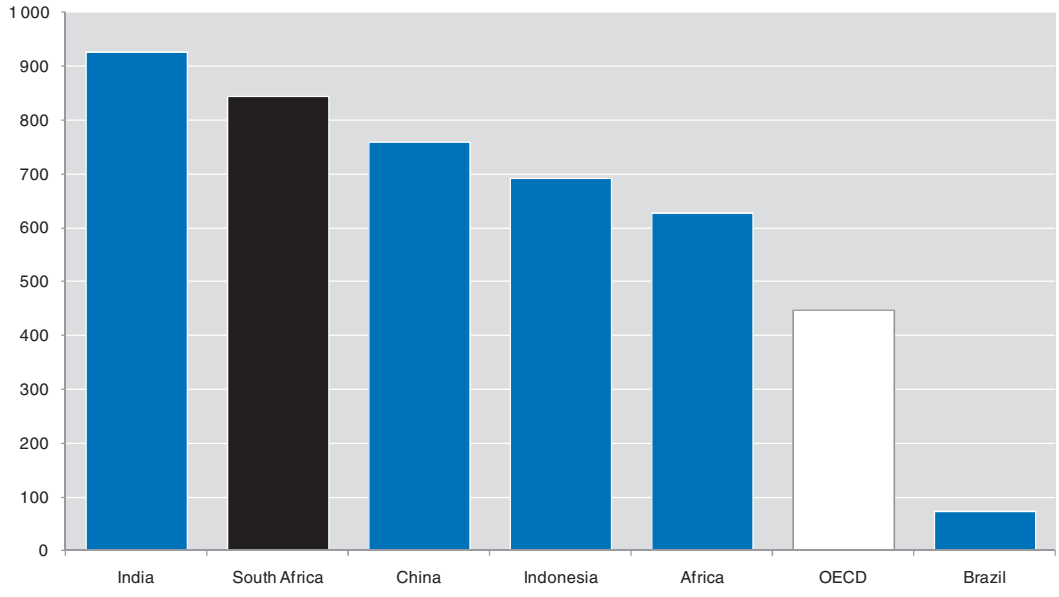
Source: Data on particulate matter concentrations are from Pandey et al. (2006), "Ambient Particulate Matter Concentration in Residential and Pollution Hotspot Areas of World Cities: New Estimates Based on the Global Model of Ambient Particulates (GMAPS)", World Bank, Washington, D.C. These data refer to 2004. Data from Cape Town were sourced from the City of Cape Town Air Quality Monitoring Laboratory and were collected from the City Hall's air monitoring station in 2007; data from Johannesburg were found in City of Johannesburg (2007), *State of the Air Report*, City of Johannesburg Environmental Management, Johannesburg and refer to the 2006 yearly average.

Heavy reliance on energy from fossil fuels in Gauteng contributes to air pollution and the costs of addressing greenhouse gas emissions. Carbon dioxide (CO_2) emissions from energy production are a growing concern for Gauteng, given the region's reliance on fossil fuels for energy production and transport. This reflects the fact that South Africa is the most coal-dependent economy in the world, with coal-driven power stations accounting for about 90% of electricity generation (OECD, 2010a). The largest source of CO_2 emissions in South Africa is electricity generation emissions from coal and oil refining to produce petroleum products, coal mining and gas extraction, and wood, coal and oil combustion for industrial and domestic purposes (Spencer et al., 2010).

Electricity and heat production are also high in CO_2 intensity, compared with most other OECD enhanced engagement countries, African countries overall and the OECD (Figure 1.32). Renewable energy sources currently represent a small share of energy production. In Johannesburg, they represented 0.2% of all energy sources for heating and cooking in 2001, and this share decreased to virtually 0% by 2007. Recently, the City of Johannesburg has committed to powering traffic lights using solar panels, which may stimulate further interest in the use of renewables (City of Johannesburg, 2008a). Likewise, the Gauteng Department of Housing and Local Government has been working with municipalities to evaluate solar heaters installed in homes.

Figure 1.32. **Electricity and heat output in South Africa, OECD enhanced engagement countries, OECD member countries and African countries**

CO_2 emissions per kilowatt/hour, 2007



Note: Data for China includes Hong Kong.

Source: *OECD Stat*.

The cost of potable water provision and sewage treatment is strained by water contamination and unlawful water abstraction in Gauteng. As of 2007, 98% of Gauteng households had access to on-site or off-site piped or tap water and only 1.3% of households did not have access to a toilet facility (Gauteng Provincial Government, 2009e). However, the existing infrastructure struggles to meet the potable

water and wastewater treatment needs of a growing population. Four main factors undermine water quality: *i)* insufficient capacity or treatment ability of many municipal wastewater treatment plants; *ii)* wastewater mixed with storm water, particularly during severe storm events; *iii)* illegal dumping of waste into sewers; and *iv)* overflowing of contaminated water in closed mines. These challenges increase the cost of water treatment and provision. One study found that increased water salinity alone cost households in the Vaal River System approximately ZAR 5 million per month in 2006 (Gauteng Provincial Government, 2009e; South Africa Department of Water Affairs and Forestry, 2007). In addition to contamination, unlawful water abstractions have also put pressure on the need to develop new water sources and upgrade post-purification bulk-supply networks. For example, the Rand Water company, which provides 75% of all bulk potable water to Gauteng municipalities, has announced the need to invest ZAR 2.5 billion over 2007-12 to meet growing water demand (Gauteng Provincial Government, 2009e).

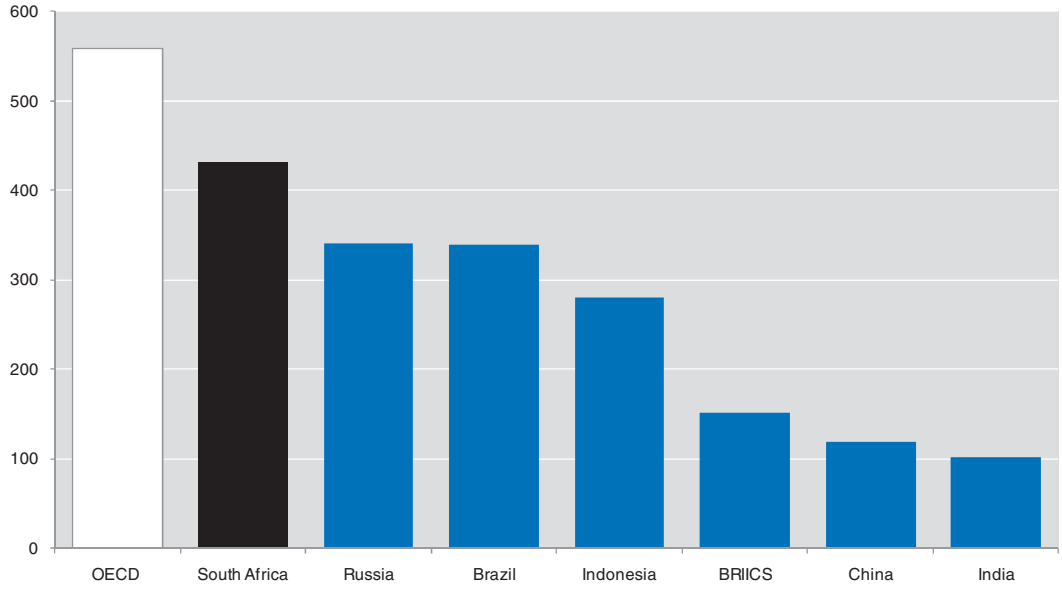
Raw sewage contamination in parts of Gauteng still imposes high human health costs. In particular, the high-density residential areas that are often located in suburban or rural areas face contamination from sewerage systems that are pushed beyond treatment capacity, poorly maintained, or used for inappropriate waste disposal (City of Johannesburg, 2008a). Most watercourses in Johannesburg have unacceptable degrees of bacterial contamination. The highest levels of the bacterium *Escherichia coli* (*E. coli*), associated with the presence of faecal matter, are found in Alexandra, Diepsloot and Soweto and the Jukskei and Klipspruit river systems (City of Johannesburg, 2008a). High levels of faecal coliform are also present in the Pienaar's, Hennops, Suikerbosrand rivers and the Vaal Dam (Gauteng Provincial Government, 2010; Gauteng City-Region Observatory, 2010c). Ingestion of *E. coli* through untreated water or food can cause diarrhoea. While the incidence of diarrhoea in children under five decreased over 1998-2001 in Gauteng, it increased nearly threefold over 2003-05 in the city of Johannesburg and in Gauteng as a whole, reaching 103.5 per 1 000 children in the city of Johannesburg and 93.9 per 1 000 children in Gauteng in 2005 (Gauteng Provincial Government, 2004; City of Johannesburg, 2008a). The health benefits of drinking water quality and sewage treatment are often greater than the costs of policy implementation, even when improvements are made where drinking water quality is already acceptable (OECD, 2008a; Gagnon, 2008; US EPA, 2006).

A large share of waste still goes to landfills in Gauteng, contributing to the region's greenhouse gas emissions. The vast majority of waste is disposed of in landfills: in Johannesburg, 384 kilogrammes per capita went to public landfills in 2007 (City of Johannesburg, 2008a). Landfills produce methane, which has a significantly greater impact on climate change than CO_2 emissions and continues to be released for decades after waste disposal (Intergovernmental Panel on Climate Change, 2007). In comparison, OECD member countries were able to hold methane emissions constant over 1990-2004, while they grew 10% worldwide (OECD, 2008a).

The city of Johannesburg reduced quantities of general waste (not including hazardous or hospital waste) by 4.4% for the period 2003-08 (City of Johannesburg, 2008a). However, while estimated per capita waste generation in Gauteng in 2004 was lower than the average for OECD member countries in 2005 (480 kilogrammes a year compared to 559 kilogrammes/year), it was higher than South Africa as a whole, which itself is the highest among BRIICS countries (Figure 1.33) (OECD, 2008a; Gauteng Provincial Government, 2004).

Figure 1.33. **Municipal waste generation in OECD and BRIICS countries**

Kilogrammes per capita per year



Note: data for OECD member countries are from 2005; data for South Africa are from 2005; data for the Russian Federation are from 2004-05; data for Brazil are from 2004-05; data for Indonesia are from 1995; data for BRIICS countries are from 2001; data for China are from 2004; data for India are from 2005.

Source: Blottnitz, von H. (2005), "Solid Waste", background briefing paper for the National Sustainable Development Strategy, University of Cape Town, South Africa; Federal Statistical Service of Russia (2006), *Main Environmental Indicators*, Statistical Bulletin (in Russian), Moscow; IBGE (Brazilian Institute of Geography and Statistics) (2004), *PNSB 2000* (National Survey of Basic Sanitation in 2000), information received in January 2007 from IBGE; Kumar, S. (2005), *Municipal Solid Waste Management in India: Present Practices and Future Challenge*, Asian Development Bank, Manila; OECD (1999), *OECD Environmental Performance Reviews: Russian Federation*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264180116-en*; OECD (2007), *Environmental Performance Review of China 2007*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264031166-en*; OECD (2008a), *Environmental Outlook to 2030*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264040519-en*; PRB (Population Reference Bureau) (2005), 2005 *World Population Data Sheet*, Population Reference Bureau, Washington, D.C.; Statistics South Africa (2005), *Non-Financial Census of Municipalities for the Year Ended*, Statistical Release P9115, 30 June, Statistics South Africa, Pretoria, *www.statssa.gov.za*; UNEP (2007), *Global Environment Outlook 4*, United Nations Environment Programme, Nairobi; World Bank (1999), *What a Waste: Solid Waste Management in Asia*, Urban Development Sector Unit, East Asia and Pacific Region, World Bank, Washington, D.C.

1.3. Multiple dimensions of inequality

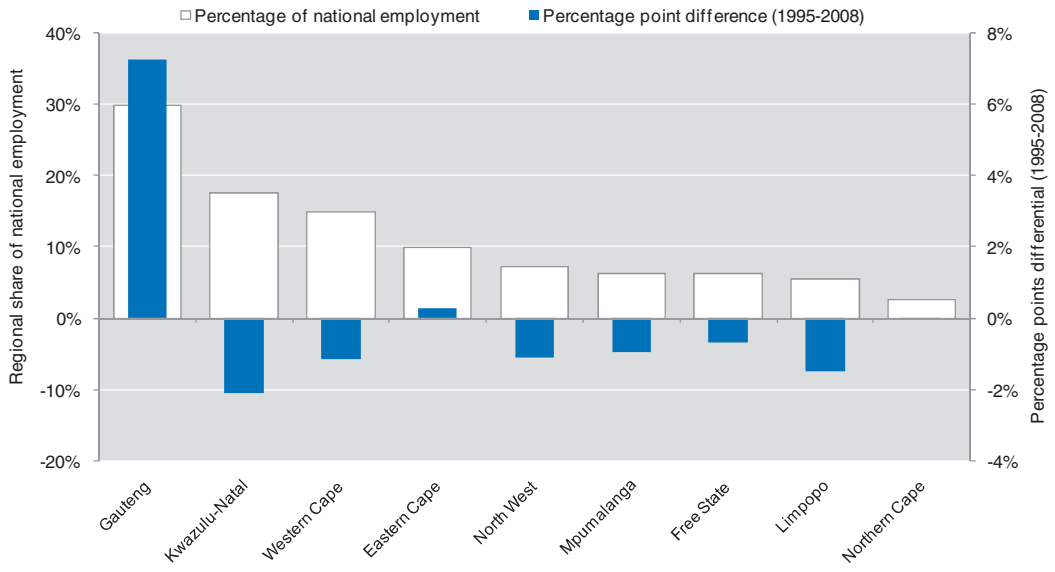
Unemployment disparities and economic exclusion

One of the most pressing issues in South Africa is massive unemployment. According to official data, South Africa has a situation of chronic mass unemployment on a scale rarely found anywhere in the world, and certainly not for a prolonged period. South Africa's extraordinarily high unemployment co-existed with a "jobs miracle" between the turn of the century and the onset of the global financial crisis in 2008. According to the *Provincial Economic Review and Outlook 2009* (Gauteng Provincial

Government, 2009a), total employment in Gauteng rose by 47% between 2001 and 2008, and in the whole country, employment rose by 26% – remarkable growth by historical and international standards. Already, 30% of all jobs in South Africa are located in Gauteng, a share that has grown 7% since 1995 (Figure 1.34). Despite this job creation, in South Africa at least one person in four is unemployed. This unemployment rate is the highest when compared with OECD member countries (Figure 1.35). The OECD average unemployment rate stood at 8.5% in 2010, more than 15% lower than in South Africa (24%). Across OECD member countries, Spain and Estonia have the highest unemployment rates (20.1% and 16.9% respectively), while Norway has the lowest rate (3.6%). Gauteng's official unemployment rate also fell over the 1995-2008 period, but was still above 20%, according to the so-called "narrow definition" (Box 1.5), before the impact of the financial crisis.[29]

Figure 1.34. **Employment in South African provinces**

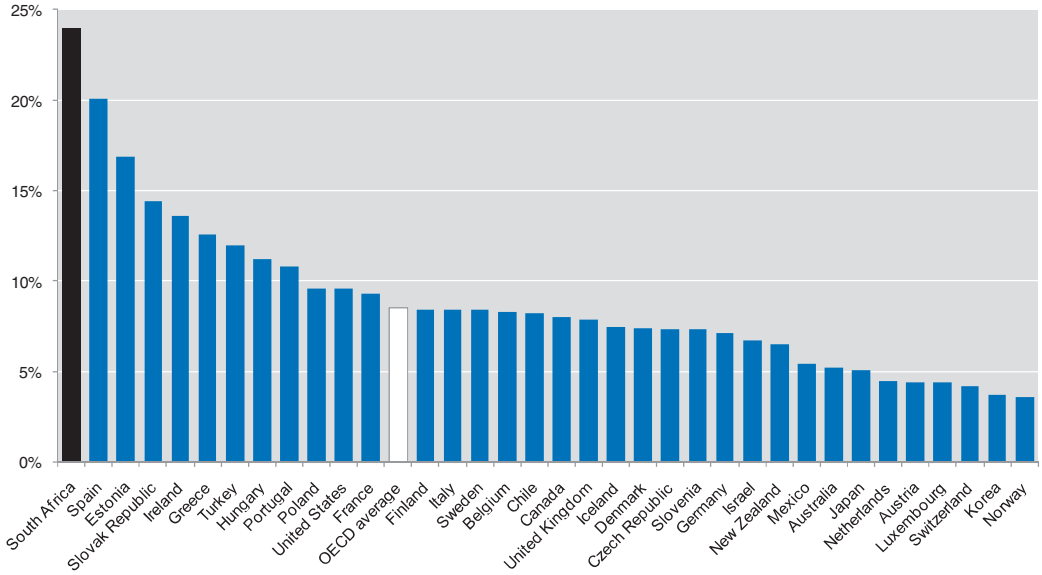
Share of national formal employment, 1995-2008



Source: OECD calculations based on data from Quantec.

Caution is warranted when interpreting unemployment data in Gauteng. The official definition of unemployment in South Africa, i.e. having not searched for work during the past four weeks and being unavailable for such work within one week, differs from other approaches that define "actively seeking" work as having searched in the previous week. If the one-week cut-off were taken, a proportion of the supposedly active unemployed would be excluded from the unemployment count. This is the norm in many other countries, though the International Conference of Labour Statisticians has yet to specify an official length of the job search period.

Figure 1.35. **Unemployment rate in South Africa and OECD member countries, 2010**



Notes: Data for South Africa refer to Q4 2010.

Source: Data for South Africa are taken from Statistics South Africa (2011), *Quarterly Labour Force Survey*, Q1, 2011. Data for all other countries come from *OECD.stat* and thus are not necessarily comparable.

Box 1.5. **South Africa's broad and narrow definitions of unemployment**

Following the definition used by the International Labour Organisation (ILO), South Africa's official (narrow) definition of unemployment classifies individuals as being unemployed if they "(a) did not work during the seven days prior to the interview, (b) want to work and are available to start work within a week of the interview, and (c) have taken active steps to look for work or to start some form of self-employment in the four weeks prior to the interview" (Statistics South Africa, 1999). This places the burden of proof upon non-employed individuals, who must demonstrate that they have made some attempt at finding or creating a job for themselves.

The expanded (broad) definition of unemployment, on the other hand, does not include criterion (c). Although the narrow definition is the official definition in South Africa, the evidence suggests that the broad definition is better able to accurately identify the unemployed in countries like South Africa, where unemployment rates are very high and many individuals give up looking for work, becoming what is termed "discouraged workers". Thus, most of the analysis in this *Territorial Review* uses the expanded definition of unemployment. Simply stated, subjects who have not worked in the last week but want to work and would, if offered a job, be able to start working within a week, are classified as unemployed, according to the expanded definition.

Source: Statistics South Africa (1999), "Census in Brief", Statistics South Africa, *www.statssa.gov.za/census01/census96/HTML/CIB/census_in_brief.htm*.

It is possible that unemployment figures are overestimating real rates given the sizable share of under-recorded migration and other recording issues. First, there is systematic under-recording of all forms of migration, particularly immigration from neighbouring countries in the Southern African Development Community (SADC). There are no reliable figures on Gauteng's foreign-born population. Estimates vary wildly, from millions to hundreds of thousands; but there is consensus that the political turmoil in neighbouring Zimbabwe has driven many to seek work in South Africa, and mainly in Gauteng; building on the historical trend for migrants to enter the country from Mozambique, Lesotho and elsewhere. Most of these migrants have to survive through selling labour or indulging in petty economic activities. South Africa's primary employment survey instrument, the *Quarterly Labour Force Survey* (QLFS), is a household survey based on dwellings sampled within some 3 080 primary sample units across the country. In theory, therefore, it should not discriminate as to whether the sampled dwelling is occupied by a foreign-born or South African household. However, the survey response rates in Gauteng are relatively low, at 82% compared to 92% for the country as a whole. It is not impossible that the non-response rate is due to the unwillingness of foreign migrants to be interviewed or to claim that they are not employed for fear of censure. Such migrants may be technically "employed" but statistically invisible, meaning that the level of employment is underestimated and the unemployment rate is correspondingly overestimated.

A second aspect is that official statistics tend to correlate subsistence work with unemployment, contrary to conventional labour force statistics as used around the world. The *Quarterly Labour Force Survey* counts as employed "any person aged 15-64 years who, during the reference week: did any work for at least one hour; or had a job or business but were not at work (temporarily absent)". Informal employment would therefore be captured. However, the QLFS distinguishes between two types of economic activity: *i)* market production activities (work done for others and usually associated with pay or profit); and *ii)* non-market production activities (work done for the benefit of the household, e.g. subsistence farming)". Persons working in market production activities are counted as employed; those working in non-market activities are not. Official statistics from the *Quarterly Labour Survey* report a very large number of adults have "never worked". In the fourth quarter of 2010, 46.6% of those unemployed in the Gauteng city-region reported never having worked.[30] Likewise, 47.5% of discouraged seekers of work reported never having worked (Statistics South Africa, 2010). This work never done is supposed to cover "formal work for salary, wage, profit or unpaid in family business; informal work such as making things for sale, selling things or providing a service; work on a farm or land, whether for a wage or as part of the household's farming activities; casual/seasonal work". Nowhere else in the world are so many people recorded as never having worked many years after they left school. According to the September 2006 *Labour Force Survey* (LFS), 13.5% of those who claimed that they had never worked in South Africa subsequently reported in a later question that they had done some subsistence farming in the previous 12 months.[31] However, this discrepancy may be less of an issue in Gauteng itself and if the time period were shortened. If the time period shifts to the last week rather than the last 12 months, the share dramatically decreases. According to the *Quarterly Labour Force Survey* (Q4, 2010), a mere 0.1% of the unemployed in Gauteng reported that they had performed non-market activities in the last week. This is probably higher outside Gauteng, however, given the city-region's low percentage (4.3%) of workers involved in subsistence farming.[32]

Improvements could be made to South Africa's *Labour Force Survey* to improve accuracy, compliance with international standards, and clarification over those "actively seeking" employment. Though there has been tremendous improvement in the collection and availability of labour market data in the post-apartheid period, serious gaps and problems bear consideration in order to improve future data collection. Improving the evidence base can have high returns: policy research can be more reliable. First, reliability is compromised by the inconsistent reference points used in the *Labour Force Survey* (LFS). It asks whether the person has done income-earning work over the past one week, job-seeking over the past four weeks and is available to start work in the next two weeks. Given the extensive flexibility of labour practices, a better combination would be to ask if a person had been doing any work over the past two weeks, and if not, whether they had been looking for work over the past two weeks, and if they were to find a job, whether they could start within the next two weeks. (Box 1.6).[33]

Box 1.6. **Data constraints in labour market analysis in South Africa**

A major difficulty in analysing South Africa's labour market performance (and indeed some other aspects of the economy) since the early 1990s is that no single consistent data source covers the entire period. One principal source of labour market data, the *October Household Survey* (OHS), began in 1995, a year after the transition to democracy, and ended in 1999. Its successor was the *General Household Survey*, which started in 2002. The *Labour Force Survey* (LFS), conducted in March and September of each year, began in 2000 and was replaced by the *Quarterly Labour Force Survey* in 2008. Censuses are typically conducted every five years (although none was made in 2006), but the pre-democracy censuses are not fully comparable with the post-apartheid ones, and data exist for only two of the latter so far, 1996 and 2001. There have also been surveys of employers: the *Survey of Employment and Earnings*, discontinued in 2005, and the *Survey of Quarterly Employment*, which replaced it. The latter two provide measures only of formal sector non-agricultural employment, however, and these partial data tend to systematically underestimate overall employment growth.

A particular problem pertains to the year 2000, the first year of the LFS. An initial LFS (with a restricted sample) was conducted in February 2000, with a second in September/October. Of the measured employment growth of 3.08 million over the 12-year period between October 1995 and September 2007, nearly half, 1.51 million, occurs in the 4-month interval between October 1999 and February 2000, when the changeover from the OHS to LFS took place. It is not clear why such a sudden surge in employment would have taken place at that time. There was relatively strong real GDP growth (4.2%) in the year 2000 relative to previous years, though still only at about potential, and the LFS for September of that year actually shows slightly lower employment than in February. One statistical factor known to be at play is the improvement in coverage of employees in the informal sector. If all of the measured increase from October 1999 to February 2000 were an artefact of the statistical shift from the OHS to the LFS, then employment growth during 1995-2007 would not have been 2.2% a year but 1.2%. Probably the true value falls between the two, especially since 1995 also looks somewhat anomalous, giving rise to an 8.5% drop in employment between 1995 and 1996. The 1995 estimate uses weights derived from the 1991 Census. If weights from the 1996 Census are used instead, total employment in 1995 would be about 9.5 million, resulting in a smoother and more plausible trend over the period 1995-99.

Box 1.6. **Data constraints in labour market analysis in South Africa** *(cont'd)*

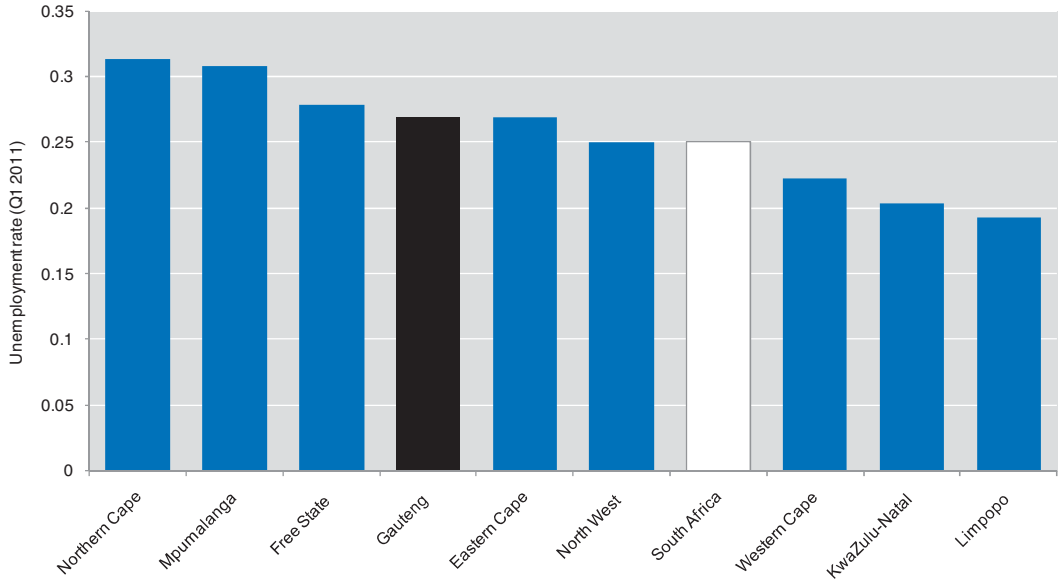
Another important problem is the absence of a reliable time series for wage data. Both the OHS and the LFS only classified earnings in ranges, preventing the calculation of precise averages. And the 2000 discontinuity problem is again marked for wages, which are shown as dropping 38% in real terms between October 1999 to February 2000, then more than doubling between February and September 2000, before falling back almost to the same level in the following March. The September 2000 figures seem to have been affected by a problem of outliers, which probably reflects misrecording (Burger and Yu, 2007), but overall, the picture that emerges from the OHS/LFS interface is that the latter captured a large number of low-paid, especially informal sector, workers (as well as unemployed individuals) not included in the former. While the October *Household Surveys* collect information on earnings and incomes, the data are collected in a somewhat different form from year to year, and this undermines reliable over-time comparisons. For instance, certain *October Household Surveys* ask for earnings information in a continuous form, some allow for a mixture of continuous and categorical responses. The *Labour Force Survey* of September 2003 does not ask an earnings question separately for the self-employed, while other surveys do. It would assist future analysis of labour market trends if good practices – learned on the basis of data collection experience – are consistently applied in future labour force surveys.

Source: Burger, R. and D. Yu (2007), "Wage Trends in Post-Apartheid South Africa: Constructing an Earnings Series from Household Survey Data", *DPRU Working Paper 07/117*, Development Policy Research Unit, University of Cape Town, Cape Town, February; OECD (2008), *OECD Economic Surveys: South Africa 2008*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/eco_surveys-zaf-2008-en*; Kingdon, G. and J. Knight (2005), "Unemployment in South Africa, 1995-2003: Causes, Problems and Policies", *Global Poverty Research Group Working Paper*, No. 010

Gauteng is not only one of the provinces with the highest unemployment rates in South Africa (26.9%) in 2011 (Q1), but it also experiences the highest across OECD metro-regions, an issue which the economic crisis has only amplified. At 26.9%, the Gauteng city-region's unemployment rate ranked as one of the highest in South Africa at the end of 2010 (Figure 1.36), and stood as the largest among metro-regions in the OECD (Figure 1.36). The region did, however, see significant improvement over the years of strong economic growth between 2004 and late 2008. Unemployment peaked in the first quarter of 2003 at 31.9%, and then steadily declined to 20.7% in the fourth quarter of 2008.

The Gauteng city-region's economy has recently suffered from extensive job losses: in 2009, this included the loss of approximately 1 million jobs. In the year to September 2009, according to official figures, Gauteng lost 344 000 jobs, and the labour force participation rate (for those aged 15-64) declined from 73% to 70%. Meanwhile, the number of economically inactive individuals increased from 1.9 million to 2.1 million and the number of "discouraged" (no longer actively seeking jobs) increased from 156 000 to 187 000. This is consistent with the economic recession. Real GDP began falling in the fourth quarter of 2008 and declined for three quarters. Output declined by 1.8% in 2009, marking the first negative annual growth rate in the post-apartheid era. Moreover, the change in the growth rate of real GDP in Gauteng between 2008 and 2009 was the largest single-year slowdown on record for South Africa, and eclipsed the rates in most advanced and emerging economies, though it was far from being the worst (OECD, 2010a). From 2007 to 2010, income and employment in Johannesburg contracted by -3.7% and -4.8%, respectively. Out of 150 cities monitored by the Brookings Institute, Johannesburg ranked 116 (Brookings Institute, 2010).

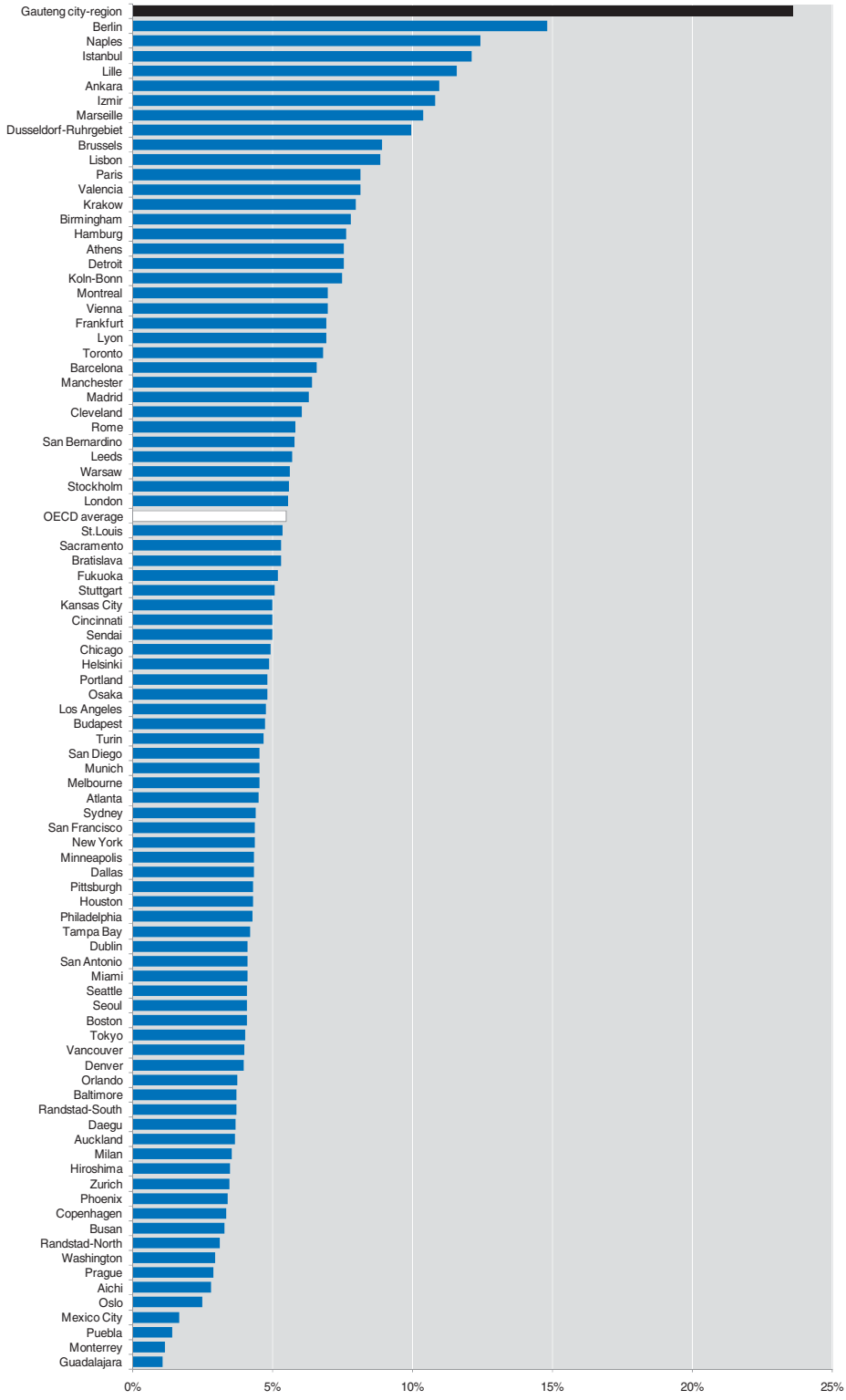
Figure 1.36. **Unemployment rates in South Africa by province, 2011**



Source: Statistics South Africa (2011), *Quarterly Labour Force Survey*, Q1 2011, Statistics South Africa, Pretoria.

Unemployment is not equally distributed across space, race, and gender in the Gauteng city-region. In 2008, Sedibeng municipality scored the highest unemployment rate (30.0%), followed by Ekurhuleni (25.8%), West Rand (22.8%), Johannesburg (20.3%), Tshwane (12.6%) and Metsweding (12.6%) (IHS Global Insight, 2009, cited in Gauteng Provincial Government, 2010). Part of the reason why Sedibeng and Ekurhuleni have such high unemployment rates is their reliance on manufacturing and trade. In Gauteng, the trade and manufacturing sectors lost 110 000 jobs and 102 000 jobs, respectively, between the first quarter of 2008 and the second quarter of 2010 (Statistics South Africa QLFS surveys, 2008-10). The unemployed population is primarily Black African: 85.7% of the unemployed are Black Africans, followed by 10.0% for coloured, 2.8% for whites and 1.5% for those of Indian/Asian descent (Statistics South Africa, 2011). Although women participate actively in the labour market, employment prospects remain biased towards men. Both formal and informal sector employment was dominated by males, who made up 57.7% of the employed workforce, compared to 42.3% females. This trend is also found in OECD member countries; men represent 56.6% of the total employment in all OECD member countries and women represent 43.4% of the workforce (2008).

Figure 1.37. **Unemployment rate in OECD metro-regions and in the Gauteng city-region, 2007**



Note: Denmark (2008), Ireland, Korea and Switzerland (2006), Mexico and Turkey (2000).

Source: *OECD Metropolitan Database* and Quantec.

Related to inequality, an increasing proportion of all those economically active are involved in insecure or precarious relationships, doing casual or temporary labour, working from time to time through temporary employment services (TES) and often reliant on labour brokers. According to Adcorp, a private employment services firm, the level of "permanent" employment was lower in 2008, before the impact of the financial shock was felt, than in 2000, and by 2010 it was much lower, having slumped dramatically through 2009 and early 2010 (Adcorp, 2010).[34] Subcontracted workers in the gold mines have been paid much less than standard employees, while their tenuous contracts leave them vulnerable to loss of jobs at very short notice (Crush et al., 2001; Bezuidenhout, 2006; Department of Labour of the Republic of South Africa, 2009).[35] In addition, although data does not exist that indicate how prevalent labour broking is, this sort of practice may be a daily reality in the informalised, flexible labour market that has emerged in the Gauteng city-region. No doubt many migrants are so desperate that they have to take a risk in supplying their labour to brokers, and no doubt some of them can say in truth that they were actually paid. The gradual drift away from what is called the "standard employment relationship" (SER) has been accompanied by the erosion of labour market social and economic security. Comparative data from the OECD Indicators on Employment Protection display particularly low levels for regulation on temporary forms of employment and specific requirements for collective dismissal (Table 1.10). According to this methodology, South African workers rank as the 5th least protected workers of the 40 countries for which data is available. These data were reinforced by the Socio-Economic Security Programme of the International Labour Organization (ILO), which highlighted the low labour market security, skills security and income security of South African workers.[36]

Gauteng's unemployment dynamics may be affected by a spatial mismatch between locations of employment and residences. The spatial mismatch hypothesis points at disadvantaged population groups' tendency to obtain less employment opportunities and lower incomes when they are located distant from employment opportunities (Zenou, 2009). There are a number of mechanisms that can produce a spatial mismatch. Gobillon et al. (2007) argue that these mechanisms include: long commuting reduces propensity of workers to work in employment clusters; distance to job centres aggravates job search efficiency; job-search intensity decreases with distance from job centres as housing prices decreases and eases pressure in family incomes; high search costs faced by workers force them to look in the vicinity; residence discrimination faced by residentially segregated workers; employers may refuse to hire or would pay lower wages to workers who have long commuting as that renders them more tired and less productive; and racial discrimination. Alternative factors contribute depending on the country context. For the United States, Anil (2008) found that mobility is reduced by local social capital and age. In the case of Gauteng, evidence in Figure 1.38 suggests that a greater spatial mismatch can be found in the municipalities located outside the Johannesburg-Tshwane corridor. Overwhelmingly, those are also the municipalities where lower-income residents are located. Most of the places where lower-income concentrations (dots in Figure 1.38) can be found are actually located within those municipalities with a greater spatial mismatch (illustrated in dark blue in Figure 1.38). That is, lower-income people reside in places where few job opportunities are being generated.

Table 1.10. **Employment protection in OECD member and selected non-member countries, 2008**

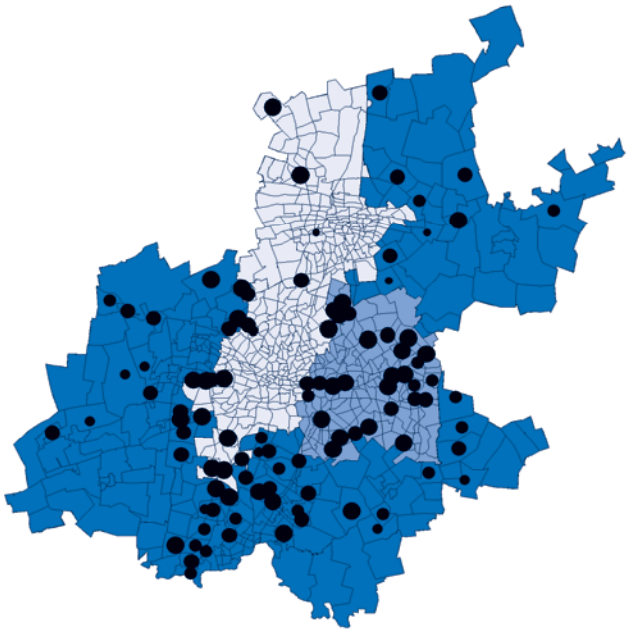
Ranking	Country	Protection of permanent workers against (individual) dismissal	Regulation on temporary forms of employment	Specific requirements for collective dismissal	OECD employment protection index
1	Turkey	2.48	4.88	2.38	3.46
2	Luxembourg	2.68	3.92	3.88	3.39
3	Mexico	2.25	4.00	3.75	3.23
4	Spain	2.38	3.83	3.13	3.11
5	Indonesia	4.29	2.96	0	3.02
6	France	2.60	3.75	2.13	3.00
7	Greece	2.28	3.54	3.25	2.97
8	Portugal	3.51	2.54	1.88	2.84
9	China	3.31	2.21	3.0	2.80
10	Slovenia	2.98	2.50	2.88	2.76
11	Norway	2.20	3.00	2.88	2.65
12	Germany	2.85	1.96	3.75	2.63
13	India	3.65	2.67	0	2.63
14	Belgium	1.94	2.67	4.13	2.61
15	Italy	1.69	2.54	4.88	2.58
16	Austria	2.19	2.29	3.25	2.41
17	Poland	2.01	2.33	3.63	2.41
18	Estonia	2.27	2.17	3.25	2.39
19	Czech Republic	3.00	1.71	2.13	2.32
20	Finland	2.38	2.17	2.38	2.29
21	Brazil	1.49	3.96	0	2.27
22	Netherlands	2.73	1.42	3.00	2.23
23	Korea	2.29	2.08	1.88	2.13
24	Slovak Republic	2.45	1.17	3.75	2.13
25	Hungary	1.82	2.08	2.88	2.11
26	Iceland	2.12	1.54	3.5	2.11
27	Sweden	2.72	0.71	3.75	2.06
28	Chile	2.59	2.04	0	1.93
29	Denmark	1.53	1.79	3.13	1.91
30	Israel*	2.19	1.58	1.88	1.88
31	Russian Federation	2.79	0.79	1.88	1.80
32	Switzerland	1.19	1.50	3.88	1.77
33	Japan	2.05	1.50	1.50	1.73
34	Ireland	1.67	0.71	2.38	1.39
35	Australia	1.37	0.79	2.88	1.38
36	**South Africa**	**1.91**	**0.58**	**1.88**	**1.35**
37	New Zealand	1.54	1.08	0.38	1.16
38	United Kingdom	1.17	0.29	2.88	1.09
39	Canada	1.17	0.22	2.63	1.02
40	United States	0.56	0.33	2.88	0.85

Notes: The scale for each indicator is from 0 to 6, with higher scores representing stricter regulation. For each country, employment protection is described along 21 basic items that can be classified in three main areas which comprise the columns above. For France and Portugal, data refer to 2009. For full details on the methodology and weights used to compile the OECD Employment Protection Indicators, see *www.oecd.org/dataoecd/24/40/42740190.pdf*. Data for Israel are supplied by and under the responsibility of the Israeli authorities. Their use by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Source: OECD Indicators on Employment Protection (2008), *www.oecd.org/dataoecd/42/4/42768860.xls*, OECD, Paris.

Figure 1.38. **Gauteng's spatial mismatch**

Employment and income shares mismatch by municipality
and location of lower income households



Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map. $SM = ½ \Sigma | (Income_i/Income) – (Employment_i/Employment)|$ Define Income i as the income in transport zone i (where i=(1,…,n) and indexes the transport zones in a given municipality), Employment *i* as the number of employed people in transport zone *i*, Income as the total income in the municipality, and Employment as the total number of employees in the municipality. This index ranges between 0 (perfect balance) and 1 (perfect imbalance). Dark blue highlights municipalities with a greater spatial mismatch and light blue highlights municipalities with a lower spatial mismatch. Circles are transport zones with average household income lower than the poverty line (lower than ZAR 1 400).

Source: OECD calculations based on Gauteng Department of Roads and Transport (2006), *Gauteng Transport Study 2000*, Gauteng Provincial Government, Johannesburg.

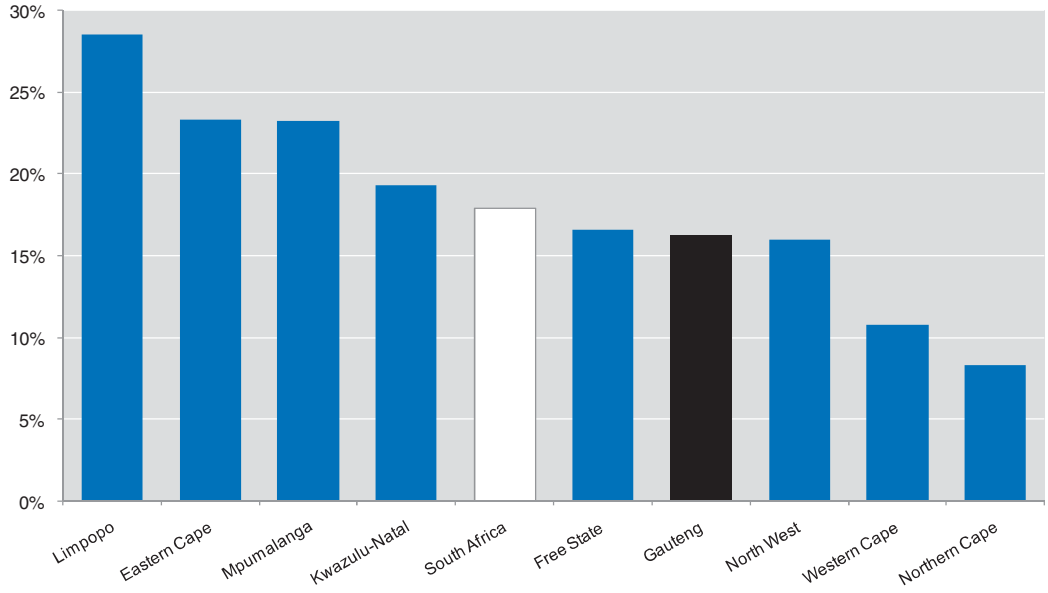
Though apartheid spatial planning may have contributed to the "spatial mismatch", the evidence of spatial mismatches outside South Africa suggests that other contributing factors may be at play.[37] In Gauteng, workers living outside the main central business districts (CBD) in Johannesburg and Pretoria will have an incentive to seize higher wages paid there instead of taking a job in suburban business districts (SBD) or being unemployed. High and persistent unemployment rates – even if some progress has been made – in Gauteng might be the product of skills mismatch between those of workers in the rest of the province and those demanded in the CBD. In addition, some workers might be discouraged from taking a job in the CBD if inadequate or at best, costly or time-consuming commuting is involved. Therefore, the key elements of a spatial mismatch in Gauteng are access to adequate transport, training to upgrade skills and an SME policy to bring jobs to people and reduce the need for long commutes.

While informal employment has been growing rapidly in South Africa, the levels remain low compared with the levels registered in developing countries (Rodrik, 2008). According to Statistics South Africa's definition of informal employment,[38] in 2008,

around 18% of total employment in South Africa were jobs in the informal sector, but the figure ranges widely by sector: wholesale and retail trade sector had the largest share of individuals working in the informal economy (47%), followed by the construction sector (13%) and community, social and personal services (10%) (Figure 1.39). Gauteng's informal share of total employment in 2008 stood at a lower level than the national share (around 12%). These rates are significantly lower than those that can be found by self-employment informal work in sub-Saharan Africa excluding South Africa, standing at 81% of total employment, or 62% for Northern Africa (World Bank, 2004). The South African informal sector also seems smaller as a proportion of total employment when compared with Latin America (60%) or Asia (59%). However, a number of issues, for example formal job creation not keeping up with population growth; economic deregulation creating incentives for informal employment, and a sectoral shift from labour-intensive primary activities to capital-intensive manufacturing, as in the case of Gauteng, have all contributed to rapid informal employment growth in South Africa. The informal economy of South Africa has grown so fast as to more than double in size between 1997 and 2005, while at the same time, semi-skilled and unskilled jobs have shrunk since the late 1980s (Blaauw, 2005).

Figure 1.39. **Proportion of informal employment by province, 2008**

Informal employment/total employment (formal + informal)



Source: Quantec.

Evidence suggests that Gauteng's labour shift between formal and informal work and may often be active in both economies simultaneously. Though the official statistics probably undercount informal labour,[39] local-based research projects have produced data that suggest a wide range of survival strategies. For example, in six informal settlement areas in Soweto,[40] a large residential community in Johannesburg, it was found that 58% of the workers were neither officially employed nor unemployed in 2008. One-third of this group had other employers (both firms and households), while the rest were self-employed casual workers (e.g. part-time manufacturers or shelf-stockers) and those who could be working but were currently inactive (retirees and full-time students)

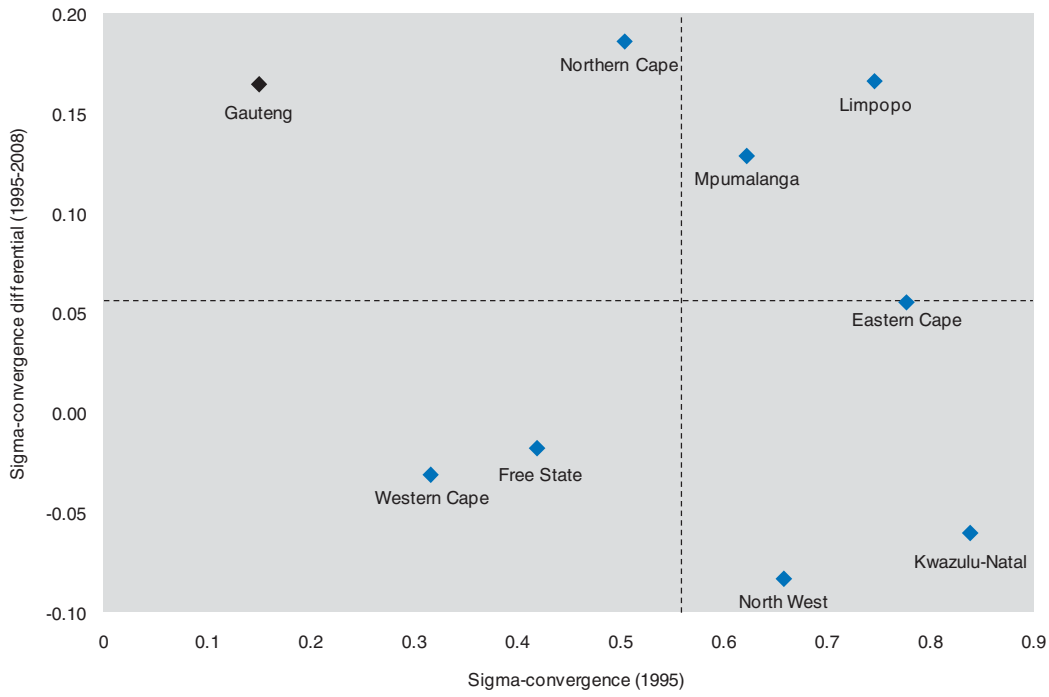
(Grant, 2010). Residents secure income through a large range of activities, including full-time and part-time work, casual work, self-employment, contributions from people in the person's household, remittances or contributions from people not staying in the person's household, gardening or livestock, and social grants or pensions.

A highly skewed distribution of income and poverty, with differences across racial lines

Income inequalities within municipalities in the Gauteng city-region are among the lowest in South Africa, but they are growing fast. One way of measuring spatial inequality is by looking at the regional per capita GDP gap. Using values of per capita GDP as proxies for income levels across provinces can show the width of per capita GDP dispersion by calculating the Sigma-convergence – showing the standard deviation of log per capita values. With around 0.16 in the Sigma-convergence indicator, Gauteng is among the most equal provinces in South Africa. Yet from 1995 to 2008, the rise in intra-municipal disparities in Gauteng was one of the highest in the country, along with Northern Cape and Limpopo (Figure 1.40). Sigma-convergence values doubled between 2004 and 2008. Despite such growth in inequality within the Gauteng city-region, its levels are common to an average metro-region in the OECD. Metro-regions in the OECD such as Warsaw, London, Budapest, Paris, Busan, Tokyo or Dublin show higher intra-regional inequalities than Gauteng (Figure 1.41).

Figure 1.40. **Intra-regional inequality in South African provinces, 1995-2008**

Sigma-convergence within provinces using provincial per capita GDP

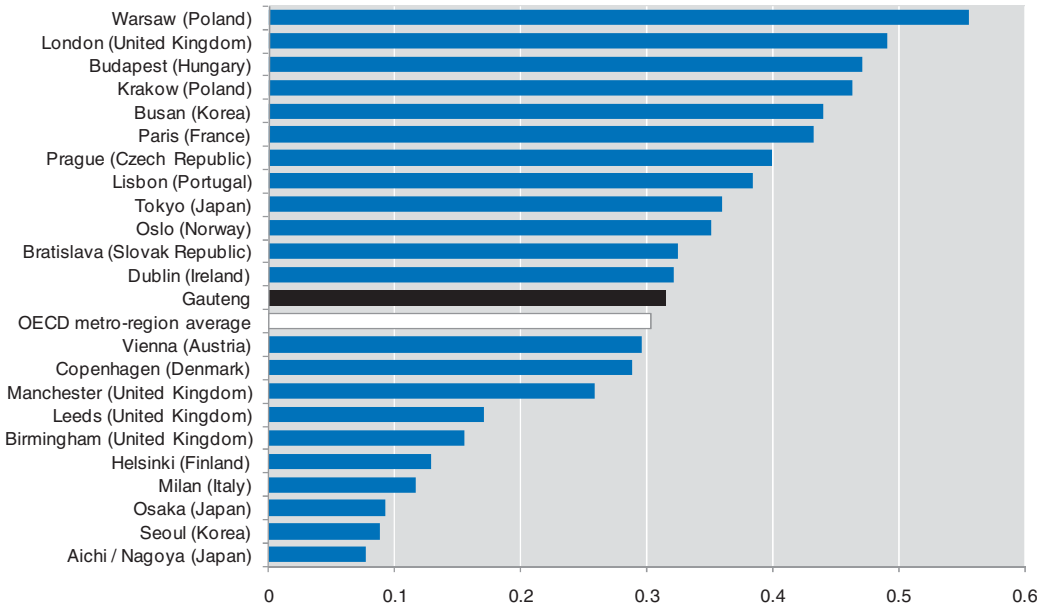


Notes: Sigma-convergence based on per capita GDP values at municipal level. Discontinuous lines refer to average. The Sigma-convergence indicator is calculated using a standard deviation of logged values for the regions in a country.

Source: OECD calculations based on Quantec data.

Figure 1.41. **Intra-regional inequality in the Gauteng city-region and a sample of OECD metro-regions, 2008**

GVA per capita



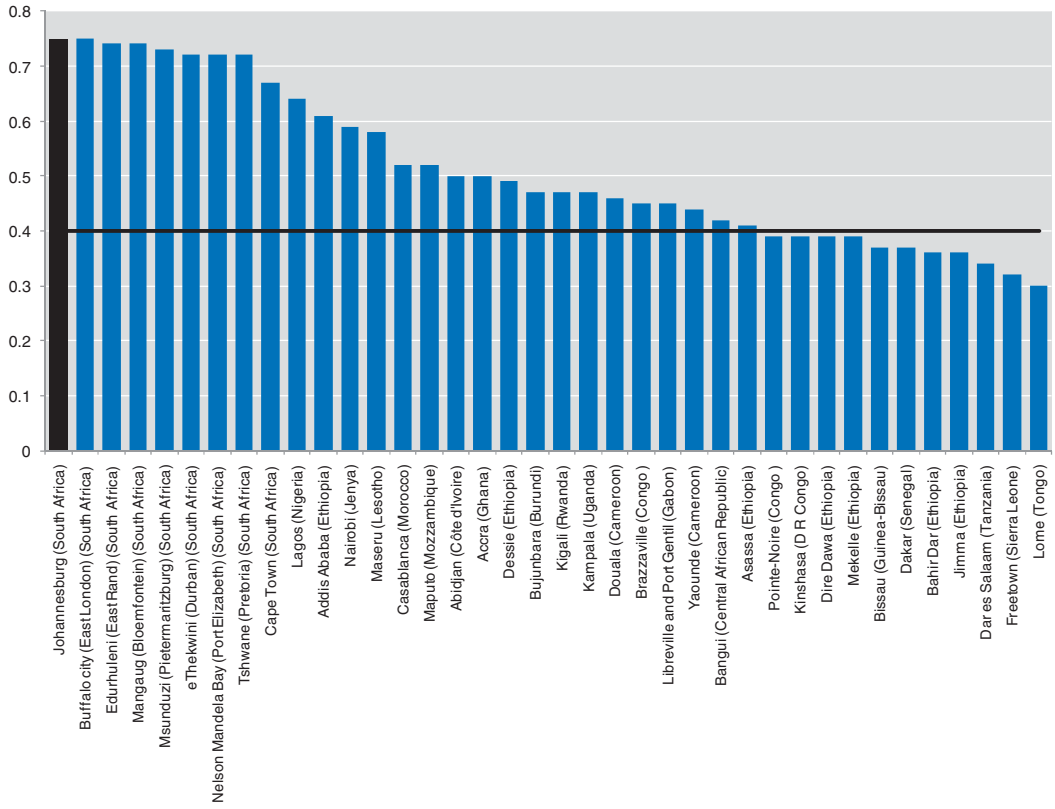
Note: OECD metro-region data refer to 2006, while Gauteng Province refers to 2008.

Source: OECD calculations based on Quantec data and *OECD Regional Database.*

Indicators of economic inequality, such as the Gini coefficient, portray a deeply polarised economy of a nature different from that of many OECD member countries. First, while inequality in functional urban areas is normally higher than across regions within a country or across countries in South Africa, the converse appears to be the case (OECD, 2009a). Disparities across provinces in South Africa are larger than within provinces, and these remain greater than within Gauteng. Second, because at least in some municipalities, inter-personal inequality is greater than the levels across municipalities in Gauteng. Inequality can be measured by the Gini coefficient, which measures the distribution of income among a society and ranges from 0 to 1. The closer it gets to 1, the more unequal a city is, while the closer to 0 the more egalitarian a society. Using UN-HABITAT data, cities in South Africa are at the top of the ranking, showing an enormous inequality based on per capita GDP. The city of Johannesburg appears to be the most unequal city in South Africa, scoring a Gini value of 0.73, which is far above the 0.4 level established as International Alert line (Figure 1.42). UN-HABITAT data also show that Johannesburg is considered the most unequal city across the sample of 100 cities of all over the world. Nevertheless, caution is warranted in interpreting these findings, given the probability of concealed incomes among low-income residents and the difficulty of interpreting the considerable movement between multiple sites of residence.

Figure 1.42. **Interpersonal inequality in a sample of cities**

Gini coefficients for selected cities in Africa in 2008 (0.4 = International Alert line)



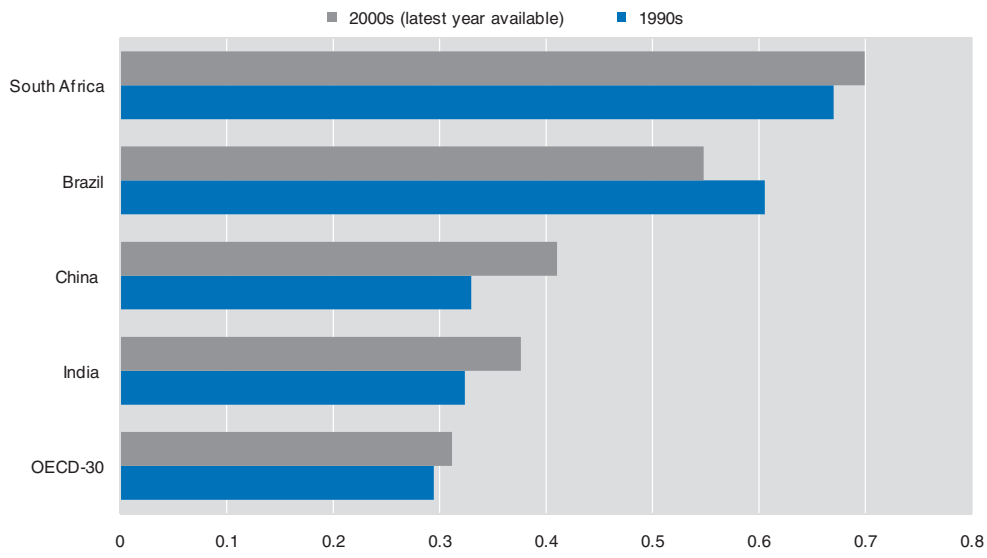
Note: Gini coefficients are based on income or consumption (depending on data availability).

Source: UN-HABITAT (2010), *State of the World's Cities 2010/2011: Cities for All, Bridging the Urban Divide*, Earthscan Publications, London.

South Africa presents not only one of the greatest levels of inequality in the world, but an instance where inequality is rising in tandem with economic growth. Compared with the highly unequal emergent economies of Brazil, China and India, South Africa shows the highest Gini coefficient. Moreover, it has been on the rise. Between 1993 and 2008, the Gini coefficient of per capita income fell by 9% in Brazil, with the decline accelerating considerably after 2000 (Figure 1.43). In contrast, it increased by 24% in China, by 16% in India and by 4.5% in South Africa, compared to 5.5% in the OECD member countries (OECD, 2010c). In China and India, income inequality has increased in urban and in rural areas, whereas in South Africa, inequality has increased more in urban areas and has decreased in rural ones. Thus, inequality is increasingly becoming an urban issue (Figure 1.44).

Figure 1.43. **Change in inequality in Brazil, China, India and South Africa, 1990s and 2000s**

Gini coefficient of household income

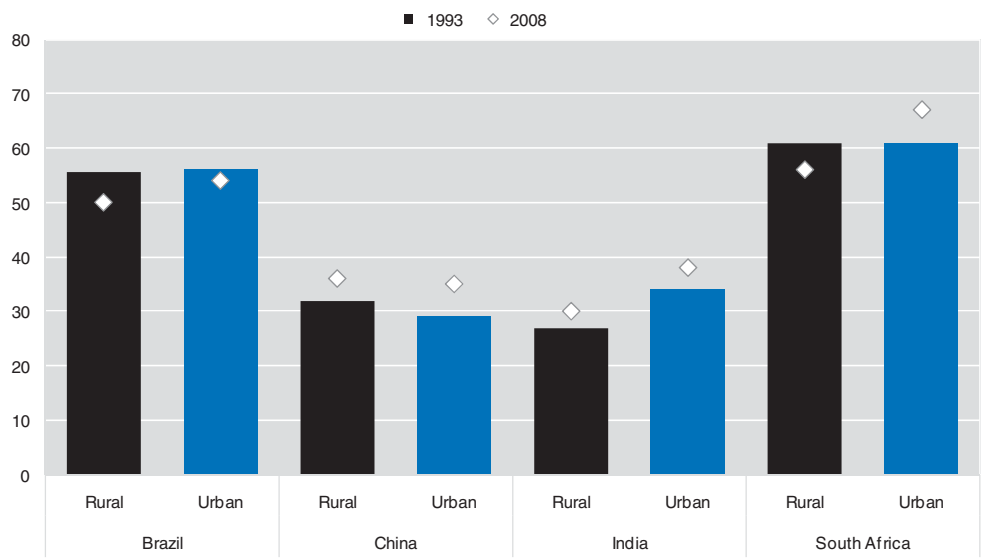


Notes: Data for the 1990's refer to 1993 for the BCIS countries and to the mid-1980s for OECD-30. Data for 2000s refer to the mid-2000s, except for Brazil and South Africa, where they refer to 2008. Gini coefficients are based on equivalised incomes for OECD member countries; per capita incomes for Brazil, China and South Africa; and per capita consumption for India.

Source: OECD (2010), *Tackling Inequalities in Brazil, China, India and South Africa: The Role of Labour Market and Social Policies*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264088368-en*.

Figure 1.44. **Urban and rural inequality in Brazil, China, India and South Africa**

Gini index of per capita household income or consumption



Note: data for China refer to 1993 and 2005; data for India refer to 1994 and 2005; data for India refer to household consumption.

Source: OECD (2010), *Tackling Inequalities in Brazil, China, India and South Africa: The Role of Labour Market and Social Policies*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264088368-en*.

Spatial disparities are all the more relevant because of their synergy with income inequality and social policies. Regional and intra-urban disparities can be argued to be part of the economic development process. Recently, a number of reports including one from the World Bank (2009), argue that economic and demographic concentration are both part of development and that economic growth will thus always be unbalanced. As such, any policy aimed at redressing the spatial imbalance will only retract from economic development. However, besides the obvious question of equity, the problem posed by spatial inequality is that it can undermine social and political stability (Kanbur and Venables, 2005). In addition, spatial inequality can be intimately related to interpersonal inequality. In the Czech Republic, Hungary, Poland and the Russian Federation, by decomposing interpersonal inequality by components of inter and intra-regional disparities computed in a Theil index,[41] Foster, Jesuit and Smeeding (2005) are able to show that while inequality accounts for some of the interpersonal inequality, intra-regional disparities account for the largest share of the variation. In the Russian Federation, much of the increase in interpersonal inequality is in fact spatial inequality (Yemtsov, 2005). The possible explanation for this is that many aspects related to income inequality can be traced back to social, political and geographical aspects of each region that govern income, such as infrastructure provision for mobility, access to public services, education, health and connectivity.

Gauteng not only faces inequality, but severe urban poverty. Before examining this, however, it is important to note that this section will rely on different indicators of poverty. The South African Government has made a concerted effort to alleviate poverty, and poverty was the focus of the first paragraph and section of the African National Council's 1994 blueprint for government (the Reconstruction and Development Programme). However, South Africa still lacks a formally agreed definition of poverty. Since 1994, government departments, civil society organisations, academics and others have proposed a wide range of measures and approaches to mitigate poverty. These range from income and asset poverty to caloric intake to a sustainable livelihoods approach, where the focus is on the capacities and potentialities the poor have, rather than the assets and income they lack.[42] Using its poverty line (four-person household with an income of ZAR1 290 per month at 2001 prices), the Human Sciences Research Council (HSRC) found that 42% of Gauteng's population lives in poverty. This seems high, but not when compared with the more rural provinces. In the Eastern Cape, 72% of the population lived in poverty, and in Limpopo, 77%, according to the HSRC definition. The Presidency, with Statistics South Africa, developed a set of National Development Indicators (NDI), which are reported against annually. Three poverty lines are used for the NDI, the percentage of population living below ZAR 238 a month or ZAR 524 a month (in 2008 currency) taken from the Statistics South Africa *Income and Expenditure Survey* (IES), and ZAR 388 a month (using the *All Media Product Survey* conducted by the South African Advertising Research Foundation) (Table 1.11). The provincial distribution is stark, although Gauteng emerges well, with the lowest proportion living under this particular poverty line – but the figure has remained constant over time, reflecting the challenge of meeting social targets while population increase continues apace. It is also notable that the more rural provinces around Gauteng – North West, Free State, Limpopo, Mpumalanga – show far higher levels of poverty, explaining the lure of the Gauteng city-region in this context (Gauteng City-Region Observatory, 2010a).

Table 1.11. **Estimates of extreme poverty in South Africa's provinces, 1995 and 2008**

Province	1996	Estimated number of people living in poverty	1995 IES	2008 population estimates	Estimated number of people living in poverty	2008 IES
East Cape	6 147 244	3 073 622	50%	6 579 245	1 907 981	29%
Free State	2 633 504	1 185 077	45%	2 877 694	460 431	16%
Gauteng	7 624 893	533 743	7%	10 447 246	626 835	6%
KwaZulu Natal	8 572 302	2 675 414	31%	10 105 437	3 334 794	33%
Limpopo	4 576 133	1 876 215	41%	5 274 836	1 793 444	34%
Mpumalanga	3 124 203	1 062 229	34%	3 589 909	1 005 175	28%
North Cape	1 011 864	404 746	40%	1 125 881	303 988	27%
North West	2 963 554	998 428	34%	3 425 153	787 785	23%
West Cape	3 956 875	356 110	9%	5 261 922	473 573	9%
Total	40 583 573	12 580 908	31%	48 687 323	10 711 211	22%

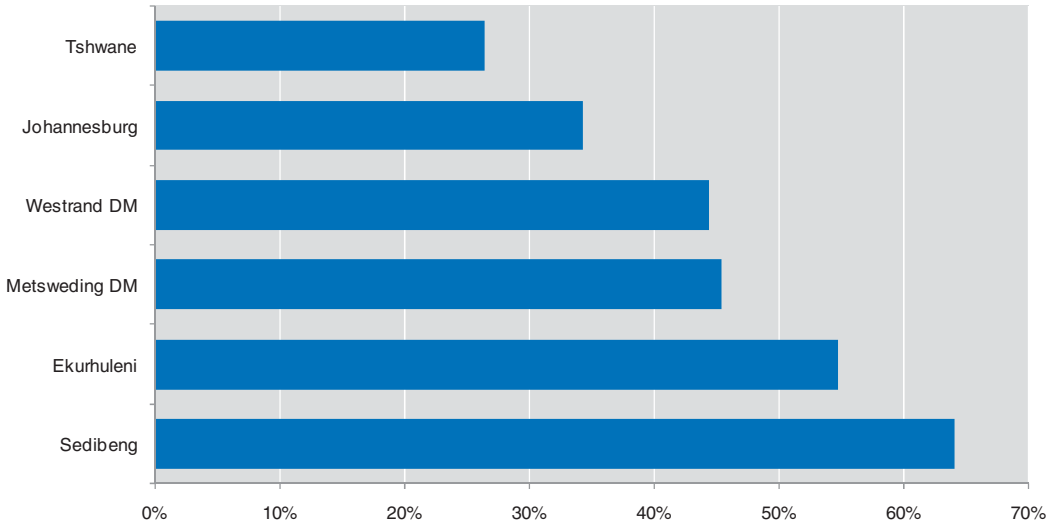
Note: Extreme poverty is defined as the percentage of population living below ZAR 238 per month.

Source: Presidency of South Africa (2009), *Development Indicators 2009*, Presidency of the Republic of South Africa, Pretoria, *www.thepresidency.gov.za/learning/me/indicators/2009/indicators.pdf*.

Poverty is not homogeneously distributed throughout Gauteng without regard for location and race. In 2010, Black Africans represented the racial majority in Gauteng (75.0% of the total population), followed by whites (18.7%), coloured (3.6%), and Indian/Asian (2.7%) (Statistics South Africa, 2010a).[43] Using census data, the spatial distribution of low-income residents in the Gauteng city-region shows that poor households cluster around the townships created by apartheid as well as in the northern border of the province (Gauteng City-Region Observatory, 2010a).[44]

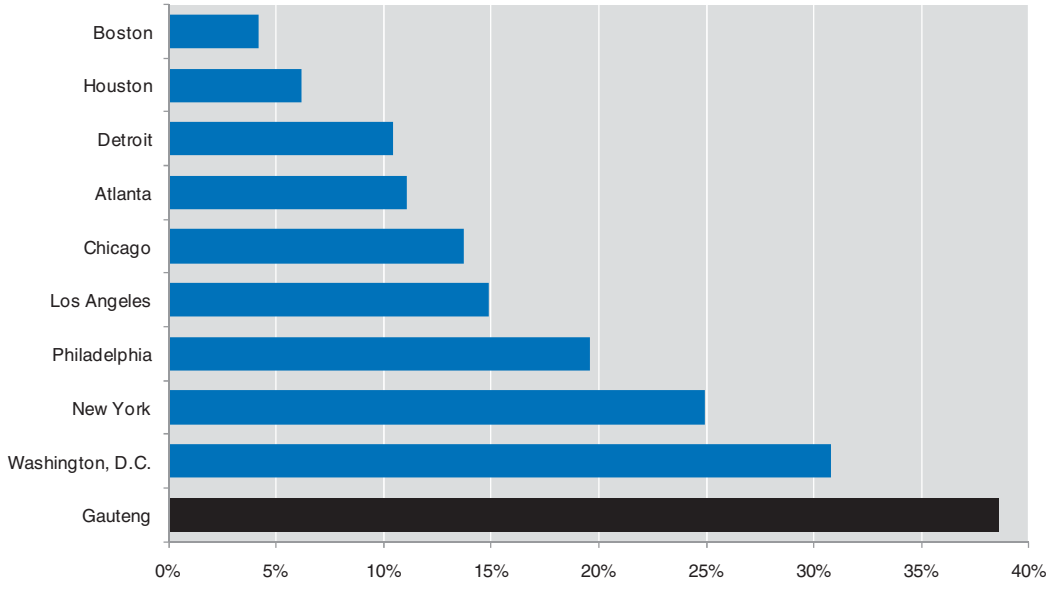
The Gauteng city-region's concentration of poor in high-poverty neighbourhoods, rather than mixed-income neighbourhoods, places additional constraints on economic mobility. A high concentration of the poor in high-poverty neighbourhoods leads to less economic opportunity, given the reliance on social networks to secure employment. The high level of economic segregation means that Gauteng's poor not only have to cope with their own poverty, but also with lower quality schools, inadequate infrastructure and social networks with a high level of unemployment. Gauteng's concentrated poverty rate (the rate of poor living in high-poverty neighbourhoods) stands at 38.6%. The rates in Sedibeng (64.1%) and in Ekurhuleni (54.7%) are particularly alarming (Figure 1.45). Though international comparative datasets do not exist on neighbourhood poverty, Gauteng's rates can be compared to rates found in major metropolitan statistical areas (MSAs) in the United States (Figure 1.46).

Figure 1.45. **Concentrated poverty rates within Gauteng, 2003**



Source: OECD based on South Africa Department of Transport's *National Transport Survey* data.

Figure 1.46. **Concentrated poverty rates in Gauteng and United States metropolitan areas, 2000 and 2003**

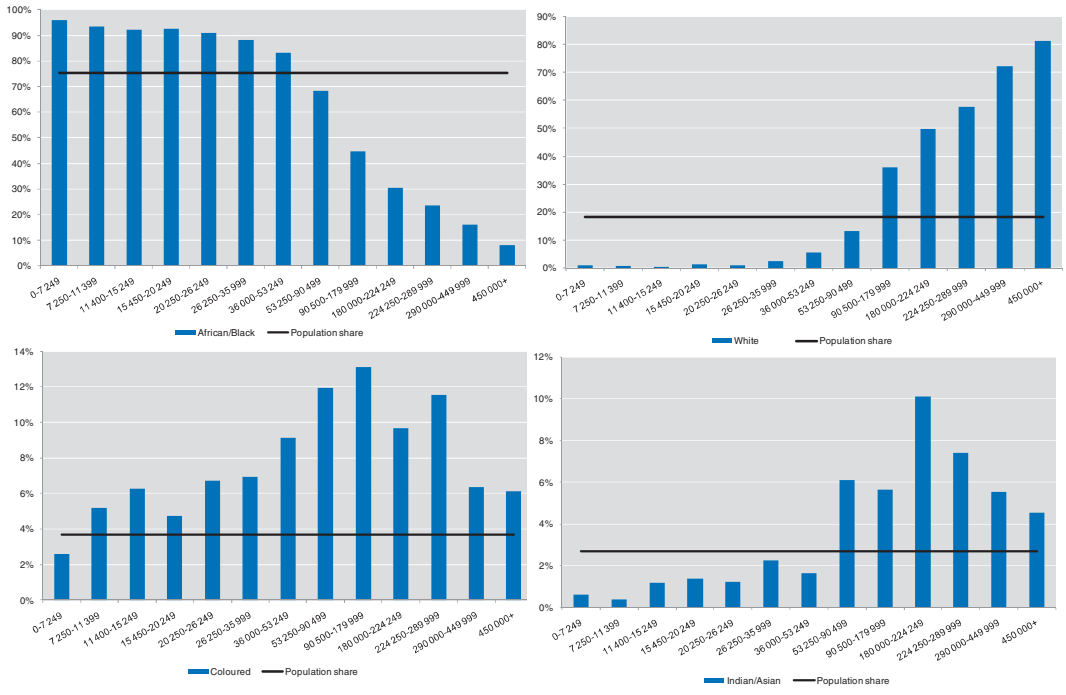


Note: "Concentrated poverty" is defined as the proportion of a metropolitan area's poor population living in high-poverty areas. Gauteng data corresponds to 2003 and the US data is from 2000.

Source: OECD based on South Africa Department of Transport's *National Transport Survey* data (2003) and Jargowsky (2003), "Stunning Progress, Hidden Problems: The Dramatic Decline of Concentrated Poverty in the 1990's", The Living Cities Census Series, The Brookings Institution, Washington, D.C., based on the 2000 United States Census.

Income distribution is not racially neutral in the Gauteng city-region: Africans earn disproportionately low levels of income. While Africans comprise 75.2% of Gauteng's population, 95.8% of households in the lowest income band (ZAR 0 to ZAR 7 249) are African. In this same income band, 2.1% of residents are white, although they comprise 18.4% of Gauteng's population. For the coloured population, the Gauteng representation is 3.7%, and 1.5% are in the lowest income band. Indians/Asians represent 2.7% of the population and 0.5% residents are in the lowest income band. On the other hand, the highest income band (ZAR 450 000+) is overrepresented by whites (75.8%), Indians/Asians (3.0%) and coloured (10.5%) households, but grossly underrepresented by Black Africans, who comprise only 10.8% of the households (Figure 1.47).

Figure 1.47. **Household income distribution by race in Gauteng, 2005**



Source: OECD calculations based on Statistics South Africa (2006), *Income and Expenditure Survey 2005-06*, Release P0100, Statistics South Africa, Pretoria.

Poor health indicators, particularly HIV and infant and child mortality, have an enormous multi-sectoral impact on society, economy, productivity and family structure. In terms of HIV, 12.0% of South Africa's population was HIV positive in 2009 and Gauteng's HIV-positive population stood at 11.7% (Gauteng Provincial Government, 2009b). The HIV-positive population in Gauteng did, however, decline by 50 000 from 1.25 million in 2004 to 1.2 million in 2008. The leading natural causes of death were tuberculosis (10.6%) and influenza and pneumonia (10.4%). Frequently, these two leading causes of death were AIDS-related opportunistic infections (Gauteng Provincial Government, 2010). Indeed, according to estimates from IHS Global Insight, it was estimated that HIV/AIDS deaths accounted for approximately a quarter of total deaths in Gauteng Province between 2001 and 2008 (cited in Gauteng Provincial Government, 2010). Infant mortality was estimated at 46.9 per 1 000 live births in 2010 (Statistics South Africa, 2010b).

Spatial inequality: the persistence of housing backlogs and neighbourhood poverty

The challenges of post-apartheid housing delivery in 1994 (the provision of decent housing for low-income population combined with deracialised service provision) have been amplified by a series of factors, including a rapidly growing population, decreasing household size, an elevated housing demand from the inflow of immigrants, and a dysfunctional secondary housing market with a limited stock of affordable housing. Collectively, this situation increases the housing backlog in Gauteng by 52 500 units per year (Gauteng Provincial Government, 2009b). Gauteng's large housing backlog is in line with national trends: South Africa still has a backlog as large as it had in 1994. While 2.5 million households have been served by the housing subsidy scheme, an estimated 2.5 million are waiting for assistance (Rust, 2009). This has occurred in spite of the dramatic delivery of public housing following apartheid. Consequently, nearly one-fourth of Gauteng's residents live in informal housing.

Allocating public housing to facilitate economic mobility and alleviate poverty is an equally complex issue for the city-region. The spatial mismatch between where the population resides and where jobs are being created may constrain job searches and limit economic opportunity. The preponderance of employment growth in South Africa's cities occurs at a distance from the residential location of the largest proportions of the African population, which is also the least employed. The distance between residential location and the city centre "plays a much more important role in explaining African unemployment in South Africa, even when controlling for education and income levels" (Naudé, 2008). Outside South Africa, spatial constraints on job searches have been shown to influence employment rates.[45]

Though the location of high levels of subsidised housing in peripheral "job-poor" zones may have trapped communities in sub-optimal employment circuits, it is undeniable that these areas provide the benefit of affordable housing that "job-rich" zones do not. People who cannot attain regular employment may locate in the least expensive areas, which happen to be on the periphery of the Gauteng city-region. In this sense, the "spatial mismatch" hypothesis may be reinforced by the real estate market and the residents' disposable income, as much, if not more, than by urban form.

The persistence of Gauteng's housing deficits

Gauteng residents maintain a broad range of tenure arrangements, ranging from ownership of a home in the formal market to occupation of a vacant lot. Though it is not possible to determine absolute numbers of households in rental, social rental or owner-occupier circumstances, the Gauteng City-Region Observatory's 2009 *Quality of Life Survey* is able to present an up-to-date picture of the proportions in each arrangement. This suggests that, across Gauteng, 65.2% own their own home, either through mortgage financing or because housing has been granted to them by the government. The survey reports that 11.8% of respondents live in free public homes (Reconstruction and Development Programme or RDP houses) and 21.7% of households rent their home either in formal or informal housing markets (Gauteng City-Region Observatory, 2010b).[46]

Housing provision in South Africa has deservedly received much policy attention, given its potential as a catalyst of economic development and a vehicle for socio-economic integration. Housing emerged as a central policy priority after the passing

of apartheid and prompted massive investment in South Africa. The *Housing White Paper* (1994) portrayed housing as "one of the greatest challenges facing the Government of National Unity" and encouraged government to strive for the "establishment of viable, socially and economically integrated communities, situated in areas allowing convenient access to economic opportunities as well as health, educational and social amenities," (Department of Housing of South Africa, 1994). Initially the South African Government focused on scale and delivered 1 million housing units within seven years. Indeed, between 4.5 million and 5 million residents in South Africa were given tenure from 1994 to 2001, a level purported to be "unsurpassed anywhere in the world" (Minister of Housing of South Africa, 2001; quoted in Khan, 2003).

Gauteng should be acknowledged for its impressive delivery of public housing after apartheid. Between 1994-95 and 2002-03, almost 1 million housing subsidies were approved in Gauteng, and a total of 340 331 RDP houses were built, indicating a significant lag in the construction of subsidised units. Between 2003-04 and 2007-08, a further 275 382 subsidies were issued and 343 012 homes were built, indicating some catch-up in the construction process. In 2008-09 and 2009-10 a further 114 123 houses were constructed (data on the number of subsidies issued were not available for these two years).[47] While the gap between subsidy approval and completion of RDP homes is large, it needs to be recognised that an estimated 797 000 RDP dwellings constructed in Gauteng over a 15-year period is a significant achievement (Table 1.12). It represents 27% of all housing delivery in the country during this period.

Table 1.12. **Scale of public housing provision in Gauteng and South Africa, 1994-2009**

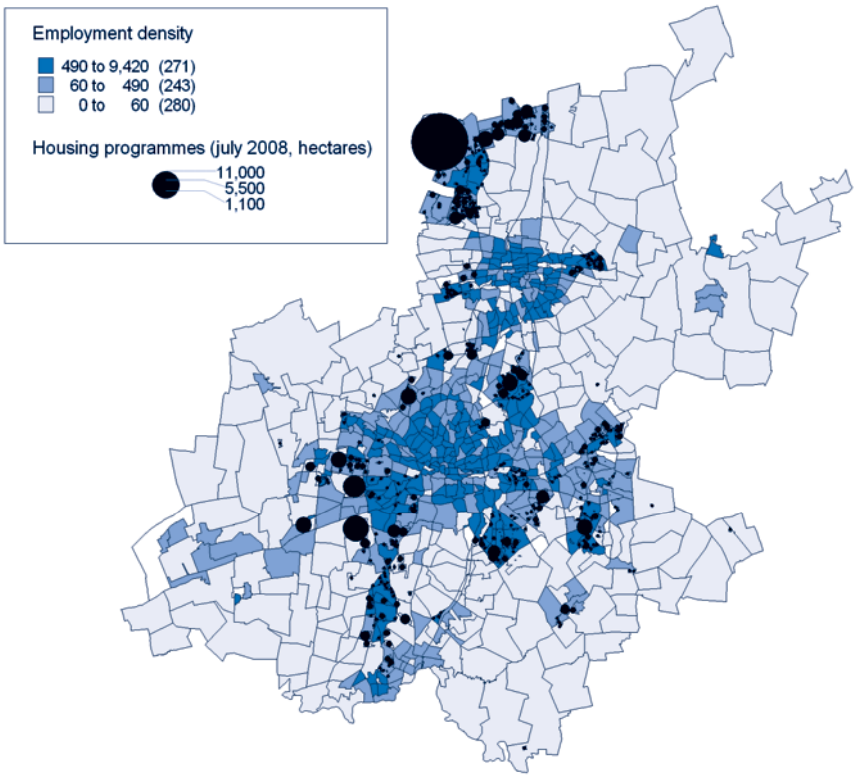
	1994-95-2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Total
Approved subsidies	989 016	39 086	54 045	56 373	53 234	72 644			
Completed units	340 331	49 034	66 738	59 310	77 044	90 886	80 469	33 654	797 466
Approved subsidies	2 299 988	189 602	250 041	137 746	166 523	252 064			
Completed units	1 420 897	193 615	217 348	252 834	271 219	248 850	239 533	161 584	3 005 880

Note: Data for subsidies approved in 2008-09 and 2009-11 were not available.

Source: Republic of South Africa, National Treasury (2009), *Provincial Budgets and Expenditure Review 2009*, and statistics on the National Department of Human Settlements website, *www.dhs.gov.za*.

Public housing provision has mainly been allocated in economically deprived areas and has generally followed a sectoral approach, which has reinforced the spatial mismatch by providing housing units in locations of minimal employment. Paradoxically, the large-scale delivery of individual units through capital subsidies has not significantly changed the urban form established under apartheid. For instance, within Gauteng, the allocation of RDP housing has been in areas peripheral to intensive employment (Figure 1.48). The combination of high financial costs and limited budgets has obliged local governments to develop in the outskirts, which lack amenities and socio-economic infrastructure. This has trapped communities in suboptimal employment circuits, with low income and employment multipliers (mainly informal employment).

Figure 1.48. **Location of RDP housing in job-poor neighbourhoods in Gauteng, 2008**



Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: OECD based on housing programmes layer for Gauteng, dated July 2008.

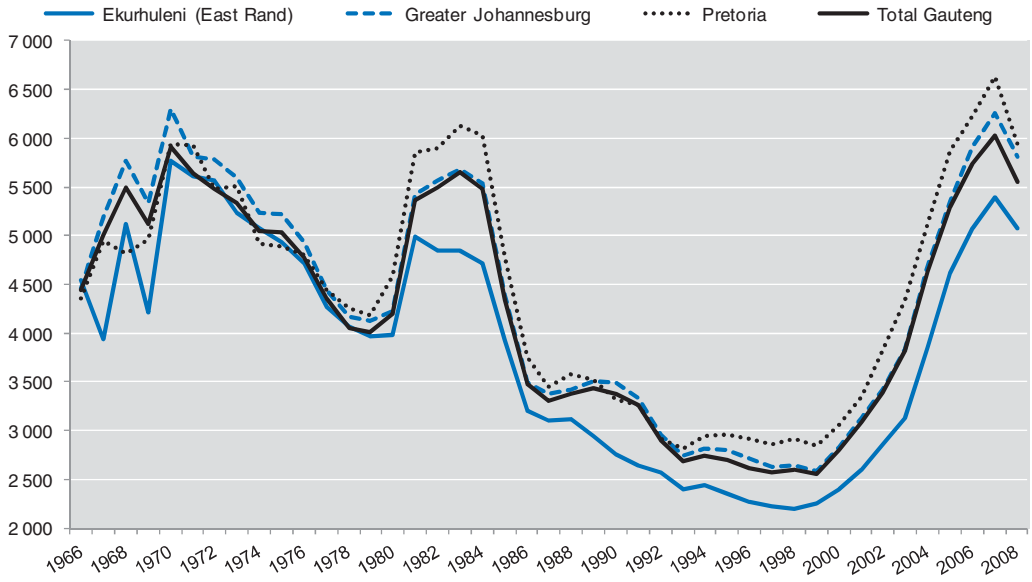
The secondary housing market (home resales) shows clear signs of being dysfunctional, given high access barriers to urban land markets and low turnover rates in former black township areas and low-income neighbourhoods. Within township areas, property markets suffer from a variety of procedural factors, including delays in transferring titles to beneficiaries of government subsidy houses. This results in lack of legal title, prohibitions on subsidy beneficiaries from selling their RDP houses within eight years of occupation,[48] lack of conveyancers and estate agents operating in these areas, and expensive transaction costs, which often force households to remain where they are or sell informally (Nell et al., 2004). In South Africa, only 3% of properties in former black township areas and 4% of properties in low-income areas were subject to transactions from 2007-09. This compares with 11% in the properties that fall into the ZAR 250 000 to ZAR 750 000 segment, suggesting both a problem in liquidity and a lack of accommodation in the lower market segment (Rust, 2009).

Home prices in Gauteng's formal market have increased markedly since 2000, which has compromised the affordability of homes in the formal housing market. Housing prices for new and old houses were relatively high in the 1970s and 1980s. However, both prices trended downwards in real terms between the middle of the 1980s until 2000, at which point they started to rise rapidly. This effect has been roughly the same across municipal areas. Tshwane appears to be the municipality with the highest housing prices, followed by Johannesburg and Ekurhuleni (Figure 1.49). In South Africa, new housing targeted at

the "affordable" market cost approximately ZAR 350 000 in 2009, which a household earning approximately ZAR 14 000 per month could afford. Unfortunately, 80% of South African households earn less than ZAR 9 000 per month and therefore cannot afford to buy new housing (Rust, 2009).

Figure 1.49. **Municipal housing prices in Gauteng**

Old and new houses, 1966-2008 (in constant prices, ZAR)



Source: Quantec.

Over one in four Gauteng residents live in a situation of housing need. Absolute need in the South African context is usually calculated by counting the number of households that in the Census, or in national surveys, are enumerated in housing types that do not meet certain minimum standards. Households living in informal backyard dwellings, in informal dwellings not in backyards, in structures made of traditional materials, and in worker hostel arrangements, are usually regarded as in need of decent housing. The largest percentage of households in need of decent housing is recorded in Westonaria and Merafong (Table 1.13). This is because of the very high numbers of (likely single-person and male) households in workers' hostels in and around mines in the area. However, it is probable that these households, living in Gauteng in migrant labour circumstances, have homes in other parts of the country. The largest total need for housing is in Johannesburg and Ekurhuleni. Ekurhuleni had an estimated 143 439 households in informal settlements in 2007, and Johannesburg had 120 701. Tshwane has a higher number of households in informal settlements, at 135 352, but its numbers of households in informal backyard dwellings is far lower. In Johannesburg, 97 880 households lived in backyard shacks in 2007, compared to 48 464 in Tshwane, and 77 161 in Ekurhuleni.

Table 1.13. **Housing need in the Gauteng city-region, 2007**

Municipality in Gauteng	Number of households in need	% of total households in need
Ekurhuleni	242 547	28.6%
Tshwane	196 029	28.5%
Johannesburg	260 153	22.3%
Mogale	28 820	30.6%
Randfontein	11 630	28.7%
Westonaria	38 110	75.2%
West Rand DMA	253	17.7%
Merafong	51 264	58.2%
Emfuleni	32 976	16.8%
Midvaal	2 742	11.3%
Lesedi	3 103	15.2%
Nokeng tsa Taemane	4 167	28.1%
Kungwini	7 847	24.8%
Total	879 641	27.0%

Note: Number and percentage of households in each municipality in informal settlements, informal dwelling in backyard, traditional dwelling or worker's hostel.

Source: Statistics South Africa (2008), *Community Survey 2007*, Statistical Release P0301, Statistics South Africa, Pretoria.

With few affordable options and a growing housing backlog, residents have entered the informal housing market *en masse*. Gauteng has a larger percentage of households living in informal dwellings than the South African national average. In 2009, approximately 22.3% of residents in Gauteng lived in informal or traditional dwellings, either in the backyards of formal homes, or in informal settlements,[49] compared to the South African national average of 13.4% (Table 1.14). In 2009, the Gauteng Provincial Government (2010) calculated that 600 000 housing units lacked basic services and infrastructure. The Gauteng Provincial Government has also identified 20 Priority Townships across the province that deserve particular attention. Within Johannesburg alone, there are now 180 informal settlement areas that accommodate approximately 180 000 households. In addition, Gauteng's decreasing household size, the smallest in the country, at an average of 3.3 people per household compared with a national average of 3.9 per household, also implies that, even if population levels were constant, household demand is increasing.[50]

Informal settlements are spreading throughout the Gauteng city-region, compounding the challenge of providing capital upgrades in a cost-efficient manner and urban development along planned economic nodes. A new spatial geography of informality is emerging, for example, in Johannesburg, where smaller informal settlements are proliferating (City of Johannesburg, 2008b). These are distributed chiefly in the south of the city and along its north-western perimeter. Most are not properly connected to public services. Smaller settlements are more costly to upgrade per inhabitant than larger settlements, given the economies of scale of sewerage, road and electrical provision. Existing figures reveal that 21 of the informal settlements have grown by more than 50% from their initial size and only 28 settlements have decreased in size. The key challenge in the future will be either to relocate the inhabitants of informal settlements to formal state-provided housing, or to formalise and consolidate informal settlements where it is possible and desirable to do so, ideally in close proximity to existing and/or future economic opportunities (City of Johannesburg, 2008).

Table 1.14. **Dwelling type by province in South Africa, 2001 and 2009**

(%)

Province	2001				2009			
	Formal	Informal	Traditional	Other	Formal	Informal	Traditional	Other
Eastern Cape	51	11	37	0	57	7	35	1
Free State	66	26	7	0	81	15	3	1
Gauteng	**75**	**24**	**1**	**0**	**74**	**22**	**0**	**4**
KwaZulu-Natal	60	11	29	0	66	09	23	3
Limpopo	73	7	20	0	85	5	7	2
Mpumalanga	72	15	13	0	81	08	8	3
Northern Cape	81	11	7	1	86	8	5	1
North West	72	23	5	0	82	16	1	2
Western Cape	81	16	2	0	79	17	0	3
South Africa	69	16	15	0	74	13	10	3

Note: "Other" includes living in a boat/ship, caravan, tent and workers' hostels as well as any mis-specified during the two surveys.

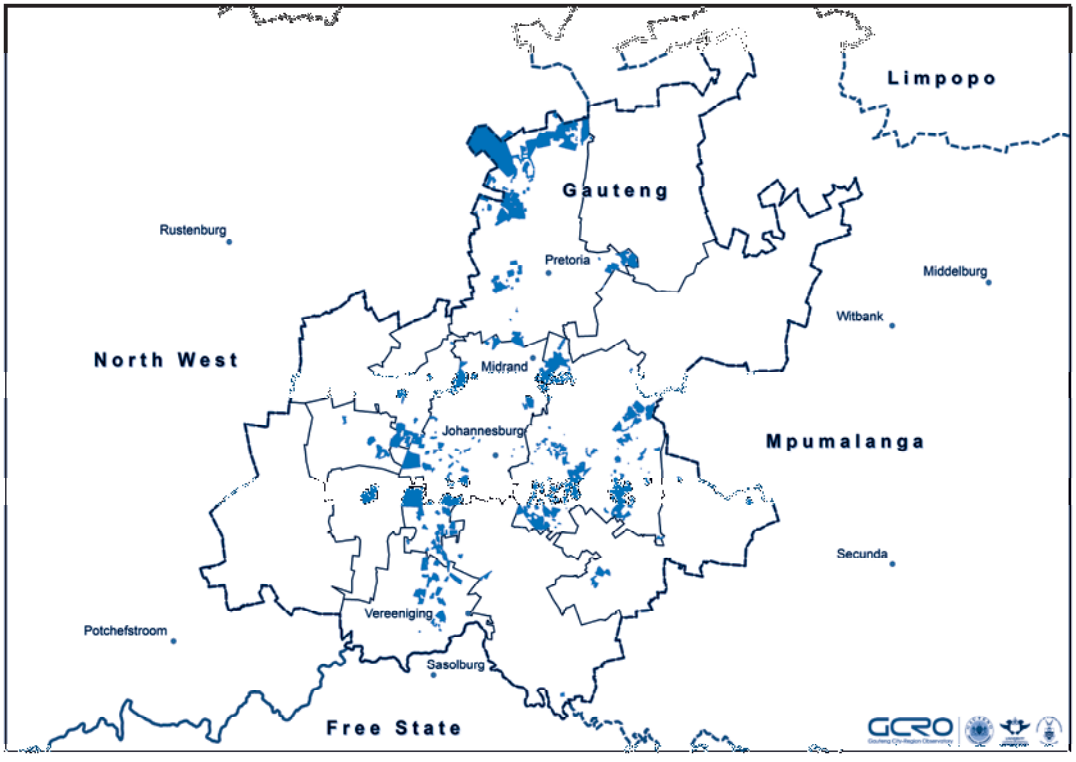
Source: Statistics South Africa (2001, 2009), *General Household Survey*, Statistics South Africa, Pretoria.

Location disadvantages and Gauteng's new geography of poverty

To achieve the high rates of public housing delivery discussed earlier, subsidised housing has tended to be built in peripheral areas that isolated residents in "job-poor" zones and prevented them from renting units in moderate-income neighbourhoods. To maximise the number of units built, RDP housing was located in poorer areas of the city-region, usually on the edges of municipalities, and with a preponderance in southern and western Johannesburg, on an axis running between Johannesburg and Vereeniging (the Orange Farm, Evaton, Sharpeville complex of informal settlements and townships), and in the far northern parts of Tshwane (Figure 1.50). Subsidies were not given for low-income residents to rent in moderate income neighbourhoods, as is common throughout OECD member countries. This has resulted in a degree of ghettoisation that has tended to trap communities in sub-optimal employment circuits.

Low-income Black Africans disproportionately live in deprived neighbourhoods compared to low-income residents of other population groups in the Gauteng city-region, which infringes upon their ability to take advantage of economic opportunities and the social networks of less disadvantaged areas. Within a typical high-poverty neighbourhood in Gauteng, 98.3% of the population is Black African, followed by whites (1.26%), coloured (0.27%), and Asians (0.09%) (Figure 1.51). These figures are not commensurate with the overall distribution of the population with poverty incomes, which shows a lower rate for the Black African population (93.9%) and whites (0.31%) and a much higher rate for coloured (4.09%) and Asians (1.70%). In other words, Black Africans are overrepresented in high poverty zones by 25%, while whites, coloured, and Asians together are underrepresented by -18.1%. Within Gauteng, 21.1% of Black Africans, 0.8% of whites, 1.1% of coloured, and 0.5% of Asians lived in high-poverty neighbourhoods. Comparatively, the spatial location of Black Africans in deprived neighbourhoods is comparable to the concentrated poverty rates experienced by African-Americans in Baltimore (21.5%) or Washington, D.C. (23.9%) and Latinos in Los Angeles (16.9%) or Washington, D.C. (23.5%) in 2000 (Jargowsky, 2003).

Figure 1.50. **Public housing projects in Gauteng, 2008**

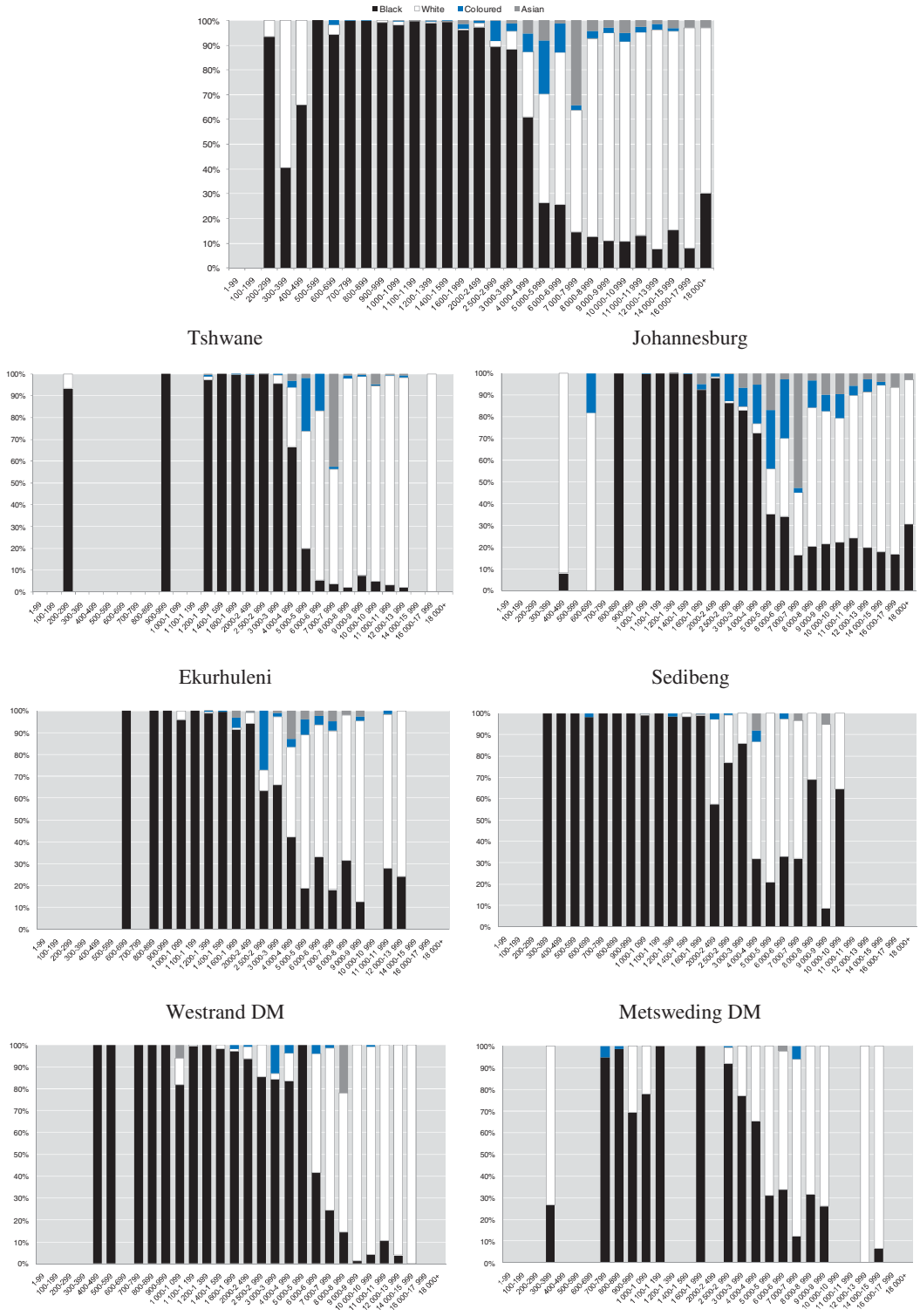


Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map. Merafong is excluded.

Source: Gauteng City-Region Observatory (2010), "Background Report for OECD Gauteng Territorial Review", 25 October version, based on data from the Gauteng Provincial Government Department of Local Government and Housing.

Important municipal differences exist with respect to the attainment of racially mixed neighbourhoods. In Tshwane, higher-income neighbourhoods generally lack Black Africans and, in Sedibeng, the opposite trend occurs. Johannesburg offers the highest degree of racially mixed neighbourhoods, and throughout Gauteng, racially mixed neighbourhoods seem to occur within the ZAR 4 000 to ZAR 7 999 income band. Spatially, there is also evidence that the African population in city centres increased in the centres of Ekurhuleni, Johannesburg and Tshwane from 1996 onwards (Naudé, 2008). Relatively few low-income neighbourhoods exist in Tshwane and Johannesburg, while Sedibeng and the West Rand offer "dormitory communities" for workers in Tshwane and Johannesburg.

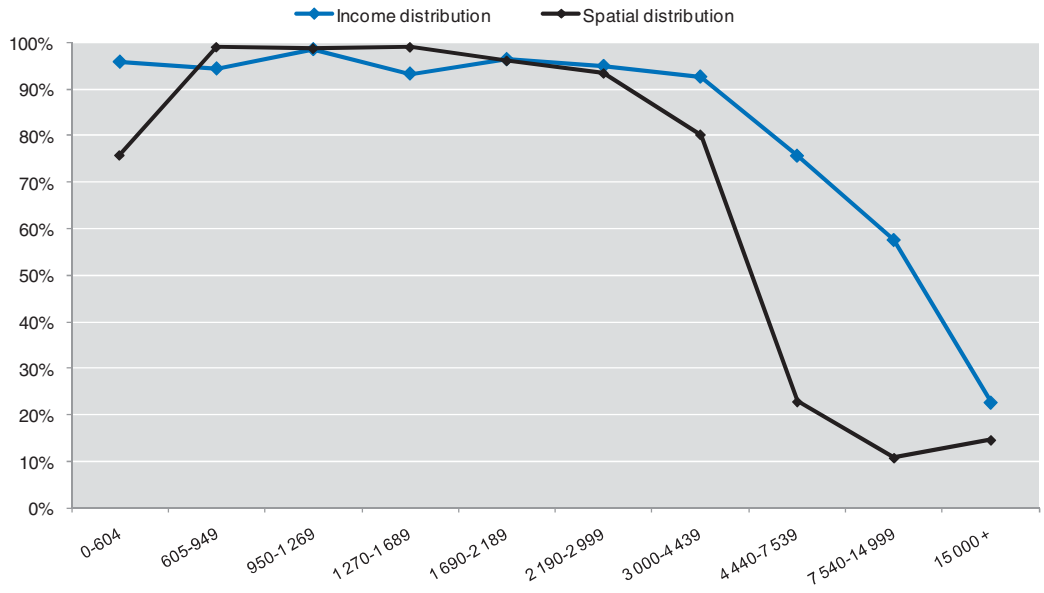
Figure 1.51. **Racial composition in Gauteng by median income level of residents in neighbourhood, 2005 (ZAR)**



Source: OECD analysis based on Gauteng Department of Roads and Transport (2006), *Gauteng Transport Study 2000*, Gauteng Provincial Government, Johannesburg.

Spatial analysis suggests that middle- to upper-middle-class Black Africans tend to live in neighbourhoods where their neighbours earn less income than themselves. This suggests a deficit in middle-class Black African neighbourhoods. Though evidence on racial desegregation suggests a rising degree of concentration of Black Africans in high-income neighbourhoods, there is a gap in middle-income housing. Indeed, while 75.6% of those who make between ZAR 4 440 and ZAR 7 539 each month are Black African, only 22.9% of those who live in neighbourhoods where the average income is in this level are Black African. If Black Africans lived in areas proportional to their income, there would be twice as many Black Africans in such neighbourhoods than the current levels. A similar gap exists for the ZAR 7 540 to ZAR 14 999 income band, though the gap narrows at the wealthiest increment (Figure 1.52).

Figure 1.52. **Spatial distribution vs. income distribution of Black Africans in Gauteng, 2005 (ZAR)**



Source: OECD analysis based on Gauteng Department of Roads and Transport (2006), *Gauteng Transport Study 2000*, Gauteng Provincial Government, Johannesburg; and Statistics South Africa (2006), *Income and Expenditure Survey 2005/06*, Statistics South Africa, Pretoria.

Infrastructure and transport constraints

The "service backlogs" problem

The Gauteng city-region has inherited a considerable problem of "service backlogs" from the apartheid era, when inequality in infrastructure and public services was institutionalised. African areas then and today remain poorly designed for the numbers of people they eventually came to accommodate. Though there was variation across townships, they were generally over-crowded, and households were inadequately serviced with water, sanitation, power and waste removal. The urban environments for Black Africans were deficient, especially compared with wealthier parts of the city-region previously designated for whites only. They had fewer green and public spaces, inferior

access to libraries, clinics and other facilities, lower quality road infrastructure and often less accessible and less efficient public transport services. Gauteng shares these challenges with other regions in South Africa. One national government study from 2005 documented that municipalities needed an additional ZAR 6 billion to effectively manage the infrastructure currently in place and to honour their service commitments.[51]

Service delivery shows positive trends in the Gauteng city-region. The percentage of residents with piped water inside their dwelling increased from 46.4% in 2001 to 66.2% in 2007. In terms of other municipal services, such as refuse removal, sanitation, and water services, the majority of households in Gauteng enjoy services that are on par with or above the minimum RDP standard (City of Johannesburg, 2008). Projects led to the near-eradication of the bucket toilet system, and Gauteng municipalities have undertaken water and sanitation projects on a massive scale. From 2006 to 2009, municipalities in the Gauteng city-region infrastructure expenditure through municipal infrastructure grants (MIGs) exceeded ZAR 5 billion. Over this period, 1 026 kilometres of roads were built and supported by 88 storm water projects. Equally important, all municipalities in the Gauteng city-region provide free basic electricity ranging from 50 kWh to 100 kWh per month.

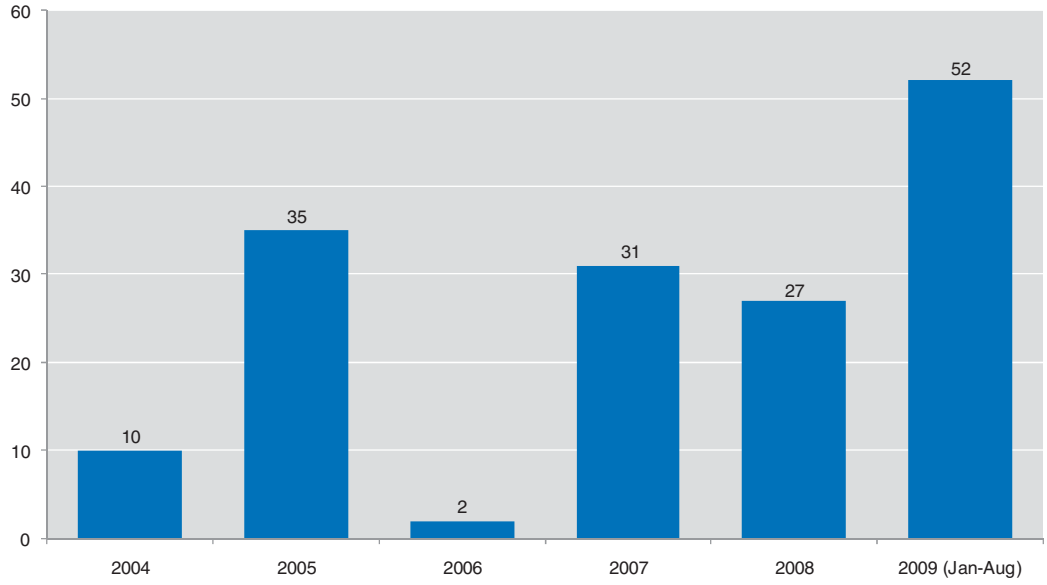
However, infrastructure gaps remain in the use of electricity for heating, waste removal and piped water (Table 1.15). This is reflected in the recent service delivery protests: from January to July of 2009, 30% of the protests on service delivery occurred within Gauteng (Co-operative Governance and Traditional Affairs, 2009). What is significant is not only that Gauteng has the largest share of protests in South Africa, but that the frequency of such protests is on the increase (Figure 1.53).

Table 1.15. **Municipal service delivery in Gauteng, 2001 and 2007**

	2001	2007
Total piped water	97.1	97.9
Piped water inside dwelling	46.4	66.2
Waste removal	84.6	86.2
Toilet access	96.4	98.4
Use of electricity for cooking	72.4	81.3
Use of electricity for lighting	80.4	83.3
Use of electricity for heating	69.8	76.7

Source: Statistics South Africa (2001), *Census 2001,* Statistics South Africa, Pretoria; Statistics South Africa (2008), *Community Survey 2007*, Statistics South Africa, Pretoria, *www.statssa.gov.za/Publications/P03011/P030112007.pdf.*

Figure 1.53. **Service delivery protests in Gauteng, 2004-09**

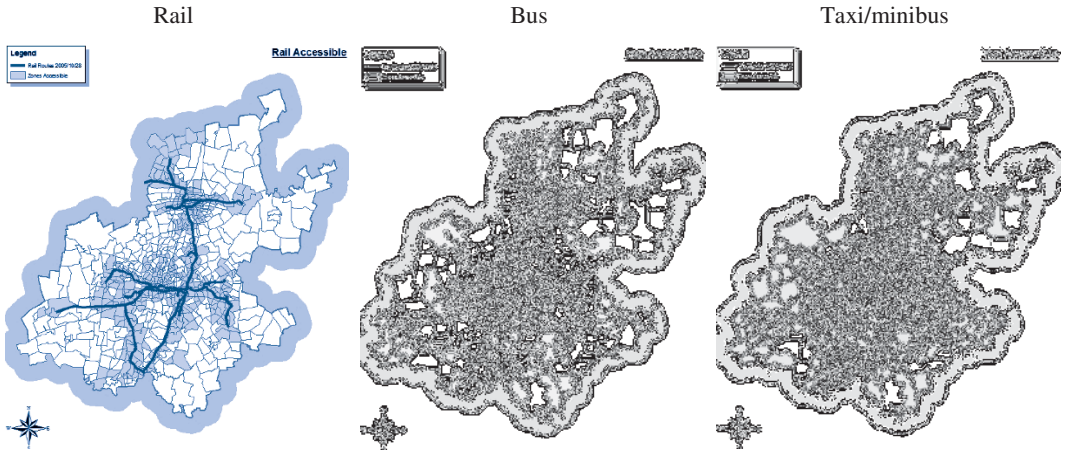


Source: Co-operative Governance and Traditional Affairs (2009), *State of Local Government in South Africa: Overview Report*, National State of Local Government Assessments, CGTA, Pretoria.

Public transport: obstacles for achieving accessibility and affordability

Accessibility and affordability of public transport pose particular challenges for the Gauteng city-region. Access to public transport is very low, which reduces mobility and raises the cost of income for transport. In Gauteng, 54.2% and 43.7% of citizens are not within walking distance to a train or bus station. This level is even more elevated in municipalities such as Metsweding, where 89.0% of the population lacks train access and in West Rand, where 81.6% lack bus access (Table 1.16). This leaves them dependent on taxis (only 6.4% of Gauteng residents do not have access) whose networks have the largest coverage area in Gauteng (Figure 1.54). Taxis, however, are not publicly owned and managed, and tend to cost more for residents, reducing their disposable income. Overall, poor levels of transport have contributed to rising rates of motorisation. Car-related commuting (private car, mini-bus taxi and bus) accounts for 81.2% of trips and private car use increased by 13% from 1995-2002. According to the 2002 *Gauteng Household Interview Survey* (GHIS), during the morning peak hours, 53% of all trips are made by private transport (private car, bicycle, walk and others) and 47% by public transport (minibus taxi, bus and train). However, the recent introduction of the "Gautrain" high-speed rail system is expected to become a key transport mode between Johannesburg and Tshwane (albeit for higher-income commuters), though it needs to be better linked to feeder lines to substantially reduce car commuting.

Figure 1.54. **Transport access in Gauteng: rail, bus, taxi/minibus**



Note: These maps are for illustrative purposes and are without prejudice to the status of or sovereignty over any territory covered by these maps.

Source: Gauteng Department of Roads and Transport (2006), *Gauteng Transport Study 2000*, Gauteng Provincial Government, Johannesburg.

Table 1.16. **Walking time to train, bus and taxi access points by municipality in the Gauteng city-region, 2003**

	1-15 min	16-30 min.	31-60 min.	61+ min.	No service
Walking time to the nearest train station					
City of Tshwane	23.4%	26.5%	6.0%	0.7%	43.3%
Ekurhuleni	21.7%	16.1%	6.9%	2.0%	53.2%
City of Johannesburg	23.5%	16.8%	6.7%	0.5%	52.5%
West Rand	10.6%	13.2%	7.1%	0.8%	68.3%
Sedibeng	13.7%	15.7%	12.5%	4.2%	53.9%
Metsweding	1.8%	3.2%	5.4%	0.6%	89.0%
Gauteng	20.4%	16.9%	7.2%	1.3%	54.2%
Walking time to the nearest bus station					
City of Tshwane	86.2%	4.5%	0.6%	0.0%	8.7%
Ekurhuleni	26.2%	3.4%	0.3%	0.0%	70.0%
City of Johannesburg	62.1%	5.8%	1.0%	0.0%	31.1%
West Rand	17.0%	1.2%	0.2%	0.0%	81.6%
Sedibeng	61.3%	14.0%	2.0%	0.2%	22.4%
Metsweding	58.8%	12.3%	1.3%	0.0%	27.6%
Gauteng	50.2%	5.3%	0.7%	0.0%	43.7%
Walking time to the nearest taxi rank					
City of Tshwane	87.1%	6.2%	1.1%	0.0%	8.0%
Ekurhuleni	79.3%	13.6%	1.5%	0.1%	5.4%
City of Johannesburg	85.6%	8.0%	1.4%	0.0%	5.0%
West Rand	74.8%	10.6%	2.9%	0.0%	11.6%
Sedibeng	72.7%	15.9%	2.8%	0.5%	8.0%
Metsweding	63.5%	17.2%	1.8%	0.0%	17.5%
Gauteng	81.3%	10.5%	1.7%	0.1%	6.4%

Source: South African Department of Transport (2005), *National Household Travel Survey 2003*, Department of Transport, Pretoria.

Bus and train ridership levels are low because of insufficient access, low stock and low frequency. Mini-taxis (minibus, sedan or *bakkie*) cover a larger area; only 6.4% are not in walking distance to these modes of transport. According to the nearly 9 000 people in Gauteng who responded to the *National Transport Survey*, 61% of train users were dissatisfied with the distance between their home and the station, 54% were dissatisfied with the travel time, 63% with the punctuality of trains, and 20% with the fares. Consequently, only 9.5% of the population uses rail to commute to work, in contrast to the much higher rates for Cape Town (17.0%) or Seoul (32.5%) (UN-HABITAT, 2007). In respect to bus ridership, 21% of bus users were dissatisfied with the distance between home and the station, 21% were dissatisfied with the travel time, 27% with the punctuality of trains, and 35% with the fares. In sum, 45% of rail users and 23% of bus users were dissatisfied with the overall service. Largely as a result of this decrease in rail and tram services, and with bus services unable to respond to the enormous demand for commuter services from the outlying areas to jobs and activities in the urban centres, minibus taxi services began to fill the gap in transport provision. Now considered a privately owned form of public transport, these minibus taxis have emerged in the South African travel landscape and resemble minibus systems used in such cities as Dakar and Dar-es-Salaam (Box 1.7).

Box 1.7. **The minibus taxi industry**

Under apartheid, African residents were regarded as temporary urban residents, and the fragmented system of apartheid local government made co-ordinated planning and spending impossible. This led to massive underinvestment in rail and bus infrastructure for the poorer sections of the population living in the south of Johannesburg. By the 1980s overcrowding on these modes of transport had become intolerable. Entrepreneurial businessmen (in townships) took matters into their own hands and launched the minibus taxi industry. In the last three decades, this has grown exponentially, to become one of the largest privately owned public transport systems in the world.[1]

Today, the minibus taxi handles 23% of all transport trips and 72% of public transport trips in the city of Johannesburg. According to the Johannesburg Integrated Transport Plan 2003-08, overall rider dissatisfaction is very high, due to a very poor safety record, inadequate facilities, quality and cost of services. However, in terms of travel time and off-peak frequency, it outperforms all other modes. Serving low-income segments of the population, the industry has operated with no government subsidies. In recent years, the government has taken action to formalise and provide a regulatory structure for the industry through a "Special Legislation Process", registration of all associations and operators, and preparation of standard constitutions and codes of conduct for taxi associations and their members.[2]

As Johannesburg's Rea Vaya Bus Rapid Transit system has been brought into operation, distress within the taxi industry over market share (e.g. 575 taxis must be withdrawn from affected routes) has resulted in violent reaction from taxi operators and drivers. Through skilful negotiations, agreements are being reached for displaced taxi drivers to be employed as Rea Vaya drivers or station personnel. Taxi owners are to become shareholders in the bus operating company.[3]

1. Extract from City of Johannesburg (2006), *Reflecting on a Solid Foundation, Building Developmental Local Government 2000-05*.

2. City of Johannesburg Integrated Transport Plan 2003-08, updated 2004.

3. Interviews with City of Johannesburg personnel and Colleen McCaul Associates, South Africa.

Crime rates limit public transport ridership and Gauteng's "attractiveness" in general. According to the *National Transport Survey*, 60% of train users and 35% of bus users were dissatisfied with security when walking to stations. Though Gauteng's reported homicide rate decreased from 5 852 in 1994 to 3 444 in 2010, there are recorded increases in several categories tracked by the Crime Information Analysis Centre of the South African Police Service (SAPS). From 1994-1995 to April 2009-March 2010, the following increases were recorded in Gauteng: total sexual crimes (+34.2%), common robbery (+73.4%), malicious damage to property (+33.6%), drug-related crime (+93.9%), and driving under the influence of alcohol or drugs (+80.5%) (South African Police Service, 2005; 2010).

Differences in commuting persist across socio-economic lines in Gauteng, though they are far less marked than the past. Residents who live in Gauteng's low-income neighbourhoods have higher commuting times than those who live in higher-income neighbourhoods. A much lower proportion of very wealthy residents (those with monthly household incomes over ZAR 51 201 per month) are able to reach work within 15 minutes, and almost 6% of the poorest commuters take over 2 hours to reach their place of work. Equally important, commuting data illustrates the commuting burden on residents in public housing projects, which tend to be located in peripheral locations in Gauteng. Only 9% of RDP beneficiaries can reach work within 15 minutes, and their average time to work is 39 minutes, 5 more minutes than the average commuting time in Gauteng. Furthermore, the improvements in travel times in low- and middle-income areas should be noted. In 1975, average travel times of between 61 and 87 minutes were noted. The corresponding times in 2000 were 52 and 64 minutes respectively.[52]

Notes

1. The period referred to is 1995 to 2007. The initial year (1995) was chosen because it is the first available data point from the Statistics South Africa database. The ending year (2007) was chosen because the years from 2008 and onwards show declines in GDP due to the global crisis and may not be representative of larger trends. However, after a short-lived decline of -1.2% in 2009 with respect to 2008, the economy seems to be in recovery, growing at 6.2% over the 2008-10 period, or at a 2.2% annual average.

2. South Africa's Gini coefficients have continued to grow over the years: 0.66 in 1993, 0.68 in 2000 and 0.7 in 2008 (Leibbrandt et al., 2010).

3. The *UN Population Database* assumptions include six different scenarios that are a combination of the medium variant with respect to the 1998 revision, which implies varying fertility rates, levels of ageing, and migration. For further information, see: *www.un.org/esa/population/publications/ReplMigED/chap3-Approach.pdf*.

4. If, for example, a slice of the northern footprint is included, the population increases considerably. Thembisile Local Municipality adds 257 000 people, Dr. J.S. Moroka LM adds a further 244 000, Madibeng another 347 000. These three local municipalities add nearly another 1 million people to the Gauteng city-region population. An inter-linked set of variables need to be analysed – transport (goods and people), economic activity, work-seeking, leisure and so on – to develop a robust basis for understanding the footprint of the Gauteng city-region. Currently, the Gauteng City-Region Observatory is developing such a model.

5. GeoTerraImage defines urban in their satellite photography as "All built-up areas, including all aspects of residential, commercial, industrial, mining and transportation infrastructure, in both urban and rural environments. Represents primarily a non-vegetated, artificially sealed surface, except for vegetated gardens not otherwise identified as urban-trees or urban-grasslands. Also includes all major road and rail networks, recently cleared, nonvegetated areas being prepared for urban development, and rural farm infrastructure (including greenhouses, propagation tunnels and chicken/pig batteries)" (GeoTerraImage, 2009).

6. The Gauteng City-Region Observatory (GCRO) is acknowledged for extracting, and furnishing to the OECD, the Quantec data used at various points in this *Territorial Review*. Under the auspices of a license for Quantec data held by the University of the Witwatersrand (Wits) where GCRO is based, which license was jointly paid for by GCRO and the Wits Corporate Strategy and Industrial Development (CISD) Research Programme, GCRO accessed selected Quantec datasets and provided these to the OECD as excel tables for the purposes of mapping and analysis. Quantec is referenced as the original source of the data wherever applicable.

7. The Gauteng City-Region Observatory notes that this image has been remodelled using the source data provided by the Department of Economic Development based on EMME2 modelling from the *Gauteng Transport Study 2000*.

8. The accumulation of wealth attracted opportunity seekers from within South Africa, as well as from Lesotho, Mozambique and as far afield as Australia, the United Kingdom, Canada, China and India. Many others came as migrant workers under oppressive and partly forcible conditions.

9. Migrants to Gauteng were most likely to come from Limpopo, followed by KwaZulu-Natal. The *Community Survey* suggested that while 5 801 000 Gauteng residents were born in the province, they were joined by 1 051 000 from Limpopo, 602 000 from KwaZulu-Natal, 494 000 from the Eastern Cape, 452 000 from Mpumalanga, 386 000 from North West, 356 000 from Free State, 132 000 from Western Cape and 78 000 from Northern Cape (most Northern Cape out-migrants go to the Western Cape).

10. The pattern of labour circulation continues, with many migrants labouring for what they hope will be a short period in which they can save to send remittances to their families. According to one analysis, a third of foreign migrants from some countries expect to be living somewhere else within two years.

11. Translated as the "ridge of white waters".

12. The logic of this system was to dispatch surplus labour to the countryside, and thereby spare cities the costs of "social reproduction" of many would-be residents and their families, except those deemed necessary to serve growing mines and factories.

13. Pretoria-Witwatersrand-Vereeniging (PWV) Transportation Survey, 1975. This was based on 10 080 household surveys in the Pretoria area and a further 5 500 in the rest of the PWV area. Data quoted in Gauteng Department of Roads and Transport (2006: 31). The *GTS 2000* included six years of research and modelling, starting with a first working paper in September 2000 and a major survey in 2002-03. Most of the research, analysis and modelling was completed between 2004 and 2006.

14. The Sigma-convergence indicator is calculated using a standard deviation of logged GDP per capita values for regions in a country in this case.

15. According to Rodrik, wage pressures have also been a factor explaining de-industrialisation. According to that view, real wages have remained relatively high for South Africa's level of income, which has made job creation difficult and has hurt competitiveness. According to OECD labour costs statistics, South Africa's unit labour costs grew annually at an average rate of 6.9% between 1995 and 2008 (and at 5.5% in the manufacturing sector). These costs were very low after apartheid ended and have naturally increased, but they have remained much lower than those paid in OECD member countries.

16. Highly skilled includes top management, senior management and professionally qualified and experienced specialists and mid-management. See *www.sablimited.co.za/sablimited/action/media/downloadFile?media_fileid=101*.

17. For more details, see Statistics South Africa (2010a).

18. It is important to note that this is just "completed schooling" and does not refer to those individuals who completed schooling and also have a tertiary qualification. Caution is required given this ambiguity, given that those with a master's degree, etc., can also be counted as having completed schooling. If this cohort is included, the number of those who had completed schooling rose from 38.6% of the population aged 25 and over in Gauteng in 2000, to 50.8% in 2010. This compares with 40% of the national population 25 and over in 2010.

19. The TIMSS studies measured Grade 8 learning achievement in mathematics and science in several countries in 1995, 1999 and 2003. South Africa's performance was disappointing in both the 1999 and 2003 studies, returning lower average test scores in both mathematics and science than all other participating countries (including other African countries, such as Morocco, Tunisia and Botswana). Out of an imputed maximum score of 800, the average South African mathematics score was 275 in TIMSS 1999 and 264 in TIMSS 2003. The average science score was even lower: 243 in TIMSS 1999 and 244 in TIMSS 2003 (OECD, 2008d).

20. High-tech is defined as those manufacturing categories that are R&D intensive in the predominantly developed OECD member countries.

21. This Review employs the OECD classification of manufacturing industries based on technology as defined by the *OECD Science, Technology and Industry Scoreboard* (2005). High-technology industries include: aircraft and spacecraft; pharmaceuticals; office, accounting and computing machinery; radio, TV and communications equipment; and medical, precision and optical instruments. Medium-high technology industries include: electrical machinery and apparatus; motor vehicles, trailers and semi-trailers; chemicals excluding pharmaceuticals; railroad equipment and transport equipment; and machinery and equipment. Medium-low-technology industries include: building and repairing of ships and boats; rubber and plastics products; coke; refined petroleum products and nuclear fuel; other non-metallic mineral products; and basic metals and fabricated metals products. Low-technology industries include: manufacturing; recycling; wood, pulp, paper, paper products; printing and publishing; food products; beverages and tobacco; and textiles; textile products; leather and footwear.

22. Gauteng province has been South Africa's innovation hub since the 19th century, when gold and mine deposits were discovered around the Witwatersrand. The massive movements of people in search of these precious stones, and the ensuing colonial war of conquest and dispossession, necessitated infrastructure such as road and railway system to carry people and other essential supplies. The expansion of the mines in the Transvaal led to the establishment of the South African school of mines, known today as the University of the Witwatersrand. Other major institutions that were essential to science and technology and overall economic development were also created in the 19th and 20th centuries: Iron and Steel Corporation of South Africa (ISCOR), Eskom, Onderstepoort Veterinary Institute, the Council for Scientific and Industrial Research (CSIR), as well the other science councils, some of which were offshoots of the CSIR.

23. Business includes state-owned enterprises (SOEs) such as Transnet, Eskom and the PBMR.

24. The training institutions include: the University of Johannesburg, Tshwane University of Technology, Vaal University of Technology, the University of Pretoria, and the University of South Africa. National Science Councils in the province, collectively with diverse research fields, some of which are state-owned are: ARC, the Council for Geosciences (CGS), CSIR, HSRC, Mintek, Standards South Africa (STANZA), the National Institute for Virology (NIV), the National Health Laboratory Service (NHLS), the Meraka Institute (CSIR), the Africa Institute of South Africa (AISA), the South African Environmental Observatory Network and the South African Biodiversity Information Facility.

25. By comparison, the business sector employs 3 199 FTE researchers in the Gauteng city-region.

26. The rate of incoming foreign direct investment in South Africa is the highest in Africa, but on the low tier of the OECD, ahead of Ireland and Greece, but below Finland and Portugal (OECD, 2010e).

27. This includes R&D by Gauteng-based higher education institutions that is not conducted within Gauteng's borders.

28. The first *Innovation Survey*, modelled on the European Union (EU) *Community Innovation Survey* (CIS), was done in 2001 and covered the period 1998-2000.

29. All data in this section come from Statistics South Africa *Labour Force Surveys*, as reproduced by Quantec Research.

30. However, in the first quarter 2011 *QLFS*, 142 000 persons in Gauteng were involved in non-market activities (subsistence farming: 21 000; fetching water or collecting wood: 22 000; producing other goods for household use: 75 000; construction or major repairs to own household: 35 000; and hunting or fishing for household use: 1 000). Even leaving aside the question of whether fetching water or collecting wood counts as employment, the total would not add so substantially to the tally of the employed (3 999 000), as to make more than a few percentage points difference to the unemployment rate.

31. The relevant question in the *LFS* is Q6.1: "Did [person] … grow or help to grow any produce … or help to keep any stock … for sale or for household use during the last 12 months?"

32. Subsistence farming refers to Variable Q59 in the *Quarterly Labour Force Survey*, "Did you do any work on your own or the household's plot, farm, food garden, cattle post or kraal or help in growing farm produce or in looking after animals for the household's own consumption?"

33. This is not a minor matter. Suppose one quarter of those without jobs last searched for a job last week, one quarter in the previous week, one quarter in the week before that, and one quarter in the week before that. This is not an unreasonable set of suppositions in a high-unemployment, labour-surplus economy. By stretching the job-seeking reference period from one to four weeks, one would quadruple the unemployment rate.

34. In the shift to non-permanent jobs, one rising source of employment has been call centres, seen as a new niche for job creation. In line with international trends, the South African call centre industry has grown dramatically since the start of the millennium. Just over half of these centres are located in Gauteng. In 2007, Johannesburg was proclaimed to be the largest base for call centres on the African continent, with Cape Town the second most popular location. The City of Johannesburg's Sector Development Programme has earmarked the business processing outsourcing (BPO) sector, which includes call centres, as one of five sectors that will benefit from support programmes (McKinsey & Company, 2005).

35. To capture the picture of what often seems to happen, it is worth quoting a government official who studied the situation in Gauteng. "Labour brokers are now hiring illegal foreigners. At the end of the month, the broker meets the workers on a street corner and 'pays' them. Before meeting the workers, he calls the police and they arrive shortly after he has started paying them. Because the workers are not legal, when they see cops approaching, they run away. So the labour broker gets away with hiring illegal migrants, with exploiting them and not paying them" (Benya, 2008).

36. In job security, South Africa scored 26th out of 94 countries and for representation security, 7th out of 99 countries. The procedure entailed ranking a country according to its policies, its institutions for putting the policies into effect, and the outcome of those policies, and to create a set of indexes (ILO Socio-Economic Security Programme, 2004).

37. For example, see Eduardo Reese's "Sustainability and Urban Form: The Metropolitan Area of Buenos Aires, in Megacities", in A. Sorensen and J. Okata (eds.) (2011), *Urban Form, Governance, and Sustainability Library for Sustainable Urban Regeneration*, Vol. 10, Part III, pp. 373-394.

38. Informal employment refers to "persons who are in precarious employment situations irrespective of whether or not the entity for which they work is in the formal or informal sector. Persons in informal employment therefore consist of all persons in the informal sector, employees in the formal sector and persons working in private households who are not entitled to basic benefits such as pension or medical aid contributions from their employer, and who do not have a written contract of employment. The informal sector has the following two components: *i)* employees working in establishments that employ less than five employees, who do not deduct income tax from their salaries/wages; and *ii)* employers, own-account workers and persons, helping unpaid in their household business, who are not registered for either income tax or value-added tax" (Statistics South Africa's *Labour Force Survey, Quarter 3, 2009*: xvi).

39. The number of people doing informal jobs of one kind or another is surely substantially underestimated. To the extent that they use workers "off the books", this might be done in collusion with workers, who in turn prefer to be prudent by not saying they are working when questioned by enumerators who seem to them to be government officials. This particularly applies to migrants without identity documents or work permits. There are no reliable statistics on the number of foreigners living and working in the country. In certain sectors, such as construction, foreign workers may account for between a quarter and a half of all the employed (Rees, 1999). Schneider (2002) calculates that, at just over a quarter of GNP in 1999-2000, South Africa has the smallest "informal economy" of the 23 African countries analysed, but for the reasons stated here, these comparisons omit many workers involved in informal labour.

40. The results of Grant (2010) are based on 320 completed questionnaires from residents of six prominent Soweto informal settlement areas (Kliptown, Klipspruit, Emdeni, Dobsonville [Snake Park], Ellis Motsoaledi and Midway).

41. A Theil index is a statistical measure used to measure inequality and has the unique characteristic of being decomposable, making it possible to pinpoint which factors drive inequality.

42. For an overview of these debates, see Everatt (2003).

43. South Africa's past is a racist one, and although it now has a robust democracy, race continues to dominate public discourse and policy making. Notably, racial classification has remained in place, in part in order to measure progress on development and the correction of historical inequities in the provision of benefits and services. The country has four official race groups: African, coloured, Indian and white. The clumsy admixture of types of noun is indicative of the ongoing debate (and confusion) about the salience of race in a country whose Constitution commits it to a non-racial, non-sexist democracy, coupled with the need to ensure that those

formerly disadvantaged because of their race have first claim on the resources of the democratic state.

44. The population, analysed by race, is also unevenly distributed across the Gauteng city-region. In some municipalities, such as Thembisile or J.S. Moroka, Africans comprise 99.7% and 99.9% respectively. But in the municipalities closer to the wealthy core, the racial profile changes. Johannesburg, for example, has 75% Black Africans, 6% coloured, 4% Indian and 15% whites; and in Tshwane, whites account for 22% of the population. By 2001, the data suggests, Black Africans, coloured and Indian citizens had begun to move out of the townships from which they were previously unable to move by law, but only slowly. Overwhelmingly, each of these populations remained heavily concentrated in the areas formerly designated for them by apartheid (Gauteng City-Region Observatory, 2010a).

45. In Philadelphia, spatial constraints on job searches, which lead to weak information on job opportunities, were responsible for between 33% and 54% of the difference between white and African-American employment rates (Ihlanfeldt and Sjoquist, 1991). In Los Angeles, it has been found that the locations where people search for employment accounted for 40% of the difference between white and African-American employment rates (Raphael and Stoll, 2000, cited in Naudé, 2008).

46. The rental category includes rentals from housing associations, public/municipal/council rentals, sub-tenant/sublets, and rentals of informal dwellings/shacks.

47. The Department of Human Settlements makes available recent statistics on units "completed and in the process of completion", but not on subsidies allocated. See *www.dhs.gov.za/Content/Stats/Housing%20Delivery%20Stats.htm.*

48. The eight-year requirement is specified in Section 10 of the Housing Act (1997).

49. Note that not all informal dwellings are in informal settlements. There are many rudimentary shacks in the yards of formal houses. In Gauteng these backyard dwellings make up a very large proportion of informal housing.

50. For South Africa as a whole, household size is declining. The average number of persons per household dropped from 4.6 per household in 1996 to 3.9 in 2007. This reflects in particular the ability of black households to divide and move, rather than being penned into hard-won, and usually larger multi-generational households in *bantustans* and designated urban ghettoes.

51. This viability analysis was undertaken for the Department of Planning and Local Government, the Development Bank of Southern Africa, the Department of Water Affairs and Forestry and National Treasury under the Municipal Infrastructure Investment Framework and Municipal Fiscal Framework Review projects (cited in Department of Provincial and Local Government, 2005).

52. PWV Transportation Survey (1975) and Gauteng Department of Roads and Transport (2006).

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