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J.W.Fedderke and A.K.Fitschen?

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Development Policy Research Unit
School of Economics, University of Cape Town

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J.W.Fedderke and A.K.Fitschen*
School of Economics, University of Cape Town

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Abstract

This paper examines growth patterns in the Western Cape over the 1970-1996 period by means of primal growth accounting decompositions. Evidence by magisterial district, by statistical region and by SIC 3-digit manufacturing sector is presented. We find that the Western Cape differs from national growth patterns. Manufacturing in the Western Cape has relied consistently relied on capital accumulation for growth, while labour has contributed more to manufacturing growth than natioanlly. TFP growth has not been an important contributor to growth in Western Cape manufacturing, with a relatively minor exception in the 1980's.

KEYWORDS: Growth, Growth Accounting, Manufacturing Sector, Western Cape South Africa

JEL Classification: O3, O47

1 Introduction

Over the past decade work examining the growth performance of South Africa has begun to emerge. Work has examined the composition of growth in growth accounting terms.[1] Analysis has been undertaken on the determinants of investment in physical capital[2] and of savings,[3] of capital flows,[4] financial deepening,[5] of foreign direct investment,[6] and in infrastructure.[7] Further analysis has extended to economic policy,[8] human capital investment,[9] innovation,[10] and to the impact of institutions in various dimensions.[11]

However, to date little or no analytical attention has been paid to growth performance at the sub-national level.

This paper undertakes a first step toward a more detailed analysis of economic growth in growth accounting terms at more disaggregated levels than the nation. Focus is on the Western Cape manufacturing sector, over the 1970-1996 period. The sample period is dictated by data availability.

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[1] See for example Fedderke (2002a) and Arora and Bhundia (2003).
[2] See Fedderke (2004), and Fielding (1997, 2000).
[3] See Aron and Muellbauer (2000) and (Romm (2005).
[4] See Fedderke (2002b) and Fedderke and Liu (2002).
[5] See Kularatne (2002).
[6] See Fedderke and Romm (2005).
[7] See Perkins, Fedderke and Luiz (2005), and Fedderke, Perkins and Luiz (2005).
[8] See Mariotti (2002) and Koch et al (2005).
[9] See Fedderke, De Kadt and Luiz (1999, 2003), and Fedderke and Luiz (2002, 2005d).
[10] See Fedderke (2005).
[11] See Fedderke, De Kadt and Luiz (2001a, 2001b), and Fedderke and Luiz (2005a, 2005b, 2005c).

StatsSA's last manufacturing census that allowed detailed regional disaggregation was conducted in 1996. The firm survey of 2001 does not lend itself to regional disaggregation.

The obvious question the paper confronts is whether regional growth patterns diverge from the national to a significant degree. In order to explore this question we undertake a growth accounting exercise for the Western Cape both for 33 magisterial districts for the manufacturing sector as a whole, as well as for 24 SIC 3-digit manufacturing sectors for the nine statistical regions of the Western Cape.[12] Choice of the Western Cape is dictated by the fact that while Gauteng is the largest single geographic area, its very size is likely to render results for Gauteng close to the national findings. Our choice is therefore the Western Cape, which is consistently amongst the top three regional manufacturing bases in the South African economy.

In section 2 of the paper we briefly summarize the national evidence. Section 3 briefly presents the growth accounting methodology, and section 4 reviews the data issues that arise for the Western Cape application. Sections 5 and 6 present the evidence for the magisterial districts and manufacturing sectors respectively. Section 7 concludes.

2 Main Findings from the National Study

Fedderke (2002) presented decompositions of output growth in South Africa over the 1970-97 period. Decompositions were presented for aggregate output growth, for South Africa's principal economic sectors, as well as for the SIC 3-digit manufacturing sectors.

What emerged is that for aggregate output, as well as for the mining and service sectors South Africa's growth performance has come to rely increasingly on the efficiency gains associated with growth in total factor productivity. Agriculture, forestry and fishing by contrast has consistently relied on growth in total factor productivity since the 1970's. Finally, the manufacturing sector shows evidence of a structural break during the course of the 1990's, with a switch from output growth that was relatively heavily reliant on total factor productivity growth, to growth driven by capital accumulation.

The aggregate evidence served to demonstrate the serious constraint that factor accumulation has placed on South African output growth. Both the pattern of labour employment and capital accumulation in the South African economy, though particularly the former, have slowed output growth considerably over the past 30 years. Improving factor usage in both the capital and labour dimensions therefore remains a matter of considerable policy urgency.

Further evidence presented in the paper demonstrated that where total factor productivity growth is weighted by the size of a sector's contribution to aggregate output, efficiency gains in South African manufacturing are highly concentrated in a very small number of sectors in any given time period. This mirrors the finding of Harberger (1998) for the economy of the United States, and suggests that technological progress is more likely to be "mushroom-" than "yeast-like" in Harberger's terminology. It is concentrated in specific sectors at any given time, rather than dispersed equally across all economic sectors. A further implication is therefore that the public goods assumption often made about technology in growth theory appears to be inappropriate for South Africa.

What also emerges from the evidence on real cost reduction in the manufacturing sector, is the considerable degree of "churning" amongst sectors over time. High growth in total factor productivity in one time period proves to be a poor predictor of future efficiency gains by the same sector. Thus sectors which experienced large total factor productivity gains in the 1970's by no means necessarily experienced such gains during the course of the 1980's or 1990's. This finding carries significant policy implications. In particular, the implication would appear to be that subsidies and incentives targeted at specific sectors chosen for perceived promise in terms of future technological advance, are

[12] StatsSA does not make available 3-digit manufacturing sector data at the magisterial district level, for reasons of data confidentiality.

likely to fail. Quite simply the predictability of future efficiency gains due to total factor productivity appears to be low.

3 The Methodology and its Limitations[13]

The most basic approach to the computation of total factor productivity (TFP) was established in Solow (1957), Kendrick (1961), Denison (1962) and Jorgenson and Griliches (1967).[14] It begins with the production function:

$$Y = F(A, K, L) \tag{1}$$

with A denoting the level of technology, K capital stock, L labour and Y output. Differentiation with respect to time and division by Y gives the decomposition of output growth:

$$\frac{\dot{Y}}{Y} = \left(\frac{F_A A}{Y}\right)\left(\frac{\dot{A}}{A}\right) + \left(\frac{F_K K}{Y}\right)\left(\frac{\dot{K}}{K}\right) + \left(\frac{F_L L}{Y}\right)\left(\frac{\dot{L}}{L}\right) \tag{2}$$

where F_K, F_L provide the factor social marginal products.[15] The rate of technological progress or TFP, under the assumption that observed factor prices measure social marginal product, can then be computed by the standard primal estimate or (Solow) residual:

$$TFP = \frac{\dot{Y}}{Y} - s_K \frac{\dot{K}}{K} - s_L \frac{\dot{L}}{L} \tag{3}$$

where $s_K = RK/Y$ and $s_L = wL/Y$, with R denoting the rental price of capital and w the wage rate. Hence s_K and s_L are the shares of capital and labour in output respectively. The standard primal decomposition of output growth proceeds not by estimation, but on the basis of time series data on $\frac{\dot{Y}}{Y}$, $\frac{\dot{K}}{K}$, $\frac{\dot{L}}{L}$ s_K and s_L. With discrete data, growth rates generally are measured following Thörnqvist (1936) as log differences in the levels between $t+1$ and t. The Thörnqvist procedure is exact under translog production technology.[16] Factor shares are arithmetic averages for $t+1$ and t.

An immediate limitation of the simple primal decomposition is that it fails to account for quality differentials in factor inputs. Jorgenson and Grilliches (1967) and Jorgenson, Gollop and Fraumeni (1987) demonstrate the importance of accounting for the quality of inputs. The implication is that:

$$TFP = \frac{\dot{Y}}{Y} - \sum_i s_{K_i} \frac{\dot{K}_i}{K_i} - \sum_j s_{L_j} \frac{\dot{L}_j}{L_j} \tag{4}$$

where we allow for i classes of capital inputs (distinguished by age, for instance) and j classes of labour inputs (distinguished by education, age, sex, etc.).[17] Failure to account for input quality is likely to bias the TFP measure upward. Note that the prior national study (Fedderke (2002b)) identified the manfuacturing sector as the one which would be most affected by changing factor quality in labour. Unfortunately at the regional level we lack the data to be able to undertake the required adjustment.

A second source of concern is that the decomposition proceeds on the assumption that factor prices reflect factor marginal products, thus presupposing a degree of perfection in factor markets

[13] A fuller discussion of these and related issues can be found in Fedderke (2002b).

[14] See also the discussion in Hulten (1986) and Jorgenson and Grilliches (1967). For a useful overview of the developments see Barro (1998), which provides a more elaborate treatment of the condensed material that follows here.

[15] Note that under Hicks-neutrality the term for technological progress reduces to $\frac{\dot{A}}{A}$. See Solow (1957).

[16] See Diewert (1976).

[17] Mutatis mutandis for the dual approach.

that may be inappropriate - particularly in South Africa. One means of responding is to avoid this restrictive assumption by estimating:

$$\frac{\dot{Y}}{Y} = \beta_0 + \beta_1 \left(\frac{\dot{K}}{K}\right) + \beta_2 \left(\frac{\dot{L}}{L}\right) \tag{5}$$

with $\widehat{\beta_0}$ now providing the TFP measure. While dispensing with the limitation presented by assumptions regarding factor pricing, the regression approach to TFP measurement faces serious limitations in its own right. First, $\frac{\dot{K}}{K}$ and $\frac{\dot{L}}{L}$ cannot be assumed to be exogenous with respect to TFP, so that correlated variation in unobservable technological change would be attributed to factor input growth rates, biasing downward the measurement of the impact of technological progress.[18] Second, both $\frac{\dot{K}}{K}$ and $\frac{\dot{L}}{L}$ are subject to measurement error, particularly given the impact of variations in capacity utilization of the capital stock.[19] Where capacity utilization has a significant impact, the result is often a downward bias on the contribution of the capital stock, and an upward bias on the contribution of technology to output growth. Given these limitations, the convention has generally been to employ the decomposition rather than the regression approach.

Where deviations from perfectly competitive pricing is believed to be pervasive, one alternative would be the use of Malmqvist indices which do not require the use of input share data.[20] Malmqvist indices are not without difficulties in their own right, however.[21] A second option is to allow explicitly for a departure from perfect competition, estimating mark-ups over marginal cost and their impact on the magnitude of the Solow residual.[22]

Further serious difficulties arise once the contributions of modern growth theory are taken into account. In particular, recognition of increasing returns to scale, of knowledge spill-overs[23] and the possibility of Schumpeterian growth (either with increasing varieties or quality-ladders of inputs)[24] will render the computation of TFP biased. Under the spillover/increasing returns literature, the contribution of capital stock accumulation comes to be underestimated, while TFP growth comes to incorporate both exogenous technical change as well as the growth effect due to increasing returns and spillover. Similar implications follow for the Schumpeterian models, except that TFP growth comes to incorporate output growth due to increasing varieties or qualities of inputs as well as

[18] Unfortunately reliable instrumentation is particularly fraught in this context, making instrumental variable estimation difficult.

[19] The degree to which variation in capacity utilization is important is a matter of some dispute. Hall (1988), Caballero and Lyons (1992) argue for its unimportance. Basu (1995) dissents. Oliveira Martins and Scarpetta (1999) provides an extension to the debate and methodology. Burnside, Eichenbaum and Rebelo (1993) extend the argument to labour hoarding over the business cycle. One should also bear in mind that one strand of the debate emphasizes that less than full capacity utilization is itself a sign of inefficiency. Fluctuations in TFP measurement due to fluctuations in capcity utilization would thus be interpretable as changes in efficiency. See for instance Domar (1961: 715 fn1).

[20] For a South African application see the discussion in Thirtle, Van Zyl and Vink (2001).

[21] Malmqvist indexes decompose productivity changes into changes in technical efficiency and an index of technical change. Change in technical efficiency is meant to capture relative efficiency (whether a sector is moving closer to or further away from best practice) while technical change is meant to measure changes in best practice. In effect, it distinguishes "catch-up" from "true" technological advance. Reliable implementation does require the identification of best practice, however, with both parametric (econometric) and nonparametric (programming) approaches being used in the literature. Results depend on the assumption that (some) observed data points reflect best practice. In parametric approaches results are sensitive to assumptions concerning the functional form of technology. In programming approaches, results are sensitive to measurement error while the absence of assumptions regarding functional form precludes the use of diagnostic tests to evaluate results. Both approaches are also unable to identify the contribution of factor inputs to production, information that is valuable in its own right. Discussions of Malmqvist indexes can be found in Charnes, Cooper and Rhodes (1978), Seiford and Thrall (1990), Fried, Lovell and Schmidt (1993), and Ten Raa and Mohnen (2000).

[22] See Hall (1990), Roeger (1995), and Oliveira Martins and Scarpetta (1999) for discussions of this approach.

[23] The now standard references are Griliches (1979), Romer (1986) and Lucas (1988).

[24] See Romer (1990), Grossman and Helpman (1991: ch3), Aghion and Howitt (1992) and Grossman and Helpman (1991: ch4).

exogenous technological progress.[25]

Both deviations from perfectly competitive factor pricing and the impact of knowledge spillover or Schumpeterian growth carry potentially serious limitations for conventional growth accounting. Nevertheless, this paper proceeds with the conventional decomposition of output growth as implied by equation 3 above for two reasons. First, we explicitly deal with the question of the impact of imperfectly competitive pricing on the Solow residual at the national level at some length in a separate paper,[26] and with the impact of increasing returns to scale and Schumpeterian growth in yet another paper.[27] Both issues require the development and application of a methodology that merit full and separate treatment. Second, both the explicit treatment of the impact of imperfectly competitive markets, and the impact of endogenous technological change require the computation of standard TFP measures as a benchmark. While this paper does not belittle the importance of the pricing and the endogenous technological change issues, conventional TFP measures are a necessary foundation to any debate concerning the structure of economic growth, and it is these that the present paper seeks to supply.[28]

In the analysis that follows we will also be concerned with the computation of TFP on a sectoral level. This raises two last methodological issues that need to be addressed. First, when computing TFP growth for the economy in aggregate, net output or value added is the appropriate outcome variable, since national accounts are net. By contrast, within industries use of net output measures may serve to bias the TFP measures upward, since part of output growth may be due to efficiency gains the industry imports in the form of inputs from other sectors.[29] In effect, we stand in danger of double-counting TFP. We will nevertheless persist with the use of the value added measure for a number of reasons. The worst is that the use of the value added measure is not unique to this study.[30] More pertinent are data limitations. The choice is dictated by the infrequency with which South African input-output tables are published, providing one with poor information concerning relevant cross-industry inputs. Given a choice between measurement error with uncertain effects, and an aggregation procedure with clearly understood bias, we chose the latter. That said, further work on this matter is clearly desirable in order to improve our understanding of TFP growth in South Africa. Readers should therefore treat the sectoral TFP estimates with care, and recognize their potential upward bias.[31]

The second methodological issue arises from an application of the comparison of industry TFP's suggested by Harberger (1998). Computing TFP growth across a range of industries, Harberger computes what he terms "real cost reduction" (RCR). RCR computes the change in real value added due to TFP growth industry by industry i as $y_{0,i}\left(\exp \tau_i T - 1\right)$, where y_0 denotes value added in the starting period, and τ_i the average TFP growth maintained by industry i over the interval $(0, T]$.[32] Consideration of the structure of TFP growth between n industries is then by means of the

[25] A full discussion of the detail can be found in Barro (1998).

[26] See Fedderke, Kularatne and Mariotti (2002).

[27] See Fedderke (2005).

[28] The use of decompositions analogous to those used in this paper continues in the literature, though ideally the distinction between types of factor inputs is taken into account. Examples from the literature include Young (1995) for East Asian countries, Christenson, Cummings and Jorgenson (1980) for the OECD, Elias (1990) for Latin America. For a more encompassing view see Maddison (1987), and see also the discussion in Jorgenson (1988) and Fagerberg (1994).

[29] See Leotieff (1953).

[30] See for instance Harberger (1998), Roeger (1995), Oliveira Martins and Scarpetta (1999).

[31] Domar (1961:724f) shows that the TFP computed on value added will be a multiple of the "true" TFP. Domar also points out that the magnitude of the TFP measured on gross output recognizing the impact of intermediate inputs, may simply reflect what he terms the "thinness" or "thickness" of the industry, viz. the *extent* to which inputs are transformed within the production processes of the industry. Use of the gross output TFP measure would therefore introduce another source of cross-industry variation in TFP not reflecting technical change properly understood.

[32] Since RCR is generated on the additional value added generated in each industry, its attraction is that it enables additive aggregation. The process of aggregation avoids the problems highlighted by Domar (1961:717ff), since the concern is not with the computation of an aggregate growth *rate* of TFP, but with the aggregate gain in output due to TFP growth industry by industry.

index $\overline{A}_H = \left[\sum^n y_{0,i}\left(\exp \tau_i T - 1\right)\right] / \left[\max \sum^n y_{0,i}\left(\exp \tau_i T - 1\right)\right] \ \forall \ i$, which can then be compared to an index of value added by industry.

4 Data Issues in the Western Cape Regional Study[33]

The data used in the research on the Western Cape sector was obtained from the official regional censuses of the manufacturing sector in the Western Cape. The study examines evidence both for the magisterial district level of geographical disaggregation as well as for three-digit manufacturing sectors at the statistical region level of geographical disaggregation.

The sample period covered by the study is 1970 to 1996,[34] the period over which the manufacturing censuses were available for the Western Cape. The regional Manufacturing Census divides the Western Cape into nine statistical regions, each with varying numbers of districts.

Over the years there have been a number of changes in the nature of the data collected and its categorization. After necessary adjustments, data analysis was carried out on 33 statistical districts and nine regions. Details of the magisterial districts and statistical regions are provided in Appendix A.

Over time since 1970 the classification of manufacturing sectors has changed. In order to deal with these sectoral changes and maintain data consistency we worked backwards from the most recent census – which classified sectors in the greatest detail.[35]

Data for intra-census years was calculated using a smoothed average interpolation. Where data was not recorded for a district for a particular year the interpolation also covered the missing year/s.

The basic growth decomposition was not only computed for nominal and real variables but also for two measures of capital - a measure of plant and machinery (P&M) only and a variable named total fixed assets (TFA) which is a summation of assets measured in the census in the categories vehicles, plant and machinery and buildings and works. For the real computation, the deflation of nominal data series was undertaken on the basis of the relevant sectoral GDP deflator obtained from the nationally aggregated manufacturing series, base year 1990.

While all research results have been obtained for the TFA measure as well as the P&M measure, the primary focus of the present discussion is on the measures based on plant and machinery. The P&M measure is intimately related to the productive processes in manufacturing industry whilst the productive contribution of land and buildings is more tenuous. Most importantly, however, the land and buildings component of the capital stock introduces greater capacity of measurement error into the compilation of an aggregate capital stock series – beyond what is already notoriously present in the measurement of capital stock.

5 Manufacturing Activity by Magisterial District

Over the sample period of this study, average real value added in manufacturing in the Western Cape grew from R6 469 363 million in 1971-75, to R9 351 757 million in 1991-1996, an overall real growth of 45 per cent. Detailed evidence is provided by sub-periods in Appendix A.

[33] Detailed description of all relevant data manipulations are available from the authors.

[34] It is unfortunate that the most recent data on the manufacturing sector is eight years old. More recent data would throw light on the fruits of government policies in the ten years of democracy. It will be interesting to update the study when such data does become available. The more recent firm survey of 2001 does not provide ready geographic disaggregation.

[35] The Pottery, China and Earthenware sector has been included in the Non Metallic Mineral Products sector as in the earlier years of the sample Pottery, China and Earthenware was not distinguished from Glass and Other Non-metallic Products. The data would suggest that during the 1970´s and again during the 1990´s many categories of manufacturing output were simply grouped under the sector Other Manufacturing Industries. It is clear that if this is the case the classification will affect results both by under-reporting changes in sectors to which activity has not been allocated, and over-reporting Other Manufacturing Industries activity.

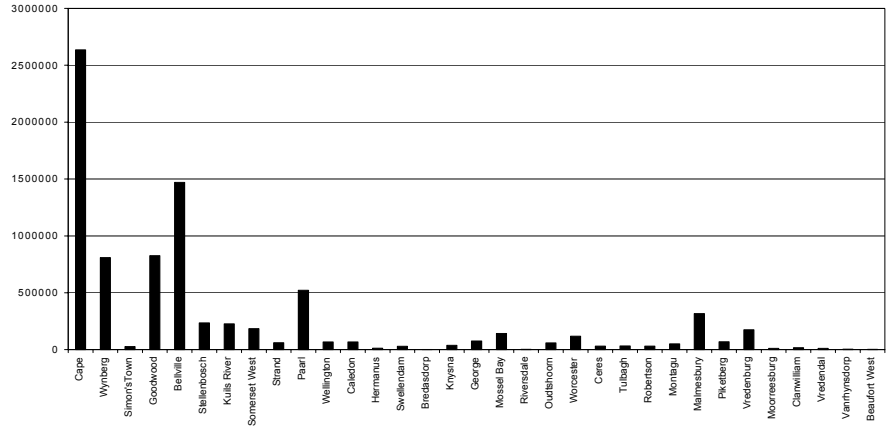

Figure 1: Average Real Value Added 1970-1996 (Rands Million)

We examine growth in Western Cape magisterial districts in four distinct ways. First, we simply examine the growth in manufacturing output in the various districts. Second, we decompose the growth by means of growth accounting techniques, and comment on the patterns that emerge from the data over the full sample period, as well as the three decades over which data is available. Third, we summarise the evidence for the magisterial districts, by reflecting on the averages across all districts, again for the distinct time periods on which we have evidence, by means of cross sectional regressions across the districts. This provides information on how *on average* across all magisterial districts, growth was due to capital, labour and TFP growth in the various sample time periods. It is important to note that this does *not* weight the evidence by the relative contribution of the various districts to aggregate manufacturing output in the Western Cape. It therefore overemphasises the impact of small, and underemphasises the impact of large magisterial districts. Fourth, we therefore remark on the sample period contributions of the three growth components, paying careful attention to the relative size of the magisterial districts. In effect, this reflects the Harbeger (1998) methodology, though the presentation differs from that adopted by Harberger. Readers should note that the evidence to emerge from the four approaches may well differ, since the relative importance of small and large magisterial districts differs across the alternative presentations of the evidence.

5.1 Output Growth by Magisterial District

Manufacturing output in the Western Cape is heavily concentrated in a small number of magisterial districts. Figure 1 illustrates. Throughout the sample period of this study, 80% of real value added in manufacturing was contributed by at most seven magisterial districts. The second salient feature of the evidence is that the proportion of manufacturing value added contributed by mid-size regions in the hinterland of Cape Town, has been increasing over time.

The growth patterns of the magisterial districts show relatively diverse patterns over time. The consistently poor performance of the magisterial districts with large contributions to manufacturing total value added is consistent with an increased dispersion of manufacturing activity in the Western Cape over time. Nevertheless, the negative growth rates in manufacturing value added, often over sustained periods of time, suggest that the region is not taking advantage of agglomeration effects in the core location of the manufacturing sector in the region.

	1970's		1980's		1990's	
	Fastest	**Slowest**	**Fastest**	**Slowest**	**Fastest**	**Slowest**
Nominal	28.1%	9.4%	30.1%	14.8%	17.3%	4.2%
Real	15.3%	-1.5%	12.8%	-0.3%	5.1%	-6.6%

Table 1: Average Growth per Category

The slow and in some instances negative rate of growth in output in districts around the industrial centre is of concern in the South African economy which relies to a large degree on small and medium enterprises for economic growth and job creation. Economic growth literature documenting international experience suggests that firms do not move far from the industrial centre (Lee 1992). The accessibility to the local input and product markets and commuting distance of production workers are the most important factors in the location choice of small manufacturing firms. Large export-oriented firms requiring more space for production technology consider the availability of lower cost land and plant space in outer areas more important than access to local markets. The particular infrastructure requirements of individual firms will depend on the types of product and the size of their operations. Small firms rely heavily on the agglomeration economies in the town or city centres.

Apart from the spatial dimension of output growth, the average growth rates of both the fastest, as well as the slowest growing districts[36] have been on a steady downward trajectory over the three decade period that is being considered for this study.[37] Table 1 provides summary evidence. In real terms, the fastest growing districts have experienced a decline from 15.3, to 12.8 to 5.1 per cent in real output growth, while the slowest growing districts have contracted at an accelerating rate over the three decades.

Of course, strictly speaking the growth slow-down observed in the Western Cape manufacturing sector is consistent with standard neoclassical growth theory, in terms of which growth rates in output and the capital labour ratio decline as steady state is approached.[38] On the other hand, empirically technology leaders of the world appear to have been experiencing a steadily accelerating rate of economic growth since the eighteenth century,[39] while developing nations in East Asia have been able to maintain consistently high growth rates over extended periods of time.[40] Such evidence amongst other has been the motivation for the development of endogenous or new growth theory, in order to be able to explain growth accelerations, or at lest non-decelerations. Given the support for such theories, including in the South African case,[41] the standard neoclassical explanation for the growth slow-down remains in need of further corroboration, at the very least.

The negative growth rates in real output in the 1990's are pervasive. Only the districts that belong to the 11 fastest growing districts reported positive growth rates in real value added output – while both intermediate and slow growing districts uniformly report negative growth rates in value added output.

[36] We classify the growth performance of the magisterial districts into three categories, fast, intermediate and slow. The fast growing districts are defined as such simply by virtue of being the 11 top ranked districts in the relevant period. Slow growers by contrast are the 11 districts that grow most slowly, and the intermediate districts are the 11 sectors distributed between fast and slow growers.

[37] The only exception to this finding is that nominal growth of the fastest growing districts rises in the 1980's, before declining substantially during the 1990's. However, this is in part an artefact of the introduction of the Moorreesburg district, with associated initial high growth rates.

[38] See the discussion in Barro and Sala-i-Martin (1995).

[39] See famously Romer (1986).

[40] The attribution of the developed world's accelration has been to the role of technology. In the case of the developing countries of East Asia there is some dispute as to whether the acceleration is due to factor accumulation, or efficiency gains. See the discussion in Young (1995), and Lim (1994) for instance.

[41] See Fedderke (2005) for an extensive discussion of the detailed evidence.

5.2 Identifying Factor Input Contributions By Magisterial District

In order to identify whether growth is due to capital or labour accumulation, or efficiency gains in production we decomposed the value added growth performance of the magisterial districts. The results of this exercise are summarized in Appendix B.

The central implication of the evidence is that growth in the manufacturing sector in the Western Cape has historically been driven by factor accumulation. This is particularly true of the 1970's and the 1980's, but for the entire sample period also. It is evidenced by the fact that for most magisterial districts, for most periods, both investment in plant and machinery as well as employment increases have contributed positively to manufacturing output growth. This finding is in contrast to the general finding in the national study where TFP growth was an important driver of manufacturing sector output growth in the 1970's and 1980's, though it declined in importance during the 1990's, during which time physical capital accumulation reemerged as an important determinant of growth.

Important nuance is present in the evidence, however. The contribution of labour to output growth has declined during the 1990's, with labour contributing negatively to output growth in a greater proportion of magisterial districts. By contrast, capital has become increasingly important relatively speaking in keeping growth in real value added positive. In both these dimensions the Western Cape has mirrored the national experience.

On the face of the evidence, of the two factor inputs into production, capital has consistently appeared to contribute more strongly to output growth. More magisterial districts show a positive growth contribution of capital. There is a preponderance of magisterial districts in which capital stock contributions to output growth have been on a rising trend over time, though for a few districts there was an interruption of this trend during the course of the 1980's. Finally, for some magisterial districts there has been evidence of a slow-down in the rising contribution of capital to output growth.

In the case of labour's contribution to value added growth, few magisterial districts have shown an increasing trend, more districts than in the case of capital have reported a decreasing trend, and the evidence of a slow-down in labour's contribution to output growth is more pervasive. Furthermore, fewer districts report a pick-up in labour's contribution to output growth in the 1990's. Importantly, all of the magisterial districts contributing a large proportion of total value added in the Western Cape show a declining trend in labour's contribution to output growth, or a slow-down in labour's contribution in the 1990's. It is important to note, however, that the negative contribution of labour to output growth in the Western Cape has been more muted than for the national study.

For the majority of magisterial districts the contribution of total factor productivity to output growth has been on a declining trend over the sample period of this study, or it has been subject to a slow-down (often dramatically so) during the 1990's. A relatively large number of magisterial districts displayed positive TFP contributions in the 1970's and 1980's, and a strong switch to a negative contribution of TFP growth in the 1990's. For other magisterial districts contributing large proportions to the total value added of the Western Cape a decreasing trend in TFP is evident. Again, this mirrors the national evidence.

TFP growth displays the presence of churning in magisterial districts over time. This is readily demonstrated by a consideration of the evidence for economically large districts. Little by way of consistent growth patterns emerge from this evidence – indeed, the evidence suggests considerable instability in the pattern of efficiency gains across magisterial districts.

In broad terms this evidence has significant commonalities with the national evidence reported in Fedderke (2002), though some differences also emerge. The increasing reliance on capital accumulation particularly in the 1990's for output growth in manufacturing was noted by Fedderke. The declining contribution of labour to output growth is also present for the national evidence, though in the Western Cape the negative contribution of labour is perhaps somewhat more muted. What differs between the Western Cape and the national evidence is that the strong positive contributions of technological progress in the 1970's and the 1980's, that is evident in the national data, is diffi-

		Capital	Labour	TFP	TOTAL
1970-96	Proportion	3.37* (1.44)	0.23* (0.04)	−2.60** (1.43)	1.00
		0.47*† (0.14)	0.25*† (0.04)	0.28**† (0.14)	1.00†
	Adj-R^2	0.15	0.55	0.10	
		0.28†	0.60†	0.12†	
1970's	Proportion	0.93* (0.15)	0.12* (0.03)	−0.05 (0.14)	1.00
	Adj-R^2	0.57	0.35	0.003	
1980's	Proportion	0.06 (0.13)	0.25* (0.05)	0.68* (0.16)	0.99
	Adj-R^2	0.01	0.48	0.38	
1990's	Proportion	15.03* (2.03)	−0.003 (0.003)	−14.18* (2.01)	0.85
		0.43**† (0.23)	0.28*† (0.09)	0.27*† (0.30)	0.98†
	Adj-R^2	0.64	0.64	0.03	
		0.10†	0.10†	0.28†	
$*$ *denotes significance at the* 5% *level*					
$**$ *denotes significance at the* 10% *level*					
† *denotes exclusion of Mossel Bay*					

Table 2: Relative contribution by factor of production and TFP to output growth

cult to find in the Western Cape. However, the declining trend in the contribution of technological progress to output growth in the national data is evident in the Western Cape also. Specifically, the Cape magisterial district (the largest Western Cape district) conforms to the national growth patterns relatively closely.

The obvious hypothesis to be examined in the following section is that the absence of strong technological contributions to growth in the Western Cape is a result of the sectoral composition of manufacturing production.

5.3 Summarizing the Magisterial District Evidence

Before concluding our examination of the evidence at magisterial district, we present the evidence to emerge from the magisterial districts of the Western Cape once more in summary form. We do so by considering:

$$\left(\frac{\dot{V}}{V}\right)_i = \alpha + \beta_V \left(\frac{\dot{Y}}{Y}\right)_i + \varepsilon_i \tag{6}$$

where $\dot{V}/V$ denotes the proportional growth rate in the two factors of production and of TFP respectively, for the i magisterial districts.

The resultant estimates of β_V represent the proportion of real value added output growth on average across all magisterial districts.[42] We report results in Table 2.

The dramatic expansion of capital stock in the Mossel Bay magisterial district during the 1990's significantly distorts the evidence. In particular, during the 1990's the contribution of capital stock to output growth is dramatically raised, TFP growth's contribution is strongly negative, while labour's contribution is statistically significant where Mossel Bay is included in the sample. Reason for these results is the strong expansion in the capital stock of the Mossel Bay magisterial district due to the

[42] It is important to emphasise that the regression evidence requires careful interpretation. The evidence requires interpretation as identifying summary characteristics across magisterial districts, rather than in causal terms.

MossGas project. We therefore estimate the 1990's relationship both with, and without Mossel Bay in the sample of magisterial districts.

The evidence shows that on average across all magisterial districts in the Western Cape, capital accumulation was the major driver of economic growth during the 1970's and the 1990's (even when Mossel Bay is excluded), while it contributed relatively little during the course of the 1980's. Labour's contribution to growth has consistently been more modest, never contributing more than 28% of the growth in real value added (during the 1990's), though during the 1980's employment appears to have been more important for growth than investment.

Finally, TFP growth proved negligible during the course of the 1970's, was the strongest contributor to output growth during the 1980's, and (provided that Mossel Bay is excluded) contributed approximately a third of output growth during the 1990's.

In broad terms therefore the evidence is consistent with the descriptive evidence of the previous subsection of the paper.

5.4 The Relative Importance of the Contributions of Capital, Labour and Technological Progress to Manufacturing Sector Growth by Magisterial District

While the relative contribution of any one of the three building blocks to growth[43] in any one magisterial district may have been either small or large in any given period, this in and of itself tells us very little about the contribution of the growth to Western Cape performance as a whole. A small magisterial district, that is receiving a strong growth impetus from capital accumulation, may be contributing very little to manufacturing growth as a whole. Similarly, a large sector that is growing relatively slowly due to additional employment, may nevertheless be contributing a relatively large amount to manufacturing growth in the Western Cape as a whole.

The analysis of the present section weights the output growth contribution by factor input or technological progress by the value added contribution of the magisterial district (See Fedderke 2002 for details of methodology).

A number of important additional insights follow from the evidence. Figures 2, 3 and 4 present the evidence for capital, labour and total factor productivity respectively, breaking the evidence down by decade.

In terms of the contribution of capital to value added growth in the Western Cape, generally but especially during the 1980´s and 1990´s the economically large magisterial districts manifested capital-accumulation led output growth, with the sole exception of the Cape magisterial district which disinvested over the 1980´s.[44]

The results with respect to labour for the economically large magisterial districts indicate a positive return to output from addition labour inputs with the exception of the Cape magisterial district where labour has consistently contributed negatively to output growth across the three decades. The contribution of labour to output growth in the 1990´s shows more large magisterial districts with a negative contribution - though for some large districts the contribution remains positive.

The story for total factor productivity is also one of decade effects. During the 1970's and 1980´s the contribution of factor productivity to output growth amongst the economically large magisterial districts reflect two tails with efficiency gains affecting output growth positively in some magisterial districts and negatively in others. In the 1990´s only a negative tail remains where the net effect of efficiency gains across the Western Cape reduced output growth significantly, sufficiently so to render

[43] We consider the relative contribution of the two factor inputs, and technological progress to total manufacturing growth.

[44] The 1990's report the same pattern in the Western Cape that Fedderke et al (2001) report for South Africa as a whole. In particular, output growth in the manufacturing sector comes to be led heavily by capital investment.

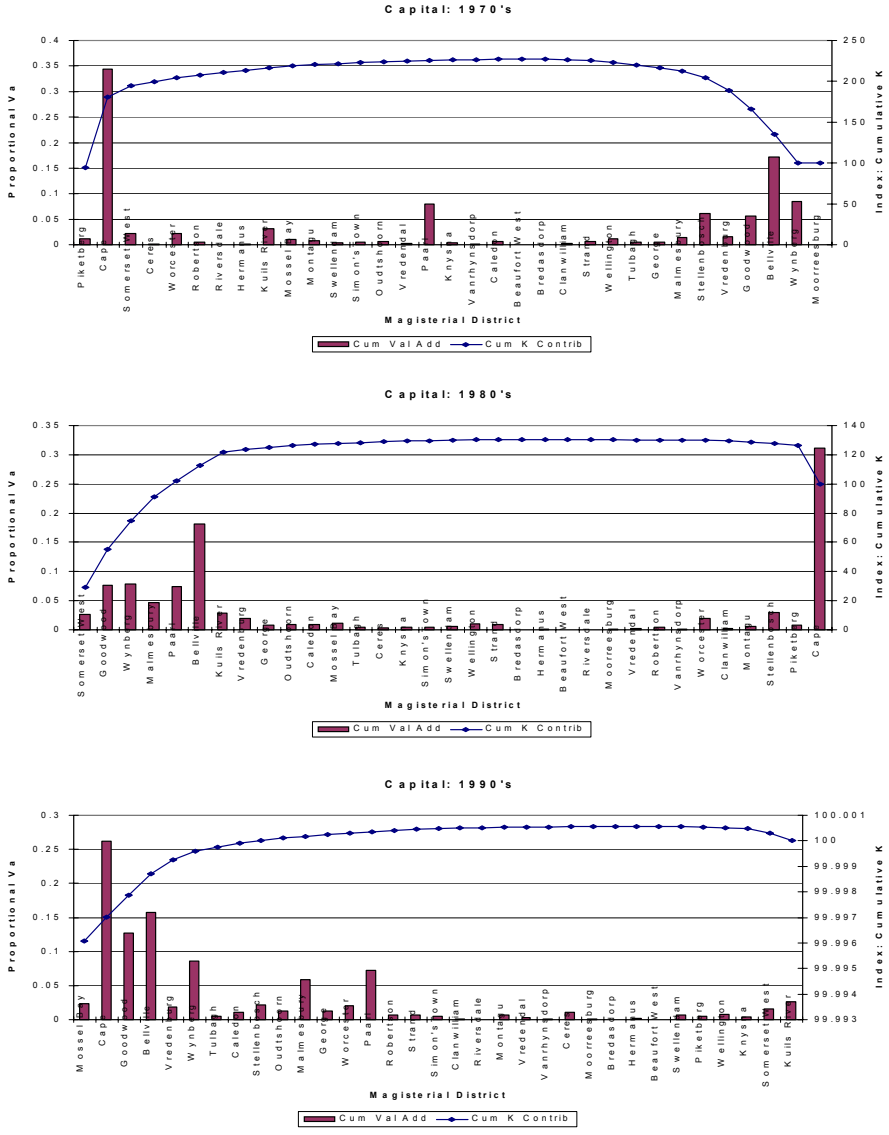

Figure 2: Capital Contribution to Value Added Growth

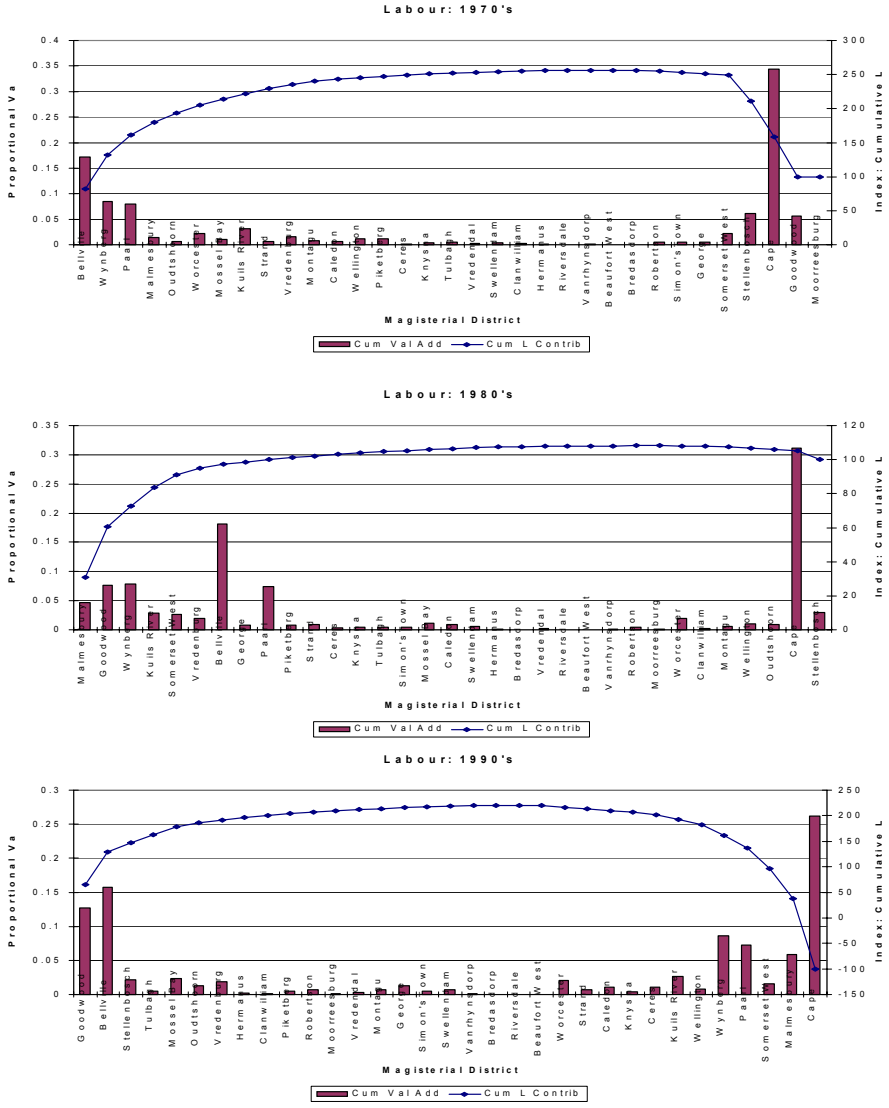

Figure 3: Labour Contribution to Value Added Growth

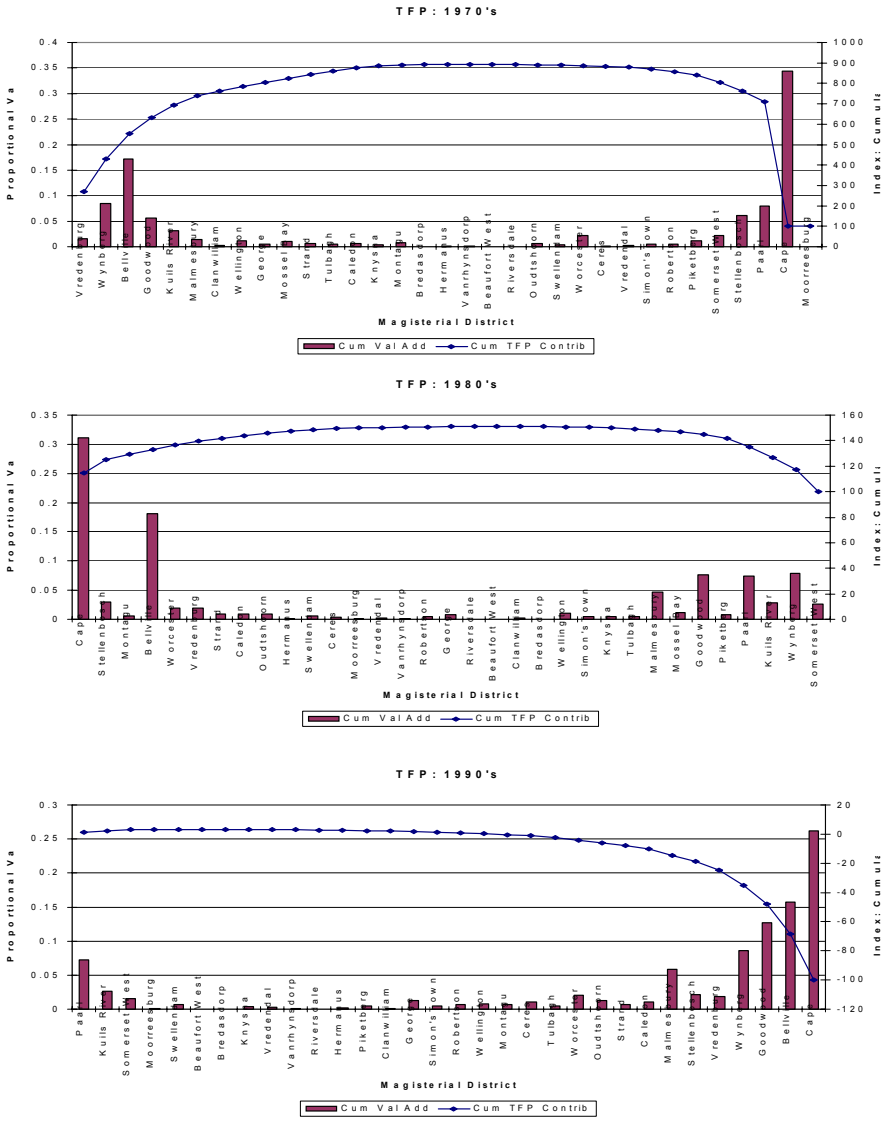

Figure 4: TFP Contribution to Value Added Growth

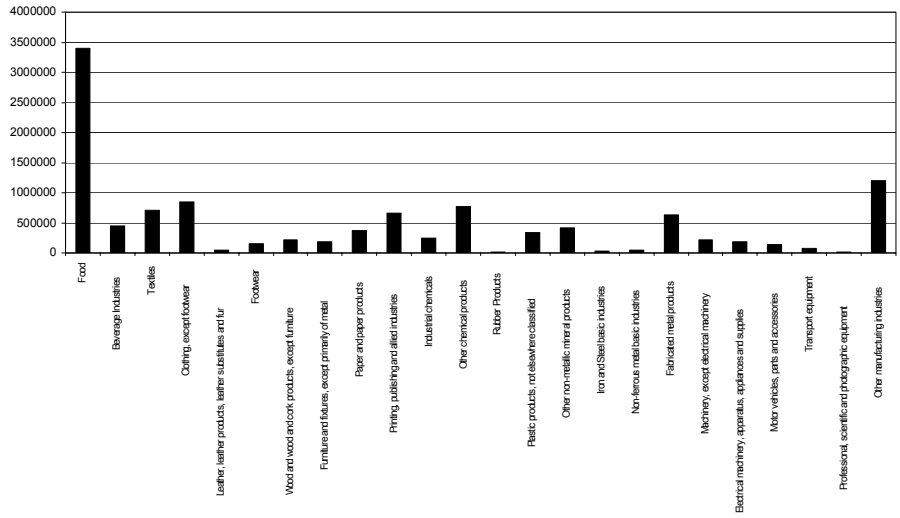

Figure 5: Average Real Output 1976 - 1996 (Rands Million)

TFP growth in the 1990's a negative contributor to output growth.[45] Specifically the magisterial district Cape shows a strong TFP growth during the course of the 1980's. In this, the evidence for the Western Cape mirrors the national evidence – see Fedderke (2002).

6 Manufacturing Activity by Manufacturing Sector in the Western Cape

The value of manufacturing output in the Western Cape is dominated by the Food sector - Figure 5 illustrates.

In the 1970's the food sector accounted for 28% of value added in the province. The Textiles, Fabricated Metal Products and Other Manufacturing Industries sectors were the next largest contributing sectors in the 1970's, each contributing 9% to provincial manufacturing output. The Printing and Other Chemical Products sectors followed closely with an 8% contribution.

In the 1980's the contribution of the Food sector had increased to 32% and Other Chemical Products increased marginally to 9%. The Textile sector's proportional contribution to manufacturing output dropped to 7% while that of the Clothing sector increased to 8% from 7%. The decline in importance of the Fabricated Metal Products and Printing sectors commenced in the 1980's and deepened in the 1990´s with the sectors' proportional contributions to provincial manufacturing output each falling to 6% in the 1980's and to 4% and 5% respectively in the 1990's.

The 1990's saw the Food sector's importance shrink slightly to 30%. The Other Manufacturing Industries sector saw remarkable increase to 18% from the previous decade's 6%.[46] The Textile sector's proportional contribution to manufacturing output continued to fall in the 1990's while that of the Clothing sector held steady at 8%. The most dramatic falloff was seen in the Other Chemical

[45] Note that we have excluded Mossel Bay from the TFP evidence during the 1990's. The very large scale of investment in the magisterial district distorts the evidence significantly – and completely dominates the evidence to emerge from all other magisterial districts. As a consequence we have suppressed the Mossel Bay data in the graphical representation of the data, in order to allow insight into the development in the province as a whole.

[46] The study remarks repeatedly on the likelihood that this is a reflection of problems of data classification.

Products sector, the 1980's second highest contributing sector, where contribution to output fell to 4% from the previous decade's 9%.

We again examine growth in Western Cape manufacturing sectors in four distinct ways. First, we simply examine the growth in manufacturing output in the various sectors. Second, we decompose the growth by means of growth accounting techniques, and comment on the patterns that emerge from the data over the full sample period, as well as the three decades over which data is available. Third, we summarise the evidence for the manufactruing sectors, by reflecting on the averages across all sectors, again for the distinct time periods on which we have evidence, by means of cross sectional regressions across the sectors. This provides information on how *on average* across all manufactruing sectors, growth was due to capital, labour and TFP growth in the various sample time periods. It is important to note that this does *not* weight the evidence by the relative contribution of the various sectors to aggregate manufacturing output in the Western Cape. It therefore overemphasises the impact of small, and underemphasises the impact of large manufacturing sectors. Fourth, we therefore remark on the sample period contributions of the three growth components, paying careful attention to the relative size of the manufacturing sectors. In effect, this reflects the Harbeger (1998) methodology, though the presentation differs from that adopted by Harberger. Readers should note that the evidence to emerge from the four approaches may well differ, since the relative importance of small and large manufacturing sectors differs across the alternative presentations of the evidence.

6.1 Output Growth by Manufacturing Sector

Very few of the statistical regions of the Western Cape show a diversified manufacturing sector structure. Only Statistical Regions 1 and 2 show manufacturing sector diversification.[47] For a significant number of three digit manufacturing sectors, more than 70% of the output produced in that sector in the Western Cape is located in Statistical Region 1.

During the 1970's, growth across all manufacturing sectors across all nine statistical regions declined from an annual average of 6.06%, to 2.87% and -3.93% from the 1970's, 1980's and 1990's respectively, indicating the dramatic slow-down in manufacturing activity over the sample period.

Sectors that have shown relatively widespread growth in terms of geographical coverage are restricted to Furniture, Machinery, and Other Manufacturing Industry. Sectors that have reported overwhelmingly positive growth performance and little contraction are restricted to Beverages, Plastics, and Other Manufacturing Industry. The pervasive sound performance of Other Manufacturing Industry raises the concern that data collection for manufacturing sectors may have been poor over the sample period.[48]

A number of sectors appear to have fared particularly poorly in the longer term. This is noteworthy particularly with respect to Motor, Electrical Machinery, and the minerals-related sectors (Other Non-metal Mineral Products, Iron and Steel Basic Industry, Non-ferrous Basic Metal Industry). While the relative remoteness of mineral extraction within the Western Cape may explain the latter case, reasons for the relatively poor performance of Motor and Electrical Machinery are less clear. This would be especially true to the extent that these two sectors may be relatively human capital intensive in production, and the Western Cape has a strong concentration of human capital present.

6.2 Identifying Factor Input Contributions by Manufacturing Sector

Manufacturing sector output in aggregate, magisterial district level evidence suggested a preponderance of output growth based on factor accumulation. The evidence from manufacturing sector level

[47] By diversification we mean that the total manufacturing sector output of the statistical region is not dominated by one or two three digit manufacturing sectors.

[48] A distinct possibility is that new manufacturing activity was simply classified under "other" rather than receiving proper classification in relevant industry groupings.

evidence adds additional nuance, since during the 1970's particularly, and to a lesser extent during the 1980's TFP growth was positive for a substantial number of sectors also. What does remain true, is that factor accumulation in both capital and labour was a substantial driver of value added output growth during these periods also. Full results are reported in Appendix C.

For the province as a whole, the most striking finding from the evidence presented is that for all three drivers of value added growth, an ever increasing number of manufacturing sectors have seen the contribution of the growth driver switching from positive, to negative – whether the driver be capital, labour or TFP growth.

This is immediately consistent with earlier findings of dwindling growth rates in manufacturing output for a wide range of sectors. What is startling, however, is that the declining growth rates are due not to any single factor alone, but appear to emerge for the contributions of capital, labour as well as efficiency gains in production. While the shift in manufacturing sectors toward a negative contribution by capital to value added output growth began noticeably during the course of the 1980's, the most marked change was reserved for the 1990's in all three determinants of growth: labour, capital and TFP. The 1990's shift is particularly marked in the case of both labour and TFP.

Sectors in which the negative growth consequences of job losses have been particularly strong include Leather, Industrial Chemicals, Rubber, Iron and Steel Basic Industries, Electrical (for this sector all three growth drivers were strongly negative), and Professional, Scientific and Photographic Equipment.

A number of sectors whose long term growth performance we have noted as having at least some indication of robustness in the preceding sections, show evidence of leading such growth through factor accumulation. This is noticeable specifically in the case of Plastics,[49] Other Manufacturing Industry, Beverages and Furniture, all of who show positive contributions of factor accumulation to output growth into the 1990's.[50]

A number of minerals-based sectors show a positive growth contribution arising from factor accumulation. This is particularly true of Other Non-metallic Mineral Products, and Fabricated Metal Products. The factor accumulation of the 1990's in these sectors has not translated into positive growth in value added. On the contrary, output growth remained negative in real terms during the course of the 1990's.

Positive efficiency gains contributing toward output growth during the 1990's were substantially concentrated in the chemicals sectors, and in Transport Equipment. At the same time, these sectors were engaged in substantial disinvestment in their Western Cape operations, with associated strong negative real growth rates in output. The efficiency gains identified by the growth decomposition thus appear to have been largely defensive measures, designed to prevent even greater output loss than implied by the job losses and disinvestment of the sectors, rather than strong output growth inducing innovation.

For the majority of manufacturing sectors the contribution of total factor productivity to output growth has been on a declining trend over the sample period of this study, or it has been subject to a slow-down (often dramatically so) during the 1990's.

In broad terms this evidence has significant commonalities with the national evidence reported in Fedderke (2002), though some differences also emerge. The increasing reliance on capital accumulation particularly in the 1990's for output growth in manufacturing noted in the earlier study, and evident in the magisterial district data, is less evident in the data across all manufacturing sectors. Rather, strong investment activity has been restricted to specific manufacturing sectors. The declining contribution of labour to output growth is also present for the national evidence,

[49] This is true regardless of how we treat the data issues presented by the apparent industry start-up.

[50] The concern voiced in preceding sections raised by the Other Manufacturing Industry performance resurfaces again in the growth accounting exercise. The very dramatic growth rates implied by capital accumulation in this sector raises the prospect that increasing manufacturing activity was inaccurately classified in the OMI sector, rather than appropriately allocated to industry grouping by Statistics South Africa.

		Capital	Labour	TFP	TOTAL
1970-96	Proportion	20.36 (15.16)	0.29* (0.06)	−19.65 (15.15)	−0.01
		1.17*† (0.15)	0.31*† (0.07)	−0.48*† (0.14)	1.00†
	Adj-R^2	0.08	0.48	0.07	
		0.76†	0.51†	0.36†	
1970's	Proportion	1.22* (0.18)	0.27* (0.07)	−0.50* (0.18)	-0.01
	Adj-R^2	0.68	0.44	0.27	
1980's	Proportion	0.97** (0.53)	0.17* (0.06)	−0.15 (0.52)	0.99
	Adj-R^2	0.13	0.28	0.004	
1990's	Proportion	105.52* (36.76)	0.39* (0.09)	−104.91* (36.74)	1.00
		0.59*† (0.17)	0.48*† (0.10)	−0.07† (0.19)	1.00†
	Adj-R^2	0.28	0.50	0.28	
		0.38†	0.55†	0.01†	
$*$ *denotes significance at the* 5% *level*					
$**$ *denotes significance at the* 10% *level*					
† *denotes exclusion of Other Manufacturing Industry*					

Table 3: Relative contribution by factor of production and TFP to output growth

though in the Western Cape the negative contribution of labour is perhaps somewhat more muted. While the magisterial district data had difficulty finding evidence of the national trend of positive contributions of technological progress in the 1970's and the 1980's, the manufacturing sector data for the Western Cape provides similar evidence to the national data. Moreover, the declining trend in the contribution of technological progress to output growth in the national data is evident in the Western Cape also.

6.3 Summarizing the Manufacturing Sector Evidence

Before concluding our examination of the evidence for the manufacturing sectors, we present the evidence to emerge from the manufacturing sectors of the Western Cape once more in summary form. We do so by considering once again equation (6), where now the evidence is for the i manufacturing sectors represented in the Western Cape.

The resultant estimates of β_V represent the proportion of real value added output growth on average across all manufacturing sectors.[51] We report results in Table 3.

As for the magisterial district evidence, the MossGas project of the 1990's significantly distorts the findings. In this instance, since MossGas was captured under Other manufacturing industry, the distortion results from the inclusion of the Other manufacturing sector in the regressions.

Throughout, we find that capital accumulation has been the most important driver for output growth, dominating the contributions of both labour and TFP growth. However, particularly when Other manufacturing industry is excluded from the analysis, the contribution of capital has been on a declining trend over time (from 1.22 to 0.59 from the 1970's through the 1990's).

Labour's contribution to output growth by contrast has increased in importance into the 1990's, though this was off a low point achieved during the 1980's, and it remains secondary to capital accumulation even in the 1990's.

[51] It is important to emphasise that the regression evidence requires careful interpretation. The evidence requires interpretation as identifying summary characteristics across manufacturing sectors, rather than in causal terms.

Finally, TFP growth has consistently been a negative contributor to output growth in the Western Cape, though only the 1970's contribution proved statistically significant in the absence of Other manufacturing industry.

Again these findings confirm the general findings to emerge from the descriptive evidence.

A further point to note is that the findings of both the magisterial districts and the manufacturing sectors confirm the importance of policy related to physical capital accumulation for the Western Cape. It also suggests that TFP growth constitutes an underutilized source of growth in the region. Finally, the evidence suggests that labour market constraints in the Western Cap appear to be less binding as growth constraints compared to the national manufacturing sector.

6.4 The Relative Importance of Contributions of Capital, Labour and Technological Progress to Manufacturing Sector Growth by Three Digit Manufacturing Sector

Once again we weight the output growth contribution by factor input or technological progress by the value added contribution, this time by three digit manufacturing sector. Figures 6, 7 and 8 present the evidence for capital, labour and total factor productivity respectively, breaking the evidence down by decade.[52]

In terms of the contribution of the capital factor of production, the pattern remains constant across the three time periods considered. For the 1970's, 1980's and 1990's the pattern is consistently that the strongest value added output growth attaches to the manufacturing sectors that contribute the largest proportion of total manufacturing value added in the Western Cape. Simultaneously, it is sectors in the mid-range size distribution in terms of their relative contribution to value added, that are engaged in disinvestment, and therefore contribute negatively to total value added growth in manufacturing.

The Food and Clothing sectors have consistently contributed positively to total value added growth through the expansion of capital stock, whilst Textiles engaged in disinvestment from the 1980's continuing into the 1990's.

While the 1970's see little distinct patterns in terms of the growth contributions of manufacturing sectors by size distribution, for the contribution of labour to value added output growth, there is a contrast between the experience of the 1980's and 1990's. During the 1980's the positive growth contributions through job-creation were located in sectors with a large relative contribution to cumulative value added in manufacturing, in the 1990's the positive contributions through job-creation came from mid-sized sectors, large sectors came to contribute negatively to output growth through job-losses.[53]

These sector-specific findings obtained for Clothing and Textiles are mirrored in the evidence for TFP-led growth. The TFP contribution is consistently positive for the Clothing sector, while that for Textiles is positive in the 1970's and 1990's, and negative during the 1980's. For the Food sector

[52] The evidence presented excludes the Other Manufacturing Industries sector because the 1980's and 1990's distort the findings substantially, due to very strong capital and TFP growth. The likely reason for these findings are the classificatory problems related to the OMI sector that have been noted a number of times in the preceding discussion. The strength of the effect in the current context is such that to all intents and purposes only the OMI sector comes to contribute to the growth of manufacturing value added in the Western Cape in these two categories. Once again, we caution that significant classificatory problems brought about by the inclusion of new manufacturing activity in the Western Cape over this period in OMI even where inappropriate, will have skewed the data and our results. Finally, we note that the strength of the effect also points to the likely candidacy of the Mossgas projects as driving the strength of the OMI capital and TFP growth.

[53] The Food sector contributed positively to output growth through job creation during the 1970's and 1980's, though job losses during the 1990's led to a negative contribution to output growth from labour in the this important sector. Clothing again proves to consistently contribute positively to output growth through job creation, over all three sub-periods of the sample. By contrast, the Textiles sector has positive contributions to output growth from labour inputs during the 1970's and 1990's, but a negative contribution during the 1980's.

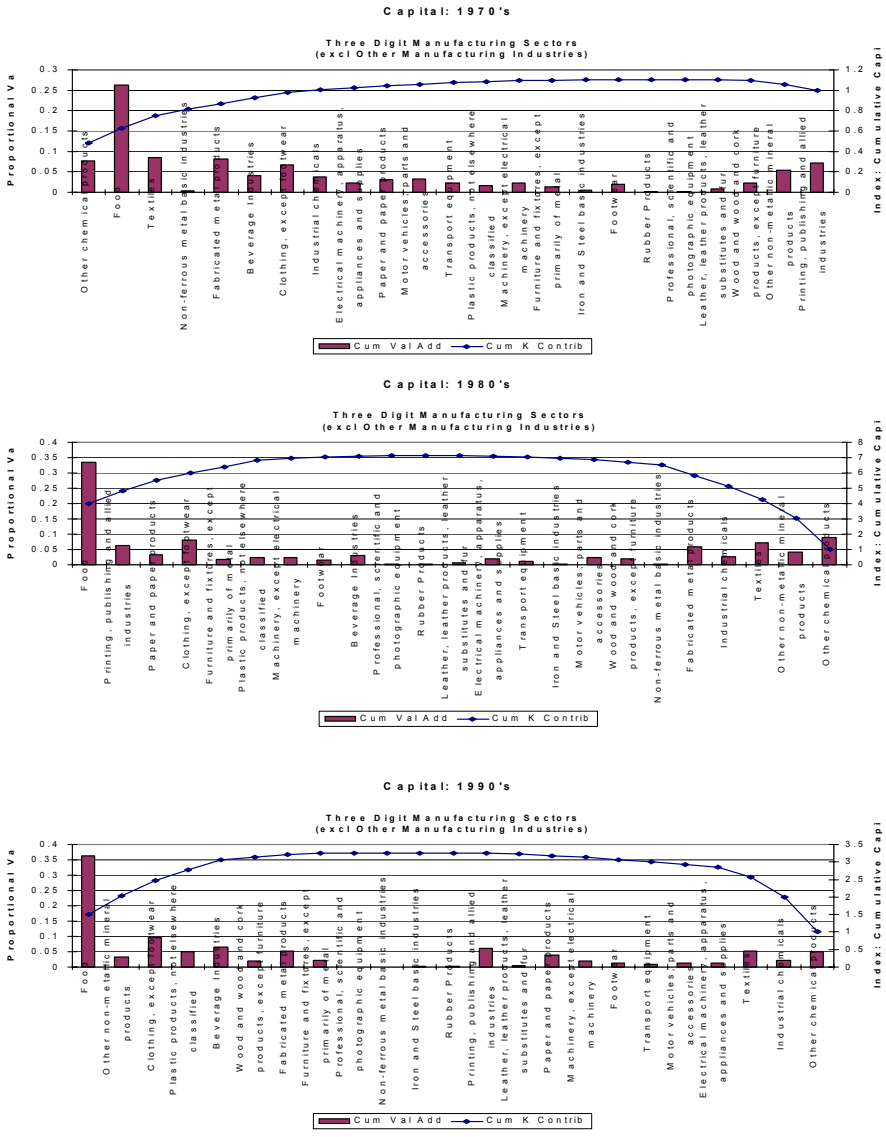

Figure 6: Capital Contribution to Value Added Growth

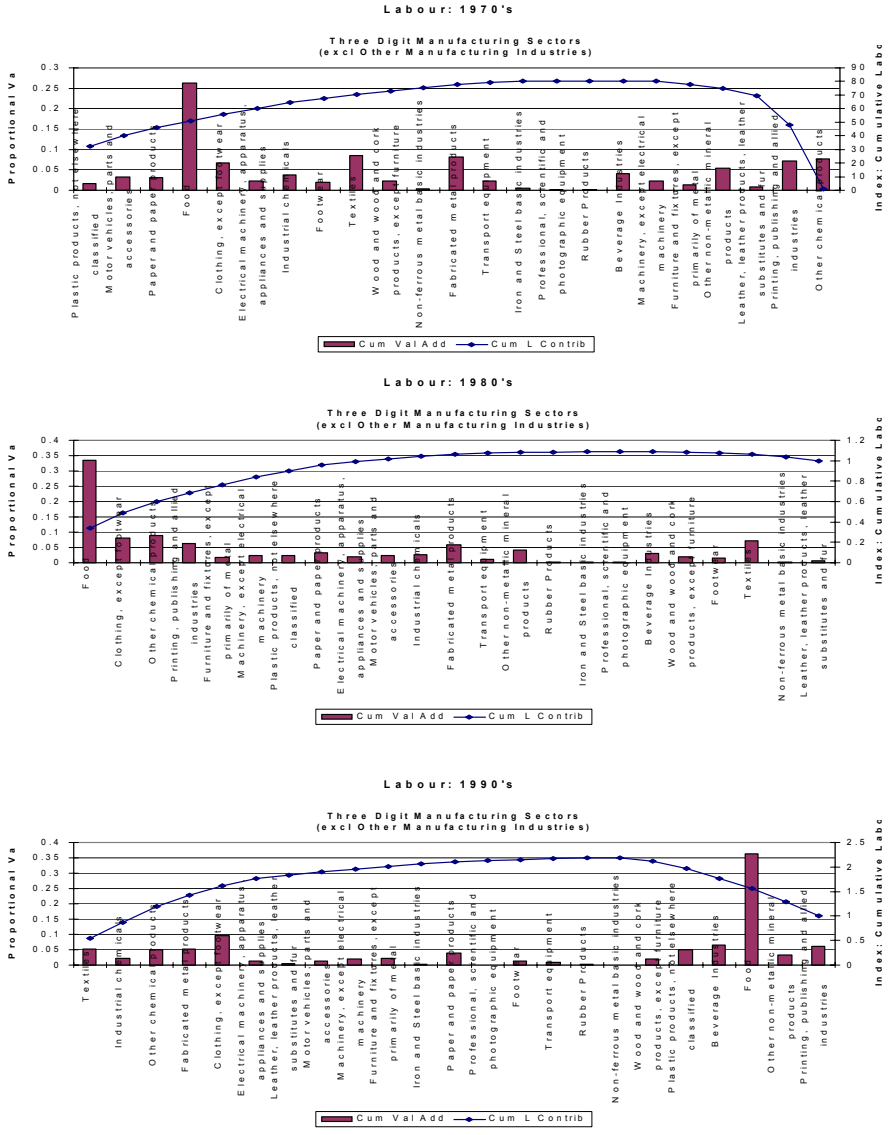

Figure 7: Labour Contribution to Value Added Growth

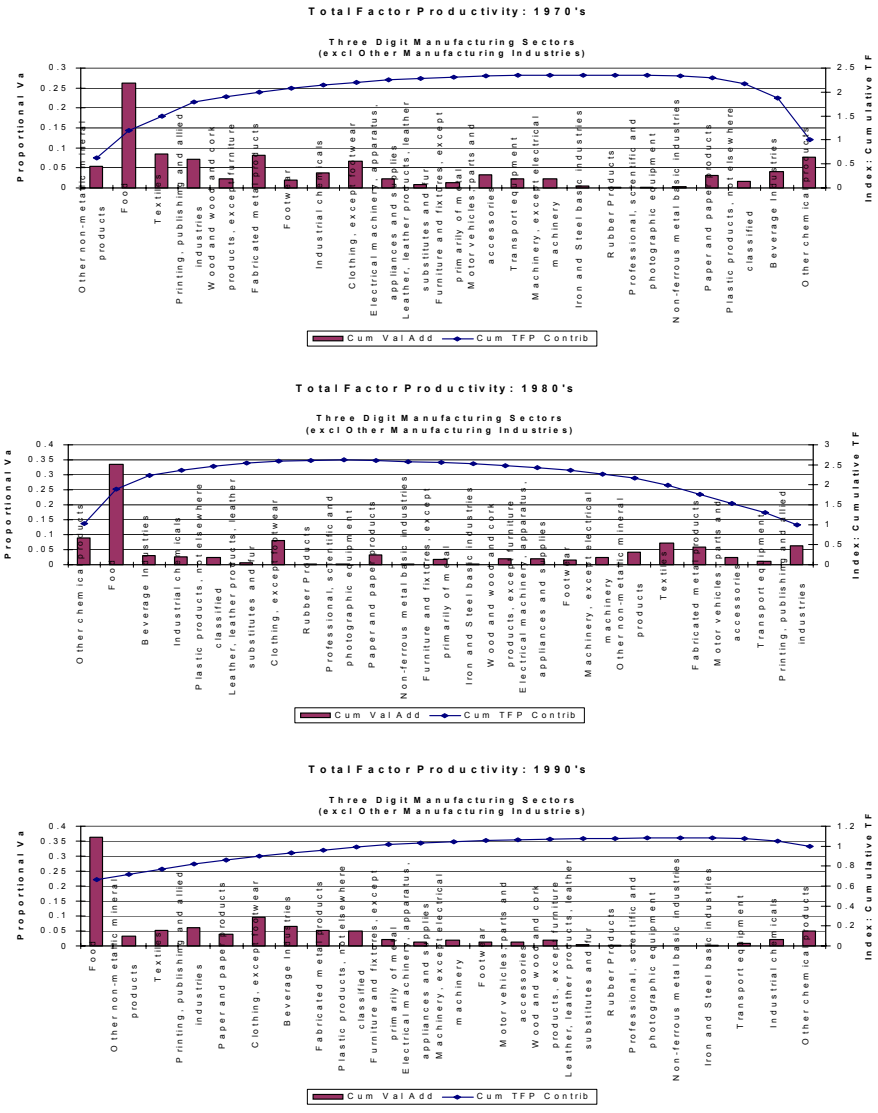

Figure 8: TFP Contribution to Value Added Growth

		Capital	Labour	TFP	TOTAL
1976-96	Proportion	1.11*	0.19*	-0.61*	0.70
	s.e's	0.21	0.06	0.25	
	adj-R^2	0.57	0.33	0.22	
1970's	Proportion	0.38	0.09	0.54	1.00
	s.e's	0.47	0.08	0.42	
	adj-R^2	0.04	0.06	0.09	
1980's	Proportion	1.05*	0.16*	-0.21	1.00
	s.e.'s	0.58	0.03	0.56	
	adj-R^2	0.13	0.59	0.01	
1990's	Proportion	-0.16*	0.03*	1.17*	1.04
	s.e's	0.07	0.02	0.08	
	adj-R^2	0.22	0.05	0.91	
$*$ *denotes significance at the* 5% *level*					
$**$ *denotes significance at the* 10% *level*					

Table 4: Relative contribution by factor of production and TFP to weighted output growth

efficiency gains are consistently such as to lead to positive output growth over the whole sample period.

Finally, the findings on the growth contribution obtained from efficiency gains in production are dominated by the manufacturing sectors with large contributions to total value added in the manufacturing sector of the Western Cape. Most dramatically, we find that for the 1970's and 1990's the large manufacturing sectors all have positive growth contributions emerging from efficiency gains. The 1980's are similar, though some of the larger sectors were subject to efficiency losses.[54]

An alternative representation of the weighted evidence is provided in Table 4.[55] The evidence repeats the evidence already reported under Table 3, but in this instance weighting output by the relative contibution to the Western Cape manufacturing sector. Note that the implications to emerge from the evidence stand in some contrast to that which emerged from the earlier, unweighted evidence. While over the full sample period the implication remains that Western Cape manufacturing growth has been driven by the accumulation of capital stock, the weighted evidence also implies that in manufacturing, during the 1990's, TFP growth has in fact dominated both of the standard factors of production. While not of a similar maginitude of importance, in the 1970's also TFP growth was more important than either capital or labour as a source of growth. A further notable point about the evidence is that the importance of labour is consistently of diminished importance to growth in output - particularly in the 1990's.

7 Conclusions

Manufacturing output in the Western Cape is heavily concentrated in a small number of magisterial districts and in a few sectors. Average growth rates amongst magisterial districts have been on a steady downward trajectory and have shown quite distinct patterns over the sample period. The consistently poor performance of the magisterial districts with large contributions to manufacturing total value added is consistent with an increased dispersion of manufacturing activity in the Western Cape over time.

Evidence shows growth in the manufacturing sector in the Western Cape has historically been driven by factor accumulation. This is particularly true of the 1970's and the 1980's, but for the entire sample period also. For most magisterial districts, for most periods, both investment in plant

[54] In particular, this is true for Textiles, Fabricated Metal Products and Printing.

[55] Note that results exclude Other Manufacturing Industry throughout.

and machinery as well as employment increases have contributed positively to manufacturing output growth. The contribution of total factor productivity to output growth has been on a declining trend especially during the 1990's. Output growth in the 1970's and 1990's was led by increasing capital intensity of production. By contrast, the 1980's saw a period of factor expansion in both capital and labour dimensions.

In contrast, the national study concluded that total factor productivity contributed increasingly to output growth over time whilst the contribution of labour and capital inputs declined. Differences across decades and between sectors were noted in the national study. In the Western Cape the story is fairly brief and concerns the largest sector, namely Food. This sector dominates output in the province, revealing a comparative advantage, becoming more capital intensive and shedding labour in the process, especially during the 1990´s.

We may ask, what led to the changing patterns of relative labour and capital usage over time in the Western Cape? The strong expansion during the period of relative international closure during the 1980's in both capital and labour led growth and the relative importance of state-led investment (Vredenburg, Mossel Bay) raises the issue of whether such investment was sustainable in the longer run. Similarly, the state-led investment in Iscor and Mossgas has not yet led to appreciable further expansion of manufacturing activity in the Western Cape. Future data may shed additional light on this question.

Part of the poor manufacturing performance of the 1990's may be a reflection of the impact of increased competitive pressure emerging with the reintegration of South Africa into world markets during the 1990's. The expansion of the 1980's was feasible only under the implicit protection afforded by international isolation. Unfortunately, the absence of data collection on the manufacturing sector in South Africa after 1996 represents a serious limitation to any analytical exploration of the impact of one of the most dramatic periods of structural change in the South African economy. The consequence is that it is not really feasible to examine with any rigour the impact of this change for future policy formulation.

When comparing the results of the national study with those of the Western Cape it may be possible to conclude that national industrial policy is not desirable for South Africa because discerned differences across regions are present. Location matters when considering where to site a specific manufacturing industry not only within a region but also between geographical regions.

8 Appendix A

Statistical Region	Magisterial District	1970-1975	1976-1980	1981-1985	1986-1990	1991-1996
1	Cape	2533515	2527348	2938184	2686592	2535396
	Wynberg	696274	666645	835087	946661	901511
	Simon'sTown	25284	23487	24205	25495	39096
	Goodwood		351536	530306	1053892	1274602
	Bellville	1293834	1399609	1647782	1522953	1512433
2	Stellenbosch	437779	278521	169110	132507	141440
	Kuils River		150648	192444	316815	240000
	Somerset West	147260	166680	250135	221320	155000
	Strand	36743	52525	67004	90597	65402
	Paarl	467148	451744	477560	587266	619212
	Wellington	65371	78361	70897	79611	51224
3	Caledon	47173	55489	77481	78189	84462
	Hermanus	3313	10214	11621	17465	22698
	Swellendam	14916	18337	34763	40457	39709
	Bredasdorp	1295	1626	2856	2851	2462
4	Knysna	25632	36597	40057	51798	42214
	George	45262	47746	59816	92311	128575
	Mossel Bay	63649	98782	109100	97201	325548
	Riversdale	1716	3596	3794	4482	4069
5	Oudtshoorn	35610	50439	60168	93579	66284
6	Worcester	107739	115565	114675	121895	132426
	Ceres	8705	16025	15845	47536	66125
	Tulbagh	32919	27460	36728	34687	33470
	Robertson	29752	30653	25309	25194	43202
	Montagu	46870	59986	64738	47556	44057
7	Malmesbury	84542	130104	375042	512561	494642
	Piketberg	64096	100002	80632	59676	48080
	Vredenburg	122540	133013	203644	223430	194961
	Moorreesburg				9575	13251
8	Clanwilliam	13090	20058	24065	16814	10266
	Vredendal	11417	10833	9152	11683	13568
	Vanrhynsdorp	3637	4764	4068	4340	4465
9	Beaufort West	2282	2573	4529	3485	1907

9 Appendix B

	1970-96	1970's	1980's	1990's
CAPE				
Value Added Growth	-0.93	-1.25	1.38	-3.82
Capital	0.16	1.59	-2.43	2.01
Labour	-0.35	-0.25	-0.04	-0.9
TFP	-0.74	-2.58	3.85	-4.92
WYNBERG				
Value Added Growth	1.1	-0.02	4.98	-2.99
Capital	1.19	-3.32	4.63	2.07
Labour	0.85	0.96	1.62	-0.39
TFP	-0.94	2.33	-1.27	-4.67
SIMONS TOWN				
Value Added Growth	1.15	-2.26	4.02	1.45
Capital	3.28	2.43	2.38	5.67
Labour	1.05	-0.97	2.97	0.9
TFP	-3.18	-3.71	-1.33	-5.12
GOODWOOD				
Value Added Growth	6.48	-10.59	15.65	0.69
Capital	4.91	-10.23	9.89	4.29
Labour	2.61	-5.99	6.33	0.97
TFP	-1.04	5.63	-0.57	-4.57
BELLVILLE				
Value Added Growth	0.34	0.46	1.82	-1.92
Capital	0.94	-1.31	1.42	3.17
Labour	0.53	0.81	0.15	0.71
TFP	-1.13	0.96	0.25	-5.8
STELLENBOSCH				
Value Added Growth	-3.77	-4.45	0.03	-8.33
Capital	0.14	-1.45	-1.31	4.25
Labour	-1.17	-1.61	-2.86	1.78
TFP	-2.73	-1.39	4.2	-14.36

	1970-96	1970's	1980's	1990's
CALEDON				
Value Added Growth	2.98	5.56	5.93	-4.55
Capital	3.02	0.33	2.37	7.4
Labour	0.51	1.07	0.79	-0.6
TFP	-0.55	4.17	2.76	-11.35
HERMANUS				
Value Added Growth	13.81	27.35	10.84	0.63
Capital	7.73	21.66	0.37	0.34
Labour	2.48	1.84	2.29	3.59
TFP	3.59	3.85	8.18	-3.3
SWELLENDAM				
Value Added Growth	5.03	3.78	9.38	0.41
Capital	2.48	4.82	2.48	-0.53
Labour	1.43	1.01	2.35	0.65
TFP	1.12	-2.06	4.55	0.29
BREDASDORP				
Value Added Growth	5.5	1.95	9.69	4.08
Capital	1.99	-5.33	4.34	8.05
Labour	2.28	-1.85	7.16	0.62
TFP	1.22	9.12	-1.82	-4.59
KNYSNA				
Value Added Growth	1.27	4.78	2.95	-5.63
Capital	0.19	0.85	2.54	-4.01
Labour	0.7	0.85	1.89	-1.21
TFP	0.39	3.08	-1.48	-0.41
GEORGE				
Value Added Growth	3.61	-0.82	8.34	2.57
Capital	1.59	-3.95	5.24	3.52
Labour	0.99	-0.51	2.81	0.33
TFP	1.03	3.64	0.3	-1.29

	1970-96	1970's	1980's	1990's
TULBAGH				
Value Added Growth	-0.13	-2.07	4.17	-3.79
Capital	4.33	-7.38	4.1	19.72
Labour	3.11	0.53	2.65	7.09
TFP	-7.57	4.79	-2.58	-30.6
ROBERTSON				
Value Added Growth	0.72	-0.26	0.01	2.98
Capital	3.96	5.27	-0.82	9.1
Labour	0.53	-0.14	0.25	1.78
TFP	-3.77	-5.39	0.58	-7.9
MONTAGU				
Value Added Growth	0.83	4.52	1.16	-4.41
Capital	0.09	2.01	-2.75	1.7
Labour	0.42	1.4	-0.73	0.79
TFP	0.31	1.11	4.64	-6.9
MALMESBURY				
Value Added Growth	7.85	4.86	19.23	-4.57
Capital	3	-3.24	10.18	0.77
Labour	4.14	2.95	9.53	-2.01
TFP	0.7	5.15	-0.48	-3.33
PIKETBERG				
Value Added Growth	6.06	25.58	-5.4	-2.68
Capital	12.99	42.77	-3.32	-1.99
Labour	1.26	1.4	1.26	1.1
TFP	-8.2	-18.59	-3.34	-1.79
VREDENBURG				
Value Added Growth	2.65	2.52	6.53	-2.75
Capital	-0.28	-13.35	2.44	12.64
Labour	1.33	0.8	2.41	0.48
TFP	1.59	15.07	1.68	-15.87

	1970-96	1970's	1980's	1990's
KUILS RIVER				
Value Added Growth	4.82	25.05	6.9	-6.81
Capital	1.92	4.39	7.62	-7.28
Labour	2.81	3.39	5.01	-0.57
TFP	0.09	17.27	-5.73	1.04
SOMERSET WEST				
Value Added Growth	-0.54	1.05	4.8	-10.22
Capital	5.37	4.35	15.4	-7.64
Labour	0.1	-0.19	3.26	-4.03
TFP	-6.02	-3.11	-13.87	1.45
STRAND				
Value Added Growth	1.62	4.89	5.5	-8.13
Capital	0.1	-1.68	0.17	2.28
Labour	1.31	2.18	1.84	-0.58
TFP	0.21	4.39	3.48	-9.83
PAARL				
Value Added Growth	1.25	-0.35	2.98	0.84
Capital	1.9	0.09	4.39	0.65
Labour	0.17	0.76	0.29	-0.75
TFP	-0.82	-1.19	-1.7	0.94
WELLINGTON				
Value Added Growth	-2.09	1.51	-0.53	-8.95
Capital	-1.01	-1.39	0.6	-2.81
Labour	-1.02	0.36	-0.87	-3.01
TFP	-0.07	2.54	-0.27	-3.12

	1970-96	1970's	1980's	1990's
MOSSEL BAY				
Value Added Growth	11.03	8.49	0.69	29.06
Capital	203.07	2.57	1.42	748.91
Labour	1.71	2.21	0.63	2.62
TFP	-193.75	3.71	-1.36	-722.48
RIVERSDALE				
Value Added Growth	6.81	20.11	2.19	-3.67
Capital	11.78	26.22	-2.79	14.03
Labour	1.6	1.07	3.83	-0.9
TFP	-6.57	-7.19	1.15	-16.8
OUDTSHOORN				
Value Added Growth	2.16	4.56	5.46	-5.63
Capital	3.53	1.31	3.82	5.98
Labour	1.17	3.78	-1.45	1.54
TFP	-2.54	-0.53	3.09	-13.15
WORCESTER				
Value Added Growth	1.73	4.34	2.6	-2.85
Capital	1.65	2.93	-0.21	2.67
Labour	0.46	1.75	-0.12	-0.36
TFP	-0.38	-0.34	2.92	-5.16
CERES				
Value Added Growth	9.59	13.72	15.52	-4.2
Capital	9.17	19.52	5.88	0.56
Labour	2.82	3.67	4.73	-1.01
TFP	-2.4	-9.47	4.91	-3.75

	1970-96	1970's	1980's	1990's
MOORREESBURG				
Value Added Growth	11.5	-	32.57	8.49
Capital	0.73	-	-13.2	2.72
Labour	4	-	5.25	3.82
TFP	6.77	-	40.52	1.95
CLANWILLIAM				
Value Added Growth	2.39	11.97	-3.83	-1.03
Capital	0.23	-3.91	-2.61	9.61
Labour	1.37	1.24	-1.22	5.24
TFP	0.79	14.64	0.01	-15.88
VREDENDAL				
Value Added Growth	2.2	0.26	2	4.98
Capital	1.77	4.15	-2.35	4.58
Labour	2.04	1.26	1.59	3.71
TFP	-1.61	-5.15	2.76	-3.31
VANRHYNSDORP				
Value Added Growth	3.65	11.63	-0.79	-0.28
Capital	2.24	7.69	-7.09	8.58
Labour	1.55	0.06	1.64	3.35
TFP	-0.15	3.88	4.67	-12.21
BEAUFORT WEST				
Value Added Growth	0.52	0.17	4.82	-5.16
Capital	-0.63	0.38	0.44	-3.45
Labour	0.74	-0.48	4.08	-2.44
TFP	0.41	0.28	0.3	0.73

10 Appendix C

	Output Growth	Capital	Labour	TFP
	1970-96	1970-96	1970-96	1970-96
Food	0.006	0.020	0.006	-0.019
Beverage Industries	0.015	0.016	0.004	-0.005
Textiles	-0.027	-0.005	-0.011	-0.011
Clothing, except footwear	0.020	0.018	0.006	-0.004
Leather, leather products, leather substitutes and fur	-0.045	-0.006	-0.063	0.025
Footwear	-0.019	-0.003	0.000	-0.016
Wood and wood and cork products, except furniture	0.004	0.000	0.006	-0.002
Furniture and fixtures, except primarily of metal	0.013	0.023	0.013	-0.023
Paper and paper products	0.003	0.016	0.009	-0.023
Printing, publishing and allied industries	-0.013	0.004	0.005	-0.022
Industrial chemicals	-0.041	-0.060	-0.011	0.030
Other chemical products	-0.033	-0.034	-0.013	0.014
Rubber Products	0.014	-0.002	0.007	0.009
Plastic products, not elsewhere classified	0.060	0.033	0.049	-0.022
Other non-metallic mineral products	-0.005	-0.003	0.009	-0.010
Iron and Steel basic industries	-0.052	-0.013	-0.016	-0.023
Non-ferrous metal basic industries	0.161	0.292	0.040	-0.171
Fabricated metal products	-0.022	-0.001	-0.004	-0.017
Machinery, except electrical machinery	-0.009	0.003	0.008	-0.021
Electrical machinery, apparatus, appliances and supplies	-0.024	-0.002	-0.001	-0.021
Motor vehicles, parts and accessories	-0.040	-0.007	0.003	-0.037
Transport equipment	-0.052	-0.014	0.001	-0.039
Professional, scientific and photographic equipment	0.066	0.029	0.011	0.026
Other manufacturing industries	0.060	17.394	0.003	-17.337

	Output Growth	Capital	Labour	TFP
	1970's	1970's	1970's	1970's
Food	0.070	0.027	0.027	0.040
Beverage Industries	-0.071	0.049	0.049	-0.120
Textiles	0.146	0.071	0.071	0.070
Clothing, except footwear	0.060	0.036	0.036	0.015
Leather, leather products, leather substitutes and fur	-0.034	-0.012	-0.012	0.075
Footwear	0.116	0.005	0.005	0.088
Wood and wood and cork products, except furniture	0.088	-0.008	-0.008	0.081
Furniture and fixtures, except primarily of metal	0.018	0.008	0.008	0.029
Paper and paper products	0.027	0.025	0.025	-0.022
Printing, publishing and allied industries	-0.011	-0.036	-0.036	0.062
Industrial chemicals	0.088	0.037	0.037	0.035
Other chemical products	-0.081	0.202	0.202	-0.212
Rubber Products	0.077	0.018	0.018	0.051
Plastic products, not elsewhere classified	0.071	0.034	0.034	-0.173
Other non-metallic mineral products	0.154	-0.041	-0.041	0.204
Iron and Steel basic industries	0.052	0.017	0.017	0.013
Non-ferrous metal basic industries	0.782	1.025	1.025	-0.450
Fabricated metal products	0.057	0.032	0.032	0.021
Machinery, except electrical machinery	0.021	0.018	0.018	0.004
Electrical machinery, apparatus, appliances and supplies	0.104	0.042	0.042	0.035
Motor vehicles, parts and accessories	0.068	0.024	0.024	0.012
Transport equipment	0.044	0.027	0.027	0.009
Professional, scientific and photographic equipment	0.042	0.015	0.015	0.008
Other manufacturing industries	-0.020	-0.504	-0.504	0.435

	Output Growth	Capital	Labour	TFP
	1980's	1980's	1980's	1980's
Food	0.047	0.020	0.009	0.018
Beverage Industries	0.049	0.002	0.000	0.047
Textiles	-0.031	-0.016	-0.001	-0.014
Clothing, except footwear	0.029	0.010	0.015	0.004
Leather, leather products, leather substitutes and fur	-0.007	-0.002	-0.057	0.052
Footwear	-0.025	0.007	-0.004	-0.027
Wood and wood and cork products, except furniture	-0.027	-0.012	-0.002	-0.013
Furniture and fixtures, except primarily of metal	0.064	0.037	0.038	-0.012
Paper and paper products	0.041	0.029	0.014	-0.002
Printing, publishing and allied industries	-0.004	0.018	0.010	-0.032
Industrial chemicals	-0.011	-0.041	0.006	0.023
Other chemical products	0.024	-0.050	0.011	0.063
Rubber Products	0.090	-0.003	0.032	0.062
Plastic products, not elsewhere classified	0.091	0.033	0.025	0.033
Other non-metallic mineral products	-0.050	-0.040	0.001	-0.011
Iron and Steel basic industries	-0.066	-0.025	0.005	-0.046
Non-ferrous metal basic industries	-0.149	-0.075	-0.043	-0.031
Fabricated metal products	-0.033	-0.015	0.002	-0.020
Machinery, except electrical machinery	0.008	0.009	0.023	-0.024
Electrical machinery, apparatus, appliances and supplies	-0.005	-0.002	0.012	-0.015
Motor vehicles, parts and accessories	-0.056	-0.004	0.008	-0.060
Transport equipment	-0.101	-0.004	0.005	-0.101
Professional, scientific and photographic equipment	0.104	0.037	0.019	0.048
Other manufacturing industries	0.078	0.815	-0.014	-0.723

	Output Growth	Capital	Labour	TFP
	1990's	1990's	1990's	1990's
Food	-0.080	0.016	0.002	-0.098
Beverage Industries	0.004	0.022	0.012	-0.029
Textiles	-0.096	-0.021	-0.033	-0.042
Clothing, except footwear	-0.008	0.022	-0.008	-0.023
Leather, leather products, leather substitutes and fur	-0.103	-0.010	-0.058	-0.036
Footwear	-0.069	-0.021	-0.005	-0.044
Wood and wood and cork products, except furniture	0.012	0.021	0.013	-0.022
Furniture and fixtures, except primarily of metal	-0.062	0.008	-0.008	-0.061
Paper and paper products	-0.061	-0.006	-0.003	-0.052
Printing, publishing and allied industries	-0.028	0.000	0.017	-0.044
Industrial chemicals	-0.138	-0.129	-0.046	0.037
Other chemical products	-0.092	-0.110	-0.021	0.040
Rubber Products	-0.122	-0.008	-0.028	-0.086
Plastic products, not elsewhere classified	0.011	0.033	0.013	-0.035
Other non-metallic mineral products	-0.008	0.066	0.027	-0.101
Iron and Steel basic industries	-0.096	-0.007	-0.098	0.009
Non-ferrous metal basic industries				
Fabricated metal products	-0.040	0.006	-0.017	-0.029
Machinery, except electrical machinery	-0.047	-0.011	-0.009	-0.027
Electrical machinery, apparatus, appliances and supplies	-0.106	-0.022	-0.030	-0.054
Motor vehicles, parts and accessories	-0.064	-0.025	-0.014	-0.025
Transport equipment	-0.023	-0.044	-0.008	0.029
Professional, scientific and photographic equipment	-0.089	0.011	-0.045	-0.055
Other manufacturing industries	0.070	48.750	0.008	-48.688

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