

The Impact of Structural and Production Method Changes on Employment Growth of Occupational Groups in South Africa

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1. Introduction

The last 25 years has seen enormous changes in the structure of the South African economy and the production methods used by firms. On the structural side, there has been a decline in the primary sectors of the economy, particularly the former foundation of the economy - the gold mining industry, while the service sectors have continued to grow at a rapid pace, increasing their importance in national output. In terms of production methods, the seventies and eighties brought the microelectronics revolution to South Africa which has seen a rapid computerisation of many sectors of the economy. This has been supported by other capital investments in new production techniques to modernise the production methods used and improve productivity.

In addition to the overall impact on employment levels that these changes in structure and production methods may have, they have also had a significant impact on employment levels in different occupational groups. For instance, structural changes may see a decline in employment of labourers in the mines and a rise in employment of clerks in the financial services sector. Production method changes may see a rise in employment of computer professionals and a decline in employment of blue-collar machinists within manufacturing. Because of racial distortions in the South African labour market and/or any gender bias in particular occupations, these occupational shifts will have very real impacts on different socio-economic groups. For example, the decline in opportunities for labourers and blue-collar machinists is likely to impact stronger on black males while the rise in clerical posts will provide greater opportunities for females of all races.

The purpose of the paper is to analyse the impact on structural and production method changes on the employment of different occupational groups in South Africa and then extrapolate these findings to derive the impact on socio-economic groups. Effectively this involves mapping output changes to employment changes, broken down by occupation, and then employment changes to socio-economic groups, broken down by race and gender. The paper is organised into two parts - an historical overview of changes that have occurred and their impact, and a forecast of expected changes to come and their policy implications. The time period, from 1970 to 1995, was chosen mainly because a) the census in 1970 was the last census that contained the former TBVC states and the 1995 October Household Survey (OHS) was the latest comprehensive survey that included the former TBVC states; and b) this time period captures the entire shift to microelectronics.

The first part is organised as follows. Section two outlines the major output changes that have occurred over the last 25 years in SA. Section three then discusses the changes in employment mix required to produce the same output for each sector of the economy. Together these two sections inform us whether employment changes for different occupational groups is due to the rise and fall of different sectors of the economy that use them in different intensities or whether it is due to changes in the intensity of use within each sector. Section four then breaks down the employment changes in occupational groups and maps them to the output and production method changes discussed in the previous two sections. Then, using a mapping of occupational groups to socio-economic groups, section five examines the effect of these employment changes on different groups of society.

The second part begins with section six which takes a look at the expected future changes in structure and production methods in the South African economy. It achieves this by taking a look at structural changes that have already occurred in industrialised and newly industrialised countries and current trends in the South African economy. It then looks at the probable impacts of these changes in different occupational and socio-economic groups. Finally, in section seven, the policy implications of the findings are discussed and conclusions drawn.

Part One: **Historical Overview**

2. Structural Change in South Africa

The South African economy is atypical from many other developing economies. Over 100 years of diamond and gold mining together with around 80 years of inward industrialisation policies of varying degrees of intensity, has left the economy with a fairly sophisticated and highly diversified industrial base. The mature manufacturing sector, with its numerous sub-sectors ranging from food processing to automobile manufacture, now forms the foundation of the economy, a position once held by gold mining. It has enabled the two primary sectors - agriculture and mining - to operate in a technologically advanced manner raising productivity levels in both sectors. The manufacturing sector is supported by the other secondary sectors - utilities and construction - both of which are advanced in their operating techniques and relatively large. The manufacturing sector is also supported by a large and growing producer services sector - including financial, business, transport and communication services - which is modern and varied, offering vital competitive support to industry. Finally, the final demand services - including wholesale, retail, accommodation and entertainment - are in some instances very sophisticated, enabling good access to, and information on, the local consumers.

Given this developed industrial base that now exists in the economy, it is interesting to examine the structural shifts that have occurred in the economy in the last 25 years since 1970. These structural shifts are manifest in the changing contribution of each of the respective main economic activities to GDP as a result of sectoral deviations from the average rate of growth of national output.

2.1 Growth Performance by Economic Activity

In analysing the nature of structural change then, it is necessary to firstly determine the growth rates, relative to GDP, of the various main economic activities. Table 1 below presents the output growth rates of the South African economy by economic activity since 1970. Before closely examining the performance of the various sectors, it is important to detail the underlying trends in the economy's performance.

The South African economy grew extremely rapidly in the 1970s, with average growth rates of 8.3% from 1970-75 and 5.5% from 1975-1980. The S.A. economy peaked in 1979-81 on the back of an extremely high gold price before declining in the first half of the 1980s driven by disinvestment and sanctions. The economy limped along at 0.7% growth for the first half of the 1980s but recovered to a slightly higher real growth of 1.1% in the latter part of the eighties. This was driven in part by increased exports which were promoted to cover the capital account deficit created by disinvestment and loan repayment obligations. The first half of the 1990's again saw slow GDP growth of 0.7% which was in part due to the enormous uncertainty during the lengthy negotiations to bring about democratic elections in 1994, and in part due to the beginning of trade liberalisation which gave a negative competitive shock to some sectors of the economy. This overall performance provides the underlying trend within which structural change has occurred, as exposed by the varying growth rates of different sectors.

Table 1: Real Growth of GDP by Economic Activity, 1980-1996

Period	GDP	Agr/Fis h/Fo	Min & Qrr	Manfctrig	El, gas & wtr	Cnstrctn	Whls/Re t/Ctr	Trsp/Sto r/Cmctn	Fi/I/RE/BSrvc e	Com/Sc/PSr vce
1970-75	8.3	8.0	13.7	7.1	5.4	14.4	6.6	8.5	12.2	6.8
1975-80	5.5	1.9	25.9	4.9	19.3	-2.8	0.7	2.8	2.3	1.9
1980-85	0.7	-2.9	-5.8	0.7	4.2	1.3	1.1	1.9	5.9	8.6
1985-90	1.1	-0.9	-6.6	3.8	1.7	0.1	7.0	-2.1	2.1	2.6
1990-95	0.7	-2.0	-0.8	0.4	2.8	-2.9	1.3	2.3	1.8	1.1
1995-97	2.1	1.5	-5.1	-0.5	-7.2	1.8	4.0	0.5	11.0	5.4
Mean	4.1	0.6	2.2	4.1	8.1	1.5	4.7	2.9	9.0	6.5

Source: SARB 1975-1998

Primary sector

The primary sector of the economy includes the following economic activities as classified by the South African Standard Industrial Classification (SIC) of all economic activities (CSS fifth edition) :

SIC 1 - Agriculture, fishing and forestry

SIC 2 - Mining and quarrying

What is evident from table 1 is that the primary sector has performed the poorest out of all sectors of the economy, recording two of the three lowest sectoral growth rates for the entire economy from 1970 to 1997 – implying a decline relative to other sectors of the economy.

The *agricultural sector* is by its very nature highly volatile, due to its dependence on prevailing weather conditions. However growth over a lengthy period is capable of isolating the general trend. Agriculture performed extremely well in the early 1970s, a period where high growth could be realised through putting new land ‘under the plough’ and increasing yields through the greater mechanisation of production and through the application of new technologies and improved seed varieties. However, once these opportunities for rapid growth diminished, real growth in agriculture declined to a low level in the latter part of the 1970s (1.5%), and in fact experienced negative real growth consistently from 1980 to 1995. Output recovered from 1995 to 1997 yet this is a short-term deviation from the trend which dictates below average growth rates for agriculture.

The *mining sector* in South Africa faces a different problem to that of agriculture. The gold mining industry, the single largest component of the sector, is in irreversible long-term decline. Table 1 shows clearly that the entire sector had its heyday in the 1970s with the rise of the gold price but since then has declined at an average rate of 5.3% since 1980, with the exception of 1996 where a large devaluation of the rand improved the rand gold price temporarily. The decline of the gold mining industry is due to both supply and demand conditions. On the supply side, South Africa’s remaining reserves of gold lie at very deep levels and are very expensive to mine. On the demand side, gold has lost its shine as a store of value and with the recent spate of central banks around the world selling large parts of their reserves, the price of gold has dropped dramatically since its high in 1979-81. The result is that many gold mines in South Africa are now unprofitable and are being closed.

Secondary sector

The secondary sector of the economy includes the following economic activities:

SIC 3 - Manufacturing

SIC 4 - Electricity, Gas, Water

SIC 3 - Construction

What table 1 suggests is that as a group the secondary sector of the economy has maintained growth rates roughly equivalent to that of GDP since 1970. This is unsurprising as the manufacturing sector is the foundation of the economy.

Growth in the *manufacturing sector* has averaged exactly that of overall GDP growth from 1970-97 with an average annual rate of 4.1%. Further, fluctuations in the growth rate have mirrored that of GDP, with extremely strong growth in the 1970s, poor or negative growth rates in the early 1980s and 1990s and relatively strong growth in the late 1980s. The manufacturing sector underwent its high growth phase before the 1980s with real annual growth rates of 17.6% from 1962 to 1970 and 13.1% from 1970 to 1980¹. This rapid growth phase created a fairly sophisticated and highly diversified industrial base which had established markets and consumers in the local economy. This is evident from the fact that local manufacturing production was already satisfying 81% of domestic demand in 1980².

Therefore, from the 1980s onwards there was little scope for above average growth through increasing penetration of the domestic market. In fact, with the beginnings of trade liberalisation under GATS in 1994, the manufacturing sector has found its dominant position in the local market under threat as years of inward

¹ SARB Quarterly Bulletin 1965-82

² IDC Manufacturing Statistics 1995

industrialisation has left it uncompetitive internationally. It is for this reason that growth from 1995 to 1997 was actually negative at -0.5%, reflecting the shrinking of traditional sectors in the face of growing international competition. For the manufacturing sector to have grown rapidly in the period from 1980, it needed to be successful in export markets. Export incentives were introduced in the late 1980s and early 1990s which established a large exporting component in a few manufacturing sub-sectors yet the majority remained vent-for-surplus exporters³. As a result, the South African manufacturing sector failed to grow at a significant rate from 1980 onwards yet remained the foundation of the economy.

The role of the other secondary sectors - *utilities and construction* - as intermediate inputs mean that their performance will be quite closely linked to the performance of the economy as a whole. Utilities underwent a massive growth phase in the 1970s – particularly the late 1970s – as large investments in capacity were done. However, subsequent to that, growth averaged only 1.4% through the 1980s and early 1990s – a rate very similar to manufacturing. Construction, on average, has not performed well, recording the second lowest average growth rate since 1970. The early 1970s was a boom period for construction as many large strategic projects were underway (e.g. Sasol 2, Iscor Newcastle Works). Negative growth in the late 1970s was a result of the end of these large projects and the construction industry then performed in line with overall GDP performance. Negative growth in the early 1990s was the result of much investment being put on hold during the pre-election period due to uncertainty.

Tertiary sector

The tertiary sector of the economy includes the following economic service activities:

SIC 6 - Wholesale and retail trade; repair of motor vehicles, motor cycles and personal and household goods; hotels and restaurants

SIC 7 - Transport, storage and communication

SIC 8 - Financial intermediation, insurance, real estate and business services

SIC 9 - Community, social and personal services

It is evident from table 1 that these service sectors are by far the fastest growing components of GDP, with all but transport and communication averaging growth higher than the GDP average for the 1970-97 period. This indicates that one of the drivers of national economic growth in South Africa has been the services sector, which have also compensated for the relative decline of the primary sector.

The general performance of final demand *consumer services*, incorporating the internal trade and entertainment components represented by SIC sector 6, is generally dependent on the overall performance of the economy as it represents final demand spending by consumers. Its close ties with GDP growth are reflected in a average growth rate marginally higher than GDP at 4.7%. The slightly higher rate is indicative of a sector which has been maturing in the domestic market through both tapping into new opportunities in the market and also creating new means of getting a larger portion of consumer income. The latter requires not only growing income levels but also higher levels of retail and entertainment sophistication. The continuance of this expansion into the mid-1990s has benefited from the rapid growth in international tourism to South Africa. Part of the reason for this deepening investment in the local market during the 1980s is the under-performance of the rest of the economy, forcing the internal trade and entertainment industry to seek growth through means other than natural increases in consumer spending power.

The performance of the intermediate input *producer services* sector, incorporating transport, communication, financial and business services from SIC sectors 7 and 8, has been somewhat mixed. The transport and communication component has experienced weak growth from 1980 to 1997, averaging a mere 0.5% per annum average, after a relatively good performance in the 1970s. Its average growth rate for the entire period is 1.2% below the economy average. Alternatively, the financial, insurance and business services component is the sector with the highest growth - an average annual growth rate of 9% or more than twice the national average for the whole period. The differences in performance amongst its components can be explained by looking at the causes of high growth for producer services as a whole in the last 27 years.

³ Bhorat 1998 pp. 12

Growth in producer services the world over has been driven in part by the changing organisation and demands from the manufacturing sector, and in part through the rapid creation and expansion of whole new product markets. With respect to the former, changes in the range of products manufactured and nature of competition within the manufacturing sector have led to more technology-intensive production. This has resulted in a greater service component in the manufacturing process (e.g. research and design, information systems, etc.) and a decrease in the proportion of workers directly transforming products. In addition, the increasing complexities of these services, and attempts by firms to focus on their core competencies, has led to an increased externalisation (or out-sourcing) of these services. This has led to a statistical increase in services production in instances where no real increase has occurred.

Independent growth in the producer services sector from the creation of new product markets have come from either innovation in established producer services (e.g. new financial instruments or insurance products) or through opportunities created by the new informatics technologies (e.g. mobile communication services, Internet products). These new service products compete with manufactured goods for a growing slice of consumer income in addition to their sales as intermediate inputs into firms.

Relating these back to South Africa, transport and communication services have traditionally been organisationally separate from firms and so will not benefit from the externalisation effect. The communications field is the source of much innovation and expected growth, though much of it is recorded within the business services sector. It also did not expand into the new services and technologies until the 1990s when cellular communications and a range of value added services were introduced. This lack of expansion in domestic markets through deeper penetration of the market and the slow introduction of new products has stunted its growth. The financial and business services sector presents a different picture. Not only has this sector benefited from externalisation and increasing demand for specialised inputs, but it also been a dynamic and innovative sector in South Africa, introducing new products and exploring new market opportunities. This expansion of existing and new markets has enabled the sector to grow at rates well in excess of GDP.

The third highest performer of all sectors of the economy has been *community/social services* - incorporating public-orientated services under SIC sector 9 which are mostly provided by government. These would include public administration and defence activities, educational services, health services, sanitation and membership organisations (e.g. trade unions, religious groups & political organisations). The average real growth of 6.5% is 50% more than the GDP average. This is one sector where supply-push factors are of equal importance as demand factors in determining growth and mix of output. As the vast majority of these services are currently provided by the state, the exact size of this sector will depend almost entirely on the overall budget and priorities of the government of the day. Government spending during this period has grown significantly because a) natural social spending increases during slow growth and recession over 1980-96 period, b) increased spending on defence, policing and public administration to prop up the apartheid system, and c) rapidly increasing interest and loan repayments from loans to support increased spending.

2.2 Changing Shares of GDP by Economic Activity

These differing growth rates do suggest a change in the industrial structure of the economy. The high growth in services represent a new industry establishing itself in the domestic economy, while the steady performance in manufacturing speaks of an industry that has already gone through its rapid growth phase. Hence the manufacturing sector is now a necessary, but not growing share of the production base of the economy, given that it has already established markets and consumers in the local economy. Clearly though, should new export markets open up, the industry is likely to grow very rapidly and bolster its share of output. For the services industry though, the high growth rates are a product of expansion in domestic markets, with foreign markets thus far remaining largely untapped.

Table 2 below presents the changing share of the industrial base of the economy, as a more accurate picture of whether the growth rates in the different sectors are matched by a growing output share of national income. What is evident from the table is that the structural shifts in the economy since 1970 have been quite dramatic. The *primary sector* has seen its share of GDP drop 6.7%, from 18.6% in 1970 to a mere 11.9% in 1997. The main source of this decline has been the agricultural sector (-3.9%), but with mining not far behind. The primary sector has clearly been usurped as the dominant sector of the economy by manufacturing - a sign that the economy has partially reduced its dependence on a primary commodity for economic growth. The mature *secondary sector* has seen its share of GDP remain relatively unchanged, decreasing only 1.5% from 31.1% in 1970 to 29.6% in 1997.

Manufacturing has the largest share of national income compared to all other sectors at 23%, remaining the base of the economy.

Table 2: Share of GDP by Economic Activity, 1980-1996

Period	Agr/Fis h/Fo	Min & Qrr	Manfctgr	El, gas & wtr	Cnstrctn	Whls/Re t/Ctr	Trsp/Sto r/Cmctn	Fi/I/RE/BSrvc e	Com/Sc/PSrvc e
1970	8.3	10.3	24.2	2.6	4.3	15.1	9.2	11.1	14.8
1975	8.1	12.1	22.8	2.3	5.2	14.0	9.1	12.5	13.8
1980	6.9	21.7	22.2	3.6	3.5	11.3	8.1	10.8	11.8
1985	5.7	14.9	22.0	4.1	3.6	11.5	8.5	13.5	16.2
1990	5.1	9.4	24.7	4.2	3.4	14.6	7.2	14.0	17.3
1995	4.2	7.5	23.4	4.0	3.0	15.7	7.3	16.4	18.5
1997	4.4	7.5	23.0	3.8	2.8	15.4	7.4	17.2	18.6
Change 70-97	-3.9	-2.8	-1.2	+1.2	-1.5	+0.3	-1.8	+6.1	+3.8

Source: CSS

The decline in the primary sector contribution to national output has been compensated for by the rise of the *service sectors*. Services as a whole have increased their share of GDP by 8.4% from 50.2% in 1970 to 58.6% in 1997. This large share increase means that services output is now almost exactly twice that of the secondary sector and just under five times that of the primary sector. The largest sub-sector of services is producer services (SIC sectors 7 & 8), which now represent 24.6% of national output, marginally more than manufacturing. Of these, financial and business services represent the largest slice with 17.2% and the largest change from 1970, with a 6.1% increase in share. The next highest component is community/social services (SIC 9) with a share of 18.6%, an increase of 3.8% from its level in 1970. Finally, the consumer services (SIC 6) has also seen its share of GDP grow by a mere 0.3% to a high of 15.4% in 1997.

In summary, it is noticeable that an important structural shift has taken place in the South African economy since 1970. The structural change in the economy can be characterised in the main, by a move away from primary and manufacturing production, towards a greater emphasis on output in the services sector. The key loss in production share though, lay in the primary sectors, with manufacturing production remaining largely unchanged. This reflects not only that the economy has been mimicking global trends, but also that the economy is well placed to exploit opportunities in a sector that is growing faster than any other in the world economy.

3. Production Method Changes in South Africa

The purpose of this chapter is to outline and analyse current production method changes in the South African economy. In terms of this paper, production method changes refer only to the occupational mix of employees that are used to produce the sectoral output and *not* the changes in the total number of employees that are needed to produce one unit of output. The latter represents productivity changes and not production method changes – even though the two may be linked.

In terms of the analysis, there are two trends in production methods that we will concentrate on - namely the move to microelectronics-based production and to more capital-intensive production. The use of microelectronics in production represents a significant shift in production techniques in all sectors of the economy and forms the basis for so-called post-Fordist or flexible specialisation production methods. The predictable move to greater capital-intensity in production is a natural economic phenomena resulting from rising average wages. Each of these is analysed in turn followed by an overall assessment of their impact on the occupational mix of each economic sector.

It should be recognised that each of these will have an impact on the productivity of labour and hence have a disemployment effect, but both will also impact on the production methods used by firms in each sector. For instance, greater capital intensity may see 100 workers replaced by 20 workers (a labour-reducing effect) but the 100 workers may have been unskilled labourers and the remaining 20 semi-skilled machine operators (an occupational switching effect). The labour-reducing effect is not the focus here.

3.1 Overall Changes in Capital Intensity

Increases in capital intensity are expected to influence production methods through lowering the need for unskilled and low skilled labour who are being replaced by the new capital equipment, but increasing the need for more skilled labour who are required to operate and maintain the new capital equipment. Increasing capital intensity of production is expected in a growing economy. The application of more capital per unit of labour is one of the major sources of productivity improvements. The drive for productivity improvements are required to grow in a competitive domestic environment. At a national level, improvements are necessary to compensate for rising average wages in the economy which occur naturally through growth in the non-tradable sectors or other tradable sectors, if the country wishes to remain internationally competitive.

However, the extent of capital investments by a country may be influenced by other factors than the drive for productivity improvements. The most obvious is the costs of capital, which will determine how profitable capital investments will be. A further factor is in which sectors profitable capital investment opportunities lie. This will be determined in part by the comparative advantage of the country and its stage of development, but also by the relative cost of capital to labour.

Table 3 below presents the levels and real growth of capital-labour ratios in South Africa by economic activity from 1970 to 1995. For the economy as a whole, the capital-labour ratio has increased by a staggering 142.8% since 1970 – an annual growth rate of 9.5%. The absolute size of this rate of substitution between capital and labour at the national level can be linked to a) the widespread substitution at a sectoral level, and b) the relatively higher growth of more capital-intensive sectors of the economy compared to the more labour-intensive sectors.

Table 3: Capital-Labour Ratios by Economic Activity, 1970 & 1995 (capital R'000s per worker)(1990 rands)

Period	Total	Agr/Fis h/Fo	Min & Qrr	Manfctgr	El, gas & wtr	Cnstrctn	Whls/Re t/Ctr	Trsp/Sto r/Cmctn	Fi/I/RE/BSrvc e	Com/Sc/PSr vce
1970	40.1	10.0	29.3	30.8	466.5	3.8	22.5	140.8	340.8	46.5
1995	97.4	27.0	151.3	79.3	712.9	9.9	26.3	252.2	282.8	100.9
Growth 70-95	9.5	11.3	27.7	10.5	3.5	10.7	1.1	5.3	-1.1	7.8
Change 70-95	142.8	168.8	416.0	157.3	52.8	160.1	17.0	79.1	-17.0	117.0

Source: IDC

Table 3 is informative of the pervasiveness of the rapid substitution of capital for labour in almost all sectors. Only one sector - financial and business services - shows a decline in the capital-labour ratio from 1970 to 1995, and this is a relatively minor changes of -17% for the entire 25 year period. In contrast, the capital-labour ratio in mining has increased more than four-fold, in agriculture by 168.8%, in construction by 160.1% and in manufacturing by 157.3%. Increases in the capital intensity of services have been less severe with increases in the capital-labour ratio of only 17% in wholesale, retail and tourism, 79.1% in transport and communication and 117% in community and social services.

The primary underlying reason for this has been relatively cheap capital and rapidly increasing labour costs in general, in addition to productivity and computerisation considerations. However, some sectoral-specific factors have also played a role. In gold mining, the extraction process at deeper levels has required more capital-intensive techniques. In manufacturing, sub-sectoral growth and share of output has been biased towards the more capital-intensive while the more labour-intensive sub-sectors have declined significantly. Table 4 below outlines the share of total manufacturing, real growth rate and capital-labour ratio for 10 sub-sectors. The sectors with the top five shares of manufacturing - Food, beverages, tobacco (20.7%); Chemicals, rubber and plastic products (20.1%); Metal products and machinery (16.1); Transport equipment (10.9%) and Basic metals (9.4%) - are ranked 3rd, 2nd, 8th, 4th and 1st respectively in terms of their capital-labour ratio amongst the sub-sectors. Of these sectors, two are amongst the top 3 sub-sectors in term of growth.

Table 4: Various indicators for manufacturing sub-sectors

	% Share of total manufacturing		Real Growth Rate	Capital-labour ratio	
	1996	Change 1972-96	Mean growth 72-96	1993	Rank
Food, beverages, tobacco	20.7	+0.7	4.2	94.7	3
Textiles, clothing, leather and footwear	6.7	-2.0	1.3	15.6	9
Wood and wood products	3.0	+0.3	5.2	12.9	10
Paper and printing	7.9	+0.7	4.9	52.7	6
Chemicals, rubber and plastic products	20.1	+4.6	7.1	265.9	2
Non-metallic mineral products	3.4	-1.0	1.2	68.7	5
Basic metals	9.4	-1.9	2.0	312.4	1
Metal products and machinery (incl. electrical)	16.1	-3.7	1.8	29.1	8
Transport equipment	10.9	+1.2	5.1	82.3	4
Other manufacturing	2.1	+1.0	14.0	35.1	7

Source: IDC

The second reason cited for a high growth of the capital-labour ratios in the national economy was the relatively higher growth of more capital-intensive sectors of the economy compared to the more labour-intensive sectors. This has already been demonstrated for the manufacturing sector but also applies to the economy as a whole. Recalling from table 1, the sectors that have experienced relative decline since 1970 were agriculture, mining and construction. Agriculture and construction represent the two most labour-intensive sectors while mining is the fifth most labour intensive yet due to its dramatic decline its job losses have been the most severe anyway. The top two growth sectors were financial and business services and community services. Although the former did

experience a slight decline in its capital-labour ratio since 1970, they still represent the second and fifth most capital-intensive sectors of the economy.

3.2 The Shift to Microelectronics

The adoption of microelectronics-based production has a similar effect to that of general increases in capital-intensity – i.e. increase demand for more skilled labour which can develop, operate and maintain the microelectronic systems, while reducing the need for low skilled labour which is being replaced by the equipment. In fact, much of the large capital investment that has occurred in each sector of the economy since 1970 has been in information technology products. The information technology revolution really took off in the mid 1970s/early 1980s, when computing power became considerably cheaper and more accessible to all aspects of the firm through the rise of personal computers. Since then, information technologies have transformed the way in which almost every business in every sector operates. The rise in importance of information technology is demonstrated by the fact that a recent survey of United States companies revealed that they are now spending more on information technology equipment than on all other capital equipment (Talero & Gaudette, 1995). South Africa has not yet reached this point but that points to the path in which the local firms are heading.

It is difficult to get an accurate quantitative account of changes in the use of information technology in South Africa and so a mixture of statistics and anecdotal evidence will have to suffice. Table 5 outlines the stock of PC's by economic sector for 1995, which presents one measure for IT penetration levels. The obvious difficulty with such a measure is inter-sectoral comparisons are difficult as there are differences in the opportunities for IT applications by sector. For instance, one would expect labour-intensive sectors such as agriculture, mining and construction to have fewer opportunities for IT usage than the service sectors where information is a key resource. The lack of comparative data for 1970 is not really problematic as the information age in business only really took off after 1970.

What the data tells us is that the overall penetration level for business in South Africa is relatively low at 15.7 PC's per 100 employees. Moving to a sectoral level one can see which sectors have adopted IT at a faster rate than others. Financial intermediation has been the leader in terms of IT adoption in South Africa with 74 PC's per 100 employees followed by the wholesale and retailing sector with 24 PC's per 100 employees. Manufacturing still has a way to go with 17 PC's per 100 employees, but the poorest performers are the construction and mining industries with 2.1 and 5.5 PC's per 100 employees respectively. However, the manual labour-intensive nature of these industries means that this is probably not a good measure of IT penetration in these industries. If one then excludes these two sectors, the sector with the poorest penetration levels is government with an average of only 7 PC's per 100 employees followed by transport, of which a large proportion is owned by government (specifically all air and rail transport and harbours).

Table 5: The S.A. PC Installed Base by Economic Sector, 1995 (in units)

Economic Activity	Total Stock	PCs per 100 employees	% share of total stock
1. Agriculture	na	na	na
2. Mining	32,000	5.5	2.9
3. Manufacturing	240,000	17.2	21.6
4. Utilities	68,000	170.2 ¹	6.1
5. Construction	7,000	2.1	0.6
6. Wholesale & Retail	170,000	24.0	15.3
7. Transport	37,000	13.1	3.3
8. Financial Intermediation	143,000	74.0	12.9
9. Government	113,000	7.0	10.2
Unspecified	100,000		9.0
Total Business	910,000	15.7	82.0
10. Home/Office	200,000	2.4 ²	18.0
Total	1,110,000		100.0

¹ This figure should be ignored as it appears to be too high to be considered accurate

² This figure represents number of PCs per 100 households

Source: BMI Techknowledge and CSS – duplicated from Hodge & Miller 199, pp. 9

More qualitative research into IT usage by sector supports the general impression created by these figures⁴. Financial services and the large wholesale and retailers are world-class users with IT very pervasive in their organisations. This considerable rate of adoption since 1980 can be linked to their higher growth rates, healthy oligopolistic competition amongst the major players, and their expansion within the local market. Manufacturing is lagging behind in its adoption rate which is most likely the result of a lack of local and international competitive pressures and low growth rates for the sector as a whole. The government sector has lagged most in terms of IT adoption and has a poor record in the efficient application of what IT it has acquired. However, judging from the sale of computing hardware and IT services, both of which have grown at nominal rates in excess of 20% since 1992, it appears as if adoption rates have increased.

The overall picture is one of high rates of IT adoption in parts of the economy - particularly financial and internal trade - with other sectors lagging behind. However, with increasing competitive pressures from the world economy, the rate of IT adoption has picked up in the 1990s.

3.3 The Share of Occupations in Sectoral Employment

The extent of production method changes in each sector from the forces of increasing capital intensity and the shift to microelectronics can be represented by the changing share of each occupation within each sector. Table 6 below contains the share of 9 main occupational groups for each sector for 1970 and 1995.

The analysis of occupational groups takes place at a high level of aggregation for the reason that more detailed statistics are not available at the sectoral level. The actual occupational classification chosen in this paper attempts to follow the “Standard Classification of Occupations” (SOC) and “Standard International Classification of All Economic Activities” (ISIC) used by CSS as closely as possible. However, both the CSS “SOC” and the “International Standard Classification of Occupations” - on which the South African standards draw - have changed several times between the collection of the data used here, the 1970 Census and 1995 Household Survey. The 1970 and 1985 data sets are therefore not perfectly comparable in their original shapes so alterations to both data sets have been necessary in order obtain an acceptable degree of comparability. Given the constraints inherent in the aggregated format these, partly very old data, are provided and in the lack of available, precise guidelines for the correction of deviations, there may still be minor inconsistencies. The data sets should none the less be suitable for a depiction of major trends and changes at the highest level of aggregation. A detailed breakdown of the composition of the occupational groups used in this paper appears in appendix 1. The major occupational groups used in the analysis are as follows:

- Occupation 1: Professional, semi-professional and technical occupations
- Occupation 2: Managerial, executive and administrative occupations
- Occupation 3: Clerical and sales occupations
- Occupation 4: Service occupations
- Occupation 5: Farming, forestry and fishing occupations
- Occupation 6: Production workers, operators and artisans
- Occupation 7: Labourers
- Occupation 8: Transport, delivery and communications occupations
- Occupation 9: Unspecified occupations

⁴ Hodge & Miller 1996 pp. 36-44

Table 6: Occupational Mix by Sector, 1970 & 1995

		Prof/Sem i-P/Tech	Adm/Exe c/Mangr	Clr & Sales	Service	F&F wrkr/Fsh	Prod.wrkr &op/Arti san	Labourer	Transpor t occup	Unspec	Total
Agriculture	1970	0.1	0	0.1	0.2	98.4	0.5	0.3	0.3	0	100
	1995	0.3	0.5	1.3	1.2	82.4	1.7	1.6	10.9	0	100
	Change	0.2	0.5	1.2	1.0	-16.0	1.2	1.3	10.6	0.0	0.0
Mining	1970	1.1	0.3	2.6	3.7	0.7	86	2.1	3.3	0.1	100
	1995	4.7	2.7	9.2	7.4	0.6	49	15	10.7	0.7	100
	Change	3.6	2.4	6.6	3.7	-0.1	-37.0	12.9	7.4	0.6	0.0
Manufacturing	1970	3.3	2.8	11.6	3.1	0.5	57.1	16.2	4.6	0.7	100
	1995	5.3	5.8	12.8	4.2	0.6	47.4	16	7.4	0.5	100
	Change	2.0	3.0	1.2	1.1	0.1	-9.7	-0.2	2.8	-0.2	0.0
Utilities	1970	5.1	0.6	7.5	5.7	1	38.7	38.4	2.6	0.5	100
	1995	16.3	2.7	14.7	6.7	0	41.1	9.6	7.3	1.6	100
	Change	11.2	2.1	7.2	1.0	-1.0	2.4	-28.8	4.7	1.1	0.0
Construction	1970	2	2.3	3.2	1.5	0.2	55.8	31.7	3	0.3	100
	1995	5.1	5.1	4.2	1.5	0.2	59.5	19.6	4.6	0.3	100
	Change	3.1	2.8	1.0	0.0	0.0	3.7	-12.1	1.6	0.0	0.0
Wholesale	1970	1.8	5.7	45	13.4	0.4	14.5	10.2	8.7	0.3	100
	1995	2.4	11.4	46.8	13.2	0.7	12.7	7.8	4.6	0.4	100
	Change	0.6	5.7	1.8	-0.2	0.3	-1.8	-2.4	-4.1	0.1	0.0
Transport	1970	3.3	2.1	14.8	5	0.3	20.4	23.3	30.3	0.7	100
	1995	12.5	7	14.6	8	0.6	12.1	5.6	39	0.7	100
	Change	9.2	4.9	-0.2	3.0	0.3	-8.3	-17.7	8.7	0.0	0.0
Finance	1970	13.4	6.1	57.9	14	0.2	1.8	2	4.4	0.2	100
	1995	17.2	8.9	51.2	16.1	0.3	3.1	1.3	1.5	0.3	100
	Change	3.8	2.8	-6.7	2.1	0.1	1.3	-0.7	-2.9	0.1	0.0
Community	1970	15.8	0.8	6	64.8	4	2.3	4.8	1.4	0.2	100
	1995	41.1	1.7	14	30.3	4.4	3	2	2.8	0.5	100
	Change	25.3	0.9	8.0	-34.5	0.4	0.7	-2.8	1.4	0.3	0.0

Sources: CSS Population Census 1970; Economic characteristics of the population (Report no. 02-05-04)

and CSS October Household Survey 1995

The trends that one expects to see is a rising share of more skilled labour that is associated with capital-intensive production (i.e. professionals and managers) in addition to the declining share of the lower skilled occupations such as labourers, farming and forestry workers, production workers and basic service workers. Naturally, the declining share of one component of employment may lead to a statistical increase in the share of other occupational groups and therefore one may expect the share of non-production occupations to increase, such as clerical and sales and transport occupations. Unsurprisingly, these trends do appear in all sectors as detailed below.

In the primary sector, the main shift in production methods in *agriculture* has been the slight decline in the share of skilled and unskilled farming, forestry and fishing occupations from 98% of employment to 82%, with an increase in all other occupational groups, especially transport occupations. This is indicative of a sector where mechanisation has reduced the need for farm workers while increasing the role of service and skilled workers - the transport drivers and managers. In *mining* there has been a more dramatic shift, with production workers and operators losing a 37% share of employment. The gains have been spread quite evenly amongst the other occupations with labourers increasing their share by 12.9%, transport occupations by 7.4%, clerical and sales by 6.6% and professionals by 3.6%.

In the secondary sectors, *manufacturing* has also seen a decline in the share of production workers and operators, losing a 9.7% share of employment. The gains have mostly been in a greater employment share for managers (3%), transport occupations (2.8%) and professionals (2%). This reflects a situation of machines replacing workers on the shop-floor with professional services within the manufacturing firms gaining in importance under

the adoption of microelectronics. In *utilities* and *construction*, the major declining share has been that of labourers (-28.8% and 12.1% respectively) with gains for the more skilled occupations, namely professionals (11.2% and 3.1%), managerial (2.1% and 2.8%) and production workers and artisans (2.4% and 3.7%). Once more, service and skilled occupations being in greater demand as the nature of production changes.

In the *service sectors* there is much the same change occurring – the decline in the share of relatively unskilled labour such as the basic service and labourer occupations, with the rise of the more skilled occupations such as professionals and managerial staff. The decline in the share of basic service occupations was most dramatic in community and personal services (-34.5%) while the decline in labourers was most severe in transport and communication (-17.7%). The decline of the share of basic service occupations is mostly due to the stagnation of employment in the armed forces and domestic workers. All service sectors experienced increases in the shares of professionals and managerial occupation groups – in wholesale/retail it was 0.6% and 5.7% respectively, in transport and communication it was 9.2% and 4.9%, in finance and business services it was 3.8% and 2.8% and in community and social services it was 25.3% and 0.9% respectively.

In conclusion, increasing capital intensity and the shift to microelectronics in all sectors has resulted in growing demand for highly skilled professionals, technicians and managers to develop, implement, operate and maintain new technology. At the same time, this technology is replacing the unskilled and low skilled labourers, farming workers, production workers and basic service workers. The declining share in production of these workers has also had the effect of increasing the share of the non-production workers – namely transport workers and clerical and sales workers.

4. The Impact of Structural and Production Method Changes on the Employment Growth of Occupational Groups

The ultimate purpose of a close examination of structural and production method changes is to understand their impact on the South African labour force. The purpose of this chapter is to derive the occupational impact of these changes for South Africa. The chapter that follows will take a look at how these occupational shifts have had a real impact on different socio-economic groups in South Africa. The chapter is split into 5 sections. The first section takes a look at the aggregate changes in the employment of occupational groups in South Africa which lays the ground for discussing the source of these changes. The second section discusses the methodology used to isolate the structural and production method impacts on occupational employment. The next two sections then discuss the results in terms of structural change and production method change respectively. The final section provides a comparison of the four sources of occupational employment change in order to understand the relative size of the different forces with respect to each other.

4.1 Aggregate Changes in Occupational Groups

Aggregate changes in the employment levels of occupational groups over time can be linked to four factors – these are:

- *General output growth* – the average rate at which the South African economy grows
- *Sectoral productivity changes* - changes in the value-added per employee by sector
- *Structural changes* - sectoral deviations from average economic growth
- *Sectoral production method changes* – changes in the mix of occupations used in production by sector

Table 7 below outlines the changes in the employment numbers and total employment share of the nine occupational groups used in this study from 1970 to 1995. These changes are due to all four factors working together. A cursory glance over the results before breaking them down by source is an interesting exercise. It is not unsurprising that the two occupations that have experienced by far the most rapid growth are the highly skilled professionals and managerial occupation groups which have increased their numbers by 265% and 269.7% respectively – this translates into an average annual rate of just over 10% for both occupations. The influence of production method change is obviously present along with the structural shift to the service sectors that use more professionals. This has enabled them to increase their share of total employment considerably from 4.7% to 15.2% for professionals and from 1.5% to 5% for managerial occupations. The only other occupations to have seen a large increase in formal employment have been the service-orientated occupations of clerical and sales (130.7%) and transport occupations (124.9%) – annual increases of around 5% for both occupations. Again, the links to structural and production method change are apparent.

Surprisingly, a number of occupations have seen an *actual decline* in the total number employed. Foremost in this category is farming, forestry and fishing occupations which have declined by 54.2% from 1970 to 1995 – an annual decline of 2.2% resulting in their share of total employment to drop 20%. Other net losers were production workers and operators (7.4% decline) and basic service workers (6.2% decline). The number of labourers in the economy remained more or less stagnant from 1970 to 1995 – increasing by only 3.8% over the entire period. All of these occupations were identified as losers in production method change and its overall influence is definitely apparent in these results.

Table 7: Employment of Occupational groups, 1970-1995

	Prof/Se mi- P/Tech	Adm/Ex ec/Man gr	Clr & Sales	Service	F&F wrkr/Fs h	Prod.wr k&op/A rtisan	Labour er	Transp ort occup	Unspec	Total
Employ										
1970 ⁵	356402	115058	732635	1243348	2522471	1679794	587884	286389	18137	7542118
1995 ⁶	1300700	425400	1690200	1165800	1155800	1556100	610400	644100	36700	8585200
% change	+265.0	+269.7	+130.7	-6.2	-54.2	-7.4	+3.8	+124.9	+102.3	+13.8
Avg. growth	10.6	10.8	5.2	-0.2	-2.2	-0.3	0.2	5.0	4.1	0.6
Share										
1970 ⁷	4.7	1.5	9.7	16.5	33.4	22.3	7.8	3.8	0.2	100.0
1995 ⁸	15.2	5.0	19.7	13.6	13.5	18.1	7.1	7.5	0.4	100.0
Change	+10.4	+3.4	+10.0	-2.9	-20.0	-4.1	-0.7	+3.7	+0.2	0.0

Sources: CSS Population Census 1970; Economic characteristics of the population (Report no. 02-05-04)

and CSS October Household Survey 1995

4.2 Methodology

In order to separate the effects of the four factors on the employment of occupation groups (general economic growth, sectoral productivity growth, structural change and sectoral production method change), an employment accounting approach was adopted. This is a step-wise approach whereby one begins with 1970 employment figures and applies each of the above factors one at a time until finally the 1995 actual employment point is reached. At each point the extent of change is evaluated in comparison to the 1970 base year to provide a standard point of reference for comparison between the different sources and a growth rate for each force. A detailed methodology is included in Appendix 3, where the data sets derived in each step are also presented. However, the main steps in the process are as follows:

1. *Establish the starting point* - begin with the 1970 employment data broken down by sector and within each sector, broken down by occupation group.
2. *Calculate the average output growth effect* – apply the average percentage change in output from 1970 to 1995 and apply it equally to each sectoral employment level. This gives the level of employment that would exist in the economy if no productivity change had taken place but economic growth had remained the same. The annual growth rate due to this factor can then be calculated from the total percentage change.
3. *Calculate the average productivity effect* – calculate the average percentage change in labour required per unit of output from 1970 to 1995 using the labour-output ratios for each year. Apply this to the sectoral employment levels generated under step 2. The change in employment is then presented as a percentage of 1970 employment to get a percentage change figure. This step will result in a total employment level equal to that of the 1995 actual level.
4. *Adjust for sectoral productivity differences* – productivity does not grow equally between sectors and so it is necessary to adjust the sectoral employment levels calculated under step 3 according to deviations in productivity between sectors. This is achieved by recalculating the employment share for each sector by the amount that that sector's productivity increase deviates from the mean productivity increase. All the time the total employment level is maintained. At the end of this step should exist a data set that consists of sectoral

⁵ Source: CSS Population Census 1970; Economic characteristics of the population (Report. no 02-05-04)

⁶ Source: CSS October Household Survey 1995

⁷ Source: CSS Population Census 1970; Economic characteristics of the population (Report. no 02-05-04)

⁸ Source: CSS October Household Survey 1995

employment levels that add up to the 1995 actual level and which are decomposed according to 1970 occupational mixes. The sectoral productivity effect can be calculated by combining the percentage change under this calculation with the average percentage change in step 3. The annual growth rate due to this factor can then be calculated from the total percentage change.

5. *Calculate the structural effect* – based on the data set that is derived from step 4, recalculate the overall sectoral employment levels based on a sectoral breakdown of employment from 1995 actual while maintaining the 1970 occupational mix. This provides structural change from the point of general output growth and productivity change without production method change. The results should be the same as the sectoral breakdown of employment in the 1995 actual data yet with different occupational make-ups within sectors. Contrast the results by occupation with the data set from step 4 and calculate it as a percentage change of 1970 employment levels. The annual growth rate due to this factor can then be calculated from the total percentage change.
6. *Calculate the production method effect* – The final step is to apply the 1995 occupational mix by sector to the sectoral employment levels obtained in step 5 and then calculate the change in occupational employment levels as a percentage change of 1970 employment levels. The annual growth rate due to this factor can then be calculated from the total percentage change.

It should be noted that the calculation of the impact of structural change or production method change details *the deviation in employment of an occupational group from the employment growth rate from 1970 to 1995 that would exist if no such change had taken place – evaluated against the 1970 employment totals*. Before discussing the specific impacts of structural change and production method change, it is interesting to quickly note the impact of average output growth and productivity changes. The combined effect of these two forces obviously result in the actual change in total employment numbers from 1970 to 1995, with the structural and production method changes providing the sectoral deviations from this point. Therefore the combined effect is the total growth in employment which was 13.8% over 25 years. Breaking this figure down, average output growth had the effect of raising employment from the 1970 level by 110.5% while productivity growth had the effect of reducing employment by 96.7% on average from the level that would exist if no productivity gains had taken place.

4.3 Occupational Employment Growth Effects linked to Structural Change

Structural shifts in the economy will impact on occupational groups in the economy due to different sectors of the economy having different occupational mix requirements. For instance, primary sectors make greater use of unskilled or semi-skilled labour, while services make greater use of professionals. Differences in the growth of sectors will then indirectly translate into differences in the growth of occupational groups. The main structural changes in the economy were outlined in section two. It was shown that the primary change in the South African economy since 1970 has been the dramatic decline of the primary sector and the rapid rise of the services sector, with the secondary sector largely unchanged. The differences in the occupational mix of these sectors was outlined in section 3.4 above. The calculation of the impact of structural change uncovers the portion of occupational employment growth or decline from 1970 to 1995 that is due to structural change. Table 8 below outlines both the overall employment growth impact of structural change on each sector as well as the impact on the employment growth of different occupational groups.

An examination of structural change on total employment in each sector is revealing as to which sectors lost or gained most as a result of structural change. Four sectors saw a negative employment growth impact as a result of structural change – these were agriculture, mining, construction and transport and communication. Agriculture and construction were the major losers, both having employment growing roughly 1.5% slower per annum from what would have been had no structural change taken place. The big winners were utilities and financial and business services – who ended up with roughly 100% more employees than they would have had no structural change taken place – an employment growth rate about 4% higher than would be expected without structural change. The other significant gains went to two other service sectors – wholesale and retail, and community and social services.

Table 8: Percentage change in Employment in each sector and in each Occupational Groups due to Structural Changes, 1970 to 1995

Employment Impact	Agr/Fish/ Fo	Min & Qrr	Manfctri g	El, gas & wtr	Cnstrctn	Whls/Ret /Ctr	Trsp/Sto r/Cmctn	Fi/I/RE/B Srvce	Com/Sc/ PSrvce	Total
% Change from 1970	-34.7	-4.4	14.4	97.6	-36.4	20.1	-9.8	104.4	35.3	0.0
Avg. annual growth	-1.4	-0.2	0.6	3.9	-1.5	0.8	-0.4	4.2	1.4	0.0
Occupational Impact	Prof/Sem i-P/Tech	Adm/Exe c/Mangr	Clr & Sales	Service	F&F wrkr/Fsh	Prod.wrk &op/Arti san	Labourer	Transpor t occup	Unspec	Total
% Change from 1970	33.6	20.6	30.1	33.1	-32.6	0.3	3.5	6.5	13.1	0.0
Avg. annual growth	1.3	0.8	1.2	1.3	-1.3	0.0	0.1	0.3	0.5	0.0

Translating these structural changes into occupational shifts results in only one occupation losing out on employment as a result of structural change – farming and forestry workers. This occupation group ended up employing 32.6% less than they would have had no structural change taken place – a decline linked exclusively to the relative decline of agriculture. The occupations that grew faster each year due to structural change were the highly skilled occupations – professionals (1.3% per annum) and managerial occupations (0.8% per annum) – and service occupations – basic service occupations (1.3% per annum) and clerical and sales (1.2% per annum). This is indicative of the structural shift to services which make greater use of highly skilled occupations and service occupations. Interestingly, structural change had almost no impact on production workers and operators as well as labourers. The relatively constant share of manufacturing and the other secondary sectors would account for this as they are the primary users of these occupations.

In conclusion, structural change does have a significant impact on the employment of different occupation groups, demonstrating an ability to affect the growth in employment of a particular occupation group by up to 1.3% per annum. As expected, the impact has been negative on those occupations used heavily by the primary sector, insignificant on those used extensively by the secondary sector and largely positive on those used significantly by the services sector.

4.4 Occupational Employment Growth Effects linked to Production Method Changes

Production method changes, as defined in this paper, relate to changes in the occupational mix of employees used in the production of output in each sector – and not to changes in the overall number of employees required due to productivity changes. As such there is a direct impact on occupational employment growth from within each sector, with the total growth impact on any one occupation being the sum of these changes from within each sector. The main production method changes in the economy were outlined in section 3. It was shown that due to increasing capital intensity and the shift to microelectronics since 1970, there had been a general occupational shift in each sector away from the relatively unskilled occupations (farming and fishing, basic service occupations and labourers) to the more skilled occupations (professionals and managerial occupations), with the service occupations also raising their relative share (transport and clerical and sales). The calculation of the impact of production method change uncovers the portion of occupational employment growth or decline from 1970 to 1995 that is due to production method change. Table 9 below outlines both the overall employment growth impact of production method change on different occupational groups from 1970-1995.

As expected, production method changes have had an enormous positive growth impact on the highly skilled occupations of professionals and managerial occupations. Professionals, semi-professionals and technicians grew 8.3% per annum faster than they would have under no production method change, while the figure for managerial staff was 7.7% per annum. These translate into total gains of around 200% over the 25 year period for both occupational groups. As expected, the only other two occupational groups to gain overall from production method changes were transport occupations (3% per annum) and clerical and sales occupations (1.3% per annum). These are service-orientated occupations and reflect the slight shift to the greater use of services

internally in the production process rather than the sectoral shift to the service sectors which is captured in the impact of structural change.

Surprisingly, production method change has not had a highly significant impact on farming and forestry workers, causing them to record a growth rate of only 0.3% lower than they would have under growth with no production method change. Instead the large negative impacts have come in the basic services occupation (-2.4% per annum), labourers (-1.3% per annum) and production workers (-0.8% per annum). The decline in the basic service occupations stems almost entirely from the community and social services sector which is the main employer of such occupations and which has drastically reduced its use of them. The source of decline of labourers is more widespread with all but the primary sectors reducing their share of this occupational group. The decline of production workers can be most closely linked with their declining use in mining and manufacturing as more capital-intensive methods of production reduce the need for them.

Table 9: Percentage change in Employment in each Occupational Group due to Production Method Changes, 1970 to 1995

Occupational Impact	Prof/Semi-P/Tech	Adm/Exec/Managr	Clr & Sales	Service	F&F wrkr/Fsh	Prod.wrk &op/Artisan	Labourer	Transport occup	Unspec	Total
% Change from 1970	207.4	192.1	33.7	-59.3	-7.2	-18.8	-32.9	74.0	57.2	0.0
Avg. annual growth	8.3	7.7	1.3	-2.4	-0.3	-0.8	-1.3	3.0	2.3	0.0

In conclusion, production method changes can have had a very significant impact on the employment growth of different occupational groups. As expected, these changes have benefited the higher skilled occupations with the low skilled occupations losing out.

4.5 A Comparison of the Relative Size of Forces Impacting on Occupational Employment Growth

It is important to place the impact of structural and production method change in the context of other forces operating on the employment growth of occupation groups in order to get an idea of their significance. To achieve this, table 10 below outlines the growth in employment from 1970 to 1995 for each occupational group broken down by the different forces of change.

Before examining specific occupations, some general observations are worth noting. In terms of the average absolute impact on occupational employment growth (whether positive or negative), the most important source is general economic growth (average 4.4%), followed by productivity improvement (average 3.2%), production method changes (average 3.0%) and structural change (average 0.8%). It is expected that production method and structural change operate at the margin, but what is surprising is the very large growth impact that production method change is having on the employment of occupational groups. The exceptions to this hierarchy of causal factors are few. The absolute impact of productivity improvements was only larger than that of general output growth for farming and forestry workers (-5% vs. 4.4%). The absolute impact of production method change was larger than all other factors in professionals and managerial occupations, and larger than productivity improvements but not general output growth in transport occupations. Structural change only outstripped production method change for farming and forestry workers but remained the weakest absolute force for all other occupations.

Table 10: Growth in Employment for each Occupational Group broken down by the different forces of change, 1970 to 1995

Occupational Impact	Prof/Semi-P/Tech	Adm/Exec/Mangr	Clr & Sales	Service	F&F wrkr/Fsh	Prod.wrk &op/Artisan	Labourer	Transport occup	Unspec	Total
General output growth	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Productivity improvements	-3.5	-2.1	-1.7	-3.6	-5.0	-4.0	-3.1	-2.6	-3.1	-3.9
Structural change	1.3	0.8	1.2	1.3	-1.3	0.0	0.1	0.3	0.5	0.0
Production method change	8.3	7.7	1.3	-2.4	-0.3	-0.8	-1.3	3.0	2.3	0.0
Total	10.6	10.8	5.2	-0.2	-2.2	-0.3	0.2	5.0	4.1	0.6

A close look at each occupational group reveals some interesting trends. In the highly skilled professionals and managerial occupations, both structural change and production method change benefit these occupations but by far the most dominant force is production method change, which is 6 to 9 times bigger than structural change. The only two other occupational groups to benefit from both structural and production method change are clerical and sales and transport occupations. What is also interesting is that the negative effect of productivity improvements in all four of these sectors is less than the economy average of -3.9%. This suggests that all forces have tended to benefit these occupations and hence their total growth rates have all been above 5% per annum.

The two occupational groups that appear worse off are farming and forestry workers and production workers. Both these occupation groups have had a negative or zero impact from both structural and production method changes, and both have had an above average negative impact from productivity improvements. Hence, they account for the two occupational groups that have had the highest negative overall growth rate. Finally, service occupations and labourers have both benefited marginally from structural change but lost out in terms of production method change.

In conclusion, production method change is a significant force in determining the growth rate of occupational groups with structural change a more marginal force. The main beneficiaries of this change are the more highly skilled occupations and those associated with service sectors. The losers are the more low skilled occupations and those associated with the primary sectors.

5. Impact of Structural and Production Method Changes on the Employment of Socio-economic Groups

In any study of issues relating to human living conditions and standards of living in South Africa it is quite natural to expect both racial and gender inequalities. This applies to employment market studies as well, and here we will attempt to incorporate a discussion of the effects and major trends following the structural and production method changes that have taken place during the last two decades and a half in the country. The analytical tools applied in this paper do not allow for a derivation of the effects separately of structural change on the one hand, and production method changes on the other, on employment of workers from the various racial classifications and from the two genders. This chapter however, attempts in two separate sections, to deal with the result on total employment of the combined effects of the two types of change for each of the two types of social distinctions. Within each section we will study separately the changes in employment by sector and occupational category.

We have earlier established a total growth in the labour force of roughly 14% over the 25 year time span the study covers. As we will see below, behind this overall growth figure lie immense racial inequalities. This chapter will not dwell on increases relative to sizes or numbers in 1970 to 1995 but rather focus on the sectors and occupations where the majority found or now find their employment, and the changes in these categories.

From the previous chapters it has been established that employment has shrunk in three sectors, and increased in all others. In only one of the growing sectors did employment grow by less than 40% (Transport/Storage/Communication where it grew by some 38%), and it increased dramatically in three. The large approximate increases took place in:

- Wholesale/Retail/Trade (800 000 jobs)
- Community/Social/Personal services (750 000 jobs)
- Manufacturing (400 000 jobs)
- Finance/Insurance/Real Estate/Business services (400 000 jobs)

Major shrinkage took place in:

- Agriculture/Fishing/Forestry (1.2 million jobs)
- Mining and Quarrying with (225 000 jobs)

As for occupations we find decline in three occupations, but mainly amongst Farming & Forestry workers/Fishermen where 1.4 million jobs were lost. Employment increased in most other occupations - except Production workers & Operators/Artisans and Service workers - but the following were the most dramatic approximated increases:

- Professionals/Semi-Professionals/Technical professions (950 000 jobs)
- Clerical & Sales occupations (950 000 jobs)
- Transport occupations (36 000 jobs)
- Administrative/Executive/Managerial occupations (300 000 jobs)

Below we will attempt to explain and describe the impact on employment shares of workers by the various racial classifications and genders in the different occupations and sectors since 1970. The extent to which employment shifts to other occupations and sectors has allowed absorption of employees from the various social groups and compensated for losses due to unfavorable initial situations, will also be discussed.

5.1 Racial Composition Of Workforce

Before we investigate the changes in occupational and sector employment mixes we need to get an overview of what employment by racial classification looked like in 1970 and in 1995.

Table 11 Employed workforce composition by racial classification and its change, 1970 & 1995

Racial classification	1970		1995		Difference		Employment Growth
	No	% Share	No	% Share	No	% Share	%
African	5276711	70.0	5074100	59.1	-202611	-19.4	-3.8
Coloured	642184	8.5	1062500	12.4	420316	40.3	65.5
Asian	165156	2.2	331300	3.9	166144	15.9	100.6
White	1458067	19.3	2117200	24.7	659133	63.2	45.2
Total	7542118	100.0	8585200	100.0	1043082	100.0	13.8

Source: CSS: 1970 Population Census and CSS: October Household Survey 1995

Among several interesting facts from the table above, three deserves special attention.

- Between 1970 and 1995, employment increased by 1,04 million jobs.
- These jobs have by no means been equally distributed among the employees from the various racial classifications. Behind this 13.8% total employment growth rate dwell large racial inequalities. For example, whereas the employment of workers from the non-African racial groups has increased by not less than 45% for any of the categories, the employment of African workers has decreased by slightly more than 200 000 jobs, or 3.8%.
- As a consequence of the racially distorted redistribution of employment in the period, the share of African employees decreased. From constituting 70% of the employed workforce in 1970, African workers' share was 59,1% in 1995. On the other hand, the share of white employees in total employment grew by 5 percentage points. The corresponding figure for Coloureds was 4 percentage points and Asians 1.7 percentage points.

In short, employment of all other racial classifications other than Africans grew, whereas the employment of African workers shrunk by 3.8%. The number of Asian employees almost doubled, employment of Coloured employees increased by 65% and White by 45%. Below we will have a look at how this is reflected in the changes in employment by sector and race.

Employment by sector and racial classification

An attempt will be made below, to examine the racial distribution of the sectoral employment losses, that were broadly outlined above. In addition, it is important to determine the racial composition of those sectors that increased their employment shares.

Table 12 Employment by racial classification and sector, 1970

Occupation	African	Coloured	Asian	White	Total
Agr/Fish/Fo	2259895	116835	7317	97913	2481960
Min & Qrr	609790	7164	720	62677	680351
Manfctrig	513795	166105	64448	281603	1025951
El, gas & wtr	29915	2460	204	14179	46758
Cnstrctn	289758	78589	9142	98013	475502
Whls/Ret/Ctr	309859	77074	50833	270069	707835
Trsp/Stor/Cmct	138434	27559	7286	164945	338224
n					
Fi/I/RE/Bsrvc	36549	6863	2864	143655	189931
Com/Sc/Psrvc	1088716	159535	22342	325013	1595606
Total	5276711	642184	165156	1458067	7542118

Source: CSS: 1970 Population Census

As the table above illustrates, of the 7.5 million individuals in regular employment in 1970, 70% or close to 5.3 million, were African. Regardless of what occurs to employment in other racial classifications, then the broad changes take place in this category will have a major impact on the labour market as a whole. From the previous chapters, we also know that employment in Agriculture/Fishing/Forestry has declined enormously, so when we

find from above that more than 40% of the African population in regular employment (i.e. close to 30% of the total employed workforce) were found in that sector. We can already foresee some of the changes which must have taken place regarding employment of African workers. Along similar lines, and with similar implications, we find 12% of the African workforce in Mining & Quarrying, the other main shrinkage sector.

The second largest strata among the regularly employed in 1970 were White employees, but as we know, this category was less than a third the size of the largest category. The impact on the labour market, in pure employment number terms, will therefore be much smaller than that of the African cohort, but we will attempt below to introduce some explanation for the quite opposite development in employment of White workers compared to that of the African. Coloured and Asian workers constituted 8.5% and 2.2% respectively so what has happened to employment within these classifications will again not have had a major impact on the overall trends, but as with the employment of White workers the trends in these categories run contrary to that of African workers.

A closer examination of the table above, finds that close to 90% of the workforce in the two sectors which shrunk were African. This implies immediately that whatever shrinkage took place in employment in those two sectors was bound to unevenly impact on African employees. Secondly, as confirmed by the above table, employment by sector for the other racial classifications was not concentrated in these two sectors. Hence, from Table 12. we find less than 5% of the Indian population in regular employment in the shrinkage sectors, less than 10% of the White, and just under 20% of Coloured workers in those two sectors. Where then does one find most of the non-African employment? The Indian subcategory was the one which grew most, and it's the easiest to describe, and is extreme with almost 85% of it's workforce in the sectors which came to grow. All in all 69% of the Coloured employees were found in sectors which grew, and 55% of the White workers. This is to be contrasted with only 35% of the African employees being found in growth sectors.

In general then, one can say the vast majority of African employees in 1970 were found in sectors where employment came to decline, and only a third in sectors which grew. The gain in employment fell disproportionately to Asian, Coloured and White workers, and indeed in different magnitudes to each of these groups. For the three non-African categories all had roughly 40% of their workforce in those sectors which grew in high numbers, and out of the same categories White workers had a smaller share than the others in Manufacturing which didn't grow by as much. (Nearly 40% of the Indian workers were found in that sector though.) For African employees, 25% were found in the high-growth Community/Social/Personal Services. If the 1970 sector pattern were to be highly determinant of the development over the period, a huge loss of employment for the African subcategory could be expected. However, the fact that the employment of African workers shrunk by as little as 200 000, even though 1,4 million jobs were lost in Farming & Forestry workers/Fishermen, should imply that employment growth must have taken place somewhere else for these individuals, and that in at least for employment of African workers the sector pattern must have changed. This redistribution could also be true for the other categories, which in the end would mean the 1970-pattern wouldn't have to be the sole determinant of 1995 employment.

By studying the distribution of employment by sector in 1995 we will be able to form an impression of how important the initial pattern was in contributing to increased or reduced employment for the various racial classifications. The table below depicts the employment numbers at the end of the period.

Table 13 Employment by racial classification and sector, 1995

Occupation	African	Coloured	Asian	White	Total
Agr/Fish/Fo	923300	220000	2200	97300	1242800
Min & Qrr	340700	12200	3300	97800	454000
Manfctrig	801500	227800	94500	312100	1435900
El, gas & wtr	47400	6900	1100	37200	92600
Cnstrctn	241500	83300	12500	93300	430600
Whls/Ret/Ctr	772800	203100	105600	423500	1505000
Trsp/Stor/Cmct n	243300	42700	19100	161900	467000
Fi/I/RE/Bsrvc	197200	45800	29100	342800	615000
Com/Sc/Psrvc	1506400	220700	63900	551300	2342300
Total No	5074100	1062500	331300	2117200	8585200

Source: CSS: October Household Survey 1995

The major trend over the period appears to be a total growth employment by 1.04 million jobs. However, 1.8 million jobs were lost - as we know in Agriculture/Fishing/Forestry and in Mining & Quarrying - but partly replaced. Confirming the analysis above, less than 50 000 of the jobs lost were held by non-African employees. To find the total number of jobs created we must add to the increase in total employment the jobs lost, and subtract those remaining lost. Adding 1.8 million to 1 million, and subtracting 200 000, one gets roughly 2.6 million new jobs created. Out of these 1.4 million went to African employees, around 420 000 to Coloured, 170 000 were allocated to Indian workers among, and the remaining 670 000 were jobs allocated to White workers. In other words, even though African employees constituted 70% of the initial regularly employed workforce, 100% of the jobs lost were held by employees from this category, and only 60% of new ones created were allocated to the same. Coloured employees got a share of new jobs equal to twice their original share of all employees. Indian employment opportunities got a share of new jobs equal to three times the category's share of jobs existing at the start of the period, and for White employees the share of 27% of jobs created was a third more than the category's original share of employment.

As we could also predict from the analysis of the previous table, African workers did lose vast numbers of jobs in Agriculture/Fishing/Forestry and in Mining & Quarrying. Gains for the category were made in Community/Social/Personal services, but primarily in Wholesale/Retail/Trade. Together these two sectors created new employment equal to more than half of jobs lost. In Manufacturing, more jobs were allocated to African workers than were lost to the same category in Mining & Quarrying but, as we know, the remaining sectors did not absorb enough workers to outweigh the combined loss in the declining sectors.

Over the period Coloured employees increased by roughly 400 000. A quarter of these found their new jobs in fast-growing Wholesale/Retail/Trade, but another quarter of the new jobs were strangely enough found in the main shrinkage-sector, Agriculture/Fishing/Forestry. The two service sectors contributed with another quarter of the new jobs, and a significant share (60 000) new jobs were found in Manufacturing. Employment of Asians increased by almost 170 000 jobs over the period. Close to 55.000 of these were found in Wholesale/Retail/Trade and another 40 000 in Community/Social/Personal services. Shares amounting to 30 000 and 25 000 were found in Manufacturing and Finance/Insurance/Real- Estate/Business services. Out of the 660 000 new jobs allocated to White workers about 400 000 were found in almost equal shares in the two service sectors, and nearly another 25% of the new jobs were in Wholesale/Retail/Trade.

Conclusions

In only one sector of those that contributed substantially to increased employment, Manufacturing, did African employees get a share of the new jobs that matched the category's initial share of all employees. The additional effect on the large shares in certain sectors, initially being Agriculture/Fishing/Forestry and Mining & Quarrying was a drastic, negative one on African employment. The increased employment in absolute numbers in Community/Social/Personal services could have been expected, and a change in the pattern towards employment in Wholesale/Retail/Trade has also had a positive impact. Manufacturing also brought substantial increases in employment, but none the less, did not compensate for the specific sector losses amongst Africans.

Against the trend elsewhere, employment of Coloured workers actually increased in Agriculture/Fishing/Forestry. Less unexpected would be the increase experienced in Community/Social/Personal services, which to some extent also is true for the category's increased employment numbers in the Wholesale/Retail/Trade sector.

Asian workers were not exposed to the shrinkage in Agriculture/Fishing/Forestry, and had large shares in the fast growing sectors. It's striking though, how large the shares of the new jobs in the service sectors were allocated to Asian employees in relation to the initially fairly small shares of employment held there.

White employees were not very exposed by employment in declining sectors, and the reductions there hardly hit these workers. For this category, the loss of jobs in Agriculture/Fishing/Forestry held by employees accrued to 1% of jobs gained elsewhere. One could expect an employment growth given initial distribution, but also half additional jobs in created in Finance/Insurance/Real Estate/Business services accounted for a large share of the growth.

In short, the changes have resulted in a drastic move away from employment for African workers in Agriculture/Fishing/Forestry and Mining & Quarrying towards a larger share, and greater dispersion, in Community/Social/Personal services with 30%, and roughly 15% shares in Wholesale/Retail/Trade, Manufacturing and in Agriculture/Fishing/Forestry. While the losses in the primary sectors are not clearly not a positive labour market development, the increased sectoral dispersion does point perhaps to a greater mobility amongst African workers. Controlling for occupation, it is true that these three sectors would require qualitatively different workers in their respective labour forces. For Coloured workers, the occupational pattern resembles that of the African employees, with lesser concentration though in Community/Social/Personal services, and rather with 20% shares in all four of those sectors which contain 75% of Africans in regular employment. As for the Indian employees 30% are found in Wholesale/Retail/Trade, a similar share in Manufacturing, and another 20% in Community/Social/Personal services. To some extent we find White employees in similar sectors, though they are much less concentrated in Manufacturing and Wholesale/Retail/Trade (which only account for 35% White employees). A share of 25% - which is higher than for any of the other racial classifications - are found in Community/Social/Personal services, and a substantially higher concentration 15% in Finance/Insurance/Real Estate/Business services.

It seems the initial distribution has to a large extent determined the loss of jobs for African employees, Whereas a movement towards increased employment in the two service sectors explains a lot of the growth for the other racial classifications. Growing - rather than constant - shares in Wholesale-/Retail/Trade seems to explain a lot of growth in employment for African and Coloured workers, though the service sector increase also was substantial for the former. The shares of new jobs allocated to African workers in the growing sectors hasn't matched the category's initial shares of total employment, and as such not compensated for the losses in the declining ones. At the same time, the skewed distribution of new jobs has allowed the employment of other racial classifications to grow in spite of declining relative shares compared to African employees in the growing sectors.

Racial employment by occupations.

From the above we have depicted the major trends as being huge job losses in the Agriculture/Fishing/Forestry sector and to some extent in Mining & Quarrying. These job losses mainly hit African employees. Increased employment took place mainly in Wholesale/Retail/Trade and Community/Social/Personal services, but also in Manufacturing and Finance/Insurance/Real Estate/Business services. Below we will briefly discuss the various occupational categories that were affected by the changes, and how these in turn had implications for employment amongst different races.

Given the decline in Agriculture/Fishing/Forestry employment it's hardly surprising that the main loss occupational category was Farming & Forestry workers/Fishermen. Similarly, with the Wholesale/Retail/Trade and Service sectors growing one should expect both Clerical & Sales occupations and Professionals/Semi-Professionals/Technical professions to grow, and similarly also growth in Administrative/Executive/Managerial occupations. The growth in the Transport/Storage/Communication sectors was not elaborated on above, but it seems related occupations grew and even more so, i.e. there was increased employment of these occupations in other sectors as well. With trade and services growing though, it's hardly surprising that there would also be an increased demand for transport of goods and people.

Below we will take a brief look at how the occupational employment pattern in 1970 reflects the sectoral patterns found above.

Table 14 Employment by racial classification and occupation, 1970

Occupation	African	Coloured	Indian	White	Total
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Prof/Semi-P/Tech	91654	25539	10225	228984	356402
Adm/Exec/Mangr	3343	2418	2989	106308	115058
Clr & Sales	133780	49132	52972	496751	732635
Service	1004235	125585	15476	98052	1243348
Frm/Ftry/Fish	2300088	119784	6764	95835	2522471
Prod.wrk&op/Artisa n	1065235	213591	55890	345078	1679794
Labourer	502040	70637	8590	6617	587884
Transport occup	166269	33606	11788	74726	286389
Unspec	10067	1892	462	5716	18137
Total No	5276711	642184	165156	1458067	7542118

Source: CSS: 1970 Population Census

In 1970, almost 83% of African employees were found in occupations which shrunk over the period, and just over half of these were of course found in Farming & Forestry workers/Fishermen occupations, but large shares were also in Service workers and Production workers/Operators/Artisans. Only 7% of African employees were found in high-growth occupations. In addition, note that the majority of workers in Farming, Forestry and Fisheries here, would be labourers. Thus, the labourer category for African workers is an understatement of the numbers in unskilled jobs.

For Coloured employees the situation was similar to that of African, though the category's share exposed to shrinkage-occupations was somewhat smaller and equal to 70%, half of which was in Production workers & Operators/Artisans. In this case though, the shares were equally allocated among the three occupational categories, and as we know employment of Coloured workers *grew* in the Agriculture/Forestry/Fishing sector, so that part of the risk-exposure wouldn't apply here. In the Asian category of employed workers almost 35% were found in low-shrinkage Production workers/Operators/Artisans, and a share of equal size were found in high-growth Clerical & sales occupations. A total share of 42% of the category were found in growing occupations. For White employees, 50% of the workers were found in the high-growth occupations (where 35 percentage points were in Professionals/Semi-Professionals/Technical professions). Another 12% were in the lower-growth occupations sectors with a slightly higher share in Administrative/Executive/Managerial occupations. In other words, at the start of the period just under two thirds of White employees were found in occupations which came to grow significantly. Below we will see whether it's true also for the occupational mixes that the initial pattern to a large extent determines the outcome, or whether there has been a higher mobility between occupations than between sectors.

The below table depicts the employment pattern at the end of the period. From this perspective the meager compensation for the loss of African employment among Farming & Forestry workers/Fishermen occupations was received among Professionals/Semi-Professionals/Technical occupations and in Clerical & Sales, where roughly 570 000 jobs were created in each.

Table 15 Employment by occupation and racial classification, 1995

Occupation	African	Coloured	Indian	White	Total
Prof/Semi-P/Tech	664500	89100	59000	488000	1300700
Adm/Exec/Mangr	81100	18200	31100	295300	425400
Clr & Sales	704800	188600	115200	681700	1690200
Service	865300	142500	16400	141400	1165800
Frm/Ftry/Fish	870600	204600	600	80000	1155800
Prod.wrk&op/Artisa n	869300	250500	81700	354700	1556100
Labourer	478000	112100	8800	11300	610400
Transport occup	514100	54500	16100	59600	644100
Unspec	26400	2800	2300	5300	36700
Total No	5074100	1062500	331300	2117200	8585200

Source: CSS October Household Survey 1995

In the case of Transport occupations, almost all of the nearly 360 000 new jobs were allocated to employees of this racial classification. In addition to the loss in the Farming & Forestry workers/Fishermen category substantial

job losses were also found in Service occupations and Production workers & Operators/Artisans with 140 000 and 160 000 in each⁹.

Again, there was no loss of jobs for Coloured employees in any of the occupational categories. Out of the 400 000 new jobs created three quarters were found in the growth occupations. The largest category, of 140 000 jobs, were found in high-growth Clerical & Sales, and another 60 000 in Professionals/Semi-Professionals/Technical occupations. Noteworthy again is that over 80 000 jobs were gained for Coloured workers in Farming & Forestry workers/Fishermen occupations. Otherwise, only 35 000 of the new jobs were found in the lower substantial growth occupations.

Out of the 165 000 new jobs allocated to Asian employees almost 140 000 were found in the main growth occupations, and two thirds of these were found in the high-growth occupations.

The increase in employment of White workers were found exclusively in the 4 growing occupations. Out of the 660 000 new jobs, 260 000 were in Professionals/Semi-Professionals/Technical occupations, 190 000 in Administrative/Executive/Managerial occupations, and a similar number in Clerical & Sales occupations.

Conclusions

For African employees the loss of Farming & Forestry workers/Fishermen occupations obviously reflects the job losses in Agriculture/Fishing/Forestry, and a similar relation would probably be true to some extent for the Production workers/Operators/Artisans category and the mining sector. We find also here less concentration in the pattern, and this would be due partly to the immense losses and to the remarkable growth in Professionals/Semi-Professionals/Technical professions and in Clerical & Sales occupations. The increase in Transport occupations has also been substantial. We know though, that jobs lost have not been met by similar size increases. It seems here that movement towards other occupations is a little more distinct than movement between sectors.

Even though absolute employment numbers for Coloured workers indeed have doubled in Professionals/Semi-Professionals/Technical professions and substantial absolute increases has taken place in Clerical & Sales occupations, the reshuffling of the *shares* of occupations for Coloured employees has been less dramatic than in the case of African employees. In spite of the large relative declines in Production workers & Operators/Artisans and increases in Clerical & Sales occupations, the shares of employment for Coloured employees Farming & Forestry workers/Fishermen and Production workers & Operators/Artisans remain fairly large. Increases in other occupations have thus been quite even and in parity with the initial pattern.

Increases in absolute numbers of employment for Asian workers did indeed take place where concentrations were high initially, but a redistribution also took place where substantially larger shares are employed in the high-skill Professionals/Semi-Professionals/Technical professions and in Administrative/Executive/Managerial occupations, where employment has respectively doubled and increased manifold.

As with Asians, employment for White workers has increased most dramatically in absolute numbers in the high-skilled professions. Even though two thirds of the new jobs allocated to this category, were found there, it constitutes a redistribution but a reversion compared to the other racial classification. If the 1970 occupational pattern were to have been maintained, even larger numbers would have been necessary in all three categories.

Again we find the dramatic loss of jobs for employees from the African strata in low-skilled Farming & Forestry workers/Fishermen and Production workers/Operators/Artisans, where by now we would expect them. Ultimately, increases in absolute numbers in employment in higher-skilled professions has been important for all races. A redistribution towards the growing categories contributed to increased employment for Black workers as a whole, whereas in spite of shrinking shares in most of these, it didn't stop employment in the categories from contributing substantially to the increase in employment *numbers* for White employees.

⁹ It may seem puzzling that Service *occupations* shrunk while the Service *sectors* grew. It must be kept in mind here though that the occupations refer to large extent to low-skilled occupations such as Domestic workers/helpers/cleaners, building caretakers, messengers, porters, doorkeepers and related workers which could to a large extent have been employed by private households or firms in non-service sectors. The sector in question though includes for example, teachers and nurses which would be high-skilled and belong to the Professional/Semi-professional/Technical occupations. In short, it's partly a result of high-aggregate analysis.

5.2 Gender Composition By Sector And Occupation

As in the above section, before we investigate the changes in occupational and sector employment mixes we need to get an overview of what employment by gender looked like in 1970 and what it looked like in 1995. This is presented in the table below.

Table 16 Employed workforce composition by gender and its change, 1970 - 1995

Gender	1970		1995		Difference		Employment Growth
	No	% Share	No	% Share	No	% Share	%
Female	2433214	32.3	2866000	33.4	432786	41.5	17.8
Male	5108904	67.7	5719200	66.6	610296	58.5	11.9
Total	7542118	100.0	8585200	100.0	1043082	100.0	13.8

Source: CSS: 1970 Population Census and CSS: October Household Survey 1995

The above table shows that two-thirds of those in regular employment today are men, and the figure hasn't really changed over the 25 year time span. The distribution described above is true in spite of the fact that 40% of the new jobs created went to women. Note also that the growth of employment of women was 50% higher than that of male employment.

Employment by sector and gender

Below we will firstly attempt to get an impression of how workers of various racial classifications were distributed across sectors which we now know came to shrink. Thereafter we will see how overall employment has been affected by the absorption of workers from the various categories into the sectors which grew.

Table 17 Employment by gender and sector, 1970

Sector	Male	Female	Total
Agr/Fish/Fo	1593046	888914	2481960
Min & Qrr	673713	6638	680351
Manfctrig	810811	215140	1025951
El, gas & wtr	45026	1732	46758
Cnstrctn	463980	11522	475502
Whls/Ret/Ctr	512540	195295	707835
Trsp/Stor/Cmct n	309839	28385	338224
Fi/I/RE/Bsrvce	115196	74735	189931
Com/Sc/Psrvce	584753	1010853	1595606
Total	5108904	2433214	7542118

Source: CSS: 1970 Population Census

To emphasize the broadest distinctions in the above table, remember that two-third's of the employed workforce was (and is) male, so what takes place with regards to employment of male workers has a disproportionate impact relative to female employees. We find that the gender distribution of employment in Agriculture/Fishing/Forestry largely reflects that of the total workforce, so one would *expect* the loss of jobs there to have hit male and female workers to proportionate extents. In Mining & Quarrying though, 99% of the employed workforce was male, so the decline in that sector would have a setback largely for male employees.

In the two high-growth sectors we find that the gender distribution was slightly skewed towards men in Wholesale/Retail/Trade with a 72-27 distribution, but that a pattern almost opposite to that of the total employed workforce prevailed in Community/Social/Personal services. In Manufacturing, 80% were male and in Finance/Insurance/Real Estate/Business services the share was 60%. If the retrenchments of labour and new appointments would have been completely gender insensitive we would assume these changes to have followed the employment patterns.

Table 18 Employment by gender and sector, 1995

Sector	Male	Female	Total
Agr/Fish/Fo	991800	251000	1242800
Min & Qrr	435400	18600	454000
Manfctrig	1014900	421000	1435900
El, gas & wtr	80700	11900	92600
Cnstrctn	401600	29000	430600
Whls/Ret/Ctr	858200	646800	1505000
Trsp/Stor/Cmct	390800	76200	467000
n			
Fi/I/RE/Bsrvce	337400	277600	615000
Com/Sc/Psrvce	1208400	1133900	2342300
Total	5719200	2866000	8585200

Source: CSS: October Household Survey 1995

From the above table it will be clear that the shedding and hiring of new labour has by no means been unbiased to gender. Out of the 1.4 million jobs lost in the period 600 000 or 42% were previously held by women, i.e. the share of jobs lost was larger than the share of jobs originally held for women. Using the figures from the previous table we can then conclude that 1 million of the jobs created in the period were allocated to women, and that accordingly the 1.6 million remaining went to men. This means 40% of jobs created were allocated to women, which is slightly higher than the category's initial share of the employment, hence allowing for a maintenance of the initial share in spite of a similarly higher allotment of jobs lost. Furthermore we can safely conclude all the jobs lost in Manufacturing were held by men¹⁰, and that the jobs lost to women were mainly in Agriculture/Fishing/Forestry. Knowing that all in all 1.2 million jobs were lost in that sector, means the remaining 600 000 retrenchments affected men, leaving the remaining loss of jobs for men, roughly 200 000, in Mining & Quarrying.

If job allocation would have been gender neutral we would assume women to be allocated 30% of jobs created in Wholesale/Retail/Trade, 20% of those in Manufacturing, 60% in Finance/Insurance/Real Estate/Business services, and roughly 70% of jobs created in Community/Social/Personal services. This was hardly the case. Out of 1 million jobs created in Community/Social/Personal services, 85% went to male employees, in spite of their share being just over 35% initially. In Wholesale/Retail/Trade and trade women got 57% of the 800 000 new jobs, which was twice the percentage share of women's existing employment there in 1970. Substantial employment increases for women were also in Manufacturing where they obtained 200 000 of the 400 000 jobs created, and men got just over half of the 425 000 jobs created in Finance/Insurance/Real Estate/Business services, leaving another 200 000 new jobs for women there. New jobs for men were then not surprisingly found mostly in Community/Social/Personal services where the category's allotment was 800 000, and roughly 350 000 males found new employment in Wholesale/Retail/Trade.

Conclusions

The distribution of regular employment in South Africa is heavily biased towards men who constitute roughly two-thirds of the group total. This pattern remained constant since 1970, largely due to the fact that in the sectors where employment was reduced women, were hit to a larger extent than the category's share of existing employment would have suggested. Furthermore, in the one sector where women dominated with 67% of employment there, in high-growth Community/Social/Personal services, women only received 15% of new jobs, leaving 600 000 new jobs for men. Both men and women found a large source of new employment in Finance/Insurance/Real Estate/Business where new jobs were divided 50-50, still leaving men in a small minority with 55% of employment there (as compared to 60% in 1970).

Employment patterns with regards to sector employment have indeed changed for the two categories. From having been concentrated in Agriculture/Fishing/Forestry and Community/Social/Personal services with nearly 40% of the female employees in each back in 1970, women are now to a larger extent found in Wholesale/Retail/Trade (22%), Manufacturing (15%), Finance/Insurance/Real Estate/Business (10%), but the share of women finding employment in Community/Social/Personal services still remains high at 40%. In 1970 a

¹⁰ In fact, Mining net hired women and shed men over the period.

third of the men were employed in Agriculture/Fishing/Forestry, but already then 10% were found in each of Wholesale/Retail/Trade and Community/Social/Personal services, and both Manufacturing and Mining & Quarrying each had 15% shares. Today the shares of Agriculture/Fishing/Forestry and Mining & Quarrying both have been halved. Manufacturing remains with around 15%. A smaller but still substantial share of men (10%) are employed in Finance/Insurance/Real Estate/Business, but the share of males in Community/Social/Personal has doubled to 20%.

Employment by occupation and gender

As in the previous section on racial inequalities, we studied how the vast decline in employment in the Agriculture/Fishing/Forestry sector and in Mining & Quarrying struck the two gender categories. Increased employment took place as we know mainly in Wholesale/Retail/Trade and Community/Social/Personal services, as well as in Manufacturing and Finance/Insurance/Real Estate/Business services. We already know though that new employment opportunities were not allocated along the categories' shares of employment in each of the sectors, so it will be interesting to find out whether this was true also from the perspective of occupational categories.

One would expect the job losses in Farming & Forestry workers/Fishermen to follow closely the gender distribution described in the subsection above. But given the uneven and unexpected turns with regards to gender-based employment in Wholesale/Retail/Trade and in the Service sectors, it will be interesting to see the gender distribution of new jobs in the Clerical & Sales occupations and Professionals/Semi-Professionals/Technical professions, as well as in Administrative/Executive/Managerial occupations. The growth in the Transport/Storage/Communication also enters as an interesting factor.

The table below takes a brief look at how the occupational employment pattern in 1970 reflects the sectoral pattern we found above.

Table 19 Employment by gender and occupation, 1970

Occupation	Male	Female	Total
Prof/Semi-P/Tech	203226	153176	356402
Adm/Exec/Mangr	105405	9653	115058
Clr & Sales	403312	329323	732635
Service	388608	854740	1243348
Frm&fstry wkr/Fshmn	1636195	886276	2522471
Prod.wrk&op/Artisan	1523755	156039	1679794
Labourer	561483	26401	587884
Transport occup	271406	14983	286389
Unspec	15514	2623	18137
Total	5108904	2433214	7542118

Source: CSS: 1970 Population Census

A few major traits of the table deserve attention:

- In 1970 more than 60% of the employed male workforce were found divided into equal shares in either the Farming & Forestry worker/Fishermen category, or in the Production workers & Operators/Artisan group. Close to another 10% were found in Service occupations. As for women, 75% were found in shrinking occupations with 35% each in either Service occupations or in the Farming & Forestry worker/Fishermen category.
- Men were in the majority in all the growth occupations, but only by 10 percentage points in the two major growth groups - Professionals/Semi-Professionals/Technical professions and Clerical & Sales occupations. In the two other growth categories men gained more than 90% of the jobs, which is also true for the shrinkage occupations in Production workers & Operators/Artisan.
- In the Farming & Forestry worker/Fishermen occupations category, the pattern resembles closely that of the corresponding sector with a 65-35 division with men in majority.

From the above discussion we know that the loss of jobs in the Farming & Forestry worker/Fishermen category affected as many women as men. With our gained knowledge we now also expect women to be disproportionately

affected by the reduction in Service occupations, and mainly men to be impacted on by the decline in the Production workers & Operators/Artisan group. Knowing now that women lost a larger share of jobs shed, than the initial distribution would have dictated, it looks more the category's larger share in declining occupations. As for growth, one would have expected women to gain somewhat from the relatively even gender distribution in the high growth occupations. Below, the 1995 figures will shed some light on these speculations.

Table 20 Employment by gender and occupation, 1995

Occupation	Male	Female	Total
Prof/Semi-P/Tech	643800	656900	1300700
Adm/Exec/Mangr	347300	78100	425400
Clr & Sales	712700	977600	1690200
Service	667600	498200	1165800
Frm&fstry wkr/Fshmn	928900	226900	1155800
Prod.wrk&op/Artisan	1324100	232000	1556100
Labourer	454500	155800	610400
Transport occup	614200	29800	644100
Unspec	26100	10500	36700
Total	5719200	2866000	8585200

Source: CSS: October Household Survey 1995

In the table on the previous page we find 50% of the males in regular employment in occupations which shrunk in course of the period, whereas for women the figure is just over 30%. For men 40% were in occupations that grew and almost 25% in the high-growth occupational categories. For women the figure is much higher, with 60% in those occupations, and with almost all of them in high-growth Professionals/Semi-Professionals/Technical professions and Clerical & Sales. Men and women lost jobs as we know in Farming & Forestry workers/Fishermen, with roughly 700 000 and 650 000 jobs lost to each category. Women lost all the category's other lost jobs in Service occupations, whereas men lost jobs mainly as Production workers & Operators/Artisans with 200 000 and half as many in the Labourer category.

Women regained jobs by half a million (55% of those created) in Professionals/Semi-Professionals/Technical professions, and 100 000 more than that in Clerical & Sales occupations. Another interesting source of growth of female occupations is that as Labourers where 130 000 new jobs were found for the category, even though 100 000 were lost here.

Men were also hired in Professionals/Semi-Professionals/Technical professions and in Clerical & Sales occupations, with 440 000 and 310 000 new jobs in each, but the males were also hired in Administrative/Executive/Managerial occupations and surprisingly also in Service occupations by about 250 000 in each. The increased employment in Transport occupations were exclusively male.

Conclusions

Even though men remain in majority with two-thirds of all employment opportunities in South Africa, the gender distribution within certain occupations has changed in the course of the period. Men still remain in the majority in the Farming & Forestry worker/Fishermen group and in Transport occupations, but also very much so in the Administrative/Executive/Managerial occupations. Relatively equal distributions are found among Professionals/Semi-Professionals/Technical professions and there are more women than men in Clerical & Sales occupations. The change towards a more equal distribution in the former group - and the reversal of the distribution in the latter - is caused by the fact that women did get a higher share of the new jobs than the category had of existing employment in these occupations. Another reversal took place in Service occupations where it went in favour of a male majority (by 57-43 from 31-69). We know there was a net loss in jobs, but this is only due to the fact that men were hired while women lost jobs there.

If one were to briefly summarise the findings, it would have to be emphasised that African and female employees have lost higher shares of jobs than the initial situation would have indicated, and that the new jobs allocated to these two categories neither followed the 1970 patterns of distribution. In the analysis of racial inequalities it can be concluded that the situation has worsened for the majority, whereas it has remained poor for women who were and still are a minority among the employed. Some important weaknesses in this analysis are firstly, that

unemployment has been completely excluded, where we would find that the two major findings in this section would be emphasized. We neither dwell much on whether those jobs created have been available to those who lost their income earning opportunities in course of the period. This asymmetry has important income and welfare considerations, which will be raised briefly in the final section of the paper. From what can be seen above, new employment would have been badly needed in the rural areas for unskilled labour. But new employment in Trade and Services, for educated people as Professionals or semi-professionals, or as (semi-skilled or skilled) Clerks and Sales staff would imply that jobs were rather created in urban areas for employees with more than a minimum of education. A more complete analysis needs an urban-rural as well as an educational angle. It would also have been interesting to see whether the types of employment in Professionals/Semi-Professionals/Technical professions allocated to female or African workers would be the same as those where White or male workers were hired. To substantiate this speculations a lower level of aggregation would also have been most suitable.

Part Two:
Expected Future Changes
and Policy Implications

6. Expected Future Structural and Production Method Changes in South Africa and their Impact on Occupation and Socio-economic Groups

The first part of this paper documented quite dramatic shifts in the structure of the South African economy and the changes in the production methods used since 1970. It then demonstrated the enormous influence these had on the employment of different occupational groups and by implication on the employment of different socio-economic groups. The purpose of this chapter is to look briefly to the future and examine what are the likely structural and production method changes to come based on the experience of other countries and what likely impacts are these to have on the employment of different occupational and socio-economic groups. The chapter begins by looking at the economic changes and then discusses their impact.

6.1 Expected Future Structural and Production Method Changes

Expected Structural Changes

The analysis of structural changes in the South African economy from 1970 to 1997 in section two exposed a major structural shift involving the decline of the primary sector, the stable share of the secondary sector and the rapid rise of the services sector. This gives rise to two questions when trying to forecast future structural changes. Firstly, is this a common experience amongst the countries of the world; and secondly, is this trend likely to continue or will structural change take a different form in the future? To answer both these questions we need to take a look at the experience of other countries. Table 21 below presents the share of GDP by economic activity for different stages of development and different regions of the world for 1980 and 1994.

Table 21: Share of GDP by Economic Activity for Different World Regions (1980 & 1994)

Category	Agric		Manu		Mining, Utilities, Construction		Services	
	1980	1994	1980	1994	1980	1994	1980	1994
World	7.1	4.8	23.0	22.5	14.4	10.4	54.9	62.3
Industrial Countries	3.7	2.2	24.2	22.0	12.1	10.0	60.0	65.8
<i>Asia</i>	4.3	2.1	27.6	26.2	13.6	13.1	54.6	58.6
Europe	4.3	2.7	25.4	20.3	12.2	9.5	58.1	67.5
Americas	3.1	2.0	21.8	20.0	11.4	8.0	63.6	70.0
Developing Countries	17.1	13.6	19.4	24.2	21.0	11.9	39.8	50.2
Africa	20.4	18.8	13.2	16.3	27.2	13.6	39.1	51.3
Asia	29.0	16.8	26.1	27.4	11.3	11.2	33.6	44.5
Europe	16.1	9.4	na	27.5	na	8.4	38.5	54.7
Middle East	6.8	10.7	6.5	11.0	56.9	35.7	29.8	42.5
Americas	9.7	9.7	25.4	21.5	14.0	11.7	50.9	57.0
South Africa	6.9	4.5	22.2	22.6	28.9	15.4	42.0	57.5

¹ This classification is taken from the IMF Balance of Payments Statistics. The Asian industrial countries consist of Japan, Australia and New Zealand. The Americas industrial countries consist only of USA and Canada. The European industrial countries consist of Austria, Belgium-Luxembourg, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Source: World Bank World Development Report 1996

In searching for an answer to the first question - is the South African experience common? - we need only look at the structural change in all economies from 1980 to 1994. The data in table 5 provides clear proof of the same

trends occurring in the world economy. The share of agriculture in GDP has dropped in both developing and developed countries over this period, with only the Middle East region showing opposite trends. Data on the other primary sector, mining, is integrated with data on construction and utilities, yet as a whole that group also shows a significant declining share in both developing and industrial countries, and in all regions of both categories. It would be fair to speculate that this decline for the group is due to a declining share of mining in GDP as most commodity prices have decreased over the 1980s.

Having established that the decline of the primary sector in South Africa has been mirrored by the rest of the world, attention now turns to the manufacturing sector. Table 5 demonstrates that on a world-wide basis, the share of manufacturing remained more or less unchanged at between 22% and 23% from 1980 to 1994. This is exactly the South African experience over the same period. However, the experience does differ slightly by development status with industrial countries in all regions suffering a slight decline in the share of manufacturing while developing countries in all but the Americas experiencing an increasing share. However, if one excludes the Middle East and Africa (which can be seen as special cases) then the share of the manufacturing sector varies between 20% and 27% in all regions, regardless of development status. This demonstrates a certain stability in the share of manufacturing over time.

Finally, the share of the services sector in all regions of both developing and industrial countries show a significant increase from 1980 to 1994 - the same as South Africa. At a world output level, this shift is over 7%, while for developing countries it is over 10% and industrial countries it is just under 6%. What this analysis then suggests is that South Africa's experience of structural change since 1970 is not unique due to local idiosyncrasies, but has been mirrored in most countries throughout the world. South Africa's structural change may have been more dramatic due to the rapid decline of the large gold mining sector, but the direction of change has been the same, and for the same reasons.

This finding that South Africa is sharing a common structural shift in the economy, brings us to the next question, which is whether this trend is likely to continue or will structural change take a different form in the future? Attempting to answer this question accurately, accounting for all domestic developments is impossible. However, to get some idea of the *direction of changes* ahead we can look at the experience of the industrial countries that have already undergone the changes we are approaching, combined with a recognition of our continued developing status for the medium term.

Table 21 is informative of the structural changes in the industrial countries. Since 1980, the share of agriculture in industrial countries has continued to decline to just above 2% of GDP, below the current South African level of 4.5%. However, South Africa's share is still way below developing country averages of around 13% in 1994. All this would suggest that there is still scope for the share of agriculture to decrease as a share of GDP in South Africa but this may not be that significant or rapid in the medium term. This hypothesis is supported by the fact that with high levels of mechanisation and high proportions of arable land already under cultivation, there is little scope for dramatic growth and so relative to other sectors it will see a declining share. Data on the other primary sector, mining, is more difficult to interpret as it is integrated with utilities and construction. However, this grouping has seen its share of GDP continue to drop to around 10% in industrial countries, well below the current 15.4% share in South Africa. In fact, the developing country average is also well below that of South Africa at around 12%. It therefore seems plausible that the share of this grouping, in particular mining, will continue to decline as a share of GDP in South Africa. This hypothesis is supported by the fact that gold mining's crisis has become more acute since the last data point of 1996. Entering 1998, there is speculation of job losses in the region of 50 000 to 100 000 in the year to come.

In terms of manufacturing, current share of GDP in South Africa is lying exactly midway between the industrial country average of 22% and the developing country average of 24%. This would suggest that the share of manufacturing in South Africa will remain more or less unchanged in the years to come. However, there does exist the possibility to increase this share through a successful export-led growth of the sector. The statistics for the Asian countries, industrial and developed, that have followed this path show a far higher share of manufacturing in GDP of around 27%. It does seem that this is unlikely in the short-to medium-term as South African firms struggle to even maintain domestic market share in the face of trade liberalisation.

Finally, although services already account for 58.6% of the South African economy, it is evident from table 5 that there is still considerably more scope for increasing this share. Industrial countries had an average services share of 66% in 1994, up from 60% in 1980. What it does suggest, however, is that the structural shift to services from this point onwards may be considerably slower than the dramatic change that has occurred since 1970 as South Africa nears the point reached by industrial countries. What is also of interest is which services are likely to be

the growth sectors? Table 22 below presents the average shares of different service sub-sectors from 1988-1990 for developing and developed countries. South Africa's service structure already looks closer to the developed countries than that of the developing countries.

What the table suggests is that as national income grows, the growth in the service sector tends to take place more in producer and community services than in consumer services. Consumer services tend to reach a peak at which they tend to remain. The reasoning is that as final demand services bounded to the domestic market, there is not the scope for dramatic growth once they have saturated the domestic market. The South African sector may have neared this point following the enormous investments and growth through the 1970s to 1990s. However, the sudden growth in the one tradable component - tourism - can still provide a growth spurt for the sector. The hypothesis is therefore that consumer services will increase their share of GDP slightly, though will be bounded in the long-term. At the other end, community services depend almost entirely on the government budget as most are provided by government and are therefore slightly easier to predict. Future South African fiscal policy, as laid out in the Growth, Employment and Redistribution (GEAR) strategy, intends to be conservative in an attempt to cut the deficit size. This has meant real decreases in expenditure in recent budgets. In addition, the public sector restructuring initiative aims to make future cuts in public service employment in order to 'right-size' the sector. One can therefore expect no significant real growth in community services in the medium-term.

Table 22: Service Sub-sectors as a percentage of GDP for different development levels (1988-1990)

	Developing Countries	Developed Countries
Wholesale & retail	15%	15%
Transport & communication	7%	7%
Finance and Business services	13%	17%
Community & social services	14%	23%
Total	49%	62%

Source: United Nations Conference on Trade and Development 1995, pp. 7

Producer services have been the key growth services through the eighties and offer continued promise of growth. As outlined in section two, growth has come from increasing manufacturing use of services as an intermediate input, splintering of services from firms, new product growth and growing consumer incomes. A recent study by Francois and Reinert (1996) looking at the role of producer services in the structure of production supports the hypothesis of a growing producer services sector and finds that:

“the share of value-added originating in (producer) services, including both private services and trade, transport and communication services, is positively linked to the level of development.” (1996, pp.).

They find that this growth in producer services is driven mainly through the increased demand by manufacturing for intermediate services and not so much through a splintering organisational process. The high growth information and communication technologies all fall under producer services and so are likely to benefit greatly from liberalisation efforts under the General Agreement on Trade in Services (GATS)¹¹. There is no reason not to believe that producer services will be the growth engine of the South African services sector.

To conclude, it was found that the structural changes in the South African economy since 1970 have been mirrored in the world economy during the same period. It was also found that these changes - namely a declining share for the primary sector, stable share for the secondary sectors and an increasing share for the services sector - are likely to continue into the near future as has happened in industrial countries. However, it is expected that these structural changes will be less dramatic than they have been over the last 27 years.

Expected Production Method Changes

The analysis of production method changes in the South African economy from 1970 to 1997 in section three discussed two major trends - the increasing use of microelectronics and the increasing capital-intensity of

¹¹ See Hodge 1997

production. The question we seek to answer in this section is whether these trends are likely to continue into the future.

To see whether the shift to more *microelectronics-based production* is a trend that will continue into the immediate future in South Africa, one needs to look at what is happening in countries with higher adoption rates than S.A. and how S.A. adoption stands in comparison to them. The best yardstick for information technology adoption is probably the United States. As noted earlier, a recent survey of United States companies revealed that they are now spending more on information technology equipment than on all other capital equipment (Talero & Gaudette, 1995). The continued rapid shift to microelectronics in the industrial countries is also apparent through the labour market data. A recent report noted that the US currently has a shortage of 340 000 computer programmers, requiring a special project by the Labour and Commerce departments to lure students into this field (Business Day 29/1/98). This indicates continued high demand for information technology even in a country which has far higher adoption rates than South Africa.

This expression of the direction that industrial countries are moving is a good indicator to us where producers in South Africa must go in order to be world-class. It was also noted earlier that South African producers have not reached this point. Only the financial services and retailers had reached a point where systems were approaching world-class, while adoption rates in all other sectors of the economy lagged behind to varying degrees. This suggests that there is likely to be continued strong demand for conversion to a more microelectronics-based production for many years to come as lagging sectors strive to catch up with world best practice. There is also a strong incentive for companies to follow this path with the continuance of trade liberalisation in both goods and services under the World Trade Organisation (WTO).

The trend towards more *capital-intensive production* is a natural one experienced by all growing economies. As noted earlier, the application of more capital per unit of labour is one of the major sources of productivity improvements. The drive for productivity improvements are required to grow in a competitive domestic environment. At a national level, improvements are necessary to compensate for rising average wages in the economy which occur naturally through growth in the non-tradable sectors or other tradable sectors, if the country wishes to remain internationally competitive. The question that needs to be asked is whether we are likely to see more rapid accumulation of capital at the expense of labour.

There are a number of forces at work which suggest that the capital-labour ratio will continue to grow strongly. South African has only just begun to undergo trade liberalisation, which under current arrangements will see tariff levels dropping annually until 2001. This competitive pressure is compounded by the fact that many sectors failed to modernise significantly during the 1980s as political instability increased and the economy stagnated. This would suggest that there is still considerable scope for firms to modernise through large capital investments in order to survive increasing competition. As for foreign investors, they are also likely to bring in more capital-intensive production methods in the future. In addition, structural shifts in the economy and within manufacturing sub-sectors have had the effect of favouring the more capital-intensive sectors of the economy suggesting that overall capital-labour ratios will continue to increase. Finally, there is the impression that labour is still overpriced in the economy prompting a shift to greater labour-saving techniques especially in the more labour-intensive sectors.

The factors that could slow down this trend appear to be less significant and insufficient to halt this trend. There is some attempt by the government to encourage more labour-intensive production with new round of investment incentives aimed at manufacturing. However, these only target new incentives and so will not influence the vast majority of national output and they are also not very significant which may see them ignored by investors. A more powerful tool is the cost of capital - interest rates - which have been increased to high levels to curb inflation and encourage the inflow of foreign capital. However, with inflation at record lows, these have already declined and expectations are that they will decline further in future years.

To conclude, the shift to microelectronics-based production methods continues apace in other parts of the world and with the adoption gap that faces South African firms, the shift in this direction is most likely to continue well into the future in South Africa. The shift to more capital-intensive production is also a natural trend that will continue. It is also likely to be strong as firms attempt to modernise in the face of growing international competition.

6.2 Expected Impact on Occupation and Socio-economic Groups

The composite set of forces that have been shaping the nature of the economy's occupational distribution and its subsequent impact on different races, have been identified and calculated above. Hence national economic growth, productivity growth, structural change and changes in production method changes, have all in different ways and in different magnitudes, been important drivers of occupational distribution in the labour market. The demands of international competition though, mean that these forces are likely to be important in the future as well, and hence will also be important determinants in shaping the future of occupational distribution in the labour market.

Expected Impact on Occupation Groups

The analysis above has shown that production method changes in the economy are being influenced primarily by higher information technology adoption rates amongst firms, as well as rising capital-labour ratios. Both types of production method changes are likely to continue in the short to medium-term, as firms attempt to become more internationally competitive, and expand into export markets. In turn, both production method changes will have effects on the demand for different occupations in the labour market.

Greater micro-electronics usage in the future alters each individual firm's labour demand specifications. The medium-term should thus see an increasing need for computer programmers, computer systems designers and analysts, computer technicians and so on. Industries that are instituting production method changes of this sort, will be likely to recruit or train larger numbers of computer professionals. The rise in demand for these professionals may be supplemented by a small rise in demand for complementary service and sales occupations, given that the domestic information technology industry is also likely to grow. It is true though, that this form of production method change is not likely to result in a direct substitution of skilled labour for unskilled labour. Rather than revealing a preference for skilled computer professionals over labourers, the rising importance of information technology in firms should see an unchanged demand for labourers, coupled with the increased hiring of professionals. It is instead, the preference for machinery over labour at the bottom end of the job ladder, that will be the reason for a decline in demand for unskilled workers. At the production level, firms in most sectors have lagged behind the production technologies that their global competitors have adopted. Hence, the rising capital intensity that is likely to occur in the future in order to remain or become globally competitive at the production level, will have a distinct impact on the distribution of occupations in the labour market. Those individuals in elementary occupations will bear the brunt of the move to greater capital usage in firms.

Structural changes in the economy are likely to continue with current trends - that being the continued decline in primary sector contribution, offset by a rising share of the services sector in GDP. The future impact of these sectoral shifts on occupations, will certainly result in a higher demand for skilled labour. The decrease in unskilled labour demand will emanate from the primary sectors, whose share will drop steadily over the medium-term. The fact that the output share of the secondary sector as a whole will remain constant, will assist in preventing a large decline in the demand for unskilled workers in the aggregate. The sub-sectoral level impacts within the secondary sector though, are likely to reveal much sharper contractions in the quantum of unskilled workers employed. These sectoral variations will be existent in sub-sectors that prove unable to compete in both domestic and export markets with competitors¹².

Ultimately, the future scenario for the occupational distribution of labour can be represented by an increasing demand for skilled workers, driven in large part by the needs of the information technology revolution and its central role in improving competitiveness. In turn, there will be a decline in the demand for unskilled labourers, as a result of rising capital intensity across all sectors, and the general structural shift away from the mining and agriculture sectors. However, it is clear that two other factors have had an unambiguous impact on occupational employment since the 1970s. These have been productivity improvements and general output growth. As Table 10 reveals, these two variables have had the same impact on employment, across all occupations. Hence, the poor productivity performances since the 1970s have led to singular decline in labour demand across all

¹² An example here would be the Clothing and Textile industry. While the manufacturing industry as a whole, may yield constant employment shares for labourers, this sub-sector may be an aberration and report declining shares and numbers of labourers. The Clothing and Textile sector is particularly vulnerable to international competitors locally, and has a very small export base. With employment levels declining in this industry, and likely to continue falling, aggregate employment numbers for labourers in Manufacturing as a whole will hide this sectoral detail.

occupations, all other factors held constant. Output growth on the other hand, had the effect of raising employment levels across all occupations. What this suggests, is that the route to raising the demand for labour, particularly at the bottom end of the job ladder, is through steadily rising productivity levels. The medium-term effects of rising capital intensity with job losses for labourers, can be reversed should these production method changes lead to productivity improvements. It is these productivity improvements in turn, that would drive national economic growth levels. Through this form of long-term national economic growth then, that the demand for labour will rise substantially across all occupations.

The above is of course a static analysis, and assumes that the nature of the labour market, particularly with regard to skills composition will not change in the future. Clearly though, a growing pool of skilled workers does create a better environment within which higher productivity levels are easier to achieve. An attempt will be made in Section 7, to assess how policy initiatives, particularly labour market policy, can assist in improving the numbers of skilled workers in the short to medium-term.

Expected Impact on Socio-economic Groups

The occupational shifts by race and gender outlined above, do reveal some distinct and disturbing trends. Hence, the data shows broadly that by race, it has been non-African workers who have disproportionately gained in terms of occupational shares over the last 25 years. Those occupations that have been growing fastest, have been allocated unevenly to Whites, Asians and Coloureds. In addition, these occupations have been medium to high-skilled jobs. Paralleling the decline in the primary sectors of the economy, has been the high attrition rate amongst those African workers in these sectors, with the largest decline being for farm workers. The other occupations, for African workers, that have experienced the largest drop include Service & Sales and those employed as production workers or artisans. The gender distribution of employment has remained constant since 1970, with the familiar pattern of rising female participation rates found elsewhere in the world, not being witnessed here. There were gains for female workers though, as their occupational shares in Clerical & Sales and the professional worker category rose significantly through the period.

If the assumption is made that the current occupational shares by race will remain unchanged over the medium-term, then there is clear evidence that future changes in the economy, marked by the move to micro-electronics and higher capital intensity, will have a differential impact on the four racial groups. The conclusion from such an initial steady state labour market is fairly obvious: African workers will bear the majority of the job losses in the primary sectors, as they are predominantly employed in these sectors as unskilled workers. It is important to remember that certain ancillary sectors, such as the engineering industry may also be affected by this decline, and here too unskilled workers will be the first to be laid off. This transition in industrial structure, as the economy moves away from the primary sector, has already borne policy proposals aimed at addressing the expectant employment losses. This set of policy proposals is raised in the next section of the paper. White, Asian and Coloured employees though have not been as negatively affected by this sectoral transition. One finds that the occupational distribution at the bottom-end of the ladder, for these three races, has remained fairly constant, and in some cases has in fact increased. With future economic changes suggesting a greater use of machinery and also increased demand for skilled workers to remain globally competitive, the demand for labour is, at current skill endowment levels, suited to the human capital characteristics of Asian, White and Coloured workers only.

It should be remembered also that the move to a greater role for the services sector and higher capital-labour ratios, is an explicit recognition on the one hand, that the global economy has altered significantly, and economic growth will be driven primarily from this sector in the future. In addition, this sectoral shift also implies a realisation that South Africa will not be able to compete in products intensive in the use of labour and hence also sectors with very low average wages. Given this choice in industrial strategy then, the attrition rate will continue at the bottom-end of the job ladder, and will rise consistently at the top-end. The optimal growth path, in labour market terms though, would be that the short-term sees a racially equitable creation of top-end jobs, at the same rate that bottom-end jobs are lost. In the medium-term of course this rate of new jobs would have to, in addition, match the number of new entrants onto the job market. A job growth rate together with a skills enhancement programme of a different order of magnitude however would have to occur, for the large pool of unemployed to also be incorporated into the formal sector.

The loss amongst African workers in the elementary occupations though was counterpoised by a rise in their employment numbers in the semi-skilled to skilled categories. Hence, there has been some racially equitable redistribution of jobs, although these still remain strongly in favour of skilled non-Africans, rather than African employees. Given the fairly acceptable assumption that discrimination at the top-end of the job ladder is minimal,

the problem with the low representation of African workers is the low levels of human capital accumulation. This issue is taken up at length in the following section. The future though will see a continued rise in the demand for skilled workers across all races. An ideal medium-term outcome would be for the share African workers in skilled occupations to be equivalent with their share in total formal employment. This would represent a first-step in racially transforming the top-end of the labour market.

A possible outcome in the future of high levels of job loss amongst labourers, and in particular artisans and machine operators, is for these workers to opt to enter the informal sector. There are fairly low entry barriers into some informal sector activities, such as Street Sellers for example. Hence these may be attractive options for retrenched workers. Those workers with skills may find small businesses in the manufacturing industry. This has happened, for example, amongst retrenched clothing workers, many of whom are machinists. Once retrenched, many of these workers start sewing clothing informally, either as individual entrepreneurs, or as part of a small informal firm. Hence, job loss in the formal sector has created a growing informal sector with large numbers of self-employed individuals. Failing highly successful corrective action to find formal employment for these retrenchees, larger numbers of individuals will enter into self-employment and the informal sector.

Finally, while the gender distribution in formal employment has remained fairly constant since 1970, the rise in the share of female employment in Clerical & Sales shows that the service industry growth will have positive second-round effects on the employment of women. In addition the rise in the female share in professional occupations, is indicative of reduced gender discrimination at the top-end of the job ladder. There is likely to be a growing number of women in these two occupations in the medium-term then. However, it is also true that the gender distribution in the labour market, remains largely skewed in favour of men, and labour market policies would be required to redress these inequities.

7. Policy Implications

The analysis above suggests that two broad trends are likely to be occurring in the occupational distribution of employment. Firstly, the demand for skilled professionals will increase, with this demand in large part being a function of greater computerisation in firms. Secondly, in the aggregate, the demand for labourers will either stagnate or in certain sectors, decline substantially. Given the racial-skills overlap in the South African labour market, these changes also map almost perfectly onto racial groups. More specifically, it is primarily African workers that will experience a non-increasing demand for their services, while White workers (being disproportionately skilled) are likely to be in greater demand. This is assuming of course, that the race-skills proportions remain constant in the short to medium-term.

It would seem then that there exist at least three possible labour market policy interventions, if they are to adequately tackle the above skills constraints. Firstly, it is obviously necessary to design policies that are aimed at raising the number of skilled individuals in the economy, at a rate and magnitude that has not been achieved in the past. Secondly, part of this skills enhancement strategy must have an inherent racial component, which will ensure that the skills composition of the workforce starts mismatching with its racial composition. While these two policy requirements focus on changing the occupational distribution of the workforce, it has to be recognised that for a significant number in the labour force, particularly in the short-run, there will be little chance of accumulating human capital that would meet the current skill requirements of firms. Hence a third, crucial policy issue, is how to reduce the attrition rate of those at the bottom-end of the job ladder as firms and sectors attempt to increase their competitiveness. In a perfect world, these policies would only need to be short-term in nature, as the medium-term should see the returns to greater capital intensity in the form of higher productivity and then higher output growth. It should be noted that the policies we focus on initially are pure labour market policies. The broader macroeconomic, trade and industrial policy issues that invariably influence any policy outcomes will either be raised within the labour market policy discussion, or if necessary as discrete policy issues at the end of this section.

The first two prongs of labour market policy identified above fall within the ambit of the skills development initiatives of the Department of Labour. These are in turn, encapsulated in the Skills Development Bill. The key features of the bill include (RSA,1997:1):

- The setting up of a Research and Strategic Planning Unit that will be the information base on skills trends in the labour market.
- The establishment of employment services to recruit and place individuals seeking employment.
- To provide 'learnerships' and other training programmes that would lead to registered qualifications.
- The introduction of a payroll levy on firms that is between 1% and 1.5% of the firm's total employment costs.
- A co-ordination strategy between the Sector Education and Training Authorities (SETAs), Education and Training Boards (ETBs), the National Skills Authority (NSA) and the Minister of Labour.

It is evident that this matrix of skills-related policies covers a wide range of goals. There is an intention to focus on disadvantaged groups, given that the broad thrust of the programme is on providing generic skills. There is a commitment to a consensus-driven plan via the SETAs, NTBs and the NSA. The attempt at building in the private sector's commitment to skills and training is borne out in the payroll levy. It would seem then that these bodies, together, can become important vehicles wherein firms' skills demands are met within the state's requirement for financial commitments to training. A programme of this sort, it should be noted, will increase in cost as the gap between the workers' existing skills level and desired skills level, as based on firms' labour demand schedules, rises. Hence, it would be in the interest of firms to first train those workers where the gap is smallest. This would, however, need to occur with due consideration given to addressing past racial inequities. The problem with the Skills Development Bill in this regard, could be that it has an undue emphasis on generic skills, meaning that while individuals are being enskilled, it may be at levels too low to meet firms' labour demand specifications. In addition, if such skills were to be met through the SETAs, ETBs or NSAs, then the costs of doing so, given the focus on those at the bottom-end, would be too high given the financial resources available

to the state. Hence the emphasis in the Bill on skills acquisition for rural women and the unemployed with minimal years of formal education, is qualitatively different from that required for training computer technicians, for example¹³. The sectoral focus of the Bill though, is an important facet, that recognises that firm's labour demand, as they upgrade technologies and make new capital investments, will be sector-specific. While the Skills Development Bill does address the training of these workers then, it is evident that these programmes are unlikely to reduce the job losses associated with structural changes in the economy, or rising capital-labour ratios. In addition, it is possible that should financial commitments defined in the Bill, be spread across those who have no or minimal skills and those who have mid-level skills in given sectors, they would be too thinly distributed to impact of firms' labour demand requirements, or indeed alter the human capital base of its recipients.

In reality, the training of most computer personnel will require the intervention of the Department of Education, in ensuring that both technikons and universities align their enrollment strategies to meeting this demand in the medium to long-term. This of course does not preclude the training of individuals in other technical skills that will always be useful in the production process. However, it is evident that the structural change in the economy points to the need for a greater emphasis on the provision of computer professionals. The state's White Paper on Science and Technology does make provision for a number of interventions that can be viewed as creating the environment for increasing the supply of computer-related personnel in the economy. These initiatives include support for Historically Disadvantaged Institutions (HDIs) in science and technology training for both students and staff, with an expressed aim to deliver outputs in the medium-term. In addition, there is a commitment to maintaining the current system that makes mathematics and science compulsory up to the Standard 7 level at the secondary schooling level. This would again be part of a strategy of ensuring a long-term supply of technically trained individuals.

A much more challenging and perhaps more immediate issue, is that of labourers bearing the brunt of structural change in the economy. As pointed out, the highest attrition rates will be for employees at the bottom-end of the job ladder, who are in the mining or agriculture sectors. There would also be certain sub-sectors, in manufacturing for example, where large numbers of labourers are at risk of losing their jobs, during the adjustment period. It is not possible, with this cohort of workers, to speak of a skills enhancement policy of the type outlined above. Workers may indeed be provided some form of skills upgrading, but it cannot be of the scale required, in order to create a larger quantity of professionals and technicians.

One policy proposal for dealing with the above, emanating from the mining industry is the Social Plan. The Social Plan recognises that labourers will suffer disproportionately from sectoral adjustments, and hence interventions may be required to ease the high economic and welfare costs of the adjustment period. The interventions that have been proposed are included in the report of the Comprehensive Labour Market Commission (CLMC), and are based somewhat on the proposals of the National Union of Mineworkers (NUM) for the mining industry. The proposals include the following:

- Information sharing between unions and business in the process of structural change. This sharing of information, the CLMC report argued, would allow unions to ameliorate somewhat, the consequences of job losses amongst its members, as they are more involved in the restructuring process within a firm or sector.
- Retrenchment procedures should contain a minimum notice period, which would allow workers to deal with pending job losses through for example, career counseling, training and so on. Within the context of our analysis above though, it is evident that the returns to such training would in reality be marginal, given the nature of labour demand.
- There is also a suggestion that the state set up a Social Plan Fund, which would serve as the financial resource designed to support retrenchees, in the form of training, counseling, environmental improvement, small business promotion and other job-creating projects (RSA,1996:102). Again though, the focus is on training, although the specifics of this training are left unresolved.

Perhaps the most attractive part of the Social Plan is that it attempts to set up a fund, financed from various government budgets and foreign donors, that is specifically targeted at those affected by structural change and changing production methods in the economy. It remains unclear whether this finance, through training,

¹³ There is a case to be made though for training unemployed youth for example, who have matriculation certificate. In this case the gap between current and desired training levels may not be as high, even though the individuals would in all probability have no work experience. It is not evident whether firms would be willing to have their payroll levy spent in this way.

counseling and the like, is the mechanism through which jobs will be created for these same individuals. It is a stronger argument, that long-term productivity improvements and national output growth, will be the primary generators of new jobs. The current and near future demand for labour specifications of firms will not in any conceivable manner be met through the training of these retrenched workers from elementary occupations. Both financial and time constraints prevent this mismatch from being realistically closed. Given that funds can be made available, and they would appear to be well targeted to retrenchees, it may be more plausible to view this expenditure as an income and welfare grant rather than training with very low or even zero returns.

Welfare and income grants to retrenchees raises several issues of course. One issue is the social acceptability of such a grant to workers, as opposed to a tangible asset (in this case human capital) that workers could use later in their working lives. The counter-argument to this has, to a certain extent, already been provided above: workers will not in the first instance gain from such training in the short or even medium-term anyway. Given the high mean age of these retrenched workers, their working lives could end a while before continuous training (if it were financially plausible) could have a positive effect on their employment opportunities. A well-targeted welfare grant aimed at these workers could then have a greater impact on reducing the economic loss associated with disemployment, than piecemeal training that is not well articulated with formal labour demand in the economy.

The employment equity policy of the state, is identified in the Employment and Occupational Equity Statute. Broadly, the intended legislation is to prevent discrimination at the workplace. There is also an expressed aim for firms to encourage the hiring, training and promotion of previously disadvantaged groups. The language of this statute though is different from that of the Skills Development and Training Bill, which has a strong focus on the development of generic skills. Here, the intention would seem to reduce discrimination at the top-end of the job ladder, rather than the predominantly African bottom-end of the job ladder. Hence, in terms of the occupational demands of the future, this policy will ensure that the racial composition of those in skilled jobs, assuming a steady flow of African candidates, will start to move away from past trends witnessed in Section 5.

A further policy consideration that is important, revolves around the impact of conflicting forces on the accepted trend of rising capital-labour ratios in the economy. The data makes it plain that these production method changes are the cause for the substitution of unskilled labour for skilled labour. One oft raised concern is that high wages in South Africa are the cause of the preference for capital equipment. The issue though is far harder to resolve, and in fact goes beyond the derivation of the relevant price elasticities and cross-price elasticities. Hence, while the elasticities show that labour demand is sensitive to changes in the wage rate, it is not evident that this is a clear case for raising employment levels through wage restraint. The structural change forces, or even the need simply to raise capital intensities to compete more effectively may mitigate against any job creation through lower priced labour. Hence the driving force of higher capital intensities may not always be predominantly wage hikes, but rather disproportionately, the need to stay globally competitive and improve the efficiency of the production process as a whole. If this is the case, and this study has not resolved the issue by any means, then a wage restraint policy is evidently not a wise mechanism for preventing job losses to unskilled workers.

It is true though that a wage-employment trade-off will be activated should undue upward pressure be placed on wages at the bottom end of the job ladder. In this regard, two labour market policy instruments are important in determining whether high wage demands can be limited. These are the Basic Conditions of Employment Act (BCEA) and the Wage Board (soon to become the Employment Conditions Commission). The BCEA in setting out the basic minima for all workers, covered and uncovered, does run the danger of setting unduly high baselines for firms to adhere to, and in so doing feeding into wage hikes or employment losses. However, it appears that this problem has been avoided as the Act is not at odds with the basic conditions already prevailing in most industries in the economy. The Wage Board has the power to set new wage determinations for uncovered workers in any schedule. The initial signs from the new Wage Board is that it is likely to be more interventionist, and also focused on raising wage levels amongst marginalised workers. Should this trend continue, and it has to be remembered that the Minister is empowered to change the proclamations of the Wage Board, then wage pressure at the bottom end of the labour market may see rising capital intensity and also employment losses. Ultimately then, the occupational distribution in the labour market can be significantly altered towards a smaller share of unskilled workers, should the Wage Board choose to generalise its policies on higher wages for uncovered workers.

8. Conclusion

The above study has attempted to identify, through the available data, the impact that the structural changes in the South African economy, together with the production method alteration, have had on the nature of the demand for labour. The initial analysis of the study found that the structural shifts in the economy are interesting in and of themselves. Hence, it was shown that the last 25 years of economic development, have been marked by a decline in the share of the primary sectors in GDP, a stabilisation in manufacturing and a rapid growth in the services sector.

A result and also manifestation of the rapid growth in the service industry, has been a shift to higher rates of IT adoption in certain sectors, including non-service oriented industries. The growth in the services industry reflects global trends in developed and some developing countries. The process of tariff liberalisation though, has brought new pressures, and domestic firms have responded by raising their capital-labour ratios, in a bid to remain competitive through higher productivity and more efficient methods of production. The broad labour market consequences of these two trends have been that the demand for high skilled individuals, particularly IT professionals, has increased dramatically. In addition, the rising capital intensity trends, have seen a shift away from elementary occupations toward machinery.

In attempting to be more rigorous in our analysis, a decomposition of the growth in formal employment by occupation was undertaken. The results made it plain that the larger effect on occupational distributions was production method alterations, relative to structural change. Hence, it was the substitution of labour for capital, that was important in shaping the allocation of individuals across the different occupations in the labour market. Importantly, the employment effects were positive for skilled workers and neutral or negative for unskilled employees. However, the results also showed that it would be productivity improvements and overall economic growth, that could substantially raise employment levels across all occupations in the job ladder. While the decomposition could not be applied to the data by racial groups, it was evident from the analysis that it was mainly African workers that had lost from the structural and production method adjustments. In contrast non-African workers, in general gained from the adjustments that occurred. This differential impact on the different racial groups was tempered somewhat by the growth of African employees in the skilled categories. The gender distribution showed no major aggregate changes since 1970, despite the move to service-oriented industries. Ultimately the analysis suggests that in the long-run, productivity improvements, leading to higher national growth rates is the key mechanism through which to raise employment levels across all occupations.

It is clear from the study that the demand for labour for the medium-term can be defined quite clearly and specifically. Given this, there is a need to meet this demand in such a way that the outcomes break the skills-race overlap, and the gender concentration in the labour market. This has to be combined with short-term consideration given to those who will undoubtedly be rendered jobless in the continuing adjustment process. More creative policies are called for in order to deal with this problem, beyond the provision of generic and non-specific skills. Finally, it has to be remembered that the most stark reality of the South African labour market is the large pool of unemployed individuals. It is essential that the demand for labour, through intervention policies can absorb some of these individuals, particularly those with adequate years of schooling, in the medium-term into productive employment.

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Appendix 1: Statistical Compilation

At the core of this study lies the comparison of employment numbers in various occupations in the main sectors of the South African economy. Hence the classification standards defining occupations and sectors have a significant impact on the basis for the analysis. The classification of both concepts attempts to follow the “Standard Classification of Occupations” (SOC) and “Standard International Classification of All Economic Activities” (ISIC) used by CSS as closely as possible. However, both the CSS “SOC” and the “International Standard Classification of Occupations” - on which the South African standards draw - have changed several times between the collection of the data used here, the 1970 Census and 1995 Household Survey. The same is true, though the extent to which it has changed is not so grave, for the ISIC. The 1970 and 1985 data sets are thence not perfectly comparable in their original shapes so alterations to both data sets have been necessary in order obtain an acceptable degree of comparability. Given the constraints inherent in the aggregated format these, partly very old data, are provided and in the lack of available, precise guidelines for the correction of deviations, there may still be minor inconsistencies. The attached data sets should none the less be suitable for a depiction of major trends and changes at the highest level of aggregation. Attention should also be drawn to the fact that the 1995 data is drawn from a *sample survey* and as such carries an inherent inability to provide a 100% true picture of the real situation in the larger population.

Occupations definitions

The following classifications of major occupations groups have been used in the study:

- Occupation 1: Professional, semi-professional and technical occupations
- Occupation 2: Managerial, executive and administrative occupations
- Occupation 3: Clerical and sales occupations
- Occupation 4: Service occupations
- Occupation 5: Farming, forestry and fishing occupations
- Occupation 6: Production workers, operators and artisans
- Occupation 7: Labourer
- Occupation 8: Transport, delivery and communications occupations
- Occupation 9: Unspecified occupations

The following alterations have been made to the major occupational groups in the 1970 census data set:

- “Clerical and related worker” and “Sales worker” have been combined into one major group corresponding to Occupation 3 above with alterations provided below.
- Occupations 7 & 8, “Labourer” and “Transport, delivery and communications occupations”, did not exist as specific major groups but have been constructed along the lines presented in the below table.

Figure 1: Alterations to 1970 census occupational groups

Occupations subgroup	Old Occupation	New Occupation
Aircraft and ships' officer	1	8
Executive official	3 (Clerical occupations)	2
Transport and communication supervisor	3 (Clerical occupations)	8
Transport conductor	3 (Clerical occupations)	8
Mail distribution clerk	3 (Clerical occupations)	8
Telephone and telegram operator	3 (Clerical occupations)	8
Manager (Wholesale & retail)	3 (Sales occupations)	2
Manager (Catering & accommodation)	4	2
Transport equipment operator	6	8
Labourer	6	9

In the OHS data set the following major groups and subgroups have been included in the following various major occupation groups:

Occupation 1

- Professionals
- Technicians and associate professionals with the exceptions of
Ship and aircraft controllers and technicians
Finance and sales associate professionals
Traditional medicine practitioners and faith healers
Sangomas (witchdoctors)
Muti-sellers

Occupation 2

- Legislators, senior officials and managers

Occupation 3

- Clerks with the exceptions of those “Library, mail and related clerks” and “Client information clerks” employed in the “Transport, storage and communications sector”
- Finance and sales associate professionals
- Models, salespersons and demonstrators
- Street vendors and related workers

Occupation 4

- Personal and protective services workers
- Domestic workers
- Domestic and related helpers, cleaners and launderers
- Building caretakers, window and related cleaners
- Messengers, porters, doorkeepers and related workers

- Garbage collectors and related labourers
- Armed forces occupations

Occupation 5

- Market oriented skilled agricultural and fishery workers
- Subsistence agricultural and fishery workers¹⁴
- Agricultural, fishery and related labourers
- Agricultural, fishery and related labourers not elsewhere classified

Occupation 6

- Craft and related trades workers
- Plant and machine operators and assemblers with the exclusion of “Drivers and mobile- plant operators”

Occupation 7

- Labourers in mining, construction, manufacturing, and transport

Occupation 8

- Drivers and mobile-plant operators
- Ship and aircraft controllers and technicians
- Library, mail and related clerks employed in the “Transport, storage and communications sector”
- Client information clerks employed in the “Transport, storage and communications sector”

Occupation 9

- Occupation unspecified
- Traditional medicine practitioners and faith healers
- Sangomas (witchdoctors)
- Muti-sellers
- Shoe cleaning and other street services elementary occupations
- Scavengers(special codes created for informal sector)
- Selling goods on street (special codes created for informal sector)
- Sales and services elementary occupations not elsewhere classified

Sector definitions

The following sector definitions have been used:

- Sector 1: Agriculture, fishing and forestry
- Sector 2: Mining and quarrying
- Sector 3: Manufacturing

¹⁴ Please see note below on the exclusion of those making a living in the “informal” sector.

- Sector 4: Electricity, gas and water
- Sector 5: Construction
- Sector 6: Wholesale, retail and trade
- Sector 7: Transport, storage and communication
- Sector 8: Finance, Insurance, Real estate and Business services
- Sector 9: Community, Social and Personal services
- Sector 10: Undefined¹⁵

The sectors used in 1970 have been adapted to the following order:

- “Agriculture” - Sector 1: Agriculture, fishing and forestry
- “Mining” - Sector 2: Mining and quarrying
- “Manufacturing” - Sector 3: Manufacturing
- “Electricity” - Sector 4: Electricity, gas and water supply
- “Commerce” - Sector 6: Wholesale, retail and trade
- “Transport” - Sector 7: Transport, storage and communication
- “Financing” - Sector 8: Finance, Insurance, Real estate and Business services
- “Services” - Sector 9: Community, Social and Personal services
- “N.E.A., ? & unemployed” - Sector 10: Undefined

In the OHS data set the following major groups and subgroups have been included in activities as defined by the CSS in:

- Sector 1: Agriculture, hunting, forestry and fishing
- Sector 2: Mining and quarrying with the exception of “Services activities incidental to mining of minerals”
- Sector 3: Manufacturing
- Sector 4: Electricity, gas and water supply
- Sector 5: Construction and “Services activities incidental to mining of minerals”
- Sector 6: Wholesale and commission trade, except of motor vehicles and motor cycles; Retail trade, except of motor vehicles and motor cycles; repair of personal household goods; Sale, maintenance and repair of motor vehicles and motor cycles; Hotels and restaurants
- Sector 7: Transport, storage and communication
- Sector 8: Financial intermediation, insurance, real estate and business services with the exception of “Research and development”
- Sector 9: Community, social and personal services and “Research and development”
- Sector 10: Other activities not adequately defined

¹⁵ Individuals in this sector has been dropped from the analysis in both data sets

Individuals excluded from the analysis

From the analysis have been excluded those individuals in the OHS 1995 data set who are:

- below the age of 15 or above 65 years old
- defined as non-active by the CSS based derived from on question 3.1 in the questionnaire
- unemployed according to the “wide” definition used by CSS
- those who have not done “any work for pay, profit or family gain” during the year proceeding the interview..
- those who for or in small businesses not registered with neither of the following:

The registrar of companies

The commissioner of unemployment insurance

The commissioner of workmen’s compensation

- those who haven’t got an entry for either main industry or main occupational group of employment