SETP No. 14

The Economic Value of Incremental Employment in the South African Construction Sector

A Report commissioned by the International Labour Organisation for the support of the Efficient Application of Labour Based Methods in the Construction Sector

Barry Standish

Employment-Intensive Investment Branch

International Labour Office, Geneva

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FOREWORD

The macro-economic case for using labour-based, as opposed to equipment-intensive technology in the infrastructure and construction sectors, has been made in many developing countries on the ground of lower unit costs, increased employment generation, higher contribution to GDP, higher multiplier effects, higher levels of household income and consumption, reduced foreign exchange requirements and hence, reduced import dependency. These conclusions apply to countries characterised by surplus labour, low wages, weak local industrial capacity (in tools and equipment production).

South Africa, obviously, is in a different situation, with higher wages and a domestic industry producing equipment of various sizes. Hence, the challenge of this study, which was to investigate whether the macro-economic outcomes of labour-based vs. equipment-based construction would still be in favour of the labour-based option, and if so, to what extent.

We are grateful to the author, Barry Standish, resident economist at the Graduate School of Business at the University of Cape Town, to have taken up this challenge and to have made an important contribution to the debate on the macro-economic potential of labour-based investment technology not only in South Africa, but also more generally in the context of world-wide efforts to foster employment-intensive growth wherever technically feasible and economically cost-effective, with a view to combating poverty and reducing inequalities.

We also thank the National Department of Public Works, South Africa, for taking the initiative in establishing the macro-economic benefit of labour-based methods in the South African context. We believe the study will contribute towards the Department's objective to mainstreaming the technology in the construction sector where it will be appropriate and efficient. We are also grateful to the United Nations Development Programme for providing the necessary financial assistance to carrying out this study.

The ILO's regional support team of the Employment-Intensive Investment Programme for English-speaking African countries, the ASIST Africa programme (Advisory Support, Information Services and Training) in Harare, who were backstopping this work, and the Branch in Geneva would appreciate any comments readers my have on this work.

Jean Majeres
Chief
Employment-Intensive Investment Branch

Geneva, October 2003

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List of Abbreviations

CBPWP	Community Based Public Works Programme
GDP	Gross Domestic Product
ILO	International Labour Organisation
NDPW	The National Department of Public Works
NPWP	National Public Works Programme
SALDRU	Southern African Labour and Development Research Unit, School of Economics, University of Cape Town.
SIC	Standard Industrial Classification of all Economic Activities.
SUT	Supply and Use Tables
US$	United States Dollar

Preface

The National Department of Public Works (NDPW) is working on a number of different fronts to reorient the construction sector. The most important underlying aim is to enhance and optimise employment in the construction process itself. In parallel with this, a supplementary aim is to provide targeted opportunities for emerging and previously disadvantaged contractors. The most prominent examples of initiatives completed or under way include:

- the National Public Works Programme (NPWP) launched in 1994/95 and comprising the Community-Based Public Works Programme (CBPWP) and a set of 12 pilot projects (testing the extent to which employment could be optimised whilst relying on mainstream technical consultants and contractors);

- the preparation and promotion of a set of Guidelines on Enhancing Employment Opportunities in the Delivery of Infrastructure Projects based on the experience gained and lessons learned through the pilot projects component of the NPWP;

- the Strategic Projects Initiative (SPI) under which targeted procurement (TP) is aiming for the use of black prime contractors in the implementation of medium and large-scale projects on behalf of the NDPW;

- the Construction Industry Development Programme (CIDP), under which progress is being made towards the creation of a statutory Construction Industry Development Board (CIDB), and which also includes an Emerging Contractors Development Programme (ECDP).

In mid-1996, as these initiatives were at earlier stages of conception or implementation, the NPWP Branch of NDPW requested continuing advisory and research resources from the International Labour Office (ILO). The rationale was twofold. First, the NPWP Branch was eager to draw on international experience with respect to the use of labour-based methods in construction. Secondly (and complementary to this), the NDPW as a whole emphasised that employment creation through construction should not take precedence over (a) value for money to the public sector client, or (b) quality standards in construction outputs. It was these two concerns that led to the title of the current ILO project - Support to the Efficient Application of Labour-Based Methods in the Construction Sector. This investigation is part of that initiative.

Structure of the Report

This report is organised into eight main chapters.

Chapter 1 introduces the study.

Chapter 2 briefly outlines the theoretical foundations of the study and the degree to which there are definitive answers to the questions being asked and the degree to which policy decisions must be made.

Chapter 3 provides a time series and cross sectional profile of the construction industry with a focus on labour and wages. The objective of this section is to answer the first question set by the terms of reference: what are current wage rates in the construction industry? How do they vary by occupation? How do they vary by location?

Chapter 4 analyses the spending patterns of people in lower income groups and answers the second question set by the terms of reference by highlighting the key expenditure changes as incomes change.

Chapter 5 brings together sections 3 and 4 and determines the macro economic impact of income increases that lead to increased and changing expenditure patterns.

Chapter 6 focuses on equipment-based construction with a view to determining the macro economic impact of the local production of earth moving equipment.

Chapter 7 analyses the relative costs of labour and equipment-based construction with the intention of setting the parameters on which policy decisions can be made.

The overall conclusions are drawn in Chapter 8 along with suggestions for future research and the kind of information that should be systematically collected from labour intensive projects.

There is one appendix which contains the terms of reference for this study.

Summary of Conclusions

1. This summary draws together the key conclusions from each of the chapters and presents them in chronological order.

2. **The first area of investigation** is the construction industry with a view to determining, in particular, wage differences by skill and location. The construction industry is a small and, currently, declining industry. Contribution to GDP has fallen, there are fewer jobs today than twenty years ago and real wages have fallen. About 300,000 people were employed in the construction industry in 1997 and about 70% of these were black.

3. On average the civil engineering industry pays wages that are greater than in house construction with skill differences being the most likely cause of this. There are significant differences in wages between provinces. In 1994, (the latest data of this type) we find the lowest average civil engineering salaries are paid In the Northern Province and the highest in the Eastern Cape. Average house construction salaries were the highest in Gauteng in 1994 and lowest in the Eastern Cape.

4. Determining average salaries by skill level proved a difficult exercise. Both the October Household Surveys and the Population Census were analysed. Unskilled labourers in the Western Cape construction industry have the highest salaries in the country of between R1,460 and R1,215 monthly (R66 and R56 a day). (Although, in contrast, the most common daily wages paid on labour intensive public works projects in the Western Cape ranged between R20 and R30). The lowest paid unskilled construction workers are to be found in the Northern Province. Here the estimated wage was a daily rate of R36. (All wages in year 2000 values).

5. **The second area of investigation** was to analyse the expenditure patterns of poor and very poor people with a view to determining the macroeconomic effects of income increases. The expenditure patterns that emerge are intuitively appealing. Grain mill products are important for the very poor and fall off rapidly as a percentage of household expenditure as incomes increase. The same holds true for sugar products, petroleum, wood, coal and mining products although the initial importance is not that great. In contrast, as incomes increase so too does the proportion of expenditure on clothing, footwear and meat.

6. Changing expenditure patterns were linked to national input output relationships and the multiplied impact calculated. It is found that if, for example, income increased by R5,000 for households with income currently less than R5,0000, then there would be an increase in GDP equal 1.40 times this increase, indirect household incomes would increase by 0.65 times, 0.26 indirect jobs would be created and there would be increases in income tax, company tax and imports to the value of R605, R307 and R1,280 respectively.

7. The objective of **the third area of investigation** was to determine the macroeconomic impact of the local manufacturing of machinery used in the construction industry. While this part of study was challenged by inadequate information some estimates were made. A locally produced wheeled loader with a retail price of R600,000 and a 43% import content will contribute R473,000 to GDP and generate 4.52 indirect jobs. A similar machine with a 68% import content will contribute R256,000 to GDP and generate 2.48 indirect jobs.

8. It is shown in **the forth area of investigation** that the macro economic effects of labour-based earthwork excavation are greater than those of equipment-based construction. A case can therefore be made for a financial premium for the substitution of labour for equipment. In addition, if we view the import component of locally manufactured earth moving equipment as 'lost' expenditure (lost to the country) then labour can compete financially with equipment under a much greater range of physical conditions and wages.

9. These results are sensitive to the import component of locally manufactured construction equipment. From this it follows that the factor that most effects the financial premium is the degree of capital amortisation. Comparing the macro economic effect of labour against new earth moving equipment with a 71% import component indicates that a labour premium of over 50% is justified. However this premium falls to 4% once the capital cost is fully amortised. Similarly comparing labour to a machine with 48% import component calls for a 32% labour premium when the machine is new but again only 4% when fully amortised.

10. A comparison of the direct cost of earthwork excavation indicates that labour-based methods may be financially viable even without macroeconomic premiums. In the Cape Town area this happens only at low wages and easy ground conditions. The competitiveness of labour-based earthworks excavation declines rapidly as wages increase and/or ground conditions deteriorate. It is suspected that higher equipment costs outside of urban areas will result in greater financial viability for labour-based earthwork in rural and remote rural areas. In addition, a programme approach will improve labour productivity and make it more competitive.

11. In general the report draws mixed conclusions about the financial viability of labour-based methods of road rehabilitation. The macroeconomic advantages of labour-based methods are compelling when we use fully imported equipment and remains so even for locally produced equipment with an import component. When the capital cost of the equipment is fully amortised then the macroeconomic advantage of labour-based methods becomes marginal.

12. The overwhelming case that must be made for using labour-based methods is the contribution it will make to economic empowerment. Roads, dams and other infrastructure are good for the regional economy and will allow it to grow. Using labour-based methods will generate jobs and provide incomes further promoting the regional economy. Involving local communities will help in capacity building. Using small and emergent contractors will generate sustainable incomes and opportunities.

13. It is beyond the scope of this report to attempt to quantify the effects of labour-based methods on economic empowerment. In a similar vein we cannot quantify the cost of economically marginalising poor rural people by using equipment-based methods. Yet, even without being able to quantify these effects, we believe that there is an overwhelming case for labour-based methods. Not only will it help the poor but it will also contribute to the generation of sustained economic growth and empowerment.

1 Introduction

1.1 South Africa is a land of stark contrasts. Majestic mountains and fertile lands. Barren plains and bleak poverty. It has great economic promise and worrying constraints. On the bright side there has been sustained economic growth over the last seven years. This last happened in the late 1960s. But the economic growth has been too little. At times it has been barely greater than population growth. And the economic growth has been jobless. For the unskilled, in particular, there are less formal jobs, not more.

1.2 This country's economic problems, as evidenced by desperate poverty and endemic lack of opportunities, have been a hundred years in the making. For problems like this there is no quick fix. The long term and sustainable solution lies in growing productivity - making firms more productive and helping people be more productive. It is only though improved productivity that we can make more of the things that people need and generate sustained increases in living standards.

1.3 One of the greatest constraints to poverty reduction is the challenge of effective economic empowerment. Many South Africans have been consigned to the stagnant backwaters of a powerful economy through decades of bad or non-existent education, discrimination in jobs and opportunities, meagre health services and misguided infrastructural spending. Such poverty does not need welfare payments as much as it needs economic empowerment.

1.4 The National Public Works Programme (NPWP) is part of the initiative that attempts to reduce poverty through a multi-pronged initiative. The NPWP aims at sustainable job creation and economic empowerment through the provision or rehabilitation of necessary and useful infrastructure using labour-based methods. The NPWP does not rely on job creation alone to generate economic empowerment. It provides training and, along with other initiatives, uses targeted procurement and promotes small or emerging business.

1.5 The NPWP should however also provide value for money and use labour-based methods that can compete financially with equipment-based methods. Some experiences in Africa, for example in Lesotho, Botswana, Uganda and Namibia, all demonstrate that labour-based methods are financially viable for activities like road building and road rehabilitation. In South Africa the known higher labour cost and the suspected lower capital cost are likely to challenge the financial viability of labour-based methods.

1.6 Financial viability is one aspect of project assessment. Socio economic effects and multiplier effects are equally important. What are the socio economic effects in the immediate vicinity of a project using labour-based methods? How does this compare to the effect of equipment-based methods? What are the relative macroeconomic effects of the choices in method? This latter question is particularly important in South Africa because there is a successful domestic industry that manufactures heavy machinery for construction.

1.7 The key objective for this investigation was set by the terms of reference as:

> what - if any - financial premium per unit of expenditure on construction is economically justified for the substitution of labour for equipment?

1.8 In order to achieve this objective, and as part of sub objectives of the terms of reference, a statistical mosaic of the construction industry was created with a view to determining job trends, skill patterns and real wages. This feeds into measures of financial viability and compares the relative cost of labour and equipment-based methods.

1.9 A second strand of the investigation focuses on macroeconomic multiplier effects. Multipliers are calculated for labour-based methods. Similarly, multipliers are calculated for the local manufacturing of construction machinery and the operation of the machinery. Finally the labour-based and equipment-based multipliers are compared and financial premiums measured.

2 Theoretical Foundations

2.1 Every choice involves a cost. The choice of labour-based methods over equipment-based methods are not just choices of technique and location but also of who bears the socio economic benefits, who bears the costs and the relative magnitude of these differences.

2.2 The poor and unemployed will benefit from a move to labour-based methods in construction. The households who bear the initial burden of a switch from equipment-based methods are the owners of equipment, drivers, mechanics and so on. Compounding these costs in South Africa is the fact that that there is domestic producer of construction equipment and vehicles. A fall in local production will have the usual multiplier effects on, for example, Atlantic Diesel Engines. Even were a machine is fully imported the actual operation generates local incomes and this portion increases as the capital cost of imported equipment is amortised.

2.3 The economic issues focused on in the terms of reference address three main areas in economics – multiplier analysis, gains from trade and cost reduction through improved productivity.

2.4 It can be shown in the discipline of economics that there are efficiency and welfare gains to be had by people trading with each other and by nations trading with each other. People and nations should seek out and maximise their comparative advantage.

2.5 Hence, if it can be shown that equipment-based construction is simply cheaper than labour-based construction then national welfare gains and comparative advantage are reduced by forcing labour-based construction. The people working on the project receive the benefits. The additional costs are (in this case) borne by the taxpayer.

2.6 Economics also recognises that comparative advantages are not static but change and evolve over time. Many economists would suggest that this process is best left to the market. Policy makers, on the other hand, faced with unemployment and poverty will wish to be proactive. At the heart of the policy decision is the need to search for a change in comparative advantage such that improved future welfare will outweigh the immediate loss of welfare by reducing the gains from trade.

2.7 Such issues are further complicated by the fact that an important economic objective in South Africa is a more equal distribution of income. Hence it may be argued that a financial premium on labour-based projects is a corrective mechanism for unbalanced standards of living. Capital intensive projects deny poor people the opportunity to participate meaningfully in the economy. Labour-based methods generate such opportunities.

2.8 In contrast to gains from trade and long term economic policy, multiplier analysis is more short term in nature. It is well known that multipliers only operate when there is excess industrial capacity. Any increase in demand when industries are at full capacity simply results in an immediate increase in imports. In the longer term this increased demand, if it is sustained, may result in increased production capacity but this depends on comparative advantage.

3 A Labour Focussed Profile of the Construction Industry

3.1 This section of the report focuses on the construction industry with the objective of determining a profile of actual salaries and wages. This is clearly the starting point of the study as wages determine the cost differential between labour-based and equipment-based construction and the magnitude of the associated macro economic impact.

3.2 Depth is given to this profile by identifying wage differentials across the country, by occupation and by size of firm and by comparing construction wages to those in manufacturing.

3.3 It will be shown that the construction industry is a small and (currently) declining industry. Not only has output fallen but so too have real wages. Some types of wage measures were easy to determine. Other proved to be less so. Determining wages by occupation by location proved particularly difficult.

Contribution to Gross Domestic Product

3.4 The construction industry plays a small role in the generation of overall economic activity. In addition this contribution has declined consistently since the early 1980s. (See Figures 3.1 and Table 3.1) In 1981 the construction industry generated GDP to the value of R10 billion (1990 values). This was large enough to contribute 4.3% to overall GDP. By 1998 the real value of contribution to GDP had decreased to R7.6 billion and contributed only 2.7% to overall GDP.

Figure 3-1

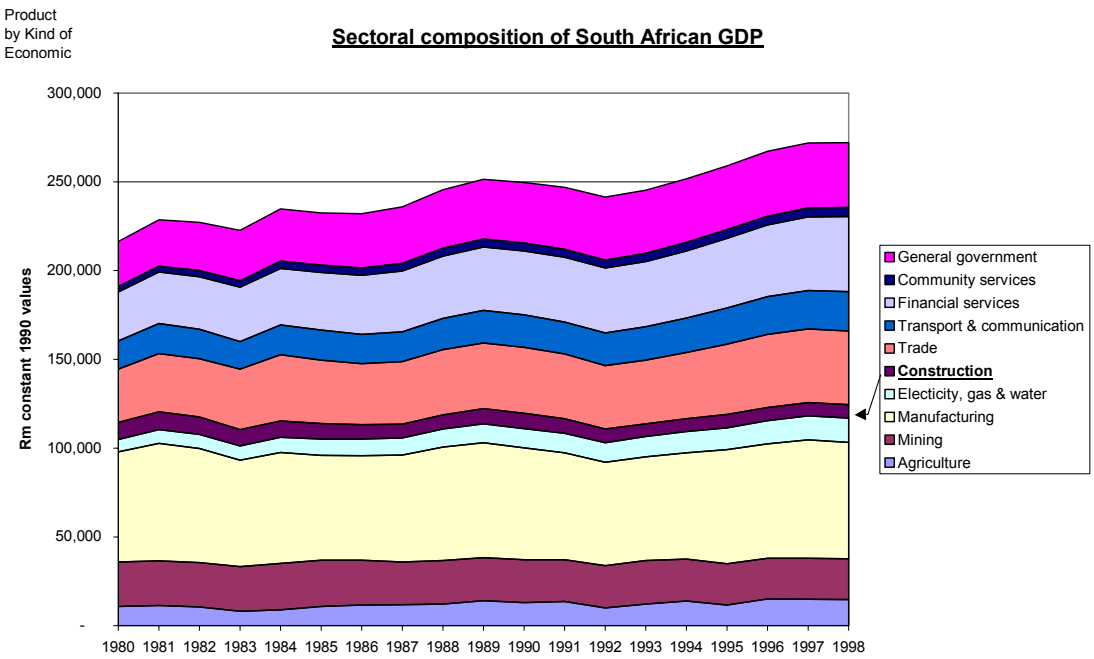


Table 3-1

Construction industry contribution to GDP

1990 values

	R millions	% of total GDP
1980	9,511	4.3%
1981	10,038	4.3%
1982	9,642	4.2%
1983	9,119	4.0%
1984	9,344	3.9%
1985	8,875	3.7%
1986	8,157	3.4%
1987	7,618	3.2%
1988	7,864	3.1%
1989	8,527	3.3%
1990	8,606	3.4%
1991	8,203	3.2%
1992	7,693	3.1%
1993	7,168	2.9%
1994	7,251	2.8%
1995	7,376	2.8%
1996	7,506	2.8%
1997	7,609	2.7%
1998	7,625	2.7%

Source: SA Reserve Bank Quarterly Bulletins

Construction Employment

3.5 The trend in contribution to GDP of the construction industry is reflected in the trend of both total employment and real wages in the construction industry. Total employment in the industry peaked at 427,000 in 1981 (see Table 3.1 and Figure 3.1). Since that time employment in the construction industry has declined consistently with an accelerated decline after 1990.

3.6 It is evident from both the diagram above and the table below that greatest reduction in the number of jobs has been to the coloured communities with the proportion of total employment falling from over 15% in the early 1980s to just over 11% by the late 1990s.

3.7 It is useful to read Table 3.2 in conjunction with Figure 3.3. Figure 3.3 (which is discussed more fully below) shows the relative performance of construction jobs to jobs in the rest of the country. It is possible to view the changes in the composition of employment as the result of a large scale search for cheaper labour. This view can be substantiated by noting how, in the period before 1992, the increased black and Asian share of jobs in construction. Following 1992, and the general job shedding in South Africa, the share of blacks in the construction industry has decline marginally.

Figure 3-2

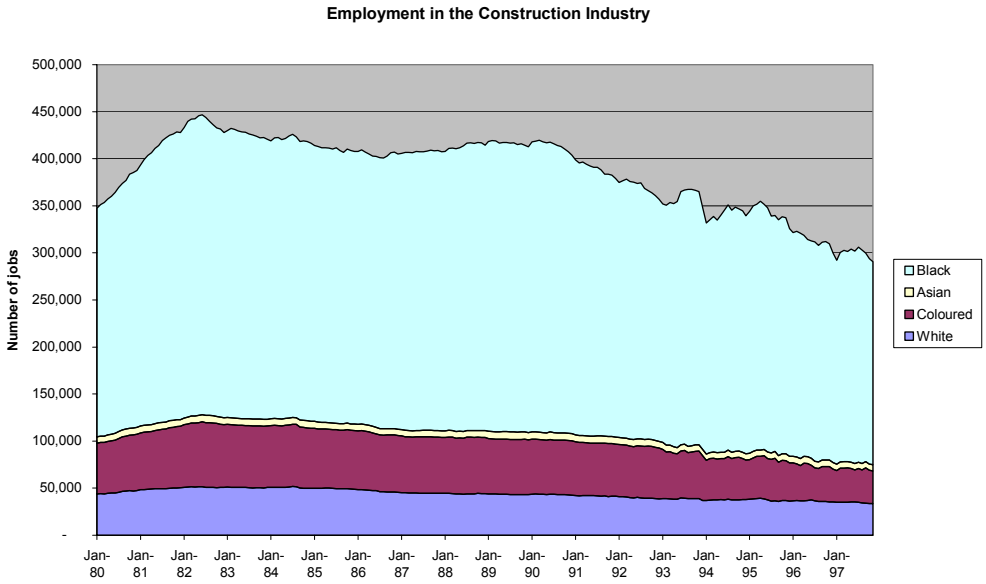


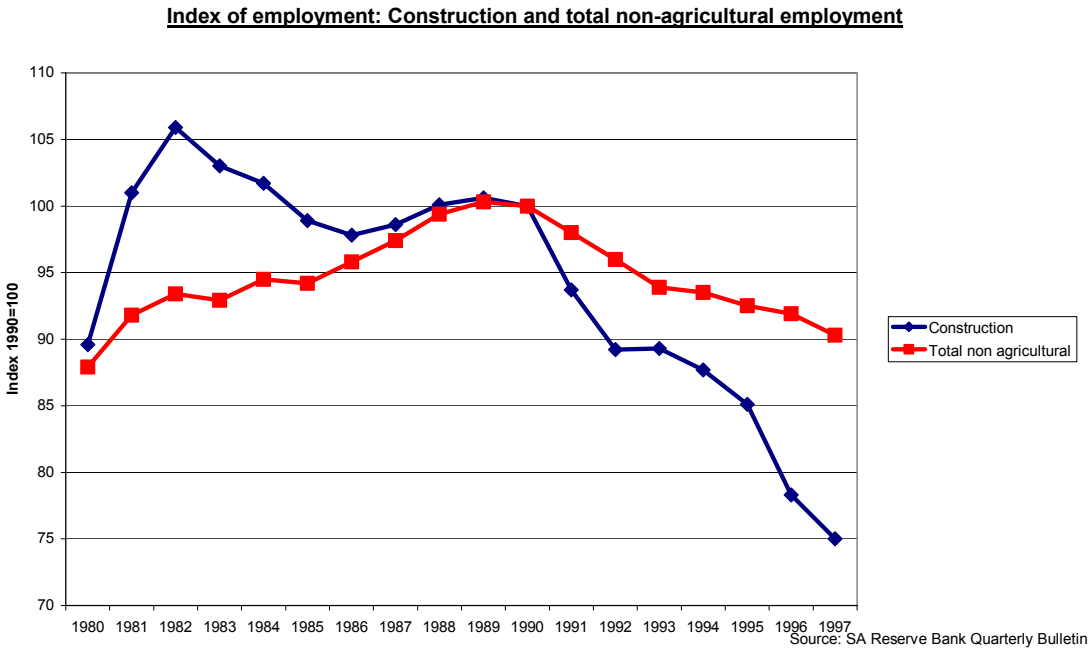
Table 3-2

Employment in the Construction Industry

End of year	Total jobs	White	Coloured	Asian	Black
1980	387,400	12.2%	15.5%	1.9%	70.4%
1981	427,700	11.8%	15.2%	1.7%	71.3%
1982	427,600	11.9%	15.5%	1.8%	70.8%
1983	420,700	12.1%	15.5%	1.7%	70.7%
1984	416,500	12.0%	15.3%	1.8%	70.9%
1985	407,800	11.9%	15.3%	1.7%	71.1%
1986	404,900	11.2%	14.9%	1.6%	72.2%
1987	407,500	10.9%	14.6%	1.7%	72.8%
1988	414,400	10.7%	14.3%	1.8%	73.2%
1989	412,700	10.5%	14.1%	1.9%	73.5%
1990	403,800	10.5%	14.3%	1.9%	73.3%
1991	378,900	10.9%	14.6%	2.0%	72.5%
1992	357,100	10.8%	15.0%	2.0%	72.1%
1993	364,605	10.1%	13.0%	1.8%	70.5%
1994	355,114	10.6%	11.9%	1.8%	71.3%
1995	336,939	10.7%	12.0%	2.2%	71.7%
1996	312,051	11.4%	11.1%	2.3%	71.3%
1997	303,392	11.1%	11.4%	2.2%	71.2%

Source: Stats SA statistical releases (TSE database)

Figure 3-3



3.8 The loss of jobs in the construction industry stands in contrast to the rest of the economy. Figure 3.3 illustrates an index of employment of total non-agricultural employment and employment in construction for the years 1980 to 1997. The index base year is 1990. In the economy as a whole there have been net job losses since 1990. The trend in the economy over the past twenty years indicates a general growth in jobs over the 1980s with a sustained loss in jobs between 1990 and 1997. While this is a bleak picture in itself, the construction industry has experienced jobs losses far greater than the rest of the economy, on the one hand, and the job losses have been happening since the early 1980s, on the other.

Construction wages

Wage trends

3.9 We see above that construction has a falling contribution to GDP and a falling contribution to total job creation. The changes in real wages reflect this trend although the differences are not as stark. Figures 3.4 and 3.5 illustrate the racial differences in wages and the changes in these real wages since 1980 for the construction and manufacturing industries respectively. (Real wages are estimated by adjusting nominal wages by the South Africa consumer price index).

3.10 For whites real wages have been falling in both construction and manufacturing since the mid-1980s although the fall has been greater in the construction industry. Real wages for coloureds are higher in manufacturing but lower in

construction. Real wages are higher for Asians in both sectors. Real wages paid to blacks have maintained their value in construction but, in contrast, have increased in manufacturing.

3.11 It is beyond the scope of this report to thoroughly analyse the causes of the relative changes between black and white wages in the construction industry. We suspect that the causes will include falling demand in the construction industry (as evidenced by a falling contribution to GDP), the highly competitive nature of construction, the need to reduce costs, and the increased 'informalisation' of the industry.

Figure 3-4

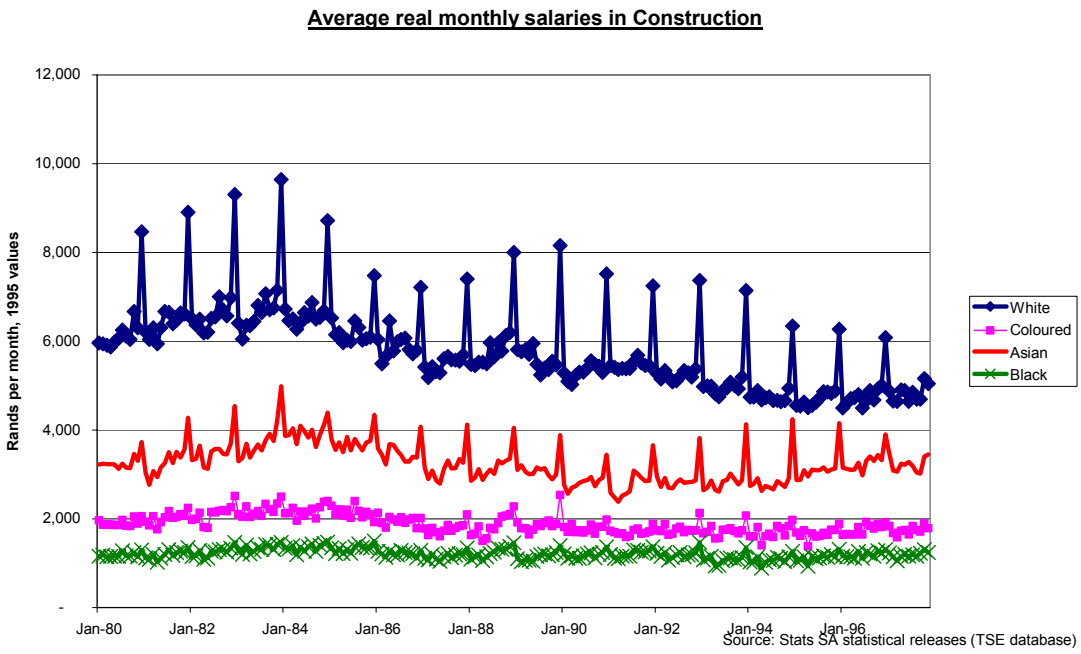
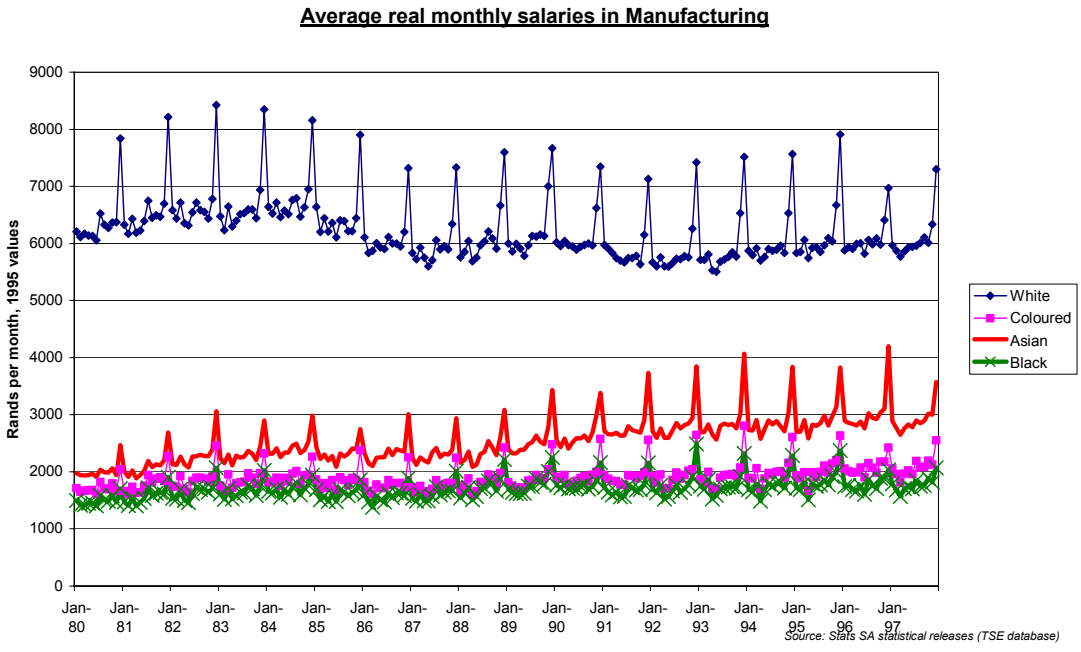


Figure 3-5



Provincial differences

3.12 In the process of determining wage paid in the construction industry, wages are reported for the construction industry generally and the two subsectors of housing construction and civil engineering. Other subsectors are not reported, as they are less likely to have potential for public work projects. The wages that are reported are based on the 1994 construction census inflated to 2000 values

3.13 Average salaries paid in the industry generally and the two subsectors are reported in Table 3.3 and represented graphically in Figure 3.6. These are average salaries across all skill levels and includes unskilled, skilled and professionals.

3.14 There is substantial variation in average industry salaries between provinces. In 2000 values, average wages in the construction industry varied between a high of over R28,000 pa in the Eastern Cape and a low of a little over R20,000 in the Northern Cape. The value of these differences are shown in Table 3.4 below

3.15 There are substantial provincial variations in salaries paid in the different subsectors.

The Western Cape, for example, has construction salaries that are, on average, nearly 6% higher than the national average. In house construction salaries are more than 10% higher than the national average. Yet in civil engineering these are 2% less than the national average. The Northern Cape, in contrast, has salaries that are nearly 19% lower than the national average, with house construction 16% lower than the national average. Civil engineering, in contrast, has salaries 30% above the national average Working on house construction in Gauteng is financially the most attractive proposition in the construction industry with salaries over 20% greater than the national average.

3.16 On the whole, and as is evident in Figure 3.6, average salaries in civil engineering are generally higher than the industry average in each particular province – as an average of all occupations. In contrast salaries paid to those in house construction are well below provincial industry averages. For construction workers the least financially attractive place to built houses is in the Northern Cape and Northern Province where salaries are R15,000 and nearly R17,000 respectively (per annum 2000 values). This equates to monthly salaries (plus bonus) of than R1,200 and R1,300 a month respectively

Table 3-3

Construction industry

Average Salaries paid in 1994, year 2000 values

	Construction total	House construction	Civil engineering
Western Cape	26,571	20,061	26,366
Eastern Cape	28,443	16,104	35,171
Northern Cape	20,356	15,272	22,346
Free State	23,745	16,629	25,855
Kwazulu Natal	25,392	20,895	25,709
North West	25,831	18,985	29,624
Gauteng	26,320	21,949	25,997
Mpumalanga	27,630	16,962	30,564
Northern Province	21,467	16,718	20,416

Source: Construction Census 1994

Figure 3-6

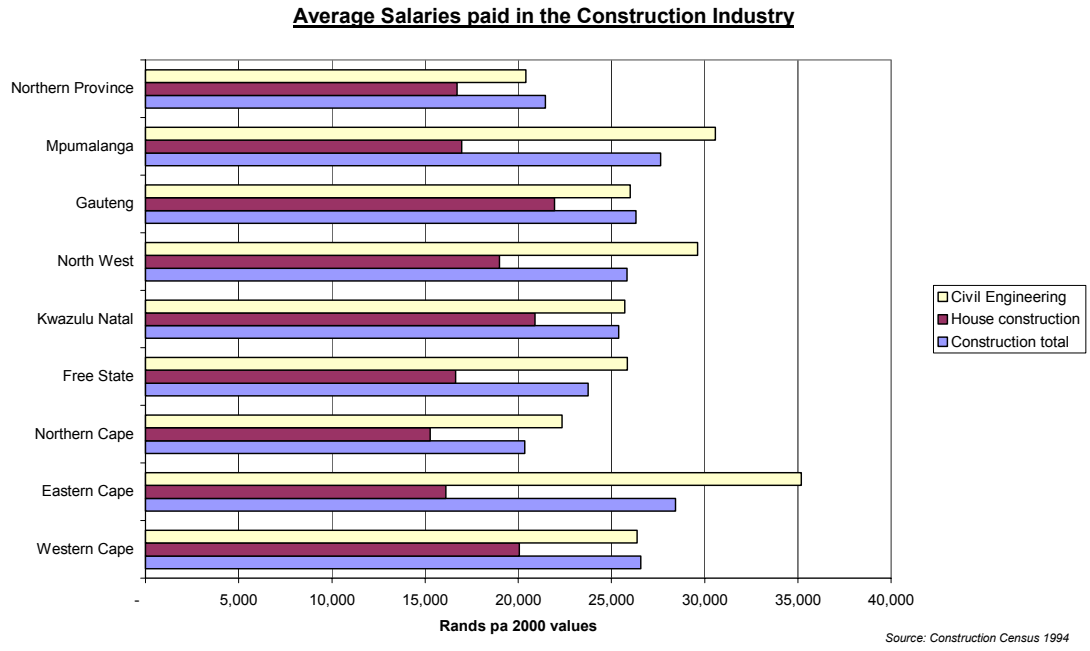


Table 3-4

Construction industry

Percentage difference from national average construction salaries

	Construction total	House construction	Civil engineering
Western Cape	5.9%	10.4%	-2.0%
Eastern Cape	13.4%	-11.4%	30.8%
Northern Cape	-18.8%	-16.0%	-16.9%
Free State	-5.3%	-8.5%	-3.9%
Kwazulu Natal	1.2%	15.0%	-4.4%
North West	3.0%	4.5%	10.1%
Gauteng	4.9%	20.8%	-3.3%
Mpumalanga	10.2%	-6.7%	13.6%
Northern Province	-14.4%	-8.0%	-24.1%

Source: Construction Census 1994

Size of firm differences

3.17 One interesting relationship that did emerge was between size of firm and average salaries paid. These results are illustrated in Figure 3.7 for the construction industry as a whole but excluding civil engineering and for civil engineering firms only. In the very small firm size civil engineering pays one of the highest average wage rate while construction generally pays the lowest to the very small firms. The civil engineering differences are explained by the likelihood that these are consulting firms. The general industry average is less easily explained – possibly these are emerging contractors. If this is the case this has important implications for targeted procurement and the national public works programme.

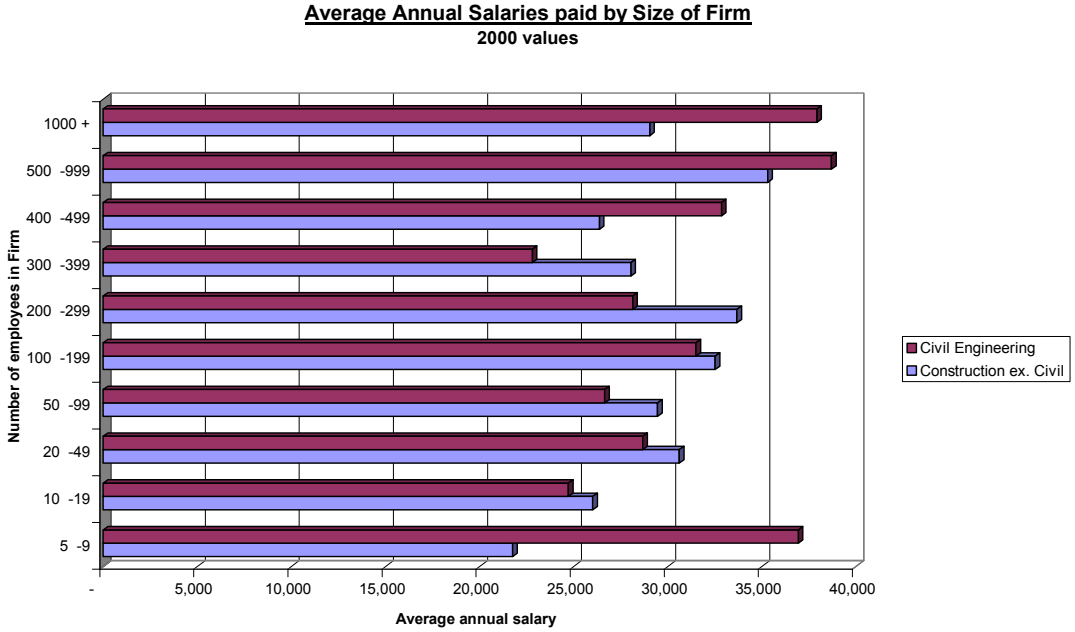
3.18 We observe that an increase in the size of the firm leads to an increase in wages with the rest of the construction industry having wages slightly higher than in civil engineering projects. Very large firms pay some of the highest wages in the industry with large civil engineering firms paying the highest average wages of all. It is suspected that these high civil engineering wages paid to large projects are probably the result of where these projects are situated and the fact that workers will be away from home for long periods of time.

Skill differences

3.19 An attempt was made to estimate the differences that skill levels make to salaries in the construction industry. These skill differences are not reported in the construction census and other data sources were consulted. In the early stages of this study the 1997 October Household Survey was analysed in an attempt to determine these differences. These results are reported below although they are less than satisfactory. Subsequent to this analysis the 1996 census was released by Statistics SA. The census data was analysed with a view to determining occupational wage differences. This met with far greater success and the results are also reported below. (The clear reason for the better results from the census relative to the October Survey is that survey has 65,000 respondents while the community profile of the 1996 census reports on 13 million respondents).

Figure 3-7

1997 October Household Survey



3.20 The October Household Surveys are very detailed surveys that are capable of providing a wealth of information. The Surveys allow people to very clearly identify the kind of work that they do and the kind of industry where the work is undertaken. Of relevance to this study, Table 3.5 illustrates the level of detail to which work in the construction industry can be categorised.

3.21 The different work categories in Table 3.5 have been aggregated into five general definitions: bricklayers, concrete workers, carpenters, construction labour, semi-skilled construction labour, as shown by the groupings in the table.. Average wages paid to each of the skill categories were calculated. Much to our consternation the results were counterintuitive. The results showed improbably low wages and an inverse relationship between skill levels and wages. In order to address this problem the final calculations are based on the hourly rate worked for the past seven days and are reported in Table 3.6 below. The table reports on the mean and standard deviation for the nine provinces and for the nation as a whole.

3.22 It will be immediately apparent that a similar (although less pronounced) inverse relationship exists between skills and remuneration. In the 'Total' column, for example, bricklayers earned an average R3.7 an hour (in 1997) while concrete workers earned R3.2, carpenters R6.1, construction labour R5.2 and semi-skilled labour R3.7. Intuitively one would expect bricklayers and semi-skilled labour to earn more than labour.

Table 3-5

CODE	OCCUPATION
7122	Bricklayer, chimney
7122	Bricklayer, construction
7122	Bricklayer, firebrick
7122	Bricklayer, furnace lining
7122	Bricklayer, ingot mould lining
7122	Bricklayer, kiln
7122	Bricklayer, oven
7122	Bricklayers and stonemasons
7122	Builder, chimney
7122	Firebrick layer
7122	Paviour
7122	Stonemason, construction
7122	Stonemason, facings
7122	Stonemason, paving
7122	Tuckpointer
7123	Caster, concrete products
7123	Concrete mixer
7123	Concrete placers,etc
7123	Finisher, cement
7123	Finisher, concrete
7123	Iron worker, concrete reinforcement
7123	Mixer, concrete
7123	Placer, concrete
7123	Shutterer, concrete moulding
7123	Terrazzo worker
7124	Boatbuilder, wood
7124	Builder, barge/wooden
7124	Carpenter
7124	Carpenter, bench
7124	Carpenter, bridge
7124	Carpenter, construction
7124	Carpenter, first fixing
7124	Carpenter, maintenance
7124	Carpenter, mine
7124	Carpenter, second fixing
7124	Carpenter, ship's
7124	Carpenter, stage
7124	Carpenter, theatre
7124	Carpenter, wharf
7124	Carpenter-joiner
7124	Carpenters and joiners
7124	Fitter, shop
7124	Joiner
7124	Joiner, aircraft
7124	Joiner, bench
7124	Joiner, construction
7124	Joiner, ship
7124	Maker, mast and spar/wood
7124	Shipwright, wood
7124	Shopfitter
9312	Construction and maintenance labourers: roads, dams and similar construction
9312	Labourer, construction
9312	Labourer, construction/ roads
9312	Labourer, construction/dams
9312	Labourer, digging/ditch
9312	Labourer, digging/grave
9312	Labourer, digging/trench
9312	Labourer, maintenance
9312	Labourer, maintenance/ dams
9312	Labourer, maintenance/ roads
9312	Labourer, tube well
9312	Labourer, water well
9312	Land clearer
9312	Navvy
9312	Shoveller
9312	Trackman, railway
9312	Trackwoman, railway
9313	Building construction labourers
9313	Handyman
9313	Handyman, building maintenance
9313	Handywoman
9313	Handywoman, building maintenance
9313	Hod carrier
9313	Labourer, construction, buildings
9313	Labourer, demolition
9313	Stacker, building construction

Table 3-6

Average hourly pay - rands per hour worked, 1997 values

Job code	Description		West Cape	East Cape	Northern Cape	Free State	KwaZulu Nat	North West	Gauteng	Mpumalanga	Northern Pr	South Africa	Daily wage [3]
7122	Bricklayer	Average [1]	**3.4**	**3.3**	**3.2**	**3.2**	**6.4**	**2.6**	**3.6**	**3.5**	**3.3**	**3.7**	**34.6**
		St. dev. [2]	4.2	4.7	3.0	2.1	13.4	2.2	4.6	2.7	3.0	6.1	
7123	Concrete worker	Average [1]	**1.5**		**2.3**	**1.4**	**1.6**	**9.4**	**3.6**	**5.6**	**2.2**	**3.2**	**29.7**
		St. dev. [2]	0.4		3.1				2.7	4.2		3.0	
7124	Carpenter	Average [1]	**6.7**	**5.1**	**4.0**	**7.3**	**6.0**	**6.0**	**8.1**	**8.3**	**3.7**	**6.1**	**56.7**
		St. dev. [2]	8.8	3.3	3.7	7.3	6.0	5.5	10.9	8.2	2.9	7.0	
9312	Construction labour	Average [1]	**4.6**	**4.6**	**3.5**	**6.3**	**6.0**	**5.8**	**6.2**	**5.7**	**4.1**	**5.2**	**48.4**
		St. dev. [2]	4.6	4.2	3.8	5.8	6.1	8.4	5.4	6.8	3.7	5.6	
9313	Construction semi-skilled	Average [1]	**2.7**	**2.8**	**1.9**	**3.7**	**4.0**	**8.7**	**10.3**	**4.9**	**5.0**	**3.7**	**34.3**
		St. dev. [2]	3.7	2.5	1.7	1.4	3.0	11.8	8.1	2.8	3.5	4.5	

Notes: 1. Average hourly wage rate during the past seven days
2.. Standard deviation
3. Daily wage based on 9.25 hour day for average wage paid across South Africa, 1997 values
Source: Stats SA: October Household Survery 1997

3.23 There are four possible reasons for these results:

- A small sample. The number of respondents for each category were: bricklayers – 214, concrete workers – 17, carpenters – 91, labour – 241, and semi-skilled labour – 86.

- A wide scatter in the data. This is evidenced by the very high standard deviations that are probably caused by the small sample of skilled workers.

- Wages in the civil engineering industry being higher than house construction such that civil engineering labour does earn more house construction bricklayers.

- The falling real wage for whites and coloureds is presumed to have a disproportional impact on skilled labour, contributing to extra deviations in the sample

The 1996 Census

3.24 The recent general availability of the 1996 census allowed for a more reliable estimate of average wages by occupation type. Because of the very large sample – 40 million in theory but 13 million in the 'labour' portion of the community profile – we expect to capture a more accurate measure of salaries by occupation.

3.25 For the purposes of this investigation, the occupation categories of relevance are the five shown in Table 3.9 below – professionals, technicians and associated professionals, craft and related workers, plant and machine operators and assemblers, and elementary occupations. Of these categories 'craft and related workers' is made up of categories 7122 (bricklayers), 7123 (concrete workers) and 7124 (carpenters) while 'elementary occupations' consists of 9312 (construction labour) and 9312 (semi-skilled labour). The term 'elementary occupations' is used in the population census and is not a creation of this writer.

National Estimates

3.26 In Table 3.9 we show the full country results of an examination of the occupational structure of the construction industry and average salaries. The first column of the table indicates the number of workers by occupation in the census sample. In theory this sample should represent the occupation profile of the industry. Some concern is expressed at the large number of 'craft and related workers' relative to 'elementary occupations'. The first impression is that this is counter intuitive – construction labourers may have responded to the census questionnaire that they are, for example, bricklayers. This kind of response is a common problem with questionnaires. On the other hand Statistics SA has worked hard to avoid these kind of problems and it may be that the civil engineering part of the construction industry causes these results but that the results are correct in themselves.

3.27 Therefore treating the results with due caution, we are able to report that in 1996 the construction industry was made up of 486,000 workers. Of this 3% are professionals, 4% are technicians, 73% are craft workers, 4% are machine operators and 17% are in elementary occupations.

Table 3-7

Average Salaries paid in the Construction Industry

	Number of workers in sample	1996 values Monthly	2000 values Monthly	Annual
Professionals	13,491	6,659	9,007	108,078
Technicians and associate professionals	17,598	3,604	4,875	58,505
Craft and related trades workers	355,214	1,479	2,000	24,001
Plant and machine operators and assemblers	17,989	1,637	2,215	26,576
Elementary occupations	82,446	1,067	1,443	17,313

Source: SA Community Profile - Census 1996. Extracted with Super Table

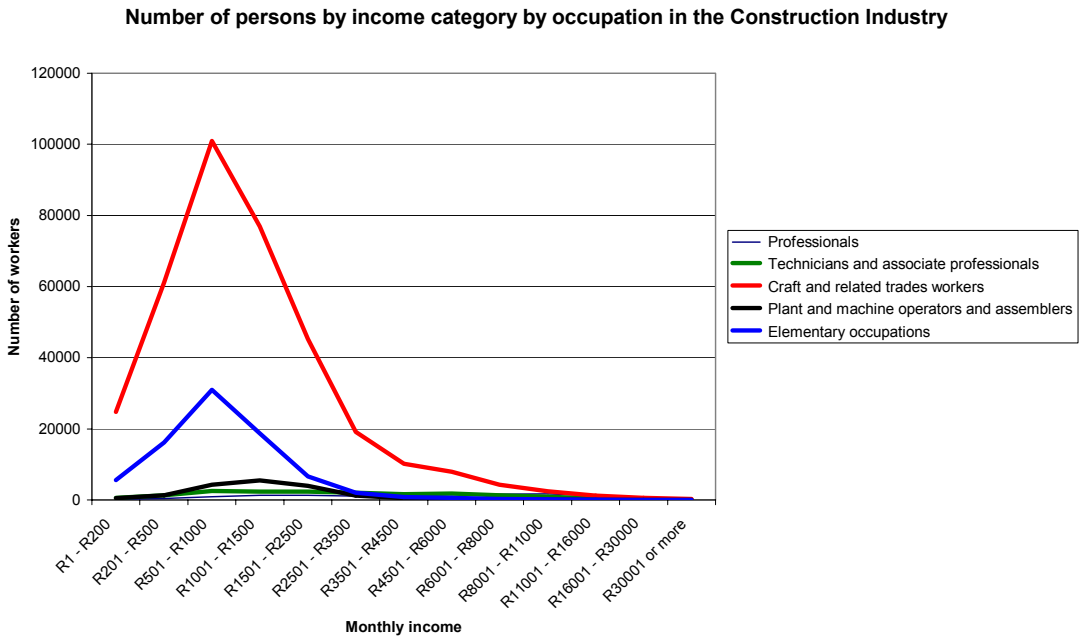
3.28 In turn these worker earned, on average and in year 2000 values, annual salaries of R108,000 for professionals, R58,000 for technicians, R24,000 for craft workers, R26,000 for machine operators and R17,000 for labourers in elementary occupations. Labourers earned about R65 a day.

3.29 The industry total of 486,000 stands in contrast to the 312,000 total reported in Table 3.2. There are two possible reasons for this difference. First, the population census is directed at people while the construction census is directed at firms. We are therefore capturing more informal firms. Second, the population census is probably capturing an element of underemployment.

3.30 Because of the nature of the way the census data is reported it is not possible to calculate accurate standard deviations. Rather, the data dispersion is illustrated in Figure 3.8 below. Figure 3.8 indicates the number of workers of workers in the construction industry by occupation by monthly income category (1996 census values). Three factors are of note:

- The data dispersion is far smaller than those for the October Household Survey. This is probably due to a far higher sample.
- Both ‘craft workers’ and ‘elementary occupations’ have a maximum number of respondents at the same income category – R500 to R1,000 a month (1996 values). This lends further credence to the ‘blurring’ of craft worker and elementary occupation categories in the construction industry as measured by the population census.
- The above observation is reinforced by the long tail on the right hand side of distribution of salaries for craft workers. What this indicates is that there is a wide distribution of salaries for a (small number) of skilled craft workers.

Figure 3-8



3.31 An attempt was made to adjust the census results to correct for the concerns about inaccurate occupational descriptions. In this exercise we attempt to establish two extreme positions. The first extreme position is given by the unadjusted census results. In establishing the second extreme position an assumption was made that any person recorded as a craft worker but earning a salary less than or equal to an average (unadjusted) labourer salary is in fact a labourer and not a craft worker. Hence the census data was adjusted so that no craft worker earned an income equal to or less than the 1996 R501 to R1,000 monthly income category. All of these workers were reclassified as elementary occupations. Numbers, averages and distributions were recalculated and are given in Table 3.8 and Figure 3.9

3.32 After adjustment we discover that there are about 170,000 craft workers in the construction industry earning an average annual salary of R41,000 (2000 prices). In contrast there were an estimated 270,000 labourers in the industry earning an average annual salary of R11,000 a year. For labourers this is about R43 a day.

Table 3-8

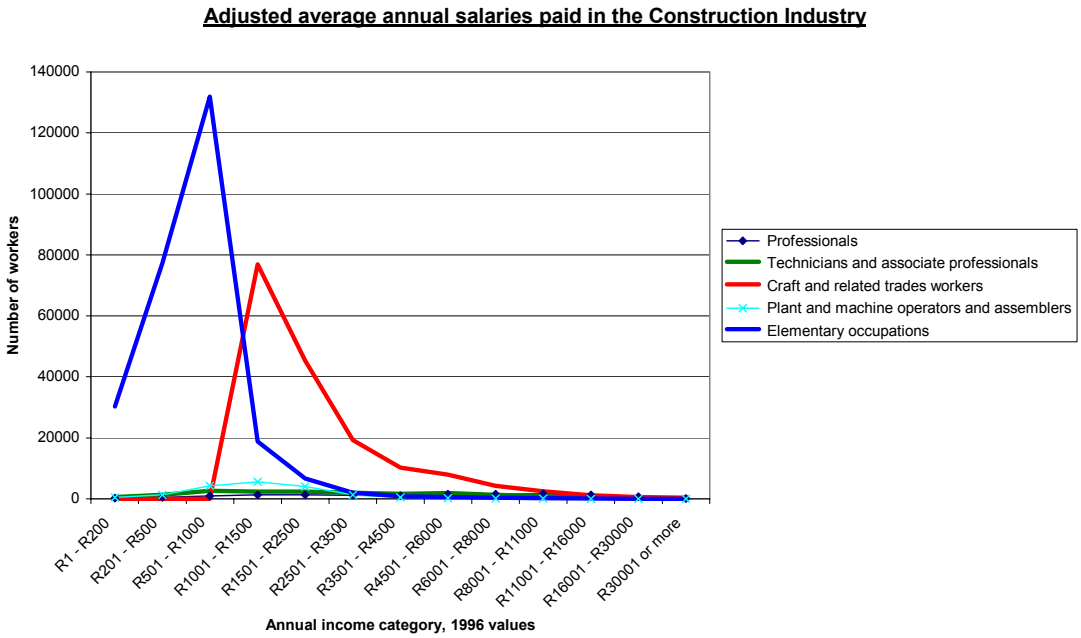
Adjusted Average Salaries paid in the Construction Industry

Adjusted made by moving craft workers earning less than R1000 1996 rand a month to elementary occupations
The 1996 salaries are scaled to 2000 nominal values using changes in the South Africa consumer price index
No scaling has been used to adjust for the fall in real salaries in construction since 1996

	Number of workers in sample	1996 values Monthly	2000 values Monthly	Annual
Professionals	13,491	6,659	9,007	108,078
Technicians and associate professionals	17,598	3,604	4,875	58,505
Craft and related trades workers	168,378	2,528	3,419	41,032
Plant and machine operators and assemblers	17,989	1,637	2,215	26,576
Elementary occupations	269,282	696	942	11,303

Source: SA Community Profile - Census 1996. Extracted using Super Table

Figure 3-9



3.33 In the absence of further evidence, the conclusion we draw from the above analysis is that average salaries for craft workers in the construction industry will lie in the range of R24,000 to R41,000 with the more regular salaried worker being at the top end of the income range. Elementary occupations earn an average of between R11,000 and R17,000 with the more regular salary probably being at the lower end of the income range.

Provincial Estimates

3.34 Where the census is limited by the way in which it aggregates occupations, it is extremely versatile in its geographic coverage. Hence we are able to report on average salaries by province and by location. As one will appreciate that because the more the census is disaggregated the smaller the sample becomes. This makes the interpretation of the mean increasingly more difficult.

3.35 Estimates of average provincial wages paid in the construction industry are presented in Figures 3.10 and 3.11 and Tables 3.9 to 3.12. Wages paid to professionals are presented and discussed but the focus is on wages paid to craft workers and construction labourers.

3.36 Table 3.9 reports the number of professionals active in the construction industry and their average 1996 and 2000 salaries. As can be expected a significant number of professional in the construction industry are resident in Gauteng – 5,700 – with 2,500 in KwaZulu Natal and 2,400 in the Western Cape. The other provinces have only a small portion of professionals resident in the province.

3.37 In claiming the lion's share of professionals, Gauteng pays the highest average wages to professionals in the construction industry – R125,000 pa (2000 values). KwaZulu Natal pays average salaries of just under R110,000 pa while in the Western Cape average professional salaries were just over R103,000 pa. All other provinces pay an average of less R100,000 a year with professionals in the North West and the Northern Province earning little more than R55,000 a year.

Table 3-9

Average Salaries paid to Professionals in the Construction Industry

	Number in sample	1996 values Monthly	2000 values Monthly	2000 values Annual
Western Cape	2,440	6,351	8,590	103,081
Eastern Cape	670	5,899	7,978	95,741
Northern Cape	116	5,712	7,726	92,715
Free State	563	4,867	6,584	79,003
KwaZulu-Natal	2,525	6,761	9,145	109,743
North West	581	3,404	4,604	55,247
Gauteng	5,731	7,717	10,438	125,250
Mpumalanga	382	5,268	7,125	85,501
Northern Province	483	3,510	4,748	56,973

Source: SA Community Profile - Census 1996. Extracted with Super Table

3.38 Table 3.10 indicates the provincial distribution of craft workers in the construction industry and the average salaries that were paid in 1996 (and their 2000 equivalent values). The distribution of numbers employed follows a similar pattern to professional employment. At 106,000 Gauteng has twice as many craft workers in construction as any other province. The Western Cape and KwaZulu Natal each have 50,000 craft workers in construction.

3.39 In contrast to average professional wages, there is not the extreme variation in average craft wages between the nine provinces. On average craft workers in Gauteng and the Western Cape earn R28,000 a year (2000 values). The lowest average wages for craft workers are paid in the Northern Province and the Northern Cape – just under R18,000 a year.

Table 3-10

Average Salaries paid to Craft workers in the Construction Industry

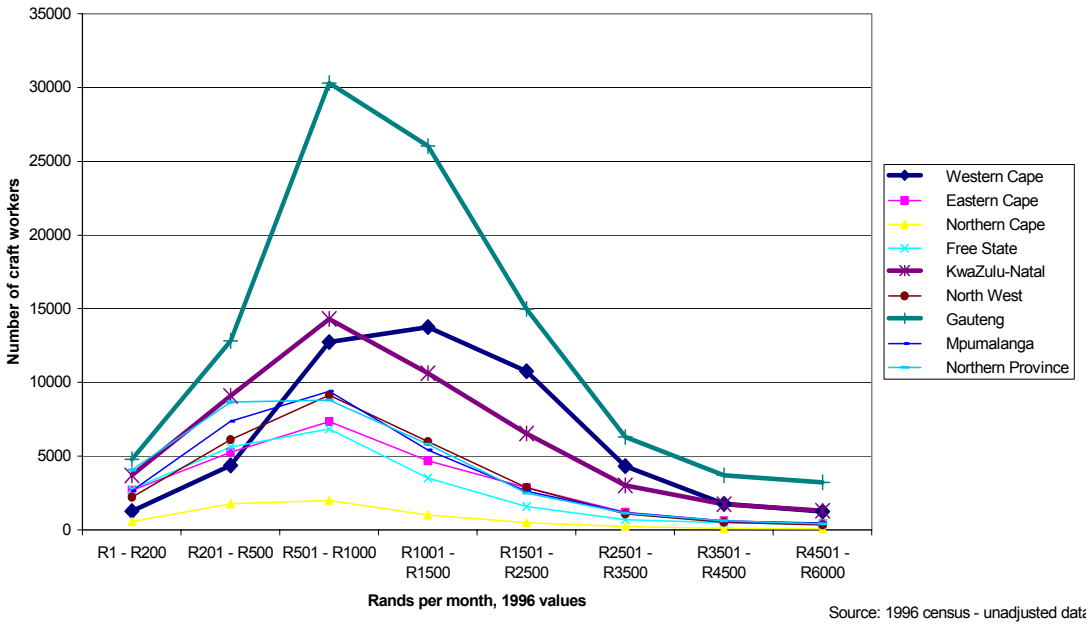
	Number in sample	1996 values Monthly	2000 values Monthly	Annual
Western Cape	51,497	1,752	2,370	28,438
Eastern Cape	25,579	1,261	1,705	20,463
Northern Cape	6,359	1,076	1,456	17,470
Free State	22,334	1,148	1,553	18,635
KwaZulu-Natal	51,749	1,521	2,058	24,690
North West	28,736	1,192	1,612	19,341
Gauteng	106,193	1,749	2,366	28,386
Mpumalanga	30,254	1,193	1,614	19,365
Northern Province	32,513	1,092	1,477	17,729

Source: SA Community Profile - Census 1996. Extracted with Super Table

3.40 Figure 3.10 records the number of **craft workers** by income category for the nine provinces. With the exception of the Western Cape and the Northern Province, the other seven province show a similar wage distribution and one that coincides with the national distribution shown above. In the Western Cape, and to a more limited extent Gauteng, we find that the most common (unadjusted) wages paid to craft workers is R1000 to R1500 a month. This compares to the most common wage at a national level of R500 to R1000 a month. In the Northern Province, in contrast, there are as many craft workers earning R200 to R500 a month as there are earning R500 to R1000.

Figure 3-10

Number of Craft workers per income category in the Construction Industry



Source: 1996 census - unadjusted data

3.41 Table 3.11 reports on the provincial distribution of **labourers** and average salaries paid. In contrast to all other occupations reported in this section, the Western Cape boasts the greatest number of construction labourers – nearly 30,000 in 1996. Gauteng is less than half this number – a little under 14,000. Average wages varied between R20,000 a year in Gauteng (2000 values), R17,500 in the Western Cape and a lowest average in the Northern Cape of R14,000.

Table 3-11

Average Salaries paid to 'elementary occupations' [1] in Construction
Unadjusted Averages

	Number in sample	1996 values Monthly	2000 values Monthly	Annual
Western Cape	29,237	1,080	1,460	17,524
Eastern Cape	8,159	925	1,251	15,009
Northern Cape	2,246	878	1,188	14,252
Free State	4,497	1,071	1,449	17,391
KwaZulu-Natal	9,604	952	1,288	15,456
North West	4,687	1,026	1,388	16,654
Gauteng	13,971	1,257	1,701	20,409
Mpumalanga	4,854	1,044	1,412	16,949
Northern Province	5,191	1,050	1,420	17,036

Source: SA Community Profile - Census 1996. Extracted with Super Table

Note: 'Elemenetary occupations' is a census definition . It is made up of semi and unskilled labour.

3.42 Figure 3.11 illustrates the distribution of wages in the elementary occupations in the construction industry. With the possible exception of the Northern Province, we find little difference in the distribution of wages paid to construction labourers with the most common wage paid ranging from R500 to R1000 a month. In the Northern Province there are more or less as many labourers earning between R200 and R500 a month as there are earning between R500 and R1000 and between R1000 and R1500. *We suspect there is a problem with the underlying data.*

3.43 It will be clear that the data problems that were encountered in determining average national salaries – labourers and craft workers reporting to have been paid similar wages – are also being found in the provincial results. The only exception to this is the Western Cape were salaries differences between craft workers and labourers are those than were intuitively expected. Hence the same correction procedure was applied to the provincial data to determine a range of potential salaries between two extreme positions. These adjustments are reported in Table 3.12 below.

Figure 3-11

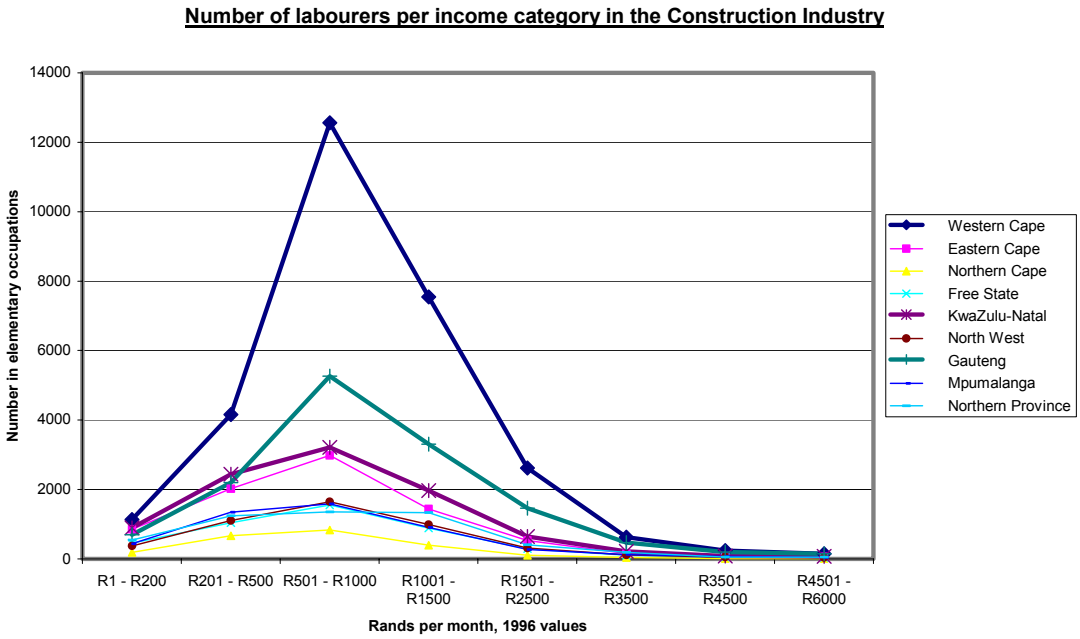


Table 3-12

Adjusted and Unadjusted Average Salaries paid in the Construction Industry

All year 2000 values, monthly salaries

	Craft workers		Labourers	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Western Cape	2,370	3,230	1,460	1,215
Eastern Cape	1,705	3,246	1,251	874
Northern Cape	1,456	3,124	1,188	853
Free State	1,553	3,478	1,449	836
KwaZulu-Natal	2,058	3,539	1,288	863
North West	1,612	3,009	1,388	856
Gauteng	2,366	3,668	1,701	989
Mpumalanga	1,614	3,275	1,412	834
Northern Province	1,477	3,145	1,420	784

Source: Own calculations

3.44 After adjusting the data we establish two extreme boundaries for the average salary of craft workers and labourers in the construction industry. The table is therefore interpreted as, for example, in the Western Cape the average salary paid to a craft worker will fall in the region of R2,400 and R3,200 a month. In the same province the average salary paid to a construction labourer will lie somewhere between R1,200 and R1,460. This amounts to an adjusted daily wage of R55. In the Northern Province the daily wage of a construction labourer will vary between an (unadjusted and unbelievable) R64 a day and (adjusted and believable) R36 a day.

3.45 An attempt was made to verify the results in Table 3.13 and a straw poll was conducted among builders in the Western Cape. (The poll included two architects, one quantity surveyor, a consulting engineer and eight building contractors). The general opinion was that for craft workers the adjusted average salary is close to the norm while full time construction labourers will earn closer to the unadjusted monthly salary than to the adjusted salary. (The adjustment methodology can bias labourer wages downward by including underemployed labourers and underemployed craft workers with fully employed labourers). As, of all the provinces, the difference between adjusted and unadjusted labourer salaries is smallest in the Western Cape (R55 a day compared to R65 a day), a challenge remains for a micro verification of the accuracy of these estimates in other provinces.

Town and City estimates

3.46 Estimates of average salaries paid to craft workers and construction labourers for a selection of towns and cities is presented in Table 3.13. The table also provides adjusted average salaries using the same correction procedure used for the national and provincial estimates. As with the provincial estimates, we focus more on the adjusted salaries for craft workers and the unadjusted salary for construction labourers.

3.47 In some of the smaller provinces, the Western Cape and Gauteng in particular, we note that there are few differences with craft worker salaries within the individual province. This is probably due to the mega-city effect and good transport systems leading to an equalisation of wages. The two notable exceptions are for Soweto in Gauteng and Thaba 'Nchu in the Free State. Here wages for craft workers are considerably lower than those in the nearby cities of Johannesburg and Bloemfontein respectively. Because the census measures people's place of residence and not their place of work we do not believe that there can be such substantial wage differences for the same kind of labour within what is largely the same market. We take it that the lower reported wage rates ae not distortions in the labour market but the result of underemployment and oversupply of labourers in particular areas, which forces the wage rate down.

3.48 In the provinces that are geographically larger we do note more variation in the average salaries of craft workers. We make a general observation (with exceptions) that there is some correlation between the salaries that craft workers earn in construction and the size of the town or city in which they work.

3.49 For construction labourers it is not possible to make such generalisations. We note substantial variation in the average salaries earned by construction workers in the various towns and cities of South Africa.

Table 3-13

Average salaries paid in the Construction Industry for a selection of towns and cities.

All values year 2000, monthly salaries

		Craft Workers		Elementary Occupations	
Province	**Town/city**	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**
Western Cape	Bellville	2,536	2,967	1,538	1,212
	Wynberg	2,268	2,678	1,195	959
	Caledon	1,531	2,000	1,024	888
	Hermanus	1,325	2,073	855	729
	Mossel bay	1,418	2,309	974	747
	Riversdal	1,444	2,082	950	849
	Ceres	1,588	2,105	1,156	959
	Vredenburg	1,655	2,063	1,085	965
Eastern Cape	Aliwal North	762	1,824	1,686	659
	Barkley-East	546	1,531	713	533
	Queenstown	1,104	2,183	797	581
	East-London	1,565	2,654	965	719
	Graaff-Reinet	921	2,352	804	589
	Port Elizabeth	1,706	2,581	1,165	794
	Butterworth	1,417	2,827	782	584
	Umtata	1,102	2,356	818	582
Northern Cape	Calvinia	908	2,297	791	586
	Prieska	777	1,902	876	662
	De Aar	917	2,333	836	547
	Kimberley	1,376	2,592	876	630
	Victoria-West	579	2,458	536	415
Free State	Welkom	1,529	2,716	1,328	751
	Kroonstad	979	2,023	1,111	617
	Parys	967	2,289	1,151	579
	Bethlehem	1,218	2,693	1,583	631
	Harrismith	1,083	2,695	838	572
	Bloemfontein	1,498	3,101	1,460	692
	Thaba 'Nchu	886	1,868	811	535
KwaZulu-Natal	Durban	2,534	3,531	1,253	784
	Chatswoth	1,998	2,720	1,287	792
	Pietermaritzburg	1,501	2,810	910	585
	Port Shepstone	1,246	2,453	733	592
	Mooi river	1,112	2,129	890	519
	Estcourt	1,375	2,403	999	662
	Newcastle	1,298	2,725	824	554
	Lower Tugela	1,333	2,421	698	576
North West	Lichtenburg	1,183	2,487	950	616
	Klerksdorp	1,310	2,641	1,074	630
	Potchefstroom	1,320	2,519	1,346	736
	Brits	1,575	2,674	1,180	690
	Temba	1,111	1,815	1,255	687
Gauteng	Pretoria	2,282	3,371	1,294	825
	Johannesburg	2,301	3,197	1,411	765
	Germiston	2,650	3,610	1,489	914
	Springs	2,012	3,190	1,892	818
	Westonaria	1,555	2,691	1,035	688
	Vanderbijlpark	1,453	2,434	1,088	698
	Soweto	1,286	1,917	1,173	664
	Ermelo	1,263	3,210	882	591
Mpumalanga	Standerton	1,598	2,896	1,146	784
	Belfast	875	2,328	735	577
	Witbank	1,553	2,755	980	658
	Nelspruit	2,042	4,379	1,123	624
Northern Province	Messina	853	2,317	588	449
	Phalaborwa	2,380	3,388	1,563	975
	Pietersburg	3,545	5,284	1,918	916
	Potgietersrus	1,313	2,781	2,519	1,404
	Mutali	1,157	1,961	1,360	728

Source: SA Community Profile - Census 1996. Extracted with Super Table

Summary

3.50 The construction industry is a small and, currently, declining industry. Contribution to GDP has fallen, there are fewer jobs today than twenty years ago and real wages have fallen.

3.51 About 300,000 people were employed in the construction industry in 1997 and about 70% of these were black.

3.52 On average the civil engineering industry pays wages that are greater than in house construction. This is likely to reflect skill differences, particularly, and work conditions.

3.53 There are significant differences in wages paid in the various provinces. In 1994, (the latest construction census) we find the lowest average civil engineering salaries are paid In the Northern Province and the highest in the Eastern Cape. Average house construction salaries were the highest in Gauteng in 1994 and lowest in the Eastern Cape.

3.54 We observe that an increase in the size of the firm leads to an increase in wages with the rest of the construction industry having wages slightly higher than in civil engineering projects. Very large firms pay some of the highest wages in the industry with large civil engineering firms paying the highest average wages of all. It is suspected that these high civil engineering wages paid to large projects are probably the result of where these projects are situated and the fact that workers will be away from home for long periods of time.

3.55 Determining average salaries by skill level proved a difficult exercise. Both the October Household Surveys and the Population Census were analysed. We conclude that average annual salaries paid to craft workers in the construction industry vary between R24,000 and R41,000 and for unskilled workers between R11,000 and R17,000 (all 1996 values).

3.56 Unskilled labourers in the Western Cape construction industry have the highest salaries in the country of between R1,460 and R1,215 monthly (R66 and R56 a day). The lowest paid unskilled construction workers are to be found in the Northern Province. Here the adjusted wage was a daily rate of R36. (All wages in year 2000 values).

4 Expenditure patterns and standards of living

Introduction

4.1 As peoples' income changes so too does the composition of what they spend their income on. This section explores expenditure patterns in South Africa with a view to determining the levels of, and differences in, the expenditure patterns of the various income groups that are targeted by the national public works programme.

4.2 In this section we describe the methodology employed to determine expenditure patterns and the impact of income changes on expenditure patterns. Existing expenditure patterns are reported and the impact of changing income measured.

Description of Methodology

4.3 This section of the investigation makes us of the national Income and Expenditure survey conducted by Statistics SA in 1995. This is a extensive survey that asked very detailed questions of over 65,000 households across the country. In order to make the detailed expenditure questions manageable each of the expenditure items of the survey was classified originally as part of the Final Supply and Use Tables (SUT) of 1993 (Statistics SA). This allowed 600 different expenditure items to be aggregated into the 95 SUT categories. In addition to this the survey was also classified according to the Standard Industrial Classification of all Economic Activities (4th and 5th edition) (the so-called SIC codes). This latter exercise was necessary in order to estimate the economic impact of changes in final demand.

4.4 From this reclassified income and expenditure survey we extracted the expenditure patterns of households. These expenditure patterns were determined individually for male and female headed households respectively, by different household income categories and separately for each of the provinces. For obvious reasons the focus was on the lower income levels. The established income categories that are reported on here are: annual household income from R1 to R5,000; R5,001 to R10,000; R10,001 to R15,000; and R15,001 to R20,000. Income categories of up to R50,000 were calculated and are used later in estimating expenditure changes.

4.5 In order to determine the changes in expenditure following a change in income we determine the differences in expenditure between each of the separate income categories. The assumption is therefore made that as the income of people increases these people will take on the same expenditure profile as other people in their new income category.

4.6 The reported changes in income categories are from changes in income categories from R1 – R5,000 to R5,001 - R10,000; from R5,001 – R10,000 to R10,001 - R20,000; from R10,001 - R20,000 to R20,001 – R 30,000 R20,001 – R 30,000 to R30,001 – R40,000; and from R30,001 – R40,000 to R40,001 - R50,000.

A profile of income and expenditure

4.7 Tables 4.1 and 4.2 show the detailed SIC expenditure patterns of households earning within the chosen income categories. Table 4.1 shows this pattern for all households while Table 4.2 records the differences between male and female headed households. The most important expenditure categories are highlighted. Given the level of detail in these tables few trends are discernible. To facilitate this the largest ten expenditure items were extracted and are presented in Figure 4.1 for female headed households and Figure 4.2 for male headed households.

Table 4-1

Percentage distribution of household expenditure

All households

	Annual household income between:	R1 & R5000	R5,000 & R10,000	R10,000 & R15,000	R15,000 & R20,000
1,100	Agriculture	8.7%	9.1%	8.8%	8.3%
2,100	Coal mining	4.7%	2.8%	2.5%	2.2%
3,111	Slaughtering, preparing & preserving of meat	9.5%	12.3%	12.8%	12.7%
3,112	Dairy products	3.5%	4.2%	4.2%	4.0%
3,114	Canning, preserving & processing of fish, fish oil & fish meal	1.0%	1.5%	1.6%	1.5%
3,115	Vegetable & animal oils and fats	2.0%	2.3%	2.3%	2.1%
3,116	Grain mill products	23.3%	17.9%	16.3%	13.4%
3,118	Sugar factories & refineries	12.3%	9.3%	7.7%	6.1%
3,119	Cocoa , chocolate & sugar confectionary	0.1%	0.2%	0.2%	0.2%
3,121	Other food products	5.3%	5.1%	4.7%	4.4%
3,122	Prepared animal feeds	0.0%	0.0%	0.0%	0.1%
3,131	Distilleries and wineries	0.4%	0.5%	0.6%	0.5%
3,133	Malt liquors and malt	1.2%	1.1%	1.3%	1.4%
3,134	Soft drinks & carbonated waters	0.7%	1.1%	1.2%	1.2%
3,140	Tobacco products	4.3%	2.9%	2.7%	2.7%
3,211	Spinning, weaving & finishing of textiles	0.0%	0.0%	0.1%	0.1%
3,212	Made-up textile goods, except clothing	0.5%	1.1%	1.2%	1.3%
3,213	Garment & hosiery knitting mills	0.0%	0.0%	0.0%	0.0%
3,214	Carpets and rugs	0.1%	0.1%	0.1%	0.2%
3,216	Other knitting mills	0.4%	0.9%	1.0%	1.0%
3,219	Textiles, not elsewhere classified	0.0%	0.0%	0.0%	0.0%
3,220	Clothing, except footwear	5.0%	9.2%	10.0%	11.0%
3,233	Leather products & leather substitutes	0.0%	0.1%	0.1%	0.1%
3,240	Footwear	2.2%	2.7%	2.9%	3.2%
3,310	Wood and wood products, except furniture	3.0%	1.2%	0.9%	0.6%
3,320	Furniture	0.1%	0.5%	0.6%	1.0%
3,411	Pulp, paper and paper board	0.1%	0.2%	0.1%	0.2%
3,420	Printing and publishing	0.1%	0.3%	0.5%	0.6%
3,511	Industrial chemicals	0.0%	0.0%	0.0%	0.0%
3,522	Medicinal and pharmaceutical preparations	0.1%	0.2%	0.2%	0.3%
3,523	Soap & cleaning preparations, perfumes, cosmetics etc.	0.6%	0.6%	0.6%	0.6%
3,529	Other chemical products	1.6%	0.6%	0.5%	0.3%
3,530	Petroleum refineries & products of petroleum and coal	4.1%	1.9%	1.7%	1.7%
3,551	Tyres and tubes	0.1%	0.0%	0.0%	0.1%
3,560	Other plastic products	0.0%	0.1%	0.1%	0.1%
3,811	Cutlery, hand tools and general hardware	0.0%	0.0%	0.0%	0.0%
3,812	Furniture and fixtures primarily of metal	0.0%	0.0%	0.0%	0.0%
3,824	Special industrial machinery and equipment	0.0%	0.0%	0.0%	0.0%
3,825	Office, calculating and accounting machinery	0.0%	0.0%	0.0%	0.0%
3,831	Electrical industrial machinery and apparatus	0.0%	0.0%	0.0%	0.0%
3,832	Radio, television and communication equipment	0.1%	0.4%	0.6%	0.7%
3,833	Electrical appliances and housewares	0.3%	0.7%	1.1%	1.6%
3,839	Other electrical apparatus ans supplies	0.0%	0.0%	0.1%	0.1%
3,840	Motor vehicles	0.0%	0.0%	0.0%	0.1%
3,859	Other transport equipment	0.0%	0.0%	0.0%	0.0%
3,901	Jewellery and related articles	0.0%	0.2%	0.3%	0.3%
3,902	Other manufacturing industries	0.0%	0.0%	0.1%	0.0%
4,100	Electricity, gas and steam	0.6%	0.6%	0.7%	0.7%
4,200	Water supply	0.2%	0.2%	0.2%	0.2%
5,100	Building construction	0.0%	0.1%	0.2%	0.4%
6,200	Wholesale and retail trade and motor trade	0.0%	0.1%	0.1%	0.2%
6,300	Catering and accommodation services	0.1%	0.1%	0.1%	0.2%
7,100	Transport and storage	0.5%	0.7%	0.9%	1.0%
7,200	Communication	0.2%	0.5%	0.6%	0.8%
8,100	Financial institutions and insurance services	0.3%	1.7%	2.3%	3.9%
8,310	Real estate	0.8%	0.6%	0.5%	0.5%
9,330	Medicinal , dental and other health and veterinary services	0.4%	1.4%	1.7%	3.0%
9,700	Other services, profit seeking	0.0%	0.0%	0.1%	0.1%
9,800	Other services, non-profit seeking	1.2%	2.3%	2.6%	3.0%

Table 4-2

Percentage distribution of household expenditure

Male and Female headed households

	Annual household income between:	R1 & R5000		R5,000 & R10,000		R10,000 & R15,000		R15,000 & R20,000	
		Male	Female	Male	Female	Male	Female	Male	Female
1,100	Agriculture	8.5%	9.1%	8.7%	9.7%	8.6%	9.1%	8.0%	8.9%
2,100	Coal mining	4.7%	4.6%	2.8%	2.9%	2.3%	3.0%	2.2%	2.3%
3,111	Slaughtering, preparing & preserving of meat	10.0%	8.9%	12.4%	12.1%	12.9%	12.7%	12.7%	12.8%
3,112	Dairy products	3.4%	3.5%	4.2%	4.3%	4.2%	4.2%	3.9%	4.0%
3,114	Canning, preserving & processing of fish, fish oil & fish meal	0.9%	1.2%	1.5%	1.5%	1.6%	1.6%	1.4%	1.7%
3,115	Vegetable & animal oils and fats	1.9%	2.3%	2.2%	2.5%	2.2%	2.4%	2.0%	2.2%
3,116	Grain mill products	21.5%	25.5%	17.0%	19.3%	16.1%	16.8%	13.3%	13.6%
3,118	Sugar factories & refineries	12.0%	12.6%	9.0%	9.7%	7.7%	7.7%	6.0%	6.2%
3,119	Cocoa , chocolate & sugar confectionary	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
3,121	Other food products	5.3%	5.4%	5.1%	5.1%	4.7%	4.6%	4.3%	4.5%
3,122	Prepared animal feeds	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
3,131	Distilleries and wineries	0.6%	0.2%	0.8%	0.2%	0.9%	0.2%	0.7%	0.2%
3,133	Malt liquors and malt	1.8%	0.3%	1.5%	0.5%	1.8%	0.6%	1.6%	0.8%
3,134	Soft drinks & carbonated waters	0.8%	0.5%	1.2%	1.0%	1.3%	1.1%	1.2%	1.2%
3,140	Tobacco products	5.6%	2.7%	3.9%	1.3%	3.4%	1.6%	3.2%	1.8%
3,211	Spinning, weaving & finishing of textiles	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.1%	0.1%
3,212	Made-up textile goods, except clothing	0.7%	0.4%	1.1%	1.0%	1.2%	1.2%	1.2%	1.3%
3,213	Garment & hosiery knitting mills	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3,214	Carpets and rugs	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%
3,216	Other knitting mills	0.5%	0.3%	0.9%	0.9%	1.0%	1.0%	1.0%	1.0%
3,219	Textiles, not elsewhere classified	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3,220	Clothing, except footwear	4.9%	5.0%	9.2%	9.1%	9.9%	10.2%	10.9%	11.2%
3,233	Leather products & leather substitutes	0.0%	0.1%	0.1%	0.1%	0.1%	0.2%	0.1%	0.2%
3,240	Footwear	2.6%	1.7%	2.7%	2.7%	3.0%	2.8%	3.2%	3.1%
3,310	Wood and wood products, except furniture	3.1%	3.0%	1.3%	1.2%	1.0%	0.9%	0.6%	0.6%
3,320	Furniture	0.1%	0.1%	0.6%	0.3%	0.7%	0.4%	1.0%	1.1%
3,411	Pulp, paper and paper board	0.1%	0.1%	0.1%	0.2%	0.1%	0.2%	0.1%	0.2%
3,420	Printing and publishing	0.2%	0.1%	0.3%	0.3%	0.5%	0.5%	0.6%	0.6%
3,511	Industrial chemicals	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3,522	Medicinal and pharmaceutical preparations	0.0%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%
3,523	Soap & cleaning preparations, perfumes, cosmetics etc.	0.5%	0.7%	0.6%	0.6%	0.6%	0.6%	0.5%	0.6%
3,529	Other chemical products	1.7%	1.5%	0.6%	0.6%	0.5%	0.5%	0.3%	0.3%
3,530	Petroleum refineries & products of petroleum and coal	3.6%	4.6%	1.9%	2.0%	1.7%	1.7%	1.9%	1.4%
3,551	Tyres and tubes	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
3,560	Other plastic products	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
3,811	Cutlery, hand tools and general hardware	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
3,812	Furniture and fixtures primarily of metal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3,824	Special industrial machinery and equipment	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
3,825	Office, calculating and accounting machinery	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3,831	Electrical industrial machinery and apparatus	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3,832	Radio, television and communication equipment	0.1%	0.1%	0.5%	0.2%	0.5%	0.6%	0.8%	0.6%
3,833	Electrical appliances and housewares	0.3%	0.3%	0.7%	0.7%	1.1%	1.3%	1.5%	1.8%
3,839	Other electrical apparatus ans supplies	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%
3,840	Motor vehicles	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.2%
3,859	Other transport equipment	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3,901	Jewellery and related articles	0.1%	0.0%	0.2%	0.2%	0.2%	0.4%	0.3%	0.2%
3,902	Other manufacturing industries	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
4,100	Electricity, gas and steam	0.5%	0.7%	0.6%	0.7%	0.7%	0.7%	0.7%	0.7%
4,200	Water supply	0.2%	0.2%	0.1%	0.2%	0.1%	0.2%	0.2%	0.2%
5,100	Building construction	0.0%	0.0%	0.1%	0.2%	0.1%	0.6%	0.3%	0.4%
6,200	Wholesale and retail trade and motor trade	0.1%	0.0%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%
6,300	Catering and accommodation services	0.1%	0.0%	0.1%	0.1%	0.1%	0.1%	0.2%	0.1%
7,100	Transport and storage	0.5%	0.5%	0.6%	0.7%	0.9%	0.9%	1.0%	0.9%
7,200	Communication	0.1%	0.3%	0.5%	0.5%	0.6%	0.7%	0.7%	0.8%
8,100	Financial institutions and insurance services	0.3%	0.3%	2.0%	1.4%	2.3%	2.4%	4.1%	3.3%
8,310	Real estate	1.0%	0.6%	0.7%	0.5%	0.6%	0.4%	0.5%	0.4%
9,330	Medicinal , dental and other health and veterinary services	0.4%	0.5%	1.3%	1.6%	1.8%	1.5%	3.2%	2.6%
9,700	Other services, profit seeking	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%
9,800	Other services, non-profit seeking	1.0%	1.4%	1.9%	3.0%	2.1%	3.3%	2.5%	4.1%

Figure 4-1

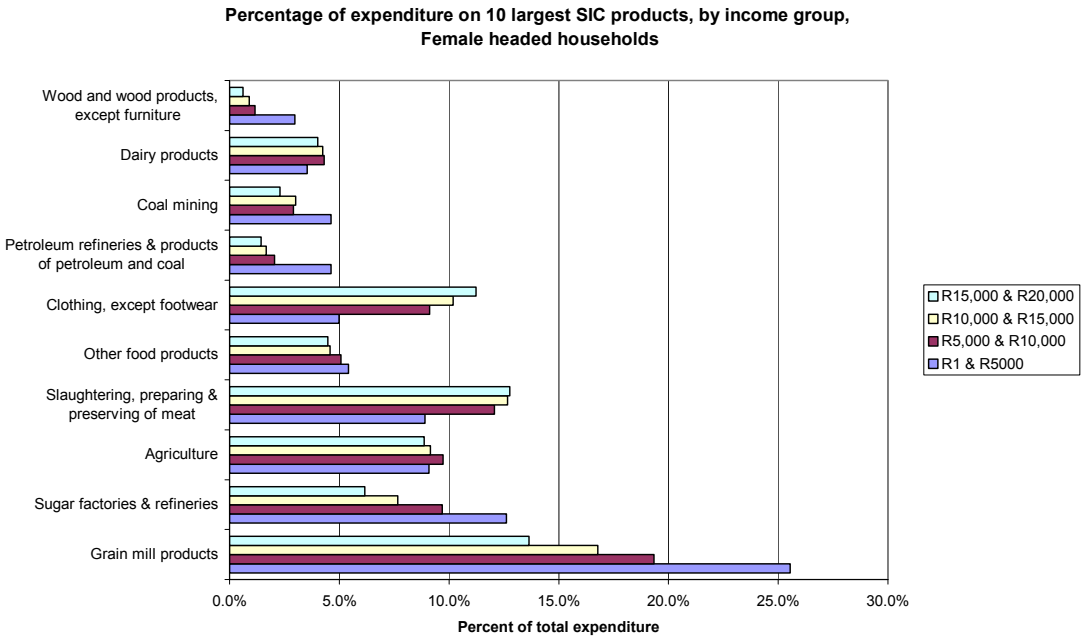
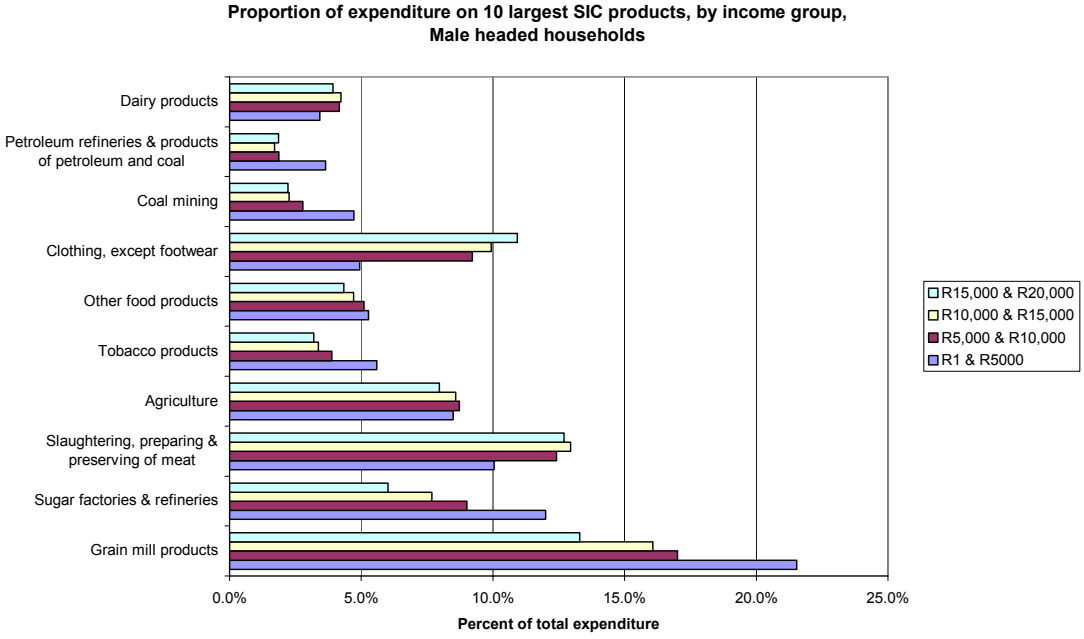


Figure 4-2



4.8 Figures 4.1 and 4.2 are intuitively appealing. In both male and female headed households grain mill products are important for the very poor and fall off rapidly as a proportion of household expenditure as incomes increase. The same holds true for sugar products, petroleum, wood, coal and mining products although the initial importance is not that great. In contrast, as incomes increase so too does the proportion of expenditure on clothing, footwear and meat.

4.9 The most interesting difference between male and female headed households is how tobacco products are the fifth most important expenditure item for very poor male headed households while they do not feature in the ten most important expenditure items for female headed households.

Changes in Expenditure Patterns

4.10 Tables 4.3, 4.4 and 4.5 record the rand value of differences in expenditure on the relevant SIC products for individual households between the various income categories. For example there is an annual R465 difference in spending on agricultural products between households with incomes of R1 – R5,000 and those earning R5,001 – R10,000.

4.11 Table 4.3 is for all households while Table 4.4 reports for female headed households and Table 4.5 for male headed households.

4.12 As with the section above, the level of detail is so great as to make casual interpretation very difficult. Figure 4.3 illustrates the ten greatest expenditure changes for the poorest households.

Table 4-3

Expenditure increases for a total expenditure increase of R5000

All households

SIC code	*Increases in annual household income from between: to between:*	R1 & R5000 R10,000 & R20,000	R10,000 & R20,000 R20,000 & R30,000	R20,000 & R30,000 R30,000 & R40,000	R30,000 & R40,000 R40,000 & R50,000
1,100	Agriculture	465	326	267	243
2,100	Coal mining	81	64	48	-138
3,111	Slaughtering, preparing & preserving of meat	704	617	501	429
3,112	Dairy products	235	153	182	139
3,114	Canning, preserving & processing of fish, fish oil & fish meal	84	65	92	72
3,115	Vegetable & animal oils and fats	113	77	62	46
3,116	Grain mill products	719	190	104	175
3,118	Sugar factories & refineries	321	38	23	58
3,119	Cocoa , chocolate & sugar confectionary	12	19	22	21
3,121	Other food products	212	175	151	136
3,122	Prepared animal feeds	1	8	9	6
3,131	Distilleries and wineries	27	17	30	33
3,133	Malt liquors and malt	78	76	15	45
3,134	Soft drinks & carbonated waters	74	62	70	47
3,140	Tobacco products	77	142	77	68
3,211	Spinning, weaving & finishing of textiles	4	8	8	8
3,212	Made-up textile goods, except clothing	73	70	92	89
3,213	Garment & hosiery knitting mills	1	2	2	1
3,214	Carpets and rugs	6	16	12	22
3,216	Other knitting mills	57	51	61	44
3,219	Textiles, not elsewhere classified	2	2	2	2
3,220	Clothing, except footwear	564	715	592	567
3,233	Leather products & leather substitutes	10	7	9	6
3,240	Footwear	155	192	142	147
3,310	Wood and wood products, except furniture	6	-27	-12	-7
3,320	Furniture	40	123	92	82
3,411	Pulp, paper and paper board	6	9	11	4
3,420	Printing and publishing	34	42	76	90
3,511	Industrial chemicals	0	1	-1	2
3,522	Medicinal and pharmaceutical preparations	14	33	29	37
3,523	Soap & cleaning preparations, perfumes, cosmetics etc.	29	25	30	19
3,529	Other chemical products	3	-7	-9	-3
3,530	Petroleum refineries & products of petroleum and coal	42	90	199	257
3,551	Tyres and tubes	0	11	16	26
3,560	Other plastic products	5	4	14	16
3,811	Cutlery, hand tools and general hardware	-1	1	5	1
3,812	Furniture and fixtures primarily of metal	2	1	2	3
3,824	Special industrial machinery and equipment	2	6	-1	3
3,825	Office, calculating and accounting machinery	1	2	-2	17
3,831	Electrical industrial machinery and apparatus	0	0	0	1
3,832	Radio, television and communication equipment	44	64	79	28
3,833	Electrical appliances and housewares	76	161	220	122
3,839	Other electrical apparatus ans supplies	4	6	7	2
3,840	Motor vehicles	4	24	52	125
3,859	Other transport equipment	0	4	2	4
3,901	Jewellery and related articles	23	13	20	32
3,902	Other manufacturing industries	5	0	6	14
4,100	Electricity, gas and steam	35	36	41	21
4,200	Water supply	7	9	9	6
5,100	Building construction	21	37	31	41
6,200	Wholesale and retail trade and motor trade	3	24	46	18
6,300	Catering and accommodation services	7	19	12	25
7,100	Transport and storage	56	66	53	41
7,200	Communication	41	63	66	48
8,100	Financial institutions and insurance services	155	445	516	798
8,310	Real estate	18	17	28	32
9,330	Medicinal , dental and other health and veterinary services	91	371	454	571
9,700	Other services, profit seeking	7	6	25	33
9,800	Other services, non-profit seeking	146	229	310	222

Table 4-4

Expenditure increases for a total expenditure increase of R5000

Female head of household

SIC code	*Increases in annual household income from between: to between:*	R1 & R5000 R10,000 & R20,000	R10,000 & R20,000 R20,000 & R30,000	R20,000 & R30,000 R30,000 & R40,000	R30,000 & R40,000 R40,000 & R50,000
1,100	Agriculture	462	393	222	177
2,100	Coal mining	138	-10	135	-213
3,111	Slaughtering, preparing & preserving of meat	697	656	460	337
3,112	Dairy products	243	160	180	88
3,114	Canning, preserving & processing of fish, fish oil & fish meal	79	105	39	54
3,115	Vegetable & animal oils and fats	112	74	51	13
3,116	Grain mill products	686	126	166	83
3,118	Sugar factories & refineries	326	41	26	-5
3,119	Cocoa , chocolate & sugar confectionary	10	20	28	18
3,121	Other food products	203	207	134	136
3,122	Prepared animal feeds	2	15	11	-2
3,131	Distilleries and wineries	5	21	45	24
3,133	Malt liquors and malt	36	81	21	-7
3,134	Soft drinks & carbonated waters	60	93	41	82
3,140	Tobacco products	71	131	67	58
3,211	Spinning, weaving & finishing of textiles	4	19	5	-2
3,212	Made-up textile goods, except clothing	75	88	118	88
3,213	Garment & hosiery knitting mills	2	0	2	-1
3,214	Carpets and rugs	7	20	3	18
3,216	Other knitting mills	61	37	91	49
3,219	Textiles, not elsewhere classified	2	2	2	4
3,220	Clothing, except footwear	545	747	752	748
3,233	Leather products & leather substitutes	13	7	12	12
3,240	Footwear	149	211	205	106
3,310	Wood and wood products, except furniture	5	-17	-14	-4
3,320	Furniture	26	162	79	218
3,411	Pulp, paper and paper board	11	7	13	-4
3,420	Printing and publishing	37	39	82	104
3,511	Industrial chemicals	0	1	0	-1
3,522	Medicinal and pharmaceutical preparations	17	33	20	27
3,523	Soap & cleaning preparations, perfumes, cosmetics etc.	28	26	33	21
3,529	Other chemical products	11	-15	-10	-5
3,530	Petroleum refineries & products of petroleum and coal	35	30	113	171
3,551	Tyres and tubes	-4	13	-1	11
3,560	Other plastic products	6	0	25	18
3,811	Cutlery, hand tools and general hardware	-4	1	12	-2
3,812	Furniture and fixtures primarily of metal	4	0	1	7
3,824	Special industrial machinery and equipment	3	10	-4	3
3,825	Office, calculating and accounting machinery	1	-3	1	8
3,831	Electrical industrial machinery and apparatus	0	0	0	1
3,832	Radio, television and communication equipment	55	30	130	15
3,833	Electrical appliances and housewares	92	184	291	74
3,839	Other electrical apparatus ans supplies	5	4	16	-6
3,840	Motor vehicles	1	34	47	139
3,859	Other transport equipment	0	3	-2	4
3,901	Jewellery and related articles	33	-8	13	72
3,902	Other manufacturing industries	8	-5	10	8
4,100	Electricity, gas and steam	34	38	30	34
4,200	Water supply	8	9	6	7
5,100	Building construction	51	-2	26	82
6,200	Wholesale and retail trade and motor trade	6	27	46	32
6,300	Catering and accommodation services	6	13	17	44
7,100	Transport and storage	48	56	99	29
7,200	Communication	47	66	43	65
8,100	Financial institutions and insurance services	177	325	518	941
8,310	Real estate	12	25	26	54
9,330	Medicinal , dental and other health and veterinary services	67	328	394	409
9,700	Other services, profit seeking	9	7	16	23
9,800	Other services, non-profit seeking	180	334	107	537

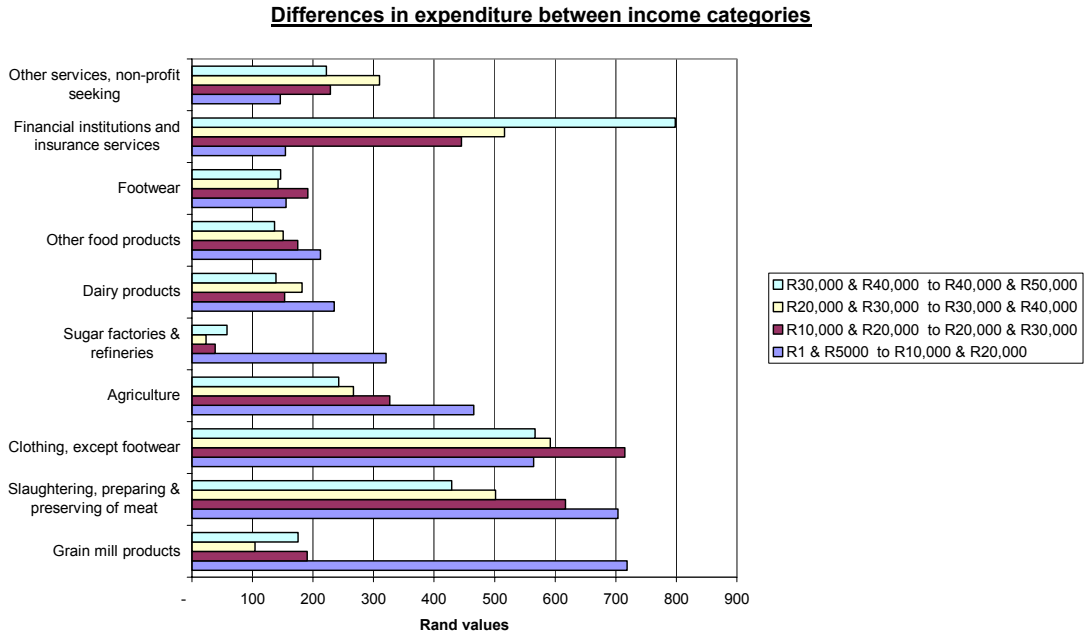
Table 4-5

Expenditure increases for a total expenditure increase of R5000

Male head of household

SIC code	*Increases in annual household income from between: to between:*	R1 & R5000 R10,000 & R20,000	R10,000 & R20,000 R20,000 & R30,000	R20,000 & R30,000 R30,000 & R40,000	R30,000 & R40,000 R40,000 & R50,000
1,100	Agriculture	464	302	292	270
2,100	Coal mining	36	105	14	-107
3,111	Slaughtering, preparing & preserving of meat	712	597	520	470
3,112	Dairy products	223	151	183	160
3,114	Canning, preserving & processing of fish, fish oil & fish meal	90	46	116	80
3,115	Vegetable & animal oils and fats	112	81	68	60
3,116	Grain mill products	720	235	85	213
3,118	Sugar factories & refineries	299	42	25	85
3,119	Cocoa , chocolate & sugar confectionary	13	19	19	22
3,121	Other food products	219	160	159	136
3,122	Prepared animal feeds	1	5	8	9
3,131	Distilleries and wineries	46	9	21	37
3,133	Malt liquors and malt	115	64	8	69
3,134	Soft drinks & carbonated waters	85	46	82	32
3,140	Tobacco products	91	132	73	75
3,211	Spinning, weaving & finishing of textiles	4	3	9	13
3,212	Made-up textile goods, except clothing	72	61	82	89
3,213	Garment & hosiery knitting mills	1	2	2	2
3,214	Carpets and rugs	5	14	15	24
3,216	Other knitting mills	55	57	48	41
3,219	Textiles, not elsewhere classified	2	2	2	2
3,220	Clothing, except footwear	593	700	528	485
3,233	Leather products & leather substitutes	8	8	7	4
3,240	Footwear	161	181	116	164
3,310	Wood and wood products, except furniture	7	-31	-11	-8
3,320	Furniture	52	102	97	23
3,411	Pulp, paper and paper board	3	11	10	8
3,420	Printing and publishing	33	44	73	84
3,511	Industrial chemicals	0	1	-1	2
3,522	Medicinal and pharmaceutical preparations	13	33	33	41
3,523	Soap & cleaning preparations, perfumes, cosmetics etc.	30	26	29	18
3,529	Other chemical products	-3	-3	-8	-2
3,530	Petroleum refineries & products of petroleum and coal	43	117	231	296
3,551	Tyres and tubes	4	9	23	33
3,560	Other plastic products	4	6	10	15
3,811	Cutlery, hand tools and general hardware	1	1	2	2
3,812	Furniture and fixtures primarily of metal	1	2	3	2
3,824	Special industrial machinery and equipment	1	3	0	3
3,825	Office, calculating and accounting machinery	2	4	-3	21
3,831	Electrical industrial machinery and apparatus	0	0	0	1
3,832	Radio, television and communication equipment	39	80	57	33
3,833	Electrical appliances and housewares	66	150	191	142
3,839	Other electrical apparatus ans supplies	4	6	3	5
3,840	Motor vehicles	6	19	54	120
3,859	Other transport equipment	1	4	3	4
3,901	Jewellery and related articles	16	24	23	15
3,902	Other manufacturing industries	3	2	5	17
4,100	Electricity, gas and steam	35	36	46	16
4,200	Water supply	6	10	11	6
5,100	Building construction	-1	60	33	24
6,200	Wholesale and retail trade and motor trade	1	23	46	12
6,300	Catering and accommodation services	7	21	9	17
7,100	Transport and storage	63	69	33	46
7,200	Communication	38	63	76	41
8,100	Financial institutions and insurance services	143	497	508	739
8,310	Real estate	26	13	29	22
9,330	Medicinal , dental and other health and veterinary services	104	385	472	644
9,700	Other services, profit seeking	5	6	28	38
9,800	Other services, non-profit seeking	120	189	403	86

Figure 4-3



4.13 Consistent with the above section, grain mill products, sugar products, other food products and agricultural, wood and coal products remain important expenditure items for lower income households. In contrast we see increased spending on meat, fuel, electrical appliances, clothing and dairy products for the higher income groups at the cost of grain mill, sugar and coal products.

Summary and conclusion

4.14 The Statistics South Africa October Income and Expenditure Survey was reconciled with the Standard Industrial Classification of Economic Activity and used to estimate expenditure differences in different income categories.

4.15 The resultant expenditure patterns are intuitively appealing. Grain mill products are important for the very poor and fall off rapidly as a proportion of household expenditure as incomes increase. The same holds true for sugar products, petroleum, wood, coal and mining products although the initial importance is not that great. In contrast, as incomes increase so too does the proportion of expenditure on clothing, footwear and meat.

4.16 The most interesting difference between male and female headed households is how tobacco products are the fifth most important expenditure item for very poor male headed households while they do not feature in the ten most important expenditure items for female headed households.

4.17 Differences in expenditure patterns across income categories were calculated with the focus being on the poor and very poor.

4.18 Here we find that grain mill products, sugar products, other food products and agricultural, wood and coal products remain important expenditure items for lower income households even with increases in income. In contrast we see increased expenditure on meat, fuel, electrical appliances, clothing and dairy products for the higher income groups at the cost of grain mill, sugar and coal products.

4.19 In conclusion we note the relative importance of wood and coal products for the lower income groups must indicate how important access is to natural sources and sellings points.

5 The Macro Economic Impact of changing Expenditure Patterns

Introduction

5.1 This section reports on the estimated macro economic impact of changes in expenditure patterns. We report on changes in GDP, increases in the number of indirect jobs, indirect increases in household income, resultant increases in personal income tax and company tax, as well as increases in imports.

5.2 As before we make a distinction between male and female headed households. In addition to this provincial differences are also reported on.

Description of methodology

5.3 This section of the research employs a standard impact analysis model and uses the results from section 4 as the input side of the model. An economic impact analysis traces spending through an economy and measures the cumulative effect of that spending. The economic region concerned can be defined as a commercial area, a town, a province or a country.

5.4 Economic impact analysis is based on conditional predictive models of the form: If stimulus A is given (e.g. an increase in wage income), then response B is likely to follow (e.g. and increase in expenditure). Generally accepted models are the income expenditure model, the economic base model (a derivative of the income expenditure model), and the input-output model.

5.5 Input-output analysis is one of the most widely used methods of applied economics. Leontief (1986) defines input-output analysis as a method of systematically quantifying the mutual interrelationships among the various sectors of an economic system. Input-output analysis measures the ripple effect of changes that originate in a given industry sector of the economy of a country, or in for the economy as a whole.

5.6 Input-output tables are compiled by Statistics SA and show input-output accounts that are grouped into categories: industries, households, government, inventory, investment and net exports. The input-output accounts are arranged in a transaction table, showing the purchases and sales among the industrial sectors in monetary units. The column records a sector's purchases from all other sectors, and its row records its sales to all other sectors. Total input and total output are always equal in the transaction table implying that supply and demand are equal.

5.7 The sales of each industry are divided up into intermediate and final demand. Intermediate demand is defined as sales to other industries while final demand is considered as; sales to households and government, investment, inventory and net exports. Total demand is the sum of intermediate demand and final demand.

5.8 Three assumptions allow the input-output table to be converted into an economic model.

- The ratio of inputs to outputs, in value terms, remains constant for each industry. This ratio is called a technical coefficient.

- Labour and capital are in unlimited supply.

- The level of household consumption is a constant proportion of income.

5.9 The concept of equilibrium is important in input-output analysis (i.e. a balance between supply and demand within each industry and between income and expenditure of the economy as a whole). In a base year, 1993 in this case, a state of equilibrium is assumed to exist in the economic system. Input-output analysis then introduces a change in final demand that unbalances the equilibrium. Simultaneous equations and matrix algebra are then used to find the new industry output values at which the system is once again in equilibrium.

5.10 Matrix algebra is used to derive a new matrix called the Leontief inverse. The column sums of the Leontief inverse are output multipliers that capture the multiple rounds of spending stimulated by the initial effect. Intermediate purchases are also generated and are known as the indirect effect. Additional household consumption expenditures are defined as the induced effect. **The sum of the direct, indirect and induced effects gives the total effect of a change in demand on the economy.**

5.11 Partial sectoral multipliers (showing direct & indirect effects) for economic variables such as household income, employment, imports, operating surplus and net indirect taxes can be calculated from the input-output tables. For example an income multiplier for a particular sector is obtained by multiplying the household income sector row of technical coefficients of income arising in each sector by the column of inter industry coefficients of the sector concerned.

5.12 Partial sectoral multipliers for any other primary input row may be calculated in exactly the same manner as shown in the example i.e. by multiplying the interdependence coefficients by the technical coefficients of the row concerned.

5.13 Partial employment multipliers can also be calculated but employment coefficients have to be calculated in order to do so. The employment coefficients are derived from sectoral employment figures contained in the Survey of Total Employment and Earnings produced by Statistics South Africa. The coefficient is usually expressed as persons employed per R1 of total output. To derive the partial sectoral multipliers the $(I-A)^{-1}$ matrix must first be converted into employment terms by means of the following formula:

$$(I-A)^{-1}_{Employment} = ((Employment/Production) \times I) \times (I-A)^{-1}$$

it follows then that : $\hat{X}_{Employment} = (I-A)^{-1}_{Employment} \times \hat{Y}$.

5.14 Owing to small numbers that result from this calculation the employment multipliers are stated in terms of employment created or lost per one million rands change in demand.

5.15 Partial sectoral GDP multipliers are generated in the same manner as those for employment but by converting the $(I-A)^{-1}$ matrix into GDP terms as follows:

$$(I-A)^{-1}_{GDP} = ((GDP/Production) \times I) \times (I-A)^{-1}$$

such that : $\hat{X}_{GDP} = (I-A)^{-1}_{GDP} \times \hat{Y}$.

5.16 The personal income tax and company tax multipliers are derived in a similar fashion to the employment and capital multipliers while the indirect tax multiplier is obtained in a similar manner to that obtained for household income.

5.17 Kuhn & Jansen (1997) derived sectoral multipliers for South Africa on a detailed sectoral basis for the following economic variables:

Gross domestic product;
Employment;
Household income;
Personal income tax;
Company tax;
Imports;
Capital;
Indirect taxes, and
Operating surplus.

5.18 Table 5.1 shows an aggregated Gross Domestic Product multiplier table as derived by Kuhn and Jansen (1997).

Table 5-1

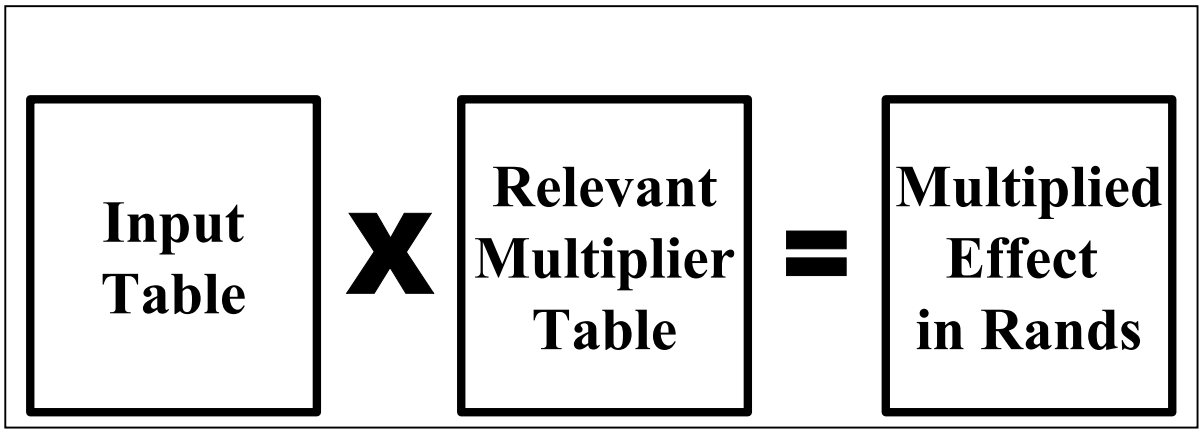
Sectoral GDP Multipliers for 1993 Owing to a R1 Change in Demand for the Sectors Product or Service (Source: Kuhn & Jansen, 1997).

Economic sector	Initial impact	First round impact	Direct impact	Indirect impact	Induced impact	Total impact
	A	B	C=(A+B)	D	E	(C+D+E)
Agriculture	0.51366	0.19258	0.70623	0.19121	0.43634	1.3338
Mining	0.63303	0.13222	0.76525	0.13363	0.60303	1.5019
Manufacturing	0.34445	0.23830	0.58275	0.22025	0.57067	1.3737
Electricity	0.53458	0.23133	0.76591	0.17454	0.44684	1.3873
Construction	0.32802	0.25305	0.58107	0.27286	0.74308	1.5970
Trade	0.55919	0.22229	0.78149	0.15024	0.76049	1.6922
Transport	0.59641	0.18119	0.77760	0.14379	0.68226	1.6037
Finance	0.71034	0.16486	0.87520	0.08804	0.56567	1.5289
Other	0.38564	0.28437	0.67000	0.21426	0.71114	1.5954
Total economy	0.5178	0.17940	0.69720	0.17600	0.5896	1.4627

5.19 The model consists of an input table, several multiplier tables and an output table. Figure 5.1 shows a schematic of the mechanics of the model. The input table presents the rand value associated with each component to the multiplier table.

Figure 5-1

Schematics of the Mechanics of the Impact Analysis Model



5.20 With the exception of the sectoral employment multipliers the sectoral multiplier tables show the direct, indirect and induced effects of a R1 change in final demand. The employment multiplier shows the direct, indirect and induced effects of a one million rands change in demand at 1993 prices.

5.21 The rand value of each component is then multiplied by the relevant (i.e. GDP, employment) sectoral multiplier to derive the direct, indirect, induced and total effects of a change in demand for that component. The individual sectoral changes are then summed to give the direct, indirect, induced and total economic effects of a change in demand for a particular size wheeled loader. The model presents the effects on GDP, household income and employment together with personal income tax, company tax, imports, indirect taxes and operating surplus effects in rand terms.

Table 5-2

Example of the Sectoral GDP multipliers

SIC_CODE	SECTOR	CHANGE IN GDP WITH R1 CHANGE IN FINAL DEMAND			
		Direct	Indirect	Induced	Total
3551	Tyres and tubes	0.56716	0.20397	0.54194	1.3131
3710	Iron and steel basic industries	0.67683	0.16665	0.58753	1.4310
3710	Iron and steel basic industries	0.67683	0.16665	0.58753	1.4310
3821	Engines and turbines	0.51712	0.16564	0.50540	1.1882
3829	Other non-electrical machinery and equipment	0.60982	0.18409	0.65451	1.4484
3829	Other non-electrical machinery and equipment	0.60982	0.18409	0.65451	1.4484
3829	Other non-electrical machinery and equipment	0.60982	0.18409	0.65451	1.4484
3831	Electrical industrial machinery and apparatus	0.69202	0.14851	0.76918	1.6097

5.22 Determining the employment effects requires an additional step whereby the prices are deflated to 1993 prices using total inflation figures for 1993 an estimated year 2000 CPI.

National Macro Economic Impact of changing Expenditure patterns

5.23 This section presents the results to the economic impact model that analysis the change in the macro economy following a change in final demand.

Aggregate impact

5.24 The national impact on various macroeconomic variables following a R5,000 change in expenditure as households move from one income category to the next is presented in Table 5.3.

Table 5-3

National macro economic impact
following a R5000 increase in expenditure

All households

Increases in annual household income					
from between:	R1 & R5000	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000
to between:	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000	R40,000 & R50,000
Contribution to GDP	6,984	7,108	7,318	7,365	7,481
Indirect contribution to household income	3,264	3,444	3,670	3,736	3,850
Indirect jobs created	0.26	0.25	0.25	0.24	0.24
Increases in income tax	605	637	686	706	739
Increases in company taxes	307	317	342	348	369
Increased in imports	1,280	1,337	1,352	1,371	1,369

5.25 The most comprehensive measure of economic impact is contribution to GDP. A R5,000 increase in expenditure will result in GDP increasing from between R7,000 and R7,500 depending on the income category in which the income change is occurring. Generally as the income level increases so to is there a slightly greater impact on the contribution to GDP (up to R50,000 per annum).

5.26 A similar pattern holds true for indirect contribution to household income following a change in expenditure. Here indirect incomes increase from between R3,200 and R3,900.

5.27 In contrast to income increase effects changes in expenditure in the lower income levels has a greater impact on the number of indirect jobs created. For every R5,000 of spending an estimated number of indirect jobs of 0.26 in the lowest income categories and 0.24 in the highest are being created.

5.28 In a similar vein there will be increases in total direct taxes (income and company tax) of between R900 and R1,100. Imports will increase by about R1,300.

Male and female head of household differences

5.29 Tables 5.4 and 5.5 present the same macro economic results as the section above, except in this case separated into female and male headed households.

5.30 Here there is nothing startling or dramatic to report. Changes in expenditure in both female and male headed households have generally similar results. In certain income categories contribution to GDP is slightly higher while in others it is slightly lower. At higher income levels female headed households generate

slightly higher additional income and slightly more employment than increases in male headed households.

Table 5-4

National macro economic impact
following a R5000 increase in expenditure

Female headed households

Increases in annual household income					
from between:	R1 & R5000	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000
to between:	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000	R40,000 & R50,000
Contribution to GDP	6,981	7,181	7,306	7,324	7,777
Indirect contribution to household income	3,257	3,540	3,645	3,717	4,168
Indirect jobs created	0.26	0.25	0.25	0.24	0.25
Increases in income tax	605	656	676	695	799
Increases in company taxes	306	315	335	344	366
Increased in imports	1,276	1,359	1,339	1,393	1,391

Table 5-5

National macro economic impact
following a R5000 increase in expenditure

Male headed households

Increases in annual household income					
from between:	R1 & R5000	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000
to between:	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000	R40,000 & R50,000
Contribution to GDP	6,989	7,059	7,324	7,381	7,354
Indirect contribution to household income	3,273	3,380	3,682	3,743	3,713
Indirect jobs created	0.26	0.25	0.25	0.24	0.24
Increases in income tax	605	624	691	710	714
Increases in company taxes	307	319	344	349	370
Increased in imports	1,284	1,321	1,359	1,362	1,359

Provincial differences

5.31 In calculating and presenting any differences that might occur to our macro economic variables as a result of the provincial location of the expenditure we were interested in how each of the income categories compared to the national average. These are presented in Tables 5.6 to 5.11.

5.32 It will be immediately evident that there are few provincial differences in expenditure patterns between households of the same income category. As before the most important differences are primarily between different income categories and, to a much lesser extent, between male and female headed households.

Table 5-6

Contribution to GDP

following a R5000 increase in final demand

Male head of household

Increases in annual household income					
from between:	R1 & R5000	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000
to between:	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000	R40,000 & R50,000
Eastern Cape	6,992	7,062	7,391	7,115	7,722
Free State	7,125	7,476	7,158	7,910	7,538
Gauteng	6,918	6,866	7,289	7,306	7,281
Kwazulu Natal	6,828	7,158	7,136	7,675	6,803
Mpumalanga	7,057	6,918	7,563	7,072	7,190
North West	7,022	6,987	7,671	7,278	8,287
Northern Cape	7,074	7,022	7,329	7,321	7,456
Northern Province	6,862	7,048	7,384	7,479	6,880
Western Cape	6,945	7,074	7,372	7,388	7,735
South Africa	6,989	7,059	7,324	7,381	7,354

Table 5-7

Contribution to GDP

following a R5000 increase in final demand

Female head of household

Increases in annual household income					
from between:	R1 & R5000	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000
to between:	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000	R40,000 & R50,000
Eastern Cape	6,969	7,391	7,274	7,463	9,489
Free State	7,059	7,361	7,778	7,450	8,085
Gauteng	6,920	7,672	7,037	7,642	7,320
Kwazulu Natal	6,954	7,091	7,305	7,194	7,360
Mpumalanga	6,967	7,158	7,062	7,275	7,534
North West	6,956	7,063	7,874	7,543	7,994
Northern Cape	6,947	7,097	6,947	7,283	7,187
Northern Province	6,996	7,157	7,613	6,974	7,339
Western Cape	7,075	7,072	7,275	7,170	7,821
South Africa	6,981	7,181	7,306	7,324	7,777

Table 5-8

Indirect job creation

Number of indirect jobs created following a R5000 increase in final demand

Male head of household

Increases in annual household income					
from between:	R1 & R5000	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000
to between:	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000	R40,000 & R50,000
Eastern Cape	0.26	0.25	0.26	0.22	0.26
Free State	0.26	0.24	0.24	0.26	0.25
Gauteng	0.27	0.28	0.23	0.26	0.24
Kwazulu Natal	0.25	0.26	0.25	0.25	0.23
Mpumalanga	0.25	0.24	0.25	0.23	0.20
North West	0.26	0.24	0.25	0.24	0.22
Northern Cape	0.25	0.26	0.24	0.25	0.22
Northern Province	0.25	0.26	0.24	0.25	0.22
Western Cape	0.26	0.25	0.25	0.24	0.25
South Africa	0.26	0.25	0.25	0.24	0.24

Table 5-9

Indirect job creation

Number of indirect jobs created following a R5000 increase in final demand

Female head of household

Increases in annual household income					
from between:	R1 & R5000	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000
to between:	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000	R40,000 & R50,000
Eastern Cape	0.26	0.26	0.25	0.24	0.29
Free State	0.25	0.24	0.27	0.24	0.26
Gauteng	0.24	0.30	0.25	0.26	0.24
Kwazulu Natal	0.26	0.26	0.26	0.24	0.25
Mpumalanga	0.25	0.26	0.25	0.25	0.22
North West	0.27	0.25	0.24	0.24	0.29
Northern Cape	0.26	0.25	0.25	0.22	0.25
Northern Province	0.26	0.24	0.26	0.24	0.25
Western Cape	0.27	0.27	0.24	0.25	0.24
South Africa	0.26	0.25	0.25	0.24	0.25

Table 5-10

Indirect increases in household income

following a R5000 increase in final demand

Male head of household

Increases in annual household income					
from between:	R1 & R5000	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000
to between:	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000	R40,000 & R50,000
Eastern Cape	3,299	3,342	3,815	3,451	4,048
Free State	3,437	3,720	3,488	4,293	3,933
Gauteng	3,156	3,344	3,592	3,702	3,648
Kwazulu Natal	3,049	3,550	3,454	3,975	3,253
Mpumalanga	3,399	3,232	3,975	3,449	3,419
North West	3,272	3,347	4,025	3,658	4,634
Northern Cape	3,340	3,363	3,620	3,756	3,787
Northern Province	3,142	3,384	3,875	3,912	3,329
Western Cape	3,215	3,395	3,702	3,765	4,005
South Africa	3,273	3,380	3,682	3,743	3,713

Table 5-11

Indirect increases in household income

following a R5000 increase in final demand

Female head of household

Increases in annual household income					
from between:	R1 & R5000	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000
to between:	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000	R40,000 & R50,000
Eastern Cape	3,260	3,797	3,570	3,939	5,766
Free State	3,354	3,686	4,155	3,837	4,363
Gauteng	3,172	4,219	3,361	3,975	3,788
Kwazulu Natal	3,221	3,428	3,692	3,554	3,730
Mpumalanga	3,241	3,535	3,410	3,701	3,953
North West	3,204	3,375	4,352	3,927	4,307
Northern Cape	3,251	3,400	3,304	3,644	3,564
Northern Province	3,273	3,659	3,919	3,423	3,746
Western Cape	3,249	3,361	3,628	3,509	4,268
South Africa	3,257	3,540	3,645	3,717	4,168

Summary and conclusions

5.33 This chapter takes the results from Chapter 4 and applies them to the national input output relationships. From this we determine the multiplied impact of changing expenditure patterns. This is done for nationally, provincially and for male and female headed households respectively.

5.34 The focus is on poor and very poor households. For example, if household income increased for those people with between R1 to R5,000 a year such that their income increased to between R5,000 and R10,000 a year (and there was a spending increase of R5,000) then, there would be an increase in GDP equal 1.40 times this increase, indirect household incomes would increase by 0.65 times this, 0.26 indirect jobs would be created, there would be increases in income tax, company tax and imports to the value of R605, R307 and R1,280 respectively.

5.35 At low income levels the recorded multipliers increase as income increase. Technically the cause is because of the different composition of expenditure at different income levels. The multiplier effects cannot measure any informal sector activity and regard all expenditure as formal. In reality much of the expenditure changes will be, initially at least, through the informal sector. In consequence we would expect higher indirect income and job multipliers than are being reported.

5.36 There are no startling differences between male and female headed households or between the various provinces.

6 The Macro Economic Impact of the Local Manufacture of Construction Equipment

6.1 The objective of this chapter is to determine the macro economic impact of the local production of construction machinery.

6.2 Bell Equipment, based in Richards Bay KwaZulu Natal, is a local manufacturer of construction equipment. Bell Equipment had, in principle, agreed to discuss the research project and assess their role in the investigation. Unfortunately, given the competitive nature of the industry, there was less enthusiasm once the degree of disclosure became clear. Other industry players such as Bateman Earth Moving Equipment, Barlows (Caterpillar) and Komatsu were approached with a similar lack of success.

6.3 Because of the above constraints the investigation focussed on one form of road construction equipment – the wheeled loader. This particular piece of equipment was selected as it is one of the most important areas where we are able to substitute labour and machines in road construction, on the one hand, and because it is an important locally made machine, on the other.

Description of Methodology

6.4 In the first instance the methodology is the identical to that applied in Section 5. The constituent capital parts of wheeled loaders were disaggregated into key components. These components were in turn reallocated to SIC code. The potential range of import component was estimated. Finally, using input output multipliers, the macro economic impact of the local production of a wheeled loader was estimated. The model calculated the corresponding direct, indirect, induced and total economic effects for each imported content scenario.

6.5 The model assumes that no local macro economic benefit is derived from an imported component. For example if tyres were imported, the rand value for tyres in the input spreadsheet was entered as zero, thereby nullifying any effects that a change in demand for tyres would have on the tyre manufacturing industry and on the South African economy as a whole.

Data

6.6 To accomplish the revised research objectives it was necessary to establish:

- The cost of wheeled loaders similar to those manufactured by Bell Equipment.
- An estimate of the cost breakdown of the above wheeled loaders i.e. the contribution of the various components to the total cost of a wheeled loader.
- An estimate of the probability of a particular component being imported.

6.7 Table 6.1 provides some key information on price and bucket capacity of a selection of wheeled loaders that are available in South Africa. Three makes of wheeled loader are reported in the table – Komatsu, Caterpillar and Bell. These range in size from 10 ton machines, to 13 ton machines and finally to the colossal

22 ton machines. The latter wheeled loader is normally used for mining operations and not for road construction. Buckets sizes vary from 1.4 m^3 in the 10 ton range to 2.1 m^3. (Bucket size is important for projecting the relative cost of labour and equipment-based construction).

6.8 Prices for 10 ton wheeled loaders range between R550,000 for the Caterpillar 914 to R716,000 for the Komatsu WA 250. The equivalent Bell (1204) retails at R619,306. The 13 ton machines cost between R731,000 for the Bell 1706 and R873,000 for the Komatsu WA 320. Very large wheeled loaders cost well over a million rand each. Bucket size appears to be important in pricing. Note how after adjusting for bucket size there is less price variation – the final column in Table 32 calculates the cost per m^3 of bucket. Here the Bell wheeled loaders are the most price competitive followed by the Komatsu range. Caterpillar trails a distant third.

Table 6-1

Machine type:	*Cost of new machine (Rm)*	Tonnage	*Bucket size M^3*	*Cost per M^3 of bucket (Rm)*
Komatsu WA 250	0.72	10.5	2.1	0.34
Komatsu WA 320	0.87	13.7	2.4	0.36
Komatsu WA 470	1.43	22.7	4.1	0.35
Caterpillar 914	0.55	10	1.4	0.39
Caterpillar 988	3.00	22	5	0.60
Bell 1204	0.62	10	1.9	0.33
Bell 1706	0.73	13	2.4	0.30
Bell 2208	1.17	22	3.5	0.33

Source: Manufacturers representatives

6.9 Table 6.2 provides an estimated capital cost breakdown for a typical wheeled loader in the 10 ton to 13 ton range. This was sourced from discussions with managers in strip mining operations in South Africa and Namibia. Hence it is expected that chassis and frame make up 9% of the total cost of a wheeled loader, the engine 15%, transmission 25%, and so on.

Table 6-2

Capital Cost Breakdown Estimate

Component	**Contribution to Capital Cost**
Tyres	10%
Chassis and Frame	9%
Bucket & Implements	5%
Engine	15%
Hydraulic Controls	12%
Transmission	25%
Drive Train	21%
Electrical	3%

6.10 The components listed in Table 6.2 were classified according to the fourth edition standard industry classification (SIC) codes using the guidelines set out in

Standard Industrial Classification of all Economic Activities (Central Statistical Services, 1993). Table 6.3 shows the classification of the components according to the fourth edition SIC codes.

Table 6-3

SIC Code Classification of the Components

Component	SIC Code	Activity
Tyres	3551	Manufacture of tyres and tubes
Chassis and Frame	3710	Iron and steel basic industries
Bucket & Implements	3710	Iron and steel basic industries
Engine	3821	Manufacture of engines and turbines
Hydraulic Controls	3829	All other machinery not elsewhere classified.
Transmission	3829	All other machinery not elsewhere classified.
Drive Train	3829	All other machinery not elsewhere classified.
Electrical	3831	Manufacture of electrical industrial machinery and apparatus.

6.11 The hydraulic controls, transmission and drive train components where allocated to activity 3829 as its sub classifications contain activities associated with driving elements and specialised parts for handling and lifting equipment.

6.12 Based on the above information we estimate the likely imported component of locally produced wheeled loaders. These are presented in Table 6.4. The table is divided into three parts.

- The second gives the contribution to capital cost.
- The third lists the estimated imported percentage of capital component. These are given as ‘Low’, ‘Expected’ and ‘High’. Discussions with manufactures’ representatives yielded information on the likely imported content of locally manufactured wheeled loaders. Tyres, transmission and drive train were in all likelihood imported. While several of the components making up the hydraulic controls could also be imported.
- The forth calculates the weighted import component of a wheeled loader and sums the total import component.

6.13 Table 6.4 reports that the possible range of the imported component of a locally produced wheeled loader will range from a minimum – and unlikely – 47.9% and a maximum – probably also unlikely – of 77%.

Table 6-4

Estimates of imported component of locally produced wheeled loaders

		Percentage imported			Imported component Weighted contribution to capital cost		
Component	*Contribution to Capital Cost*	Low	Expected	High	Low	Expected	High
Tyres	10%	80%	100%	100%	8.0%	10.0%	10.0%
Chassis and Frame	9%	0%	0%	20%	0.0%	0.0%	1.8%
Bucket & Implements	5%	0%	0%	25%	0.0%	0.0%	1.3%
Engine	15%	0%	0%	20%	0.0%	0.0%	3.0%
Hydraulic Controls	12%	80%	100%	100%	9.6%	12.0%	12.0%
Transmission	25%	70%	100%	100%	17.5%	25.0%	25.0%
Drive Train	21%	50%	100%	100%	10.5%	21.0%	21.0%
Electrical	3%	75%	100%	100%	2.3%	3.0%	3.0%
Imported component of capital cost					**47.9%**	**71.0%**	**77.1%**

The Macro Economic Impact of a locally manufactured Wheeled Loader

6.14 Tables 6.5 to 6.7 report on the macro economic impact of the domestic production of a wheeled loader. This exercise is reported for 10 ton, 13 ton and 22 ton wheeled loaders.

6.15 A ten ton wheeled loader that is fully manufactured in South Africa, and cost R600,000 to produce will have the effect of increasing GDP by nearly R840,000, increase total jobs by nearly 8 positions, generate indirect income to the value of R438,000. It will also generate total taxes to the value of R121,000. While the value of the contribution to GDP is important so too is the value of total imports. It will boost imports by nearly R200,000 even thought the wheeled loader is fully (and totally) locally produced.

6.16 Clearly as the imported component increases so the macro economic impact decreases. A wheeled loader that is 56% imported makes only a R361,000 contribution to GDP, creates 4.5 jobs and generates total imports to the value of R424,000.

Table 6-5

Macro economic impact of local production of 10 ton Wheeled Loader

Initial cost of R600,000	*Contribution to GDP*	*No. of jobs*	*Indirect income*	*Income tax*	*Company tax*	*Induced imports*	*Total imports*
Full Local Manufacture	838,946	7.98	438,566	85,819	35,537	199,620	199,620
22% imported	655,876	6.24	343,902	67,096	27,877	156,027	288,027
43% imported	473,375	4.52	245,879	47,637	19,871	114,503	372,503
56% imported	360,399	3.46	185,197	35,591	14,914	88,798	424,798
68% imported	256,113	2.48	129,184	24,472	10,339	65,071	473,071
83% imported	149,179	1.38	75,118	13,754	5,569	27,939	525,939
Fully Imported	-	-	-	-	-	-	600,000

6.17 A machine that has a high 68% imported component and costing R600,000 makes only a R256,000 contribution to GDP, creates 2.48 jobs and generates imports to the value of R473,000.

6.18 Tables 6.6 and 6.7 tell similar tales for 13 ton and 22 ton wheeled loaders.

Table 6-6

Macro economic impact of local production of 13 ton Wheeled Loader
Initial cost of R750,000

	Contribution to GDP	*No. of jobs*	*Indirect income*	*Income tax*	*Company tax*	*Induced imports*	*Total imports*
Full Local Manufacture	1,048,683	9.98	548,207	107,274	44,421	199,620	199,620
22% imported	819,845	7.80	429,878	83,870	34,846	156,027	321,027
43% imported	591,719	5.65	307,348	59,546	24,838	114,503	437,003
56% imported	450,499	4.32	231,497	44,489	18,643	88,798	508,798
68% imported	320,141	3.09	161,480	30,589	12,924	65,071	575,071
83% imported	186,474	1.73	93,898	17,193	6,961	27,939	650,439
Fully Imported	-	-	-	-	-	-	750,000

Table 6-7

Macro economic impact of local production of 22 ton Wheeled Loader
Initial cost of R1.2 million

	Contribution to GDP	*No. of jobs*	*Indirect income*	*Income tax*	*Company tax*	*Induced imports*	*Total imports*
Full Local Manufacture	1,677,892	15.97	877,132	171,639	71,073	199,620	199,620
22% imported	1,311,752	12.47	687,805	134,192	55,754	156,027	420,027
43% imported	946,751	9.04	491,757	95,274	39,741	114,503	630,503
56% imported	720,798	6.91	370,395	71,182	29,829	88,798	760,798
68% imported	512,226	4.95	258,368	48,943	20,678	65,071	881,071
83% imported	298,358	2.77	150,236	27,508	11,137	27,939	1,023,939
Fully Imported	-	-	-	-	-	-	1,200,000

Summary and conclusions

6.19 The objective of this chapter was to determine the macroeconomic impact of the local manufacturing of machinery used in the construction industry. This chapter was challenged by less than adequate information on the local content of South African manufactured construction equipment.

6.20 Prices for 10 ton wheeled loaders range between R550,000 for the Caterpillar 914 to R716,000 for the Komatsu WA 250. The equivalent Bell (1204) retails at R619,306. The 13 ton machines cost between R731,000 for the Bell 1706 and R873,000 for the Komatsu WA 320. Very large wheeled loaders cost well over a million rand each.

6.21 Bucket size appears to be important in pricing. If bucket capacity is taken into account the Bell wheeled loaders are the most price competitive followed by the Komatsu range. Caterpillar trails a distant third.

6.22 The imported component of locally manufactured wheeled loaders is estimated to be between an extreme minimum of 48% and maximum of 77%.

6.23 A locally produced wheeled loader with no import content and costing R600,000 will generate GDP of R838,000 and 7.98 jobs. A similar machine with a 43% import content will contribute R473,000 to GDP and generate 4.52 jobs. Finally a machine with a 68% import content will generate R256,000 in GDP and 2.48 jobs.

7 Labour-based and equipment-based construction: the net macroeconomic effect

7.1 This chapter assesses the relative macro economic costs and benefits resulting from the choice between labour-based and machine based construction.

7.2 It was clear from the outset that it would be difficult to fully model the complexities of equipment and labour-based construction methods. Different projects need different construction techniques and will result in different labour productivity, degree of management and equipment cost, and so on. Table 7.1 illustrates the experiences from the South African National Public Works Programme in the Western Cape. The table gives the cost of one day of work and the percentage of project cost accumulating to labour. It is clear that there is very wide deviation between project type and location, and the cost of creating and sustaining jobs.

Figure 7-1

The Labour Share of Public Works Projects
Western Cape 1998.

Project type	Cost of 1 day of work	Percent of cost to labour
Cleaning and greening	62	64
Community Based PWP	183	24
Community Based PWP/CEP	67	32
Working for water	40	73
Pilot project (Dept of Public Works)	229	13
Transport	749	11
National Economic Forum	150	22
Community centre	138	79
Roads	347	22
Water supply	186	22
School	38	51
Clinic	49	42
Greening	51	45
Recreation grounds	31	100

Source: SALDRU 1999 p200

7.3 It is well recognised that labour-based productivity increases are best achieved by using a programme approach (Phillips 1995, McCutcheon 1991 p168). Under a programme approach not only can we improve labour productivity over time through better supervision, management and tools but careful choice of technique can minimise financial costs. This type of analysis has been reported from Namibia and is reported in Table 7.2 below. The table reports on the total cost of road construction using equipment and labour-based methods and the on individual subcategories of work. Overall the Namibian experience shows that labour-based road construction can have lower financial costs than equipment-based. In addition the major savings are in 'Road formation and mass earthworks' and, to a less extent, in 'Gravel wearing course'.

Figure 7-2

Cost of Gravel Road Construction

Republic of Namibia, 1998.

	Average cost per km of road (N$)	
	Equipment based	Labour based
Total cost	606,047	392,648
Road formation & mass earthworks	355,008	67,051
Gravel wearing course	37,636	32,928
Borrow pits	16,481	27,028
Drains	970	2,866
Culverts	83,968	119,279
Ancillary roadworks	11,343	29,481
General	100,641	114,014

Source: Ministry of Works, Transport and Communication, Republic of Namibia Volume 3 Table 6 (Draft report).

7.4 In the light of these complexities only a single building operation has been analysed for the sake of estimating comparative macroeconomic effects of labour and equipment-based construction. This operation is earthwork excavation.

7.5 The methodology employed is spreadsheet modelling based on a realistic range of assumptions. The estimates start at a direct cost comparison and then consider the opportunity cost of the imported component of equipment-based construction. Finally we estimate the differences in the macro economic impact of labour-based and equipment-based construction.

Costs and Productivity

7.6 This subsection outlines the financial costs of labour-based construction methods and of equipment-based construction methods. For the purpose of this exercise we focus on the cost of one particular construction operation – the digging of earth (sand, small gravel, earth, etc). This particular operation was chosen for a number of reasons: it is one area where there can be clear substitution of equipment for labour; productivity levels are generally easy to measure; we have already investigated the equipment in question – the wheeled loader.

7.7 It is appreciated that it is not possible to generate a single cost and cost comparison as a result of at least five factors:

- Differential wage rates
- Varying productivity levels due to varying working conditions
- Variable labour overheads like supervision and tools
- Different bucket sizes on the wheeled loaders and variable load cycles
- Different hire rates for wheeled loaders.

7.8 All of these factors have been incorporated into the estimates below by using either know data or allowing a range of estimates based on sensible assumptions.

7.9 Table 7.3 estimates the cost of earthwork excavation using labour-based techniques under varying soil conditions (and hence productivity levels), different wage rates, supervision and tool costs. The table is arranged so that low wages are coupled with low supervision and tool costs while higher wages are coupled with higher supervision costs. This is done to allow us to estimate possible highest and lowest costs, not because of any assumed relationship.

Table 7-3

The Cost of Earthwork Excavation using labour based methods

Varying costs and ground conditions

Assumptions

Costs	Rands		
Daily wage [1]	25	33	50
Daily cost of supervision per 20 workers [2]	40	50	76
Monthly cost of tools per worker [3]	10	25	50
Labour productivity	M3 per day [4]		
Soft Ground	5.0	5.0	5.0
Normal Ground	3.0	3.0	3.0
Hard Ground	1.5	1.5	1.5

Estimated cost per M3 of earthwork excavation

	Rands		
Soft Ground	5.5	7.3	11.2
Normal Ground	9.2	12.2	18.7
Hard Ground	18.3	24.4	37.4

Notes: 1. More than half the public works projects in the Western Cape paid daily wages between R20 and R30 as determined as part of the SALDRU (1999) study. Unpublished data.. R33.20 is the minumum statutory wage for civil engineering in Northern Province (based on an 8 hour day)

2. Taylor & Bekabye 1999 p14 indicate that supervision of labour based projects in Uganda costs 3.4% of project budget. At the same time labour cost 44.4% of project budger. Hence supevision was 7.6% of labour cost. At R25 per day this translates into R38 per day, at R33 this equals R50 supervision and at R50 wage R76.

3. Guestimate

4. Average productivity rates as determined by McCutcheon (1991) and Namibia, Ministry of Works, Transport and Communication (2000) vol. 2 Table E.8 (draft report)

7.10 Three different daily wages were chosen – a social minimum, a statutory minimum and an urban/peri-urban wage. SALDRU recently completed an investigation into public works programmes in the Western Cape (SALDRU 1999). Unpublished data on wages from the SALDRU study has been released for the purposes of this investigation. SALDRU investigated 101 projects. Of these eleven paid R15 or less per day; thirty five paid between R16 and R29 and thirty three paid R30 a day. In other words, over 78% of public works projects investigated in the Western Cape paid daily wages of R 30 or less. The statutory minimum wage chose here is for the Northern Province.

- Under good soil conditions where construction labour earns R25 a day and there are low supervision and tool costs, it costs R5.6m^3 for earthwork excavation. As the wage rate and other costs increases so the cost of moving soil increases to R7.6 m^3 with a wage of R33 a day and R11.5 m^3 for a daily wage of R50 and high supervision and tool costs.

- Under normal working condition – daily wages of R33 result in costs of moving soil of R9.3m^3. With higher wages and associated costs the extraction costs increase to R12.7m^3 and R19.1 m^3 respectively.

- When adverse soil or other conditions result in low productivity, extraction costs can vary between R18.6m^3 and R38.2m^3.

7.11 Table 7.4 does for equipment-based construction what Table 7.3 does for labour-based construction. In order to reduce the degree of computation and increase the degree of accuracy the cost of equipment is based on hire rates rather than on new equipment costs. In this decision we take comfort from the fact that equipment hire companies are likely to factor all costs into hire rates such that hire rates do reflect the full cost of using equipment. The rates used are the so-called 'wet' rates meaning they include the cost of driver, fuel, oil, overheads, provision for depreciation, etc.

7.12 In the Western Cape hire rates were sourced for two types of caterpillars (the CAT 920 and CAT 988). The different hire companies had different size buckets on the CAT 920 and charged different hourly rates.

Table 7-4

Equipment Based Cost of Earth Moving for varying charges and ground conditions

Soft ground increases efficiency by:	**20%**			
Loader:	CAT 920	CAT 920	CAT 920	CAT 988
Bucket Capacity	1.2	1.9	2.0	5
Effective Bucket Capacity	90%	90%	90%	90%
Load Cycle Time (minutes)	2.5	3.0	3.2	3.2
Operator Efficiency	80%	80%	80%	80%
M^3 per hour	24.9	32.8	32.4	81.0
Rental cost per hour (ex. VAT)	150	165	180	500
Cost per M^3	6.0	5.0	5.6	6.2

Average ground - normal efficiency				
Loader:	CAT 920	CAT 920	CAT 920	CAT 988
Bucket Capacity	1.2	1.9	2.0	5
Effective Bucket Capacity	90%	90%	90%	90%
Load Cycle Time (minutes)	2.5	3.0	3.2	3.2
Operator Efficiency	80%	80%	80%	80%
M^3 per hour	20.7	27.4	27.0	67.5
Rental cost per hour (ex. VAT)	150	165	180	500
Cost per M^3	7.2	6.0	6.7	7.4

Hard ground decreases efficiency by:	**20%**			
Loader:	CAT 920	CAT 920	CAT 920	CAT 988
Bucket Capacity	1.2	1.9	2.0	5
Effective Bucket Capacity	90%	90%	90%	90%
Load Cycle Time (minutes)	2.5	3.0	3.2	3.2
Operator Efficiency	80%	80%	80%	80%
M^3 per hour	16.6	21.9	21.6	54.0
Rental cost per hour (ex. VAT)	150	165	180	500
Cost per M^3	9.0	7.5	8.3	9.3

.

7.13 The cost of equipment-based extraction is determined by the following factors:

- Hourly hire rate
- Bucket capacity
- Load cycle time
- Operator efficiency, and
- Soil and other operating conditions.

7.14 Table 7.4 allows for these factors and is divided into three parts – soft ground (easy working conditions), average ground with normal efficiency and hard ground where the going is heavy. Under these conditions and assumptions the cost of soil moving using the specified wheeled loaders will vary between R5m^3 under good soil conditions with an efficient operator and R9m^3 when ground conditions are heavy going and the operator is less than efficient.This conclusion must be tempered by two caveats:

- Continued use of labour-based methods will boost labour productivity and management productivity. Phillips reports on labour productivity in the building of the railways in Britain in the nineteenth century of 12 cubic metres per man-day for excavating and loading (Phillips 1995 p85).

- The wheeled loader rental rates are for use in and around Cape Town. Projects in rural and remote rural areas will face escalated transport cost.

7.15 We suspect that both of these factors are major contributors to the demonstrated financial superiority of labour-based methods to equipment-based methods for earthwork excavation in Namibia (Table 7.2).

7.16 We draw the following conclusion from Tables 7.3 and 7.4. On a direct cost comparison the digging of earth using labour techniques is more expensive than using a wheeled loader. It is only with daily wages of R25 and where the ground is relatively soft (or other factors boost labour productivity) that labour-based techniques compete on a cost basis. As working conditions deteriorate (harder ground, etc) so the cost of labour over equipment widens

Repayment of capital costs

7.17 One of the calculations that was made in this part of the investigation was to estimate how long it will take to repay the capital cost of a wheeled loader that is fully employed at some normal rate. This is an exercise in calculating opportunity cost where the wheeled loader is imported or partially imported. The results to this exercise are presented in Tables 7.5 and 7.6 below.

7.18 In order to make a comparative calculation the full period of capital amortisation we allow three factors to vary – the purchase price of the machine, the hourly hire rate and the hourly running costs. Based on the values shown in Table 7.5 a Komatsu 470 can repay its capital in just under two years of full time operation (based on a single daily shift and no overtime). The Caterpillar 988 takes the longest period of little under four years. The three Bell wheeled loaders take between 2.5 and 3.7 years.

Table 7-5

Capital cost amortisation

Machine type:	Cost of new machine (Rm)	Bucket size M^3	Hourly hire rate	Hourly running costs	No. of years to pay capital cost
Komatsu WA 250	0.72	2.1	160	70	4.30
Komatsu WA 320	0.87	2.4	250	85	2.86
Komatsu WA 470	1.43	4.1	500	98	1.92
Caterpillar 914	0.55	1.4	160	70	3.31
Caterpillar 988	3.00	5	500	88	3.94
Bell 1204	0.62	1.9	160	70	3.72
Bell 1706	0.73	2.4	250	85	2.40
Bell 2208	1.17	3.5	300	98	3.14

7.19 In Table 7.6 we estimate the number of years needed to repay the imported capital component of the Bell wheeled loaders. As before, the estimates are made for differing costs of production, hire rates and running costs. In addition we allow for four different import components – fully imported, 48% import component, 71% import component and a 77% import component.

7.20 Where Bell wheeled loaders are 48% imported and fully employed (single shift) the import share of the capital component can be repaid between 1.15 years and 1.78 years. A machine with an imported component as high as 77% will take between 1.85 years and 2.9 years to amortise the imported part of the capital cost.

Table 7-6

Capital cost ammortisation

Machine type:	Import component	Cost of new machine (Rm)	Hourly hire rate	Hourly running costs	No. of years to pay import component
Bell 1204	100%	0.62	160	70	3.72
Bell 1706	100%	0.73	250	85	2.40
Bell 2208	100%	1.17	300	98	3.14
Bell 1204	48%	0.62	160	70	1.78
Bell 1706	48%	0.73	250	85	1.15
Bell 2208	48%	1.17	300	98	1.50
Bell 1204	71%	0.62	160	70	2.64
Bell 1706	71%	0.73	250	85	1.70
Bell 2208	71%	1.17	300	98	2.23
Bell 1204	77%	0.62	160	70	2.87
Bell 1706	77%	0.73	250	85	1.85
Bell 2208	77%	1.17	300	98	2.42

The Macro Economic Impact of Equipment-based Construction

7.21 The final section of this chapter estimates the macro economic impact of equipment-based construction and compares it to the same impact from labour-based construction. As before we focus on only one operation – earthwork excavation – and on one piece of capital equipment – the wheeled loader.

7.22 In the calculations the imported component of both manufacturing and operating a wheeled loader had to be estimated. This allows two separate comparisons to be made between labour and equipment-based construction. The first is an imported adjusted cost per m^3. This is based on the proposition that expenditure

on imports is 'lost' to the economy and that true cost comparisons must take these losses into account. The second is the overall macro economic effects of separate construction techniques.

7.23 In preparation for the final section of this report we estimate the imported and local components for the purchase and running costs of a Bell 1204 wheeled loader. The estimates for a wheel loader with a 71% imported share is given in Table 7.7 and for that with a 48% import share in Table 7.8. As shown in the tables, these estimates are based on the following assumptions:

- Hourly hire rate of R150 per hour
- Five year capital write off period
- Driver (and therefore machine) works an 8 hour day with one hour for breaks
- Of the diesel and oil 80% of the value is imported
- Labour is half of spare and service charges and 80% of spares are imported
- All margins accumulate to the national economy. These margins are made up of profit and all other costs like overhead costs, costs of raising capital, etc.

7.24 Under these assumptions the wheeled loader will have an annual running cost (including capital repayment) of R277,000. If the loader has an initial 71% imported component, the total imported component of the running costs is a little over R154,000 and the local cost component totalling nearly R122,000.

Table 7-7

Local and Import costs of operating Wheeled Loader

Based on a Bell 1204 with 71% import component.

	Assumptions	*Cost/ cost per hour*	*Total revenue/ margin*	*Total annual cost*	*Imported component*	*Local component*
Total revenue	*Based on hire rate of R150 per hour*	150	277,200			
Capital cost Rm	*Five year amortisation*	619,300		123,860	87,941	35,919
Driver	*Works 7 hr day 22 day month*	20		36,960	-	36,960
Diesel & oil	*80% imported*	40		73,920	59,136	14,784
Spares & service	*Labour local, 80% spares imported*	10		18,480	7,392	11,088
Total margin	Revenue less direct costs		23,980	23,980		23,980
Total annual cost				**277,200**	**154,469**	**122,731**

Table 7-8

Local and Import costs of operating Wheeled Loader

Based on a Bell 1204 with 48% import component.

	Assumptions	*Cost/ cost per hour*	*Total revenue/ margin*	*Total annual cost*	*Imported component*	*Local component*
Total revenue	*Based on hire rate of R150 per hour*	150	277,200			
Capital cost	*Five year amortisation*	619,300		123,860	59,329	64,531
Driver	*Works 7 hr day 22 day month*	20		36,960	-	36,960
Diesel & oil	*80% imported*	40		73,920	59,136	14,784
Spares & service	*Labour local, 80% spares imported*	10		18,480	7,392	11,088
Total margin	Revenue less direct costs		23,980	23,980		23,980
Total annual cost				**277,200**	**125,857**	**151,343**

7.25 Table 7.8 tells the same tale as Table 7.7 but for a change in the imported component of the wheeled loader. It illustrates how a reduction in the imported component of a wheeled loader reduces total operating imports by a much smaller extent than the fall in the imported component. In this case the imported component of the wheeled loader falls by nearly 33%. The final fall in the imported component of the running costs is only 18% (from R154,000 to R125,000).

Table 7-9

Cost of Earth Moving based on local expenditure component

Labour Based	Daily wage	25	33	50
	Soil conditions	Soft	Soft	Soft
	Cost per M^3	**5.5**	**7.3**	**11.2**
	Daily wage	25	33	50
	Soil conditions	Normal	Normal	Normal
	Cost per M^3	**9.2**	**12.2**	**18.7**
	Daily wage	25	33	50
	Soil conditions	Difficult	Difficult	Difficult
	Cost per M^3	**18.3**	**24.4**	**37.4**
Equipment Based	Bell 1204 with 71% import component			
	Ground conditions	Soft	Normal	Difficult
	Total Cost per M^3	5.0	6.0	7.5
	Implicit local content cost M^3	**11.4**	**13.6**	**17.0**
	Bell 1204 with 48% import component			
	Ground conditions	Soft	Normal	Difficult
	Total Cost per M^3	5.0	6.0	7.5
	Implicit local content cost M^3	**9.2**	**11.0**	**13.8**

7.26 Table 7.9 uses the results from table 7.8 and calculates the implicit import 'losses'. It biases the equipment cost upwards because of this import loss. The

labour-based part of Table 7.9 is replicated from Table 7.3 for ease of comparison.

7.27 We draw some interesting conclusions from Table 7.9. After adjusting for the imported component of locally produced wheel loaders we find that labour-based construction can compete financially with equipment-based construction in soft ground conditions with daily wages at or lower than R33 even where only 48% of the wheeled loader is manufactured from imported components. Labour can compete with a 71% imported wheel loader in soft and normal soil conditions, although daily wages cannot be much more than R33. As before, increased labour productivity (due to learning and capacity building) and increase equipment cost (due to transport to remote areas) will both lower the relative cost of labour.

7.28 **The overall macro economic impact**.

7.29 In this final subsection the overall macro economic effects of equipment-based construction is estimated and compared to the macro economic from labour-based construction.

7.30 The methodology used is the same as that employed in chapters 5 and 6 where we allocate expenditure items to SIC codes and use the input output multipliers to estimate the overall macro economic effect. Table 7.10 is extracted from Table 7.8 and indicates the applicable SIC codes for each expenditure item. For the salary of the wheeled loader driver and for the margins accruing to the owner of the wheeled loader we employ the methodology used in chapter 5 – at the relevant income level the change in expenditure patterns are measured and the macro economic effect estimated.

7.31 In addition to this an assumption is made that the capital cost of the wheeled loader is written off over five years. Hence if there is any imported capital component this reduces the macro economic effects for the first five years only.

Table 7-10

Annual Macro Economic Impact of operating a locally manufactured Wheeled Loader

Assumptions table

Based on a Bell 1204 with 48% import component.

		Local component			*Income*
		First five years	*After five years*	*SIC code*	*category*
Capital cost	*Five year amortisation*	64,531	-	*3,824*	
Driver	*Works 7 hr day 22 day month*	36,960	36,960	*Final demand*	R40,000
Diesel & oil	*Full cost (multiplier measures impact)*	73,920	73,920	*3,530*	
Service	*100% local*	11,088	11,088	*3,830*	
Spares	*Full cost (multiplier measures impact)*	9,240	9,240	*3,824*	
Total margin	*Revenue less direct costs*	23,980	145,992	*Final demand*	R120,000
	Total	219,719	277,200		

7.32 Table 7.11 records the estimated macro economic impact of the operation of a wheeled loader with a 48% capital imported component and an annual operating cost of R277,200.

- In the first five years of operation the wheeled loader will make an annual contribution to GDP of R292,000, sustain 4.7 indirect jobs and result in annual imports to the value of R74,000.

- After five years when the capital cost is amortised the operation of the wheeled loader will contribute over R373,000 to GDP, sustain 9.6 full time indirect jobs and result in increased annual imports worth R87,000.

Table 7-11

Annual Macro Economic Impact of operating a locally manufactured Wheeled Loader

Output table

Based on a Bell 1204 with 48% import component and capital cost R619,000

	First five years			After five years		
	Contribution to GDP	*Jobs*	*Imports*	*Contribution to GDP*	*Jobs*	*Imports*
Capital cost	98,060	0.9	19,909			
Driver	54,360	1.8	10,047	54,360	1.8	10,047
Diesel & oil	74,601	0.6	31,691	74,601	0.6	31,691
Service	15,950	0.2	3,053	15,950	0.2	3,053
Spares	14,041	0.1	2,851	14,041	0.1	2,851
Total margin	35,269	1.1	6,518	214,721	6.9	39,684
Total	**292,280**	**4.7**	**74,068**	**373,672**	**9.6**	**87,325**

7.33 We are finally in a position to compare the macro economic effects of equipment-based construction in the form of a 48% imported Bell 1204 costing an annual R277,000 to operate to labour-based construction where the labour costs are R277,000 a year. Table 7.11 records the macro economic effect of a wheeled loader. Table 7.12 records the macro economic effect of labour-based construction.

7.34 At the lower income levels (where the national public works programme targets) a labour cost of R277,000 a year (where this increases household income by R5000 a year) will make a contribution to GDP of nearly R387,000, sustain 14 indirect jobs and generate imports of nearly R71,000. In contrast the annual operation of a wheeled loader will add R292,000 to GDP while imported capital is amortised and R373,000 after capital is amortised. Similarly 4.7 and 9.6 jobs will be sustained and imports will increase by R74,000 and R87,000.

Table 7-12

National macro economic impact

following a R5000 increase in expenditure per household for a total budget of R277,000

All households

Increases in annual household income					
from between:	R1 & R5000	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000
to between:	R5,000 & R10,000	R10,000 & R20,000	R20,000 & R30,000	R30,000 & R40,000	R40,000 & R50,000
Contribution to GDP	386,919	393,758	405,402	408,019	414,459
Indirect jobs created	14	14	14	13	13
Increased in imports	70,899	74,043	74,902	75,950	75,837

7.35 The single, inescapable fact that becomes clear from this comparison is that labour-based construction (in the form that it has been investigated in this report) has a more beneficial macro economic impact than does equipment-based construction (in the form of a 48% imported component wheeled loader).

Cost premiums

7.36 The terms of reference requested that the investigation explore potential cost premiums that might be attached to labour-based construction should we find (as we have) that the macro economic effects of labour-based construction exceed those of equipment-based construction.

7.37 Bearing in mind the cautions and reservations expressed in chapter 2 – theoretical foundations – we calculate cost premiums based on the pure macro economic effect – the contribution to GDP - of labour versus equipment-based construction techniques. These are reported in Table 7.13.

7.38 For a wheeled loader that has a 71% imported component where the capital value is amortised over five years a wage premium of 56% is estimated. In other words there can be cost differences of up to 56% between equipment and labour-based construction for the macro economic effects to indicate that labour-based construction is preferable to equipment-based. For a wheeled loader that has a 48% imported component the wage premium is calculated at 32%.

7.39 However when the capital value of the wheeled loader has been amortised the calculated wage premium falls to 4% in both cases.

Table 7-13

Labour Based Wage Premuim due to differential macro economic effects

	Contribution to GDP	*Wage premium*
Labour based construction	386,919	
Wheeled loader 71% import, first five years	248,803	56%
Wheeled loader 71% import, after five years	373,672	4%
Wheeled loader 48% import, first five years	292,280	32%
Wheeled loader 48% import, after five years	373,672	4%

7.40 A second method of calculating a wage premium was undertaken based directly on the import component of wheeled loaders and focussed on project specific costs rather than on the overall macro economic effects. This approach takes its starting point from the notion that spending on imports in spending that is 'lost' to the country. If this point is accepted then it follows that there can be a wage premium equal to the difference between actual operating costs and import imputed operating costs. The results to this exercise are reported in Table 7.14.

7.41 Table 7.4 is sourced from Tables 7.4 and 7.9 and indicates the cost differential that might be applied to labour for differing ground conditions. Hence on soft ground this cost premium can be as high as 36%, in average conditions 30% and in difficult terrain 24%.

Table 7-14

Cost differentials between operating cost and implicit local content cost

Costs per m^3 for a 10 ton wheeled loader with 1.9 m^3 bucket with 48% import component

	Actual cost	*Implicit local content cost*	*Cost differential*
Soft conditions	5.0	9.2	36%
Average conditions	6.0	11.0	30%
Difficult conditions	7.5	13.8	24%

Conclusion

7.42 It has been shown that the macro economic effects of a certain labour-based construction operation are greater than those of equipment-based construction. A case can therefore be made for a financial premium for the substitution of labour for equipment.

7.43 These results are sensitive to the imported component of locally manufactured construction equipment. The factor that most effects size of the financial premium is the degree to which the capital cost of the equipment has been amortised. Comparing the macro economic effect of labour against new earth moving equipment with a 71% imported component indicates that a labour premium of over 50% is justified. However once the capital cost is fully amortised then this premium falls to 4%. Similarly comparing labour to a machine with 48% import component calls for a 32% labour premium when the machine is new but again only 4% when fully amortised.

7.44 An alternative approach that looks at the direct cost of labour and equipment – rather than the macro economic effects – concludes that under certain conditions labour can compete directly with equipment and result in no cost premium. However as ground conditions deteriorate the cost premium between labour and equipment opens rapidly. These calculations are based on fixed estimates for labour productivity. The reality of labour-based projects is that labour productivity rates can be improved after training over the duration of the programme.

7.45 Alternatively, it can be shown that if we view the import component of locally manufactured earth moving equipment as ‘lost’ expenditure (lost to the country) then labour can compete financially with equipment under a much greater range of physical conditions and wages. This methodology yields a cost premium of 36% in soft conditions falling to 24% in difficult conditions.

8 Conclusion

8.1 What is the cost of building roads and dams and other useful assets? How many jobs can be created and what is the economic impact. Why not, in a country with desperate poverty and unemployment, use people rather than machines to build roads and dams? The roads and dams are needed, as is other infrastructure. The people are able and willing to work.

8.2 One of the answers is cost. Under extreme ground and climatic conditions machines can perform better than people. But not always. Whether people or machines perform better depends on costs, wages and productivity.

8.3 Experiences in Lesotho, Botswana *(McCutcheon, 1991)*, Uganda *(Taylor and Bekabye 1999)* and Namibia *(Ministry of Works, 2000)* all demonstrate that labour-based methods are financially viable for road building and rehabilitation.

8.4 In South Africa the known higher labour cost and the suspected lower capital cost conspire against the financial viability of labour-based methods. On the Ugandan road rehabilitation programme average daily wages were the rand equivalent of R7.80 a day (at R6.50 per US$) or R8.90 a day (at R7.40 per US$) *(calculated from Taylor and Bekabye 1999 p vi)*. In Uganda a daily wage of R26.00 or R29.60 (respectively at the two exchange rates) was the upper limit for the financial viability of labour intensive road rehabilitation.

8.5 In South Africa, in the Northern Province, for example, statutory minimum wages in civil engineering are currently R4.15 for rural areas and R5.25 for urban areas *(Government Gazette 12 November 1999)*. This is the daily equivalent of R33.20 and R42.00 respectively.

8.6 In contrast to these minimum wages, R20 to R30 a day was the most common wage paid on the labour intensive public works projects investigated by SALDRU (1999). It was found that there is a direct relationship between proximity to Cape Town and project wages. Some projects, one in Hout Bay for example, paid R50 a day, while at the other extreme projects in Prince Albert paid R15 a day and in Barrydale R12 a day.

8.7 In this investigation one construction task was analysed to determine the financial viability of labour-based methods under various working conditions and wages. The selected task was earthwork excavation and the chosen machine a wheeled loader. It is shown that labour-based earthwork excavation is financially viable at wages of less than R25 a day with easy ground conditions. The wheeled loader is financially superior as wages rise and/or ground conditions deteriorate.

8.8 Two factors are likely to mitigate this conclusion.

8.9 First, this analysis was conducted on the basis of equipment hire rates in the Cape Town metropolitan area. It is likely that equipment costs will be higher in rural and remote rural areas, if only because of transport costs. Under these conditions labour-based earthwork excavation will be viable financially under a greater range of ground types and at higher wages.

8.10 Second, the analysis did not take into account the potential for learning on the job and other labour productivity gains that can be achieved using a programme approach to project planning. Many commentators advocate the virtues of using a programme approach for labour-based methods and increasing labour usage in an incremental and financially viable manner.

8.11 A second strand of the investigation focussed on the macroeconomic consequences of the choice between labour and equipment-based methods with the objective of determining whether labour-based methods have macroeconomic advantages over using machines. In most developing countries there is little debate and labour-based methods have far greater macroeconomic benefits than equipment-based techniques. South Africa is different. South Africa makes its own earthmoving equipment, produces a substantial amount of its own oil, produces spare parts locally, and has specialised mechanics and technicians who are residents not contracted expatriates. Hence macroeconomic estimates were made for labour and equipment-based methods.

8.12 This part of the analysis was challenged by limited information on locally produced equipment and local content had to be estimated within bounded assumptions.

8.13 It is shown under these assumptions that labour-based methods have considerable macroeconomic advantages over equipment-based methods for both fully imported and locally made wheeled loaders. However this advantage becomes marginal when the capital cost of the wheeled loader has been amortised.

8.14 Better information on the cost of equipment might prove that there is no macroeconomic advantage to labour-based methods.

8.15 One of the most debated issues is the saving of foreign exchange. There is no doubt that a reduction in imported capital equipment will save on foreign exchange. This foreign exchange is then available to fund other kinds of imports or to be kept in the country and fund local production. It should be recognised that, if there are cost premiums involved, these savings on foreign exchange are at the expense of standards of living.

8.16 A policy conflict exists if it occurs that labour and equipment-based methods have similar macroeconomic effects and labour-based methods cost more. This conflict is between the promotion of a demonstrated comparative advantage in the production of construction equipment and the generation of economic empowerment and a less skewed distribution of income. In this case the choice of labour-based methods is based on the argument that equipment-based methods prevent the very poor from participating in the formal economy. They are therefore marginalised and disempowered. Hence labour-based methods have positive externalities that go beyond anything that can be measured using conventional macroeconomic techniques.

8.17 The overwhelming case that must be made for using labour-based methods is the contribution it will make to economic empowerment. Roads, dams and other infrastructure are good for the regional economy and will allow it to grow. Using labour-based methods will generate jobs and provide incomes further promoting the regional economy. Involving local communities will help in capacity building. Using small and emergent contractors will generate sustainable incomes and opportunities.

8.18 It is beyond the scope of this report to attempt to quantify the effects of labour-based methods on economic empowerment. In a similar vein we cannot quantify the cost of economically marginalising poor rural people by using equipment-based methods. Yet, even without being able to quantify these effects, we believe that there is an overwhelming case for labour-based methods. Not only will it help the poor but also it will contribute to the generation of sustained economic growth and empowerment.

8.19 This investigation has raised as many questions as it has answered and suggests several strands for future research. Some of this research can be facilitated by a systematic collection of data on labour intensive projects.

8.20 A more careful and detailed investigation is warranted into the local content of South African manufactured earth moving equipment. Also needed is a more detailed profile of the operating costs of different types of construction equipment and the local content component. What is the productivity rate of different types of equipment? How does, for example, bucket size and operator efficiency impact on productivity? How does the age of a machine impact on productivity. What is the relationship between equipment age and breakdowns? Do machines breakdown more often once capital costs are amortised and therefore have lower macroeconomic effects than estimated here?

8.21 A more focussed view is needed on wages paid in the construction industry. This study found many problems trying to capture a fine resolution on wages and how these vary by skill level and location. This could be done by a small survey, a straw poll or, possibly, through tender documentation. These should be compared to wages paid on the National Public Works Programme.

8.22 Labour productivity on projects must be carefully monitored and recorded. This is best achieved using choice of technique analysis. This will allow for an incremental approach to labour-based methods and give a full profile of labour productivity under a variety of working conditions. It will also allow for an analysis of labour productivity over time and better identification of the factors that promote labour productivity.

8.23 More attention must be paid to the secondary effects from the application of labour-based methods. This study made use of national surveys and input output relationships. A more fine-grained focus is needed and simply describing these effects is not enough. It is recommended that such a study establish a methodology that will carefully measure these secondary effects. The intention should be to have a better understanding of the impact of the National Public Works Programme on poverty alleviation and economic empowerment.

ENDS

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Appendix. Terms of Reference

Introduction and Background

1.1 The National Department of Public Works (NDPW) is working on a number of different fronts to reorient the construction sector. The most important underlying aim is to enhance and optimise employment in the construction process itself. In parallel with this, a supplementary aim is to provide targeted opportunities for emerging and previously disadvantaged contractors. The most prominent examples of initiatives completed or under way include:

- the National Public Works Programme (NPWP) launched in 1994/95 and comprising the Community-Based Public Works Programme (CBPWP) and a set of 12 pilot projects (testing the extent to which employment could be optimised whilst relying on mainstream technical consultants and contractors) ;

- the preparation and promotion of a set of Guidelines on Enhancing Employment Opportunities in the Delivery of Infrastructure Projects based on the experience gained and lessons learned through the pilot projects component of the NPWP,

- .the Strategic Projects Initiative (SPI) under which targeted procurement (TP) is aiming for the use of black prime contractors in the implementation of medium and large-scale projects on behalf of the NDPW.

- the Construction Industry Development Programme (CIDP), under which progress is being made towards the creation of a statutory Construction Industry Development Board (CIDB), and which also includes an Emerging Contractors Development Programme (ECDP).

1.2 In mid-1996, as these initiatives were at earlier stages of conception or implementation, the NPWP Branch of NDPW requested continuing advisory and research resources from the International Labour Office (ILO). The rationale was twofold. First, the NPWP Branch was eager to draw on international experience with respect to the use of labour-based methods in construction. Secondly (and complementary to this), the NDPW as a whole emphasised that employment creation through construction should not take precedence over (a) value for money to the public sector client, or (b) quality standards in construction outputs. It was these two concerns that led to the title of the current ILO project - Support to the Efficient Application of Labour-Based Methods in the Construction Sector.

The Concept of Efficiency in Value for Money

1.3 In exactly the same way as the calculation of an internal rate of return on investment, the concept of efficiency in value for money can also be analysed in both financial and economic terms.

1.4 In the production of physical outputs, construction is already relatively labour intensive. Certainly, in comparison with international trends towards mechanisation and robotisation in the manufacturing and appliance assembly industries, even the most equipment-intensive approaches to construction still rely on labour for some operations and activities. Nevertheless, in terms of

practical feasibility alone, labour can be fully substituted for equipment in the great majority of civil works projects. The original diamond mine at Kimberley is one of many domestic examples in the mining industry of the extent to which this was - hence (in practical terms) still is - possible.

1.5 The key issue, therefore, is not what the technical boundaries may be for the substitution of labour for equipment. It is rather a matter of (a) when it makes financial sense to do so, and (b) when the overall economic benefit of increased employment, may outweigh any financial premium paid for a given output.

Financial Limits for Labour Substitution

1.6 The financial boundary to the substitution of labour for equipment in construction can be set quite simply and clearly. It is that the enhancement of employment should not lead to a higher cost for a given construction output than for any other balance of labour and equipment inputs. The main issues at stake are the cost of labour per unit output and associated management and supervision costs.

1.7 As noted, it is practically feasible for the complete substitution of labour for mechanised equipment in most civil engineering projects. It is even possible to achieve adequate compaction of earth in roadwork's using labour-intensive methods. The problem is, however, that the amount of effort required - the work-day inputs, hence the costs - are usually so high that compaction by hand is rarely even considered.

1.8 In sum, the financial limit for substituting labour for equipment in construction is set by the lowest price for which the very same output could be produced by means of any other balance of factor inputs.

1.9 The 'Big Hole' at Kimberley involved the manual excavation of in the order of 60 million tonnes of solid rock. This was then carefully crushed and washed - again by hand - yielding about 45 grams of diamonds per thousand tonnes excavated.

Economic Limits for Labour Substitution

1.10 The economic limits for substituting labour for equipment are more complex. Not only are the economics themselves complicated, but labour substitution as a whole raises complex political issues, particularly in South Africa. There are two broad fronts on which economic valuation is required:

i) the economic benefit of incremental employment:

ii) the economic cost (or benefit) of using equipment.

The Economic Value of Employment

1.11 Keynesian theory emphasises that in conditions of high unemployment, hence broadly depressed demand for goods and services, employment-intensive construction programmes not only support the subsistence of those engaged. They have wider beneficial effects in two main directions:

i) the wages earned give increased purchasing power among the direct beneficiaries (and in turn, there are beneficial multiplier effects among the industries satisfying that demand);

ii) there are benefits to those sectors on which the construction industry itself relies - most notably the building materials industry.

1.12 In other words, there are both backward and forward economic linkages which may justify increased spending on labour in construction. The key question is what such linkages offer in terms of aggregate economic benefits? If the benefits of using more labour are strong, the government can take a policy decision. As a key client of the construction industry, it may decide to reap the economic advantage of employment by means of paying a financial premium for a construction process which substitutes more labour for equipment than the industry itself would otherwise choose.

Scope of Work

1.13 The scope of work is determined by the Terms of Reference: The research to be undertaken will aim to provide an answer to the following question:

- what - if any - financial premium per unit of expenditure on construction is economically justified for the substitution of labour for equipment?

1.14 The research will focus on the fronts of both labour and equipment, as indicated below.

Labour Economics

1.15 The starting point for work on this front will be to analyse regional differences in wage levels in relation to prevailing costs of living (in terms of a standard consumption 'basket'). What, if any, are the real differences in wage levels (or earning levels among those paid on a piece-work or task-work basis) in construction -say, for (a) a skilled bricklayer, and (b) an unskilled labourer - in Western Cape, Eastern Cape and Northern Provinces?

1.16 At the next level of detail, the research will explore the likely primary directions of expenditure among those employed under a labour-intensive policy framework set by the government. What shares of incremental income are likely to be spent on food, clothing, house improvements and the like?

1.17 The outcome of the analysis of labour economics will be to establish a multiplier effect for wages in construction.

Equipment Economics

1.18 Most developing countries are obliged to import any equipment to be used in the construction industry. As such, the economics of equipment utilisation are set by the opportunity cost of scarce foreign exchange. In South Africa, however, there is already a domestic construction equipment manufacturing industry. This is dominated by Bell Equipment, though other brands of equipment are imported. The research will establish the proportion of the value of demand for equipment that is satisfied by domestic manufacture versus imported items.

1.19 Of course, the domestic manufacture of construction also has employment benefits, albeit only a limited number of relatively high wage-earning opportunities. The research will calculate a multiplier effect for earnings in this

domestic industry to set against that of incremental employment in construction itself.

1.20 For imported equipment, the research will establish an opportunity cost for foreign exchange which could be used for other developmental purposes.

1.21 The choice of labour-based methods in construction is likely not only to depress overall demand for equipment but to shift the pattern of that reduced demand towards lighter and intermediate items. The research will gather data from Bell Equipment and any other major domestic equipment manufacturers on the share of labour in the cost of manufacturing different types and sizes of equipment. These data will be used to calculate the wage (and wage multiplier) effects of possible changes in the pattern of demand for construction equipment.

Methodology

1.22 The research is expected to involve three main stages:

i) conceptualisation, including the development of an economic modelling approach;

ii) the collection of data and information - both on the labour economics and equipment economics fronts:

iii) computer modelling of changes in the balance of labour and equipment factor inputs for construction and associated costs and benefits

1.23 The first stage will be of critical importance as it may affect the scope and nature of data collection and the time required for computer modelling. Accordingly, an Inception Report should be prepared on completion of the first stage of work, including detailed proposals of work required in the second and third stages.

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