Changing Factor Market Conditions in South Africa: The labour market - a sectoral description of the period 1970 - 1997¤

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ABSTRACT: This paper presents descriptive evidence on developments in South African sectoral labour markets over the 1970-97 period.
The paper reviews employment trends, in terms of both relative and absolute changes in the importance of economic sectors as employers over the 1970-97 period. For the manufacturing sector, changes in the skills compostion of the labour force is also examined. The paper continues by arguing that the evidence on the relative change in real labour renumeration and real labour productivity has to be taken seriously in any explanation of the poor employment creating capacity of the SA economy.
KEYWORDS: Labour Markets
JEL Classi…cation: 321,323,330

¤We would like to thank the Trade & Industry Policy Secretariat for making available the data that made this project possible. The South African Department of Finance and USAID provided …nancial assistance for the project. Views expressed in the paper are ours, and should not be taken to re‡ect in any way the views of the institutions that provided data and …nancial assistance for the project.

1 Introduction

Employment creation in the South African labour market has been less than healthy for some period of time. Understanding conditions within South African labour markets is crucial to developing a strategy designed to improve employment creation in the future.

The present paper is to be understood as a preliminary study of the determinants of labour demand within the South African economy.[1] The focus of the present paper is not to present estimation results, but to review economic sectoral panel data that will be employed in subsequent estimation. Given the problems frequently encountred with respect to South African labour data, it is useful to undertake preliminary exploratory data analysis, before more sophisticated estimation is attempted. In the discussion that follows we examine employment trends, real labour remuneration trends, and labour productivity trends. On the basis of the description we extend the analysis to a …rst tentative examination of the likely forms of interaction between employment, real labour remuneration, and labour productivity.

Two core …ndings emerge from the analysis. First, adherence to sound economic principles in price setting is the most conducive to long run sustainable employment creation. In short, the real wage matters in determining changing employment patterns. Moreover, the interplay between real labour productivity and the real wage is important in determining employment patterns. Since we do not engage in more than exploratory data analysis in this paper, such …ndings are suggestive hypotheses rather than de…nitive, and it remains for detailed econometric work to con…rm the …ndings.

It is also worth emphasizing that the descriptive evidence makes it abundantly clear that the inability of the South African economy to create employment is not new. It is an ingrained structural problem that has been with us at least since the 1970's.

This in turn carries with it two important implications. The …rst is that poor employment creation cannot be made the responsibility of any recent change in policy regime. The problem is deeper, and is likely to be structural. But second, and as a corollary, it also follows that fundamental structural labour market reform is required if employment creation is to take place in the South African economy. Fundamental supply side measures are likely to

[1] We were not able to …nd many precursors in the literature. See however Bhorat and Hodge (1999) and Smit (1999).

be required - and such reforms are never easy to accomplish.[2]

2 Employment

We begin with a brief description of developments in the employment of labour in South Africa, on a sectoral basis. The objective of the section is to identify the distribution of employment across sectors, and to shed some light on the most simple dynamics in the labour market: changes in employment patterns across sectors over the 1970-97 period. As a …nal step, we examine the skills composition of the labour force of sectors, and changes in the skills composition.

2.1 Employment: the relative importance of South African economic sectors in labour employment

Our …rst consideration is the relative importance of industrial sectors in the South African labour market. Figure 1 provides rankings of sectors in terms of employment levels, for the years 1970, 1980, 1990 and 1997.[3] The implication of the evidence is that the relative importance of sectors in the aggregate labour market has been subject to considerable change over the 1970-97 time period. Only 9 of 48 sectors show no change in their relative importance as employers in the market, and a number of sectors show very strong changes in their relative importance.

In particular, a number of sectors show very dramatic increases in terms of their relative importance as employers: Electrical Machinery, (increase in rank of +9), Business Services (+7), Finance & Insurance (+6), Plastic Products (+5), Coke & Re…ned Petroleum Products (+5), and Other Community, Social & Personal Services: Non-pro…t Seeking (+5) all show a rank improvement of 5 or greater. Moreover, for a number of these industries, the strongest change in relative importance in the labour market occurs after 1990, suggesting the possibility of a structural break in employment patterns during the course of the 1990's.

[2] The data used for this study was provided by the Trade & Industry Policy Secretariat (TIPS)

[3] Note that the evidence does not re‡ect yearly changes, given the use of a few benchmark time points.

	Rank 1970	Rank 1980	Rank 1990	Rank 1997	Change Rank 1970 - 97
Tobacco	1	1	1	1	0
Professional & Scientific Equipment	2	2	2	2	0
TV, Radio and Comms. Equip.	3	3	4	6	+3
Leather and Leather Products	4	4	5	3	-1
Coke and Refined Petroleum Products	5	5	9	10	+5
Water Supply	6	6	6	4	-2
Other Transport Equipment	7	8	7	7	0
Glass & Glass Products	8	7	3	5	-3
Basic Non-Ferrous Metals	9	11	10	8	-1
Other Industries	10	10	11	11	+1
Rubber Products	11	9	8	9	-2
Plastic Products	12	12	16	17	+5
Basic Chemicals	13	16	13	13	0
Beverages	14	13	14	14	0
Footwear	15	13	12	12	-3
Furniture	16	14	15	15	-1
Other Community, Social and Personal Services: Profit Seeking	17	18	18	18	+1
Printing, Publishing and Recorded Media	18	19	19	19	+1
Paper & Paper Products	19	17	17	16	-3
Electricity, Gas & Steam	20	24	25	22	+2
Electrical Machinery	21	23	22	30	+9
Medical, Dental & Other Health & Veterinary Services	22	22	21	26	+4
Other Chemicals and Man-Made Fibres	23	21	21	25	+1
Wood & Wood Products	24	20	20	25	+1
Motor Vehicles, Parts & Accessories	25	25	24	29	+4
Other Community, Social and Personal Services: Non-profit Seeking	26	26	29	31	+5
Basic Iron & Steel	27	31	27	20	-7
Communication	28	28	32	32	+4
Machinery & Equipment	29	29	28	27	-2
Other	30	32	33	33	+3
Non-Metallic Minerals	31	27	26	23	-8
Coal Mining	32	30	30	21	-11
Wearing Apparel	33	34	34	35	+2
Finance & Insurance	34	35	37	40	+6
Textiles	35	33	31	28	-7
Business Services	36	38	41	43	+7
Metal Products excl. Machinery	37	37	35	34	-3
Civil Engineering & Other Construction	38	36	36	36	-2
Food	39	39	38	39	0
Other Mining	40	40	39	40	0
Building Construction	41	41	40	37	-3
Catering & Accommodation Services	42	42	42	41	-1
Transport & Storage	43	43	43	42	-1
Gold & Uranium Ore Mining	44	44	44	44	0
Wholesale & Retail Trade	45	45	45	45	0
General Government	46	48	48	48	+2
Households (Domestic Servants)	47	46	46	46	-1
Agriculture, Forestry & Fishing	48	47	47	47	-1

Figure 1: Relative Importance of Economic Sectors in Terms of Employment

Some additional plausibility of the presence of a structural break in employment patterns during the course of the 1990's is gained from the fact that a number of sectors also showed a strong decrease in their relative importance in the labour market after 1990. Four sectors showed very strong relative decreases in relative employment shares (de…ned as a fall of 5 or greater in rank): Coal Mining (-11), Non-Metallic Minerals (-8), Basic Iron & Steel (-7) and Textiles (-7). For at least three of the four sectors (the exception is Non-Metallic Minerals) the strongest change occurs after 1990.

Again, therefore, the proposition that 1990 represents a signi…cant structural break in terms of employment is plausible certainly for some sectors of the South African economy, and may be plausible more generally for more or even all sectors in the South African economy.[4]

Finally, to con…rm that labour market conditions display some strong dynamics, we note that the rank correlation coe¢cient between the rank of each sector in 1970 and its rank in 1997 is 0.26. The implication con…rms what has already been noted: that the relative importance of sectors in the South African economy has been subject to some strong change over the 1970-97 period.

2.2 Employment: the absolute importance of South African economic sectors in employment

The relative importance of sectors in creating employment does not yet capture their absolute importance as employers within the South African economy.

The South African labour market is dominated by a relatively small number of sectors. The Agricultural sector, Government, Gold and Uranium Ore Mining and a number of service sectors provide the bulk of employment in the South African labour market. Moreover, an examination of consecutive time points demonstrates that of the large sectoral employers, only General Government showed very strong tendencies to grow over the 1970 - 1997 period, widening the di¤erential between itself and the next largest sectoral employer.

[4] The 1990's have seen a changed policy environment. But this relates to trade policy, macro stablization policy, reintegration into world capital markets, and changed labour market policy. It is therefore di¢cult to pinpoint the reasons for the structural break in employment patterns in the 1990's.

A particularly notable point is that for none of the sizeable employment-creating sectors in the South African economy has employment been growing particularly strongly - with the exception of the already identi…ed government sector. Moreover, this lack of employment creation is evident over the full 1970-97 period.

This evidence carries with it a number of core implications for any consideration of the South African labour market:

- while current South African debates concerning the employment creating capacity of economic growth in the economy are thus fully warranted in terms of the absolute level of employment in the economy, the evidence just cited also makes it clear that this is not a new development. Rather, economic growth in South Africa has been poor at generating additional employment ever since the 1970's.

- moreover, the relative importance of sectors as sources of employment in South Africa needs to be tempered by the realization that in absolute terms, changes in the four to …ve largest sectors in terms of employment will have a disproportionately large impact on the aggregate level of employment. By way of extension, strong changes in relative terms in the manufacturing sector will simply not translate into very signi…cant employment changes in aggregate in the short term, simply because manufacturing sectors individually do not contribute a large proportion of employment in the South African labour market.[5]

It follows that determinants of employment in the sectors creating the greatest employment, are likely to have a proportionately large impact on employment creation or destruction in the SA economy. Similarly,determinants of employment in small economic sectors (in employment terms) are likely to have relatively weak impacts on aggregate employment.

On the one hand this suggests that more detailed clinical sectoral studies would be useful in developing an understanding of employment trends in the

[5]One important caveat is in order here. This is that our data set treats the manufacturing sector at a relatively disaggregated level, while other sectors (services, mining) are treated at a relatively high level of aggregation. Thus the comparison across sectors is placing the manufacturing sector at a disadvantage. We recognize the problem. However, to our knowledge no more disaggregated data than that employed for this study is publicly available on employment trends in non-manufacturing sectors, and we therefore have no means of improving the precision of our comparison.

SA economy. But equally, given that the labour market in SA has historically faced substantial distortions,[6] low growth rates in aggregate employment may at least partially be an expression of a restructuring of the economy with employment growth taking place in sectors which are relatively small in absolute employment terms.

2.3 Employment: the relative rate of change of employment in South African economic sectors

Implicit in the absolute levels of employment already discussed and the changes in such levels of employment, are long term rates of change in employment. In Figure 2 we list the average growth rate in employment both for the 1970-90 period, and the 1990-97 period, given the already noted hypothesis that 1990 marks a signi…cant structural break in the South African labour market.

An examination of the average growth rates of employment listed in Figure 2 con…rms that 1990 might mark a structural break in the South African labour market. The average growth rate across all sectors (unadjusted for the total level of employment in each sector) over the full 1970-97 period was 1.22% per annum. By contrast, the average growth rate in employment (again across all sectors, unadjusted for absolute levels of employment) from 1970-90, and 1990-97 was 2.16% and -1.26% per annum respectively.

It is notable that the rate of employment creation across sectors has been below average annual population growth,[7] emphasizing the observation already made of the very low capacity of the South African economy to generate employment over a very protracted time frame since the 1970's. This is further evident from the fact that of the economic sectors with employment growth rates above 3% per annum (Plastic Products, Business Services, Television, Radio & etc., Finance & Insurance, Electrical Machinery, General Government) only one lies amongst the large employment creators in the economy (in absolute terms). Moreover, General Government is likely to be the single sector least susceptible to market pressures, such that the increase in employment in General Government cannot be taken to re‡ect improved

[6] Witness the impact of apartheid, and note again the prepondance of the state as employer in the economy.

[7] While population growth in South Africa is the subject of some controversy, one estimate places average annual population growth over the 1970-97 period at 2.38%. The estimates are based on Sadie's (1993) demographic data.

low rank indicates low growth rate	Growth 70-97	Growth 90-97	Growth 70-90	Rank 70-97	Rank 90-97	Rank 70-90
Tobacco	-1.43	-5.65	0.12	1	1	5
Glass & glass products	-0.96	-0.99	-0.95	2	24	1
Agriculture, forestry & fishing	-0.90	-0.90	-0.90	3	26	2
Transport & storage	-0.75	-4.57	0.61	4	6	6
Gold & uranium ore mining	-0.73	-5.07	0.79	5	3	8
Textiles	-0.71	-2.91	0.03	6	15	4
Households (domestic servants)	-0.57	-0.72	-0.52	7	28	3
Water supply	-0.55	-3.73	0.79	8	10	7
Coal mining	-0.35	-4.01	1.27	9	9	12
Basic iron & steel	-0.26	-4.51	1.44	10	7	14
Non-metallic minerals	-0.20	-2.92	0.83	11	14	9
Building construction	-0.09	-4.97	1.79	12	4	20
Leather & leather products	0.00	-5.56	2.08	13	2	24
Footwear	0.11	-4.74	1.64	14	5	17
Other mining	0.13	-2.96	1.52	15	13	15
Rubber products	0.34	-1.46	1.00	16	21	10
Metal products excluding machinery	0.63	-0.62	1.29	17	29	13
Machinery & equipment	0.64	-1.67	1.25	18	18	11
Catering & accommodation services	0.66	-1.62	1.96	19	19	21
Civil engineering & other construction	0.74	-1.56	1.68	20	20	18
Basic non-ferrous metals	0.75	-4.16	2.52	21	8	29
Wholesale & retail trade	1.10	-0.60	1.62	22	30	16
Other transport equipment	1.12	-1.73	2.19	23	17	26
Food	1.19	-1.04	2.08	24	23	23
Paper & paper products	1.44	0.03	2.09	25	33	25
Beverages	1.44	-2.86	2.85	26	16	37
Other chemicals & man-made fibres	1.55	-1.22	2.86	27	22	38
Wood & wood products	1.63	1.25	1.69	28	42	19
Professional & scientific equipment	1.76	-0.26	2.55	29	32	30
Communication	1.80	-0.75	2.75	30	27	31
Motor vehicles, parts & accessories	1.92	1.44	2.41	31	43	28
Printing, publishing & recorded media	1.92	0.99	2.39	32	39	27
Wearing apparel	2.00	0.99	2.06	33	40	22
Other industries	2.11	-0.34	3.03	34	31	39
Basic chemicals	2.13	-3.33	3.72	35	11	41
Other community, social & personal services: Profit seeking	2.22	0.39	2.84	36	37	33
Other	2.22	0.39	2.84	37	34	35
Medical, dental & other health & veterinary services	2.22	0.39	2.84	38	36	34
Other community, social & personal services: Non-profit seeking	2.22	0.39	2.84	39	35	36
Electricity, gas & steam	2.27	-3.29	4.17	40	12	43
Furniture	2.39	1.02	2.79	41	41	32
Coke & refined petroleum products	2.94	-0.99	4.24	42	25	44
General government	3.41	0.59	4.37	43	38	46
Electrical machinery	3.44	3.16	3.69	44	47	40
Finance & insurance	3.52	2.45	3.97	45	46	42
Television, radio & communication equipment	3.88	3.91	4.33	46	48	45
Business services	3.96	2.09	4.72	47	45	47
Plastic products	4.33	1.71	5.39	48	44	48

Figure 2: Formal Employment Average Growth Rate

economic or market-related employment prospects for labour. In sharp contrast, amongst the …ve sectors with the strongest proportional decrease in employment, three sectors lie amongst the top six employment creators in absolute terms.

The point generalizes. The correlation between the level of employment in 1970 and the average rate of change of employment by sector, is -0.27, indicating that the larger the contribution of a sector to employment in 1970, the less likely it was to experience strong growth in employment.[8] Subsequently the suggestion is that of a long-term restructuring of the South African economy. Employment patterns in the South African economy are subject to change, with a movement from traditional employment sectors to newly emerging and as yet relatively small sectors. Such restructuring takes time, particularly given the human capital de…cit of signi…cant portions of the South African population, which acts as an additional impediment to adequate labour mobility.

But what also requires recognition is that the 1990's appear to be particularly structurally distinct from preceding time periods. It has marked a protracted period of negative growth in employment of a number of economic sectors. Of the total of 48 sectors recorded, 31 had negative growth rates in employment over the course of the 1990's. By contrast, over 1970-90 only three sectors had negative employment growth rates. The di¤erence between the two sample periods may re‡ect the fact that the 1970-90 period contains a longer time run, over which cyclical variation is averaged out, while the data for the 1990's contain the impact of a severe recessionary period for the South African economy. On the other hand, seven years represents close on a full decade, and hence if the di¤erence in the two time periods is indeed an artifact of recessionary pressures, it represents at the very least a very long and severe recession in South African labour markets.

In addition, the di¤erence between the two time periods is su¢ciently marked to suggest that the South African labour market is indeed subject to a structural break in 1990. The correlation between average employment growth rates in economic sectors over the 1970-90 period and those over the 1990-97 period is only 0.49 - suggesting that the growth rate in employment

[8] The point can be made in a number of ways from the evidence. Thus the correlation between the rank of each sector in terms of employment in 1970 and its rank in terms of average annual employment growth over the 1970-97 period is -0.21. And the correlation between the rank of each sector in terms of employment in 1970 and its average employment growth over the 1970-97 period is -0.19. The picture is consistent in its import.

a sector maintained over the 1970-90 period constituted a relatively poor predictor of the growth rate it would maintain post-1990.

So much for the relatively gloomy general picture. But the general malaise of the labour market does hide the presence of some feel-good evidence. Of the non-government sectors with employment growth above 3%, three manufacturing industries and two service sectors have maintained very healthy growth rates.

Admittedly, in the case of Plastic Products and TV, Radio & Comms. Equipment, the sectors are small in absolute terms. But the remaining sectors are mid-ranking in absolute employment levels. Moreover, the fact that these sectors proved to be robust to the shock of the 1990's (the exception is the Plastic Products sector) that a¤ected so many other sectors in the economy negatively, suggests that these sectors may well be exploiting a comparative advantage of the South African economy, and there may be evidence of the restructuring of the South African labour market (and economy) already identi…ed as a potential feature of the 1990's.[9]

2.4 Employment: the volatility of employment and its growth for South African economic sectors

We conclude with a brief consideration of a last feature of employment in South Africa, the volatility of employment and the growth rate of employment by sector, sorted in ascending order of volatility of the average growth rate in employment from 1970 - 1997. Results are presented in Figure 3.

We note that volatility of the average growth rate of employment (as measured by the standard deviation of the growth rate of employment) bears no relation to the level of the growth rate in employment maintained by sectors in the South African economy. The correlation between the standard deviation of the growth rate in employment, and the average growth rate in employment is -0.04. While there are some exceptions, notably the TV, Radio & Comms. Equipment sector, strong growth in employment in the South African economy thus does not appear to have been achieved under conditions of strong ‡uctuations in employment growth. Once again, this

[9] Given a constant growth rate of 3% per annum, employment in each of these sectors would double in approximately 22 years. The implication is simply a reminder that small sectors can come to be large in time. Given appropriate conditions, such as buoyant demand conditions, such a transformation may accelerate even further.

	Employ70-97	Employ90-7	Growth70-97	Growth90-7
Households (domestic servants)	44419.40	14656.43	0.37	0.35
Medical, dental & other health & veterinary services	9604.24	1308.99	1.88	1.10
Other community, social & personal services: Profit seeking	7067.87	963.30	1.88	1.10
Other community, social & personal services: Non-profit seeking	12422.02	1693.04	1.88	1.10
Other	16606.40	2263.34	1.88	1.10
Agriculture, forestry & fishing	70673.15	22754.59	2.22	0.31
Printing, publishing & recorded media	6861.39	1351.20	2.36	2.43
Water supply	786.94	1352.39	2.54	2.79
Finance & insurance	41436.59	12826.43	2.61	2.03
Business services	60882.17	13970.97	2.62	1.99
Paper & paper products	6990.30	1654.90	2.73	2.94
Wholesale & retail trade	57147.01	18883.26	2.78	2.54
Food	19279.83	9425.45	2.84	3.05
Communication	15372.23	4181.81	2.90	2.35
Wood & wood products	6558.95	5357.51	3.25	5.20
General government	313631.24	26980.05	3.95	2.01
Rubber products	1115.15	982.16	3.98	4.67
Beverages	4428.76	2711.24	4.23	2.95
Other chemicals & man-made fibres	10096.15	3838.08	4.36	3.80
Glass & glass products	1530.18	573.90	4.68	5.15
Metal products excluding machinery	11722.99	5895.54	4.79	3.98
Transport & storage	64539.72	37136.91	4.82	4.00
Machinery & equipment	10129.44	4799.61	4.96	5.65
Wearing apparel	16038.30	10366.00	5.03	7.33
Tobacco	649.03	563.68	5.53	4.79
Electricity, gas & steam	14756.53	6427.42	5.55	3.76
Basic iron & steel	11718.48	10372.03	5.58	3.59
Non-metallic minerals	6234.83	8482.89	5.62	6.48
Basic non-ferrous metals	2867.76	2028.67	5.68	3.92
Other industries	3243.78	1612.54	5.72	7.10
Furniture	7994.61	2400.72	5.85	4.62
Plastic products	11423.38	3788.22	6.00	7.64
Motor vehicles, parts & accessories	11844.37	3436.39	6.08	4.98
Coke & refined petroleum products	4194.72	962.99	6.14	4.35
Catering & accommodation services	23122.13	17205.94	6.16	4.90
Footwear	3744.43	3153.01	6.35	5.83
Leather & leather products	1158.17	1733.91	6.36	4.86
Gold & uranium ore mining	59860.08	70002.09	6.98	8.48
Textiles	14488.77	12042.16	7.09	11.24
Electrical machinery	15186.54	7742.91	7.24	9.60
Basic chemicals	7716.99	1952.91	7.33	4.03
Coal mining	13389.20	11380.46	7.71	5.93
Other mining	19575.36	23103.48	7.83	5.71
Civil engineering & other construction	15988.02	10255.92	8.19	5.42
Building construction	34284.55	32486.93	8.78	2.86
Other transport equipment	1850.27	1983.29	8.90	11.49
Professional & scientific equipment	1200.99	604.46	9.15	10.86
Television, radio & communication equipment	2806.28	2074.35	10.84	14.10

Figure 3: Standard Deviations by Sector

evidence implies a process of long-run restructuring of the labour market, rather than the impact of fluctuating demand conditions - since high growth rates of either sign appear to be persistent rather than subject to sharp spurts of acceleration and deceleration.

Supporting evidence is given by the relatively high correlation between the standard deviation of growth in the 1970-90 period, and the standard deviation of growth in the 1990-97 period, with a correlation coefficient of 0.56. Thus the sectors that had unstable growth rates over the 1970-90 period, were also more likely to have had unstable rates during the course of the 1990's.

Restructuring of the South African labour market, to the extent that it is occurring at present, therefore does not appear to have had its strongest impact on the volatility or variability of employment growth. Rather, the impact of the restructuring has been on the distribution of employment across the economic sectors of the South African economy.

2.5 Skills composition of the South African labour force by sector

Lastly, for the manufacturing sectors we have data on the skills composition of the labour force at our disposal. The data provides information on the number of employees that fall into categories denoted "highly skilled", "skilled" and "unskilled". On the basis of this we compute what we shall henceforth term the "skills ratio", defined as:

$$SR = \frac{\text{Highly skilled} + \text{Skilled}}{\text{Unskilled}}$$

It thus represents the proportion of the labour force that is considered to be other than unskilled.

Figure 4 reports the changing skills composition of the manufacturing sectors from 1970 through 1997, and the average annual percentage growth in the skills ratio.

While all sectors with the exception of Footwear have shown improvements in the skills ratio from 1970 to 1997, there exist very strong differences between sectors in the strength of change of the skills ratio. Thus for seven sectors[10] (out of the 24 manufacturing sectors for which we have data) the

[10] In descending order: Wood, Other Manufacturing, Coal & Petroleum Products, Basic Chemicals, Leather, Food, Printing.

High Rank indicates a high skills ratio	1970	1980	1990	1997	Rnk70	Rnk80	Rnk90	Rnk97	ChgRan	AvgGrwth
Footwear	0.11	0.14	0.11	0.10	1	2	1	1	0	0.50
Leather	0.11	0.12	0.23	0.31	2	1	4	6	4	5.44
Textiles	0.13	0.18	0.21	0.22	3	3	3	2	-1	2.20
Glass	0.20	0.24	0.26	0.30	4	6	5	5	1	2.40
Non-Metallic Minerals	0.20	0.24	0.26	0.30	5	7	6	4	-1	2.40
Clothing	0.23	0.22	0.19	0.27	6	4	2	3	-3	1.10
Food	0.25	0.32	0.69	0.82	7	9	15	16	9	5.12
Wood	0.25	0.23	0.57	0.43	8	5	11	8	0	9.82
Rubber & Plastic	0.29	0.31	0.35	0.40	9	8	7	7	-2	1.52
Fabricated Metals	0.32	0.39	0.51	0.51	10	11	10	9	-1	3.71
Paper & Paper Prods	0.33	0.39	0.49	0.51	11	10	8	10	-1	3.75
Beverage	0.36	0.45	0.63	0.87	12	12	12	17	5	3.68
Basic Iron & Steel	0.39	0.56	0.70	0.64	13	17	16	15	2	2.82
Basic Non-Ferr Metals	0.39	0.56	0.70	0.64	14	18	17	14	0	2.82
Electrical Machinery	0.44	0.54	0.63	0.58	15	14	13	12	-3	1.45
Prof & Scient Equip	0.44	0.54	0.63	0.58	16	15	14	13	-3	1.45
Furniture	0.47	0.56	0.49	0.52	17	16	9	11	-6	1.99
Other Manuf	0.47	0.84	0.73	1.31	18	23	18	21	3	5.83
Basic Chemicals	0.49	0.62	1.37	1.43	19	19	22	22	3	5.62
Coal & Petrol Prods	0.49	0.62	1.37	1.43	20	20	23	23	3	5.62
Other Chemicals	0.52	0.71	0.95	1.17	21	21	21	20	-1	3.07
Motor Vehs & Parts	0.54	0.53	0.80	0.89	22	13	19	18	-4	1.98
Machinery	0.71	0.72	0.85	1.09	23	22	20	19	-4	2.03
Printing	1.32	1.49	2.56	3.50	24	24	24	24	0	4.41

Figure 4: Labour Productivity

growth rate of the skills ratio lay above 4% per annum on average over the 1970 - 1997 period, suggesting strong human capital augmentation in these sectors.

For all of the sectors with strong skills augmentation, with the exception of Wood and Printing, strong growth in the skills ratio was accompanied by improvements in the relative skills intensity of production relative to other manufacturing sectors.[11] Thus the rank of Food (+9), Leather (+4), Basic Chemicals (+3), Coal & Petroleum Products (+3), and Other Manufacturing (+3) all increased over the 1970 - 97 time frame. Beverages (+5) also showed a strong increase in relative skills intensity.

Where the skills ratio grew by 2% or less on average per annum, sectors tended to become less skills intensive over time relative to other manufacturing sectors. Thus Machinery (-4), Furniture (-6), Motor Vehicles & Parts (-4), Rubber & Plastic Products (-2), Professional & Scienti…c Equipment (-3), Electrical Machinery (-3), and Clothing (-3) all lost ranking relative to other manufacturing sectors. (While Footwear had an even lower growth rate in the skills ratio, it was unable to lose ranking since it consistently remains the bottom ranked sector in terms of skills composition, except for a brief period during the 1970's.)

It is also worth noting that while for most sectors the unskilled component of the work force constitutes the majority, by 1997 a number of sectors have more skilled and highly skilled workers than unskilled workers. Thus the skills ratio of Machinery (1.09), Other Chemicals (1.17), Other Manufacturing (1.31), Basic Chemicals (1.43), Coal & Petroleum Products (1.43) and Printing (3.50) all indicate relatively skills intensive production. Given the preponderance of the various chemicals sectors in this list, the …nding is perhaps not surprising.

Nevertheless, a consideration of the average of the skills ratio across all manufacturing sectors demonstrates that the skills intensity of production in manufacturing is steadily rising over time. Even on average, by 1997 the ratio had reached 0.78, suggesting that skilled and unskilled labour may soon constitute an equal proportion of the labour force.

[11] In the case of Printing, because the sector is top-ranked in terms of skills-intensity over the full sample period.

3 Real Labour Remuneration

In terms of economic analysis, changes of quantity in any good, including labour, are at least potentially associated with changes in its price. As a consequence, we now turn to the issue of real labour remuneration, and its potential link to employment patterns.

3.1 Relative Real Labour Remuneration by Economic Sector

In contrast with employment levels, relative real labour remuneration by economic sector shows greater stability over the full 1970-97 period. In Figure 5 we report the rank of economic sectors in terms of real remuneration per labourer, computed as:

Real wage bill=employment

Again, there are strong changes in rank across sectors - indeed, the magnitude of such changes are stronger than they are for the rank of employment levels for a number of sectors (see Figure 1) However, on average relative remuneration by sector remains more constant than does employment, with the correlation between the rank of real labour remuneration in 1970 and the rank in 1998 being +0.52 (compare this with the corresponding correlation for employment of +0.26).[12]

Nevertheless, as already noted the data does indicate that some strong changes in relative labour remuneration are present. In particular, nine sectors increased their real per employee remuneration ranking by more than ten placings, indicating improving relative pay in those sectors relative to other economic sectors in South Africa. By contrast, eleven sectors dropped by more than ten rankings in terms of real per employee remuneration, indicating worsening relative pay in those sectors relative to other economic sectors.

The sectors showing strong improved rankings were: Other Chemicals (+35), Other Industries (+28), Coal Mining (+24), Other Mining (+21), Water Supply (+20), Basic Non-Ferrous Metals (+20), Transport & Storage (+18), Glass & Glass Products (+13) and Electricity, Gas & Steam (+11).

[12] Of course relatively constant relative real labour remuneration is consistent with strong changes in absolute real labour remuneration.

(Low rank indicates low real labour remuneration)	Rank 1970	Rank 1980	Rank 1990	Rank 1998	Chg Rank 1970-98	Avg Grwth	StdDev Grwth
Agriculture, forestry & fishing	1	1	1	2	1	3.68	7.97
Households	2	2	2	1	-1	1.50	4.97
Other	3	4	4	6	3	4.18	9.90
Catering & accommodation services	4	3	3	3	-1	2.67	11.18
Other mining	5	7	15	26	21	5.41	16.56
Wearing apparel	6	10	9	9	3	1.69	9.47
Medical, dental & other health & veterinary services	7	6	13	14	7	3.22	9.98
Coal mining	8	8	27	32	24	5.73	18.91
Other chemicals & man-made fibres	9	43	35	44	35	6.03	12.51
Food	10	12	10	11	1	1.68	5.69
Plastic products	11	22	18	15	4	2.75	10.85
Civil engineering & other construction	12	33	12	12	0	1.79	10.11
Wood & wood products	13	15	5	5	-8	-0.64	6.80
Textiles	14	17	6	17	3	2.56	12.15
Other industries	15	9	31	43	28	6.22	21.05
Water supply	16	24	25	36	20	4.84	18.44
Furniture	17	18	19	8	-9	-0.27	9.75
Other community,social&personal services:Non-profit	18	14	22	23	5	1.72	5.16
Non-metallic minerals	19	25	14	18	-1	1.43	8.48
Electrical machinery	20	37	20	29	9	3.07	13.32
Beverages	21	34	38	24	3	1.71	8.67
Transport & storage	22	23	28	40	18	3.50	6.66
Footwear	23	13	8	4	-19	-2.66	9.23
Professional & scientific equipment	24	11	21	13	-11	1.62	19.91
Leather & leather products	25	16	7	10	-15	-0.27	9.37
Communication	26	20	29	31	5	1.87	6.27
Basic non-ferrous metals	27	31	26	47	20	3.22	9.61
Rubber products	28	27	34	35	7	2.05	8.31
Glass & glass products	29	26	32	42	13	3.26	11.06
Other community, social & personal services: Profit	30	29	33	25	-5	0.63	4.51
Wholesale & retail trade	31	35	40	34	3	1.41	5.08
Gold & uranium ore mining	32	5	11	27	-5	2.49	19.16
Metal products excluding machinery	33	38	30	19	-14	-0.30	7.11
Paper & paper products	34	39	24	28	-6	1.05	10.53
Electricity, gas & steam	35	30	42	46	11	3.96	11.17
Building construction	36	19	17	22	-14	0.16	7.92
General government	37	28	23	20	-17	-0.47	2.70
Business services	38	32	16	7	-31	-2.88	4.49
Motor vehicles, parts & accessories	39	44	36	16	-23	-0.61	13.30
Printing, publishing & recorded media	40	36	39	21	-19	-1.06	8.92
Basic iron & steel	41	41	37	48	7	3.22	9.61
Finance & insurance	42	46	45	45	3	0.59	4.69
Coke & refined petroleum products	43	21	41	38	-5	0.96	18.33
Basic chemicals	44	42	44	41	-3	0.21	8.84
Tobacco	45	45	46	30	-15	-0.65	13.19
Machinery & equipment	46	48	47	33	-13	-0.65	14.70
Television, radio & communication equipment	47	40	48	37	-10	-0.46	14.49

Figure 5: Real Labour Remuneration

By contrast, the sectors with strongly declining relative pay in the economy were: Business Services (-31), Motor Vehicles (-23), Footwear (-19), Printing (-19), General Government (-17), Leather & Leather Products (-15), Tobacco (-15), Metal Products (-14), Building Construction (-14), Machinery (-13), Professional & Scienti...c Equipment (-11), and Television, Radio & Communication Equipment (-10).

Comparison with average growth rates in employment in these sectors is instructive - compare again the information of Figure 2. Of the sectors with strong increases in relative pay in the economy, four have positive average growth rates in employment (Other Mining +0.13, Basic Non-Ferrous Metals +0.75, Other Chemicals +1.55, Other Industries+2.11), suggesting that the increase in relative pay is attributable either to improved demand conditions for sectoral output and hence factor inputs into those sectors, or to improving labour productivity in those sectors (see the discussion below). On the other hand, it is also notable that the average growth rate in employment for all of these sectors (with the possible exception of Other Industries) did not place any of the sectors with strong improvements in relative pay into the strongest employment growth sectors. Moreover, four of the sectors with strong increases in real per labourer remuneration also manifested negative average growth rates in employment over the 1970-97 period (Coal Mining -0.35, Water Supply -0.55, Transport & Storage -0.75, Glass & Glass Products -0.96) -suggesting that for these sectors too rapid an expansion in the real wage may be one reason for the fall in employment.[13]

While demand conditions or labour productivity changes may well be at least partly attributable for the changing relative pay structure of the South African economy, it is also worth noting that strong increases in relative pay were thus not associated with strong increases in employment in the South African economy.

This interpretation is enhanced when looking at the sectors with strong decreases in relative pay in the South African economy. Only two of the eleven sectors with strong relative decreases in their real cost of labour also manifested negative growth rates in employment over the full 1970-97 period (Building Construction -0.09, Tobacco -1.43), and for both plausible demand conditions for such declines may be advanced. All remaining sectors, with the exception of Leather (with no growth at all) showed positive growth in

[13] To be sure, one needs a comparison with the growth rate of labour productivity. On this see the discussion below.

employment - and in the case of a number of the sectors with declining relative pay, the increase in employment was substantial (Business Services +3.96, Television, Radio & Communication equipment +3.88, General Government +3.41), and well above average for a number of others (Motor Vehicles +1.92, Printing +1.92, Professional & Scienti…c Equipment +1.76).

The implication of all of the preceding evidence is that while relative pay was perhaps not the sole determinant of the growth rate of employment in South African economic sectors, it is certainly plausible to advance as one of the determinants of growth rates in employment.

Of course demand conditions in the sectors had an impact on factor input demand also, and changes in labour productivity remain to be examined on a sectoral level. Certainly the relative price of other factors of production must also have played a part, and institutional conditions in the sectoral labour markets may have exercised considerable in‡uence. Nevertheless the relative cost of labour by sector must be considered a plausible a priori candidate as a determinant of employment in South Africa.

3.2 Absolute Real Labour Remuneration by Economic Sector

Again, relative remuneration does not yet shed light on the absolute level of real labour remuneration.

For real per labourer remuneration, the di¤erential between the highest ranked sectors and others is not as stark as for the absolute level of employment - though from 1970 to 1997 the di¤erential widens. Also noticeable is that the highest paying sectors in absolute terms are relatively volatile - with the ordering of the highest paying sectors changing from decade to decade.

The top-ranked sectors have increased their real per labourer remuneration. However, over the full 1970 - 1997 period, the di¤erential between top-ranked and bottom-ranked sectors has narrowed. Thus from 1970 to 1980, 1990 and 1997 the di¤erential has changed from 30:1, to 35:1, to 22:1 and 26:1. Despite some decade variation, the tendency has thus been for real pay di¤erences between sectors to narrow rather than widen.

Such trends carry distributional implications - but will be justi…ed in long run labour market terms only with concomitant changes in labour productivity. We will return to the question of whether this is the case in a subsequent section.

3.3 Links between Real Labour Remuneration and Employment

In the …nal instance, our concern is with the link between employment and the real wage rate. We examine this link through two mechanisms.

The …rst is the correlation between the level of employment and the real wage rate. The results are reported in Figure 6. Two forms of information are presented. The …rst is the correlation between the level of employment by sector, and the level of the real wage in that sector, across the full time run available for each sector (1970-97). The second is the correlation between the growth rate of employment by sector, and the growth rate of the real wage in that sector, across the full time run available for each sector (1970-97).

An important conclusion emerges from an examination of the evidence presented: evidence collected for the aggregate South African labour market hides important sectoral di¤erences - and indeed obscures the most striking features of the link between real labour remuneration, and employment.

While there appears to be a relatively strong positive association between employment and the real wage rate for the South African labour market as a whole (at +0.52), and only a very small negative correlation (of -0.07) on average across all sectors of the economy,[14] this obscures some important sectoral patterns that emerge from the data. First, the large employment sectors of the economy that have experienced strong declines in employment also show strong negative correlations between real labour remuneration and employment. Thus, as Figure 6 shows:

- Agriculture Forestry & Fishing (average employment growth 1970-97: -0.9% per annum; employment - real wage correlation of -0.81; employment growth - real wage growth correlation of -0.4),
- Household Servants (average employment growth 1970-97: -0.57% per annum; employment - real wage correlation of -0.87; employment growth - real wage growth correlation of -0.12),
- Gold and Uranium Ore Mining (average employment growth 1970-97:

[14] The di¤erence arises since the correlation for the economy as a whole is the correlation between total employment and the real wage rate. By contrast, the average correlation for all sectors is the average across all individual sectors, and is thus not weighted by the size of employment.

	Employment vs Real Wage (levels)	Employment vs Real Wage (Growth Rates)
Agriculture, forestry & fishing	-0.91	-0.1
Coal mining	-0.24	0.1
Gold & uranium ore mining	-0.81	-0.4
Other mining	-0.41	-0.49
Food	0.56	-0.21
Beverages	0.91	0.1
Tobacco	-0.06	-0.46
Textiles	-0.54	-0.53
Wearing apparel	0.66	-0.43
Leather & leather products	-0.61	-0.19
Footwear	-0.32	-0.08
Wood & wood products	-0.43	-0.27
Paper & paper products	-0.66	-0.46
Printing, publishing & recorded media	-0.48	-0.38
Coke & refined petroleum products	-0.05	0.18
Basic chemicals	-0.35	-0.08
Other chemicals & man-made fibres	0.49	-0.44
Rubber products	-0.45	-0.36
Plastic products	0.78	-0.4
Glass & glass products	-0.62	-0.14
Non-metallic minerals	-0.32	-0.34
Basic iron & steel	-0.72	-0.41
Basic non-ferrous metals	-0.39	-0.26
Metal products excluding machinery	0.3	-0.25
Machinery & equipment	0.18	0.04
Electrical machinery	-0.21	-0.39
Television, radio & communication equipment	-0.33	-0.32
Professional & scientific equipment	0.7	-0.48
Motor vehicles, parts & accessories	-0.39	-0.17
Other transport equipment	0.52	-0.08
Furniture	0.02	-0.06
Other industries	0.36	0.07
Electricity, gas & steam	-0.05	-0.51
Water supply	-0.04	-0.08
Building construction	-0.77	-0.83
Civil engineering & other construction	-0.27	-0.43
Wholesale & retail trade	0.73	-0.09
Catering & accommodation services	-0.02	-0.77
Transport & storage	-0.8	-0.3
Communication	0.55	-0.38
Finance & insurance	0.38	-0.06
Business services	-0.97	-0.49
Medical, dental & other health & veterinary services	0.86	-0.55
Other community, social & personal services: Profit seeking	0.78	0.15
Other community, social & personal services: Non-profit seeking	0.77	-0.12
Other	0.62	-0.33
Households	-0.87	-0.12
General government	-0.64	-0.93
Total labour remuneration	0.51	-0.09
AVERAGE	-0.07	-0.28

Figure 6: Correlations: Employment versus Real Labour Remuneration

-0.73% per annum; employment - real wage correlation of -0.91; employment growth - real wage growth correlation of -0.1),

- Transport & Storage (average employment growth 1970-97: -0.75% per annum; employment - real wage correlation of -0.80; employment growth - real wage growth correlation of -0.3),

- and Building Construction (average employment growth 1970-97: -0.09% per annum; employment - real wage correlation of -0.77; employment growth - real wage growth correlation of -0.83),

all share a negative employment - real wage nexus. The point can be strengthened since every sector in South Africa that has showed negative growth rates in employment, also shows a negative correlation between employment and the real wage. Compare for instance the correlation between employment and the real wage for the following sectors with negative employment growth rates in Figure 6: Agriculture, Forestry & Fishing (-0.81), Glass & Glass Products (-0.62), Tobacco (-0.06), Transport & Storage (-0.8), Gold & Uranium Ore Mining (-0.81), Textiles (-0.54), Household Servants (-0.87), Water Supply (-0.04), Coal Mining (-0.24), Basic Iron & Steel (-0.72), Non-Metallic Minerals (-0.32), and Building Construction (-0.77).

Even amongst sectors that have experienced strong positive growth rates in employment (de…ned as above 3% per annum), in which we might have expected strong upward pressure on wages due to strong demand for labour, negative correlations persist. Thus:

- General Government - though this sector is of course less likely to respond to pure market signals (average employment growth 1970-97: 3.41 % per annum; employment - real wage correlation of -0.64; employment growth - real wage growth correlation of -0.93),

- Electrical Machinery (average employment growth 1970-97: 3.44 % per annum; employment - real wage correlation of -0.21; employment growth - real wage growth correlation of -0.39),

- Finance & Insurance (average employment growth 1970-97: 3.52 % per annum; employment - real wage correlation of +0.38; employment growth - real wage growth correlation of –0.06),

- TV, Radio & Communications Equipment (average employment growth 1970-97: 3.88 % per annum; employment - real wage correlation of -0.33; employment growth - real wage growth correlation of -0.32); Business Services (average employment growth 1970-97:3.96% per annum; employment - real wage correlation of -0.97; employment growth - real wage growth correlation of -0.49),

- Plastic Products (Rank 12; average employment growth 1970-97: 4.33 % per annum; employment - real wage correlation of +0.78; employment growth - real wage growth correlation of -0.40), while not uniformly generating additional employment on the basis of falling real wages, show a strong propensity to do so. Only for Finance & Insurance, and for Plastic Products is the correlation between employment and the real wage positive.

While there are thus some sectors in the South African economy that show a positive correlation between employment and the real wage, careful examination of the evidence suggests that the negative association between employment and the real cost of labour predicted by economic theory, is in fact present in the South African labour market.

No examination of the determinants of employment can thus ignore the impact of the real wage rate.[15]

3.4 Labour Productivity

One possible explanation besides changes in the real wage for changing employment trends, are changes in labour productivity.

We need to note here that the measure of labour productivity in the South African economy is materially a¤ected by the measure of output that is employed. Two measures of real output are available: Real Sales (or gross output) and Real GDP (or net output). The appropriate measure is that for Real GDP, since Real Sales incorporates the value of intermediate inputs into production, and does not therefore represent a true measure of true value-added of labour.

[15] Further con…rmed by econometric evidence - see Fedderke, Shin & Vaze (2000).

3.5 Relative Labour Productivity

Figure 7 reports the ranks of economic sectors based on the ratio of real GDP produced in the sector to the level of employment in the sector as a measure of total labour productivity.

Relative labour productivity in the South African economy remains remarkably constant over the 1970-97 period, with the correlation between the Rank of sectors in 1970 and that in 1997 being +0.72. Nevertheless, there are a number of sectors that show very strong relative changes in labour productivity over the 1970-97 period. In particular, sectors with very strong increases in relative labour productivity, as measured by changed rank in labour productivity from 1970 to 1997, include: Other Industries (+28), Other Chemicals & Man-Made Fibres (+22), Coal Mining (+20), Transport & Storage (+18), Basic Non-Ferrous Metals (+16), Plastic Products (+13), and Other Mining (+11).

It is noticeable that of the sectors experiencing a strong relative improvement in labour productivity, for a number of sectors this translated into a growth in employment, while for others improved labour productivity appears to have been the result of a shedding of labour. Thus while Plastic Products (+4.33%),[16] Other Industries (+2.11%), Other Chemicals and Man-made Fibres (+1.55%), Basic Non-Ferrous Metals (0.75%), Other Mining (0.13%), all experienced positive growth rates in employment of varying strengths, both Transport & Storage (-0.75%) and Coal Mining (-0.35%) manifested negative growth rates in employment on average over the 1970-97 sample period. Improved labour productivity in these instances thus may re‡ect a growing capital intensity of production, rather than labour augmenting technical change.

For all the sectors with a strong improvement in relative labour productivity, there is a strong improvement in the real per labourer remuneration, however. Other Mining (+5.41%), Coal Mining (5.73%), Other Chemicals & Man-Made Fibres (+6.03%), Plastic Products (+2.75%), Other Industries (+6.22%), Basic Non-Ferrous Metals (+3.22%) demonstrate what economic theory would predict: that improving marginal product of labour translates into higher labour remuneration.

Indeed, the evidence of this section explains the presence of positive correlations between the real wage and employment for a number of sectors. Recall that the correlation between employment and the real per labourer

[16] The fastest-growing sector in terms of employment in the South African economy.

High rank indicates high productivity	Rank 1970	Rank 1980	Rank 1990	Rank 1997	ChgRank 1997-1970	Avg Growth	Rank Avg Growth	Std Dev Growth	Rank Std Dev
Households	1	1	1	1	0	1.72	28	4.93	8
Other	2	3	3	2	0	3.66	41	8.91	23
Agriculture, forestry & fishing	3	4	4	5	2	4.73	44	14.89	43
Catering & accommodation services	4	2	2	3	-1	1.97	30	8.79	21
Wearing apparel	5	5	5	4	-1	1.17	18	9.59	27
Civil engineering & other construction	6	23	10	8	2	2.15	31	10.49	32
Other community, social & personal services: Non-profit seeking	7	6	9	11	4	1.50	23	5.02	9
Plastic products	8	21	20	21	13	3.67	42	10.09	30
Wood & wood products	9	14	7	9	0	0.87	14	7.43	16
Other industries	10	7	31	38	28	6.82	47	20.88	47
Furniture	11	10	14	7	-4	0.94	15	10.75	33
Food	12	16	15	14	2	1.37	21	4.50	4
Coal mining	13	20	28	33	20	5.08	46	12.51	39
Other chemicals & man-made fibres	14	38	33	36	22	4.99	45	10.79	34
Footwear	15	9	8	6	-9	-0.18	5	7.29	15
Textiles	16	17	6	12	-4	1.14	17	11.73	37
Transport & storage	17	22	24	35	18	3.82	43	4.77	6
Electrical machinery	18	32	17	15	-3	1.24	20	11.73	36
Other mining	19	18	23	30	11	3.40	39	9.44	26
Leather & leather products	20	12	12	19	-1	1.72	27	8.91	22
Professional & scientific equipment	21	8	19	17	-4	2.56	32	18.53	46
General government	22	13	13	10	-12	-0.47	4	2.64	1
Medical, dental & other health & veterinary services	23	15	22	25	2	1.55	24	4.56	5
Communication	24	19	30	32	8	2.80	34	5.40	12
Building construction	25	11	11	13	-12	-0.03	7	7.12	14
Non-metallic minerals	26	25	18	20	-6	1.06	16	7.95	17
Glass & glass products	27	30	39	34	7	3.06	37	10.91	35
Other community, social & personal services: Profit seeking	28	26	25	22	-6	0.64	10	3.70	2
Metal products excluding machinery	29	31	21	23	-6	0.86	13	6.63	13
Wholesale & retail trade	30	27	29	28	-2	1.56	25	4.34	3
Rubber products	31	29	32	26	-5	1.22	19	8.28	18
Basic non-ferrous metals	32	37	42	48	16	8.71	48	17.41	45
Paper & paper products	33	41	38	39	6	2.69	33	9.94	29
Beverages	34	34	41	40	6	2.85	35	10.43	31
Motor vehicles, parts & accessories	35	36	35	27	-8	1.95	29	17.27	44
Water supply	36	39	36	41	5	2.95	36	9.40	25
Printing, publishing & recorded media	37	28	27	24	-13	-0.11	6	9.11	24
Gold & uranium ore mining	38	24	16	16	-22	-1.67	3	8.31	19
Basic iron & steel	39	35	37	46	7	3.35	38	8.78	20
Machinery & equipment	40	45	40	31	-9	0.16	9	14.38	42
Finance & insurance	41	48	46	42	1	1.70	26	5.02	10
Television, radio & comms equipment	42	33	45	37	-5	0.15	8	14.20	41
Electricity, gas & steam	43	44	48	47	4	3.40	40	5.04	11
Other transport equipment	44	42	26	18	-26	-2.58	2	12.15	38
Basic chemicals	45	43	43	43	-2	0.80	11	9.82	28
Business services	46	46	34	29	-17	-2.79	1	4.87	7
Tobacco	47	47	44	45	-2	0.86	12	13.91	40
Coke & refined petroleum products	48	40	47	44	-4	1.45	22	23.64	48

Figure 7: Real GDP/Employment

remuneration was positive for Plastic Products (+0.78), Other Chemicals and Man-Made Fibres (+0.49), and Other industries (+0.36). The suggestion appears to be that the increase in labour productivity outstrips the increase in the real wage for these sectors, providing a positive incentive for increased employment. By contrast, for at least some sectors, the increased productivity of labour was not enough to compensate for the rising wage, such that the correlation between real wage and employment remained negative: Coal Mining (-0.24), Other Mining (-0.41), Basic Non-Ferrous Metals (-0.39), and Transport & Storage (-0.8).

There are also a number of sectors for which there were strong losses in relative labour productivity. Sectors with strong decreases in relative labour productivity, as measured by changed rank in labour productivity from 1970 to 1997, include: Other transport equipment (-26), Gold & Uranium Ore Mining (-22), Business Services (-17), Printing, Publishing & Recorded Media (-13), Building Construction (-12), and General Government (-12).

Of the sectors with strong decreases in relative labour productivity, two were labour shedding over the 1970-97 period: Gold & Uranium Ore Mining (-0.73%) and Building Construction (-0.09%) both had negative average annual growth rates in employment. The remainder showed positive growth rates in employment, and in the case of General Government[17] (+3.41%) and Business Services (+3.96%) average annual growth rates were amongst the six fastest growing sectors in terms of employment. Other transport equipment (+1.12%) and Printing, Publishing & Recorded Media (+1.92%), showed positive though more moderate growth rates in employment.

The explanation of the difference between Gold & Uranium Ore Mining and Building Construction on the one hand, and the sectors with declining relative labour productivity but positive growth in employment, can be readily provided by an examination of developments in real per labourer remuneration in these sectors. Gold & Uranium Ore Mining (+2.49%) and Building Construction (+0.16%) both experienced increasing average annual growth in real wages in the presence of declining productivity - with inevitable negative impact on labour demand for these sectors. By contrast, General Government (-0.47%), Business Services (-2.88%), Printing, Publishing & Recorded Media (-1.06%), and Other Transport Equipment (-0.74%) all showed declining average annual growth in real wages - and it appears

[17] The usual disclaimer on the absence of clear market forces for this sector is relevant here, as throughout this paper.

that the declining real wage was of a su¢cient magnitude to o¤set declining labour productivity.

Once again, therefore, the suggestion that labour pricing is an important determinant of the demand for labour in the South African economy on a sectoral basis is di¢cult to dismiss on the basis of the evidence presented on real labour productivity.

3.6 Absolute Labour Productivity

Relative labour productivity gives little information concerning the absolute di¤erences between sectors in real labour productivity.

The two top ranked sectors in terms of labour productivity show an increasing level of labour productivity (Tobacco, Coke & Re…ned Petroleum Products) over the 1970 -1990 period. Basic non-ferrous metals during the 1990's shows a very strong increase in absolute labour productivity: doubling from 1990 to 1997, joining the two top-ranked labour productivity sectors.

While the top ranked labour productivity sectors appear to show a strong increase over the 1970 - 1997 period, it is also notable that the di¤erential between the top-ranked and bottom-ranked sectors narrowed after 1980. Thus the ratio of labour productivity of top- to bottom-ranked sectors changed over the course of 1970, 1980, 1990, 1997 from 31:1, to 38:1, to 24:1 to 20:1. In relative terms therefore, the least productive sectors of the South African economies were closing the productivity gap with respect to the most productive - though the gap remains substantial.

We further note that the narrowing of the real wage gap between top- and bottom-ranked sectors in terms of real per labourer remuneration that we noted in an earlier section, is mirrored in some measure by the narrowing productivity gap between the most and least productive sectors in terms of labour productivity.

One interpretation of such evidence is that once again prior expectations of economic theory are borne out. Economic theory would anticipate that perfect labour markets would serve to equalize the marginal product of labour across sectors, thereby generating the most e¢cient allocation of labour inputs into production. While we have advanced evidence concerning the average product of labour, nevertheless the implication is at least potentially that the reallocation of labour has been such as to achieve at least an improved use of labour resources in the economy.

3.7 Links between labour productivity and real per labourer remuneration and employment

Economic theory would anticipate a link between real labour product and the real wage. Figure 8 reports the correlation between real labour productivity and the real per labourer remuneration by economic sector for which the relevant data is available.[18]

It is noticeable that for most sectors the correlation between labour productivity and the real wage is not only positive, but frequently very strong. For eight sectors[19] the correlation lies above +0.9, for eleven[20] sectors above +0.8, for four[21] above +0.7, and for seven[22] equal to or above +0.59. Thus for 31 out of 46 sectors for which requisite data is available, the correlation conforms not only to economic theory, but is reasonably strong - if it is borne in mind that economic theory assumes all other in‡uences on the real wage to be held constant in predicting the positive correlation

For only ten[23] sectors does the correlation lie between 0 and +0.5, and is the link predicted by economic theory thus relatively weak - and only six[24] sectors had the negative correlation between labour productivity and the real wage contradicting economic theory.

Noteworthy is the distinct performance of these groupings of economic sectors in terms of the growth of employment and the real wage they ex-

[18] Strictly speaking, we are interested in the link between the marginal product of labour and the marginal cost of labour. For the time being, this is as close as we are likely to get.

[19] In declining order: Professional & Scienti…c Equipment, Other Chemicals & Man-Made Fibres, Communication, Plastic Products, Other Industries, Furniture, Printing, Publishing & Recorded Media, Medical, Dental & Other Health & Veterinary Services.

[20] In declining order: Paper & Paper Products, Wholesale & Retail Trade, Food, Basic Non-Ferrous Metals, Finance & Insurance, Wearing Apparel, Other Mining, Agriculture, Forestry & Fishing, Wood & Wood Products, Beverages, Rubber Products.

[21] In declining order: Catering & Accommodation Services, Coal Mining, Transport & Storage, Electrical Machinery.

[22] In declining order: Civil Engineering & Other Construction, Other Community, Social & Personal Services: Pro…t Seeking, Coke & Re…ned Petroleum Products, Electricity, Gas & Steam, Water Supply, Television, Radio & Communication Equipment, Other Transport Equipment.

[23] In declining order: Motor Vehicles, Parts & Accessories, Machinery & Equipment, Metal Products excluding Machinery, Gold & Uranium Ore Mining, Building Construction, Basic Iron & Steel, Textiles, Basic Chemicals, Other, Other Community, Social & Personal Services: Non-Pro…t Seeking.

[24] In declining order: Glass & Glass Products, Non-Metallic Minerals, Footwear, Leather & Leather Products, Tobacco.

	Y/L vs W/P	Y/L vs e	dY/dt vs dW/dt	dY/dt vs de/dt
Agriculture, forestry & fishing	0.86	-0.97	0.12	-0.40
Coal mining	0.75	-0.10	0.28	-0.09
Gold & uranium ore mining	0.41	-0.42	0.24	-0.25
Other mining	0.86	-0.19	0.18	-0.38
Food	0.88	0.73	0.48	0.00
Beverages	0.81	0.74	0.59	-0.13
Tobacco	-0.68	-0.79	0.43	-0.61
Textiles	0.22	-0.68	0.63	-0.53
Wearing apparel	0.87	0.63	0.67	-0.28
Leather & leather products	-0.49	-0.28	0.41	-0.31
Footwear	-0.34	-0.25	0.48	-0.13
Wood & wood products	0.83	0.66	0.51	0.02
Paper & paper products	0.89	0.58	0.79	-0.25
Printing, publishing & recorded media	0.91	0.74	0.69	-0.32
Coke & refined petroleum products	0.64	0.58	0.72	0.21
Basic chemicals	0.15	-0.05	0.32	-0.24
Other chemicals & man-made fibres	0.96	0.66	0.77	-0.35
Rubber products	0.81	-0.13	0.47	-0.18
Plastic products	0.95	0.91	0.62	-0.17
Glass & glass products	-0.15	-0.93	0.58	-0.03
Non-metallic minerals	-0.24	-0.31	0.52	0.09
Basic iron & steel	0.29	-0.55	0.58	-0.25
Basic non-ferrous metals	0.87	-0.31	0.85	-0.21
Metal products excluding machinery	0.42	0.61	0.28	-0.13
Machinery & equipment	0.44	0.02	0.87	0.09
Electrical machinery	0.73	-0.15	0.71	-0.15
Television, radio & communication equipment	0.60	-0.17	0.67	-0.25
Professional & scientific equipment	0.97	0.81	0.73	-0.59
Motor vehicles, parts & accessories	0.45	0.23	0.76	-0.27
Other transport equipment	0.59	0.08	0.60	-0.15
Furniture	0.94	0.83	0.72	-0.01
Other industries	0.95	0.72	0.73	-0.01
Electricity, gas & steam	0.63	-0.32	0.09	-0.58
Water supply	0.62	-0.48	0.56	-0.23
Building construction	0.32	-0.64	0.16	-0.68
Civil engineering & other construction	0.69	-0.44	0.17	-0.63
Wholesale & retail trade	0.89	0.69	0.25	-0.14
Catering & accommodation services	0.77	-0.01	0.55	-0.77
Transport & storage	0.74	-0.69	0.36	-0.35
Communication	0.95	0.65	0.53	-0.60
Finance & insurance	0.87	0.83	0.59	0.31
Business services	-0.83	-0.93	0.15	-0.67
Medical, dental & other health & veterinary services	0.91	0.83	0.42	-0.36
Other community, social & personal services: Profit seeking	0.65	0.67	-0.27	-0.67
Other community, social & personal services: Non-profit seeking	0.04	-0.10	0.34	-0.22
Other	0.04	0.10	-0.23	-0.03
Total	0.91	0.64	-0.25	-0.32
AVERAGE	0.53	0.07	0.47	-0.26

Figure 8: Correlations

perienced over the full sample period. The strength of the correlation between labour productivity and the real wage appears to be a predictor of the strength of sustainable real wage improvements, as well as growth in employment.[25] Thus:

- for the eight sectors with the strongest correlation between labour productivity and the real wage, average growth in real per labourer remuneration was 2.56% per annum over 1970 - 1997, and average growth in employment 2.26% per annum over 1970 - 1997.
- for the ten sectors with a correlation between +0.8 and +0.9 between labour productivity and the real wage, average growth in real per labourer remuneration was 1.99% per annum over 1970 - 1997, and average growth in employment 1.15% per annum over 1970 - 1997.
- for the four sectors with a correlation between +0.7 and +0.8 between labour productivity and the real wage, average growth in real per labourer remuneration was 3.74% per annum over 1970 - 1997, and average growth in employment 0.74% per annum over 1970 - 1997.
- for the seven sectors with a correlation between +0.59 and +0.7 between labour productivity and the real wage, average growth in real per labourer remuneration was 1.57% per annum over 1970 - 1997, and average growth in employment 1.80% per annum over 1970 - 1997.
- for the ten sectors with a correlation between 0 and +0.5 between labour productivity and the real wage, average growth in real per labourer remuneration was 1.30% per annum over 1970 - 1997, and average growth in employment 0.805% per annum over 1970 - 1997.
- for the six sectors with a correlation between labour productivity and the real wage below 0, average growth in real per labourer remuneration was -0.31% per annum over 1970 - 1997, and average growth in employment 0.25% per annum over 1970 - 1997.

With the exception of perhaps only the sector grouping with a correlation between +0.7 and +0.8, the evidence appears to suggest the presence of a

[25] A similar relationship holds with respect to employment when we consider the correlation between changes in real labour productivity and changes in the real wage.

declining employment creating capacity in sectors as they conform less closely to the dictates of standard economic theory. Where the real wage is less closely linked to real labour productivity, the growth in employment also tends to be lower. Moreover, the capacity for a heightened but sustained increase in real wages also appears to be linked to the degree to which real wages are justi…ed by labour productivity.

The immediate implication for policy intervention in South African labour markets appears to be that "well-functioning" labour markets, de…ned as those that link factor rewards to factor productivity in accordance with the requisites of economic theory, appear to be more likely to generate both employment, and sustained improvements in labour remuneration. In e¤ect, to the extent that by labour market ‡exibility we mean the capacity of labour markets to adjust freely and rapidly to the market clearing wage suggested by labour productivity, the evidence from the link between real labour productivity and the real wage suggests that labour market ‡exibility is desirable.

Once again, therefore, our …ndings tend to con…rm the prior expectations that economic theory provides.

4 Conclusions

The present paper has been concerned with exploratory data analysis on the South African labour market. We have presented developments in employment trends, in real labour remuneration, in labour productivity, and have examined potential links between these dimensions of the labour market.

We have seen that real wages are likely to be important in determining employment trends in South Africa's labour markets. More speci…cally, where the growth rate in labour remuneration has outstripped growth rates in labour productivity, we have observed a tendency for labour inputs into production to decline.

Poor employment creation in South African labour markets has been a long-standing structural feature, present since at least the 1970's. Recent macroeconomic policy changes in South Africa are therefore very di¢cult to identify as the cause for poor employment creation. Supply side features of the labour market are far more probable as a cause of sluggish employment growth, and real wages and labour productivity are two such candidates.

Investment in human capital, improvement in the skills base of the South African economy, is one possible response should this diagnosis be correct.

Increasing the flexibility of labour markets, to allow for a range of real wages, appropriately adjusted to labour productivity is another response, perhaps most appropriate to existing unskilled labour that is struggling to enter the formal labour market.

We are aware of the fact that there may be many additional constraints to the efficient functioning of labour markets in South Africa. Asymmetric information may be a particularly severe impediment. But to say that there are further inefficiencies, is not to argue that those rigidities associated with the relative price of labour that we can identify should not be addressed in their own right.

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