The Post-Apartheid Challenge: Labour Demand Trends in the South African Labour Market, 1995-1999

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Abstract

The paper attempts to provide a descriptive overview of absolute and relative shifts in labour demand in the South African economy over the post-apartheid period, 1995-1999. The paper debunks the myth that the domestic economy is characterised by 'jobless growth' in this period. However, it does reveal that the rate of job creation has been far below the growth of the labour force, yielding a relatively poor employment performance for the South African economy. In particular, the analysis shows that the economy is a poor creator of low-end jobs. The second segment of the paper attempts to ascribe, using an established labour demand decomposition methodology, reasons for these labour demand shifts. It is clear that the adoption of new technologies, relative to structural changes in the economy, have remained the dominant determinant of the economy's employment trajectory. One key exogenous factor though, has impacted on employment changes in this period namely the process of intensive process of public sector restructuring.

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Introduction

The mismatch between demand and supply, marked by skills-biased labour demand shifts, has clearly been the defining feature of employment trends in South Africa since the 1970s (see Bhorat & Hodge 1999; Bhorat 2000 and Edwards 2001). This paper will attempt to continue this line of enquiry in the post-apartheid period, for two specific reasons. Firstly, it is important to assess whether the long-run shifts reported in these previous studies are replicated in this later period both in terms of scale and direction. Typically, we would want to determine whether the skills-biased employment shifts reported over the long-run have been reinforced during this shorter, more recent, time period. Secondly, should there continue to be similar employment shifts, we would still want to assess any new features that are peculiar to this 1995-99 period, and in particular how these new features may impact on the future labour demand trajectory of the domestic economy in this post-apartheid period.

Employment Trends between 1995 and 1999: A Descriptive Overview

The analysis of employment shifts covers the period 1995 to 1999, and is drawn principally from the October Household Surveys (OHS) for these two years. In the case of the 1995 data, the 1991 census weights were used, while in the case of the 1999 OHS, the 1996 Census were applied to the data. In working with employment and other numbers that are to be aggregated up, this differential weighting would clearly pose a problem. As a result, to ensure that consistency and comparability was achieved in the data set between the two years, the 1995 OHS was re-weighted using the 1996 weights. In all the data here, both formal and informal employment was included. Despite the misgivings concerning the estimation and inclusion of the informal sector in the household surveys (Bhorat,1999b), it remained essential to include the sector in an attempt at gauging the total employment shifts that have occurred in the labour market.

Table 1 attempts to provide the first descriptive overview of employment shifts that have occurred since 1995. The table presents total employment shifts in the economy between 1995 and 1999, according to sector and occupation. While the 9 main sectors have been included in the table, domestic services have also been attached as a separate category. Importantly, the mining figures have been adjusted to account for the undercounting of mineworkers in hostels in the OHS95. Hence, the third quarter estimate for total employment in the mining industry, drawn from the Standardised Series of Employment and Earnings (SEE) of SSA, was used as our 1995 employment figure for mining.[1] The occupational weights in the OHS95 were then used to distribute the SEE estimate according to the 10 occupations classified in the table below. The table reports the changes in employment (actual and percentage), while the absolute figures for 1995 and 1999 are provided in Appendix 1. In addition, note that there is an unspecified category in both the sectoral and occupational breakdown, representing incorrect or nil returns for these codes in the questionnaire.

[1] In terms of the undercount of miners in hostels for 1995, these individuals have been added to the pool of total employed by recourse to official Chamber of Mines data (Statistics South Africa, 2002). For 1996 and 1997, mining figures from the *Survey of total employment and earnings* (SEE) were utilised (Statistics South Africa, 2000). From 1998 onwards the sampling frame was adequately adjusted to account for miners living in hostels.

Table 1: Employment Shifts by Sector and Occupation, 1995-1999 (OHS, 1995 and 1999)

Occupation	Sectors	Agric.	Mining	Manuf.	Utilities	Construction	Trade	Transport	Finance	Comm. Services	Domestic Serv.	Unspecified	Total
Managers	**Change**	24301	1918	37656	4231	20427	-9794	9993	55519	41675	-585	1223	**186564**
	% change	*369.65*	*12.26*	*50.43*	*215.43*	*88.58*	*-4.42*	*15.16*	*113.38*	*108.61*	*-100.00*	*10.48*	***36.66***
Profess.	**Change**	1744	3265	20531	207	-476	10577	4858	71116	118680	93	2387	**232983**
	% change	*257.61*	*50.32*	*152.05*	*7.32*	*-9.89*	*129.68*	*102.32*	*145.58*	*50.78*	*n.a.*	*155.91*	***71.62***
Technicians	**Change**	899	-4664	30320	-5654	-9486	26925	-13243	50879	-77318	-207	-323	**-1872**
	% change	*28.93*	*-26.02*	*38.12*	*-52.55*	*-64.28*	*54.37*	*-24.58*	*41.29*	*-11.08*	*-17.54*	*-7.96*	***-0.18***
Clerks	**Change**	-1045	-30615	-9656	-1035	832	13175	6167	23319	-59548	1178	-7655	**-64883**
	% change	*-8.63*	*-58.08*	*-7.31*	*-9.48*	*5.52*	*4.60*	*6.90*	*10.60*	*-19.91*	*n.a.*	*-31.02*	***-5.68***
Sales	**Change**	9414	-18620	4224	1858	3358	142780	11486	85583	-71608	43	2400	**170918**
	% change	*109.01*	*-51.75*	*12.61*	*48.20*	*164.69*	*29.70*	*86.24*	*116.34*	*-17.68*	*0.33*	*50.20*	***15.91***
Sk. Agric & Domestic W.	**Change**	212328	604	1104	329	171	7739	1011	11134	21580	249038	-738	**504300**
	% change	*205.88*	*50.42*	*21.97*	*n.a*	*64.77*	*198.39*	*116.88*	*1510.72*	*271.11*	*36.10*	*-100.00*	***61.98***
Crafts	**Change**	14259	-45811	78309	-4612	106151	52468	-2036	6351	3548	8721	-933	**216415**
	% change	*97.64*	*-21.00*	*25.58*	*-17.14*	*39.96*	*27.28*	*-4.14*	*33.66*	*6.54*	*602.70*	*-14.86*	***18.76***
Operators	**Change**	3469	44103	-79689	-5224	-4792	-17719	53430	9826	-14282	5126	-18007	**-23759**
	% change	*2.69*	*33.84*	*-16.03*	*-36.92*	*-19.59*	*-21.09*	*39.04*	*97.26*	*-20.38*	*515.18*	*-71.30*	***-2.12***
Elementary	**Change**	-307694	-66327	-17107	2124	18478	228259	-2409	38385	-92587	-84117	-22908	**-305903**
	% change	*-33.96*	*-60.27*	*-6.26*	*18.77*	*22.48*	*71.65*	*-4.60*	*104.58*	*-29.33*	*-89.65*	*-72.13*	***-13.71***
Unspecified	**Change**	2928	1266	28808	2216	1534	4461	4636	5500	-13564	487	18468	**56740**
	% change	*377.81*	*27.54*	*472.03*	*165.50*	*128.37*	*87.21*	*175.08*	*302.36*	*-46.15*	*n.a.*	*24.35*	***44.04***
Total	**Change**	**-39397**	**-114880**	**94500**	**-5559**	**136197**	**458871**	**73893**	**357612**	**-143424**	**179777**	**-26086**	**971504**
	% change	***-3.33***	***-19.37***	***6.65***	***-6.61***	***31.42***	***27.81***	***15.75***	***61.35***	***-6.67***	***22.45***	***-13.98***	***10.17***

The first, most interesting feature of the data is the aggregate employment performance of the domestic economy. The data shows that over the period 1995 to 1999, employment increased by about 970 000 workers, representing a 10 percent increase over the 5-year period. While the sectoral and skills detail of this growth did of course vary, it is clear that, if this data is correct, the notion of aggregate 'jobless growth' in the South African economy is erroneous. The economy, in the aggregate, has been creating jobs rather than shedding them.

It is important though to try and place this absolute expansion of employment into context. Specifically, it is necessary to assess the number of jobs that have been created, relative to the new entrants that have come into the labour market between 1995 and 1999. The data indicates that between 1995 and 1999, the number of new entrants was about 2.9 million individuals. Over the same period, 970 000 additional jobs were created. This means therefore that about 2 million individuals some of whom were first-time entrants into the labour market have been rendered or have remained jobless since 1995. The upshot from this is that while we did not have jobless growth, we have clearly had 'poor employment growth' over the last 5 years. Put differently, while employment grew at 10 percent over the period, if all the new entrants were to have been placed into employment since 1995, employment would have needed to have grown by 31.2 percent over the period more than three times the actual proportion. Ultimately, the aggregate data suggests that while employment expansion has been recorded over the last five years, in terms of the economically active population and its growth over time, this job performance has been far from adequate.

Interrogating the Employment Data: Are the Numbers Correct?

Given the strongly held belief in both research and policymaking circles that the economy has experienced 'jobless growth' it is critical that we examine this initial result of aggregate employment growth more closely. We opt here to deal with the issue in three different ways. Firstly, the issue of weights is examined, as it is possible that the imposition of 1996 Census weights on the 1995 data, may have biased the weighted employment figures derived. Secondly, the notion of formal as opposed to informal growth is examined, in the hope that this may also shed further light on the results obtained here. Thirdly, there are possible criticisms of the results obtained on the grounds of poor or insufficient coverage of certain occupations or sectors, most notably domestic workers and farm labourers. In the analysis that follows we hope to deal with each of these critiques in one manner or another.

Table 2 presents the official estimates of employment, as derived by Statistics South Africa. Firstly, given the known difficulties with the 1995 OHS in deriving a measure of employment in the informal sector, official estimates do not publish employment according to the formal and informal sector. If one assumes, in the first instance, that the weights derived from OHS95 are incorrect, the employment growth figures for the period 1996 through to 1999 suggest a very similar pattern to that presented above: namely, a growth in aggregate employment of about 12 percent during the 1996-99 period amounting to approximately 1.1 million jobs. There are two important issues to raise here. Firstly, most of the employment growth over the period has occurred in the 1998-99 period, with aggregate employment expanding by 10 percent in this period. However, there were steady increases in informal sector employment in earlier years that accumulated across the entire

1995-99 period. Secondly, the aggregate growth is primarily driven by employment expansion in the informal sector, although there has been some growth in the formal sector as well. Over the

Table 2: Official Estimates of Formal, Informal and Total Employment (SSA, 2002)

Year	Formal Sector		Informal sector		Total Employment	
1995	n.a		n.a		9 590 000	
1996	8 291 000		996 000		9 287 000	*-3.16*
1997	8 111 000	*-2.17*	1 136 000	*14.06*	9 247 000	*-0.43*
1998	8 074 000	*-0.46*	1 316 000	*15.85*	9 390 000	*1.55*
1999	8 462 000	*4.81*	1 907 000	*44.91*	10 369 000	*10.43*
1996-1999	**171 000**	**2.06**	**911 000**	**91.47**	**1 082 000**	**11.65**

1996-99 period, specifically, the informal sector accounted for 84 percent of the net job creation. It is apparent therefore where the initial scepticism of the employment creation notion originates. For on the basis of this data, it appears unlikely that in a single year such large increases in employment could be recorded. However, it needs to be remembered that in the first instance, it is wholly possible that the informal sector figures are a function of both organic growth in the sector as well as an improvement in the collection of this information across the survey years. So we may be simultaneously picking up better measurement techniques, as well as an actual growth in the sector. Ultimately, it is very difficult to derive a definitive answer as to the population estimate (as opposed to the weighted sample estimates reported here), of employment growth since 1995. However, it needs to be added that the scepticism that the figures in Table 1 often elicit are problematic on two counts. Firstly, there is no recourse to an alternative, equally representative dataset that would allow one to seriously question the survey data results. Within this, no serious criticism of the survey designs across the years, the weighting structure and so on are currently available, although this is no doubt made much harder due to the difficulties with accessing this sort of information from Statistics South Africa. The second problem is an analytical one and possibly the more important of the two. The notion of 'jobless growth' implies an absolute reduction in the number of employed in the society over the time period considered. This is an extremely strong assumption, and one that, in labour market sense is far stronger than the trend postulated above, namely of poor employment growth.

Finally we present data in an attempt at dealing with the difficulties in collecting domestic and farm worker data. Table 3 presents employment for the period 1996 to 1999 for non-agricultural, non-domestic employment.[2] It is evident that employment in the period 1996 to 1999 grew by about 9 percent, with close to 700 000 jobs being created outside of agriculture and domestic services.

Table 3: Official Estimates of Non-Agricultural, Non-Domestic Employment, 1996-1999 (SSA, 2002)

Year	Total	% Change
1996	7 788 000	
1997	7 862 000	*0.95*
1998	7 706 000	*-1.98*
1999	8 471 000	*9.93*
1996-1999	**683 000**	***8.77***

[2] We have excluded 1995, as the 1996-weighted figures on OHS95 do not separate domestic workers from other employees in the services sector.

This compares to about 830 000 jobs in these sectors according to figures in Table 1.

Ultimately then, table 3 suggests firstly, that we cannot determine the true population estimate of employment growth, until the release of the 2001 Census figures, from which we then have two Census data points to confidently deal with the above issues. However, despite the rapid employment growth in the 1998-1999 period, there remains evidence of a growth in the informal sector prior to this, and indeed it would be hard not to ascribe a significant share of this growth to organic expansion of the sector. Finally, despite the fact that we would always need to be cautious with this data, the assumption of weak employment growth remains more feasible than one of negative growth in aggregate employment.

Employment Shifts by Sector and Occupation

The above suggests that in the aggregate, positive employment growth has been reported for the domestic economy. It is important, however, to determine the distribution of these employment gains at the sectoral and occupational level. As will be made clear, in this manner we are able to determine more specifically the winners and losers from these overall employment changes.

The detailed employment shifts indicate that the national employment expansion had a differential impact at the sectoral level. Hence, we find that the largest increase in employment was reported for the financial and business services sector, where employment grew by 61 percent over the 5-year period. It is worth noting that this growth rate is close to double the 31.2 percent 'target' employment growth rate alluded to above. The second and third fastest growing sectors were Construction (31 percent) and Internal Trade (28 percent) respectively. These high employment numbers reveal on the one hand the continued expansion of the services sector, in keeping with the previous long-run studies. This includes in part, the construction industry, which does have a fairly significant services component. Indeed, the growth in the services sector and the consequent positive impact on employment in these sectors is a trend that is likely to intensify and continue over the medium- to long-run in South Africa. An interesting result, and one that will be dealt with in more detail below, is that, while all the service sectors reported healthy employment growth rates, Community, Social and Personal Services (referred to as Community Services henceforth), constituted primarily by the public sector, was the only service sector to yield a decline in employment over the period.

Apart from community services, the sectors that reported a decline in employment levels since 1995 were Mining (19.4 percent), Utilities (6.6 percent) and Agriculture (3.3 percent). The largest employment drop therefore was found in Mining followed by Community Services. This shorter term data analysis also reconfirms the patterns observed in the long-run labour demand analysis, namely that both primary sectors were in secular decline. Collectively, the primary sectors shed over 150 000 jobs over this period, an average of 30 000 jobs per annum since 1995. Noticeably, the economy's largest contributor to gross domestic product (GDP), Manufacturing, has seen its employment levels rise by about 7 percent since 1995. While clearly a positive trend, this is below the national employment growth rate, and four times below the target employment growth rate of 31.2 percent over the same period.

Relative shares of sectoral employment are of course critical as a proxy for labour flows between sectors. Table 4 presents this evidence. The share of employment in the primary sectors, Utilities

and Community Services also declined in relative terms, with the largest adjustment found in the latter main sector. Noticeably, Manufacturing's share of employment fell by 0.73 percentage points.

Table 4: Share of Employment by Sector, 1995 and 1999

Sectors	1995	1999	% Point Change in Share
Unspecified	1.95	1.52	-0.43
Agriculture	12.40	10.88	-1.52
Mining	6.20	4.54	-1.66
Manufacturing	14.87	14.39	-0.47
Utilities	0.88	0.75	-0.13
Construction	4.54	5.41	0.88
Wholesale & Retail	17.26	20.03	2.77
Transport	4.91	5.16	0.25
Financial Services	6.10	8.93	2.83
Community Services	22.51	19.07	-3.44
Domestic	8.38	9.31	0.93

In contrast, increases in the share of employment was reported for Construction, Internal Trade, Transport and Financial and Business Services. The latter, in particular, saw the highest percentage point rise in its share of employment. Indeed, the data here does confer with the long-run analysis, indicating that significant job reallocation is taking place from the primary sectors and some secondary sectors, toward parts of the services industry.

Perhaps the most interesting trend in the data is the decline in employment in Community, Social and Personal Services and in the Utilities sector, irrespective of whether one uses the growth or the share employment data. Both these are dominated by the public sector. Hence the data reflects a public sector that is in the process of significant restructuring. For example, the Community Services sector shed over 140 000 jobs between 1995 and 1999. In addition, the share data makes it clear that the job destruction in the public service has been both rapid and particularly large. The loss in Utilities was relatively small, but is representative of a sector that employs under 100 000 workers. Ultimately then, at the sectoral level, the growth data for 1995 to 1999 from Table 1, reveals that the employment losses that occurred were predominantly in the public sector and the two primary sectors with all other sectors reporting a rise in employment levels. These public sector results reflect the new government's intention to reduce inefficiencies within government, reduce the size of the public sector wage bill and finally to drive its restructuring plan around the notion of outsourcing non-core functions at all tiers of government. The result of this extensive and rapid public sector restructuring programme therefore, has been significant employment losses within the sector.

The important point though is to try and determine which occupations within each of these sectors bore the brunt of the overall employment losses, or as the case may be, gained most from intra-sectoral employment growth. It is useful to begin with the aggregate occupational shifts in the labour market. Table 1 reveals that the demand for all occupational groups increased, with the exception of four skills categories technicians, clerks, machine operators and those in elementary

(unskilled) occupations. In the case of the latter, their employment fell by about 300 000 over the time period. In turn, the number of clerks fell by just over 60 000 over the same period representing a 6 percent decline in employment over the period. The third poorest performers were machine operators, whose employment declined by 2 percent over the period, while employment of technicians was essentially stagnant. In terms of increased labour demand, the largest increases were recorded for professionals (72 percent), skilled agricultural workers and domestic workers (62 percent) and managers (38 percent). While we return to skilled agricultural workers and domestic workers, it is evident that the two highest skilled categories accounted for about 420 000 new jobs created over this period. Interestingly, the fourth largest increase was recorded for craft workers, whose employment rose by about 19 percent since 1995. The employment of sales staff also increased by 16 percent across all sectors over this period,. We expand on the reasons for this growth pattern in the intra-sectoral discussion below.

It should be evident that two categories have been omitted from the above analysis, namely workers in domestic services and individuals categorised as skilled agricultural workers. The reason is that the numbers presented for these categories are difficult to interpret and deserve special attention. For example, one of the oddities in the data here is that domestic services gained some 249 000 skilled agricultural employees, while it lost close to 84 000 labourers. This is a change that is very hard to explain, and may be purely due to altering definitions of the skilled agricultural worker category from 1995 to 1999. One of the factors that may have influenced this definitional change could be, for example, the fact that many individuals ostensibly doing domestic work in rural areas, are in fact primarily farm workers. By the same token, the huge increase in the aggregate demand for this occupation of some 395 000 workers yielding an increase of 344 percent over the period, is simply too large to represent a pure employment shift. It may rather be the changing definitions used in the two survey years, combined with the implicitly amorphous nature of the occupation, that has resulted in these numbers. Indeed, the OHS99 reports skilled agricultural workers as 'skilled farmworkers' defined according to the crop that they are farming.[3] Rather than these workers being skilled in the generic sense then, they would appear to be farm labourers defined in a very specific manner for the purposes of the 1999 survey.

Given the uncertainty around these figures, it is probably fair to assume that the figures for elementary employees within agriculture, better reflects the changing pattern of farm worker employment. In turn, the change in domestic services employment is probably more accurately reflected by the reduction in employment of elementary employees, rather than the aggregate shift, which reports a rise in domestic service employment. The proposed solution for our purposes here and indeed for ease of exposition, was therefore to report the two occupations as a combined category.

Intra-Sectoral Employment Shifts by Occupation

The above brief discussion around domestic service and the skilled farm worker categories points to the importance of examining how aggregate sectoral shifts have indeed important nuances when dissecting this overall shift by skill levels.

Taking the primary sectors first, there was a decline in employment levels in both Agriculture and Mining. In the former, despite the overall drop in employment, the two highest skilled occupations

[3] The crops listed include groundnut, grove, mushroom, livestock, jute, hops, ostrich, potato, poultry, rice and so on.

professionals and managers yielded an employment expansion of over 250 percent for the period. Indeed, while the loss was about 40 000 workers in this period, the Agriculture created about 26 000 high skilled jobs. As should be evident from Table 1, the loss was disproportionately due to the attrition rate amongst elementary workers, whose employment fell by 307 000. Even if we assume that all these workers are simply a function of reclassification in the encoding between 1995 and 1999, from elementary workers to skilled agricultural worker, then the net loss of employment amongst farm workers would still be of the order of 95 366 workers. Ultimately then, Agriculture reveals the common within-sector trend that despite overall employment losses, gains were evident for highly skilled workers, while unskilled employees bore the brunt of the employment decline.

Within the Mining industry, the aggregate employment decline again masks the occupational breakdowns. Hence, while the industry lost over 100 000 workers, these were primarily amongst individuals in semi-skilled and unskilled occupations. In addition, there were gains, albeit relatively small, for managers and professionals in the industry. Hence, the largest declines in employment are reported for clerical staff, craft workers and those in elementary occupations. The former two occupations may have been a result of the corporate restructuring and realignment that has taken place amongst Mining houses within the industry. Nevertheless, the largest decline in employment was reported for labourers, whose number fell by over 66 000 workers since 1995. As with the labour market in Agriculture then, these short-term labour demand trends indicate that intra-sectorally, it has been unskilled (and in some cases semi-skilled) workers who have lost out. The winners in both sectors, irrespective of the aggregate employment shift, have been highly skilled workers. This is a labour demand trajectory that conforms with the long-run studies done previously and reinforces the view that since the mid-1990s within each segment of the primary sector, despite their factor choices, skilled workers are rapidly replacing unskilled and semi-skilled workers in the internal labour market.

In the secondary sectors (Manufacturing, Construction and Internal Trade), similar trends do emerge, with some important differences though. Hence, within Manufacturing it is evident that the sector has created jobs since the mid-1990s. However, the detailed statistics illustrate that the demand expansion was once again for top-end workers, namely professionals, managers and technicians. Collectively, they accounted for almost all the new jobs created in the industry. In contrast there was a high attrition rate amongst operators and elementary workers. In the former case, this reflects most probably on sub-sectors such as the clothing and textile industry which under enormous global competition, has rapidly shed its semi-skilled workforce. Again, the manufacturing industry reveals trends that replicate the results found in the long-run labour demand studies.

The construction industry has mixed results. While skilled employment grew for managers (and notably declined marginally for professionals), the demand for craft workers was the catalyst for the positive employment figures in construction. In addition, employment of labourers also increased a little. While this sector is of course pro-cyclical, there is evidence to suggest that it can, with the right economic growth conditions, be a major source of semi-skilled employment growth. This is an important result, as it goes against previous evidence which seemed to suggest that demand was bifurcated strictly along high skilled and unskilled lines only, with semi-skilled worker demand remaining essentially dormant. Ancillary (and very informal) evidence suggests that the

output-employment elasticity of the sector is fairly high with respect to semi-skilled workers, given that in this same period construction output grew by a modest 1.2616 percent. Of course, one needs to note that these employment figures are for the short-run, and within construction particularly may not be manifest of long-term and sustainable employment growth.

Additional positive employment results emanate from the Wholesale and Retail Trade sector, where employment also grew by close to 30 percent since 1995. More importantly though, the big winners here were elementary workers and sales personnel. This is representative of a sector that grew fairly strongly in output terms, as growth was close to 3 percent in the sector. What this suggests is that expansion in the large-scale retailing industry will induce greater demand for semi-skilled (sales staff) and unskilled workers. It is also possible though that, given the focus on formal and informal employment, the rise in employment is picking up the increasing number of individuals entering the informal retailing industry for lack of a job in the formal sector.

Within the tertiary sector, the tendency for increasing demand for semi-skilled workers is partially replicated. Hence, in the Transport sector for example, the overall increase in employment benefited machine operators (in absolute terms) more than any other occupation. This is notwithstanding the fact that the demand for the two highest skills groupings also rose. Within Transport though, elementary workers continued to be shed. Over the same period, the industry grew faster than any other main sector, with the exception of Utilities. What this suggests is that should the industry continue to grow, while unskilled workers may lose out, semi-skilled employees could be the key beneficiaries of this output expansion. The Utilities sector, while a very small employer, reflected rising demand for both highly skilled and unskilled workers, albeit off a very low base.

With the rapid growth and increasing dominance of the Financial and Business Services industry, it is natural that the employment results here would have particular importance. Not unexpectedly, the trends reveal a rapid growth in demand for professionals, managers and technicians which in absolute terms is second only to the community services sector. Of course, given the total employment size of the sector, the shift is relatively greater than that of community services. What is very heartening to note though, is that the demand for all occupations has also risen, although of course by a smaller percentage. This then suggests a more balanced and perhaps more nuanced result on South African employment patterns: that a growing industry which is skills-intensive, will still increase its number of semi-skilled and bottom-end workers. Indeed, within Finance, the demand for unskilled workers was three times the target growth for the economy as a whole. There are of course several important caveats to this result. Firstly, the absolute number of employed within financial services means that even at higher growth rates, it is unlikely to induce significant reductions in unemployment numbers. Secondly, while sectoral growth can realise employment gains for the unskilled, it is still higher skilled workers who have a greater probability of finding employment. But the relevance of these results are that we now have some evidence to suggest that while there is skills-biased employment growth; since 1995, in certain growing sectors unskilled and semi-skilled workers have also gained. Simply put, growth is good for all occupations, but continues to be better for those at the top-end.

The Community Services sector comprises almost wholly of the public sector. As such, it represents the single largest employer in the economy. South Africa has embarked on a sustained

programme of privatisation and deregulation, which has been matched by a concerted effort to restructure the public sector. This has had an immediate and profound impact on labour market trends within this institution. The data from Table 1 displays this vividly: it has been the largest single shedder of jobs since 1995. More importantly, the brunt of the adjustment has been borne by elementary workers and machine operators. Collectively, between 1995 and 1999, the public sector has shed about 100 000 employees in these two occupations. In addition semi-skilled employees such as sales staff and noticeably skilled workers such as technicians, have also witnessed a significant depletion in their numbers. Ultimately, the public sector, through its intensive restructuring process, has ensured that unskilled, semi-skilled and skilled workers have experienced job losses. At the skilled level, technicians would include employees such as nurses, safety and quality inspectors and certain teachers. It is therefore likely that these individuals, in particular nurses and teachers, had the highest attrition rate amongst the semi-skilled and skilled work force. Despite this restructuring process though, the number of managers and professionals within the public service rose dramatically. Hence, since 1995, the number of workers in these top-end occupations increased by over 150 000 greater than the net job loss in the sector. The public sector, through its restructuring programme has thus constricted the demand for technical staff (particularly nurses and teachers) and unskilled employees, while continuing to hire highly skilled managers and professionals.

There are two points of relevance from the above. Firstly, given the fact that the public sector is in quantity terms the largest employer in the economy, the deterioration of its work force disproportionately impacts on aggregate unemployment levels and future unskilled labour demand patterns. Secondly, these results conform with the long-run labour demand analysis, indicating a high and rising demand for skilled workers, with an erosion of the bottom-end workforce. However, it is additionally clear here, that the labour demand response is very specific about the supply characteristics of skilled workers that are required. Hence, there is a heterogeneity in these characteristics, and as such the market would value, for example, a high-school teacher differently from a mechanical engineer, even though generically both are viewed as skilled workers.

Employment by Race and Gender

An important addition to the sectoral and occupational detail is of course an analysis of employment shifts according to supply-side markers, such as race, gender and education. The data would essentially try and differentiate the aggregate growth rate in Table 1 of 971 504 new jobs according to race and gender.

Table 5, therefore, divides the national employment trends, observed in Table 1, by race. In addition, these employment shifts have been matched to the growth of the economically active population (EAP) for the different race groups. We are implicitly then measuring the relative performance of labour absorption in the domestic economy.4 In terms of the employment by race figures, it is evident that for all groups the demand for labour increased. Hence, the highest increase in percentage terms was for Coloured workers, followed by Asians, Africans and then White workers. The racial distribution of the total employment shift between 1995 and 1999 therefore indicates that all groups gained from employment. However, it is important to present these figures in terms of relative demand shifts – something which is extended further in the

[4] Note that the racial employment numbers do not sum to the aggregate employment shift, due to a fifth category in the questionnaire, denoted as 'other' into which these individuals were coded.

detailed decompositions provided below. In essence then, one needs to measure and evaluate the employment shifts relative to the net number of new entrants coming into the labour market over the same period.

Table 5 therefore shows for example, that while African employment grew by about 10 percent since 1995, the net number of African entrants seeking employment grew by 26 percent. In other

Table 5: Employment and EAP Changes, By Race

Race	Employment		EAP		Target Growth	Employment Absorption Rate
	Change	% Change	Change	% Change		
African	612146	9.94	2441841	25.50	39.65	25.07
Coloured	178515	15.95	258090	17.97	23.06	69.17
Asian	43607	12.37	88534	21.75	25.11	49.25
White	119799	6.22	170266	8.42	8.84	70.36
Total	971504	10.17	2980719	22.18	31.19	32.59

words, African employment grew, but not fast enough to provide employment to all new work-seekers. Indeed, in order for all these new worker-seekers, numbering some 2.4 million, to have found employment African employment would have needed to have grown by 39.65 percent since 1995. We have termed this the 'target growth rate', as it essentially summarises the desired employment growth rate for each of the race groups. The target growth rate can be represented simply as:

$$\frac{EAP_{kt} - EAP_{kt-1}}{L_{kt} - 1}$$

where EAP refers to the economically active population for group k and L is the number of employed individuals, by any given covariate. Note that because this target growth rate captures the growth required to provide employment to only the new entrants since 1995, it is essentially the rate of growth required to absorp all net new entrants, independent of the unemployment numbers existent in the base year, namely 1995. The employment absorption rate is the ratio between the actual employment growth and the desired (or 'target') rate, and is expressed as a percentage. The closer the employment absorption rate is to 100, the better the actual relative to the desired employment performance. These figures are critical as they are predictors of relative employment performance – something that the standard growth rates do not yield.[5]

Using the above approach, it is evident that while all growth rates were positive, the relative labour demand shifts, as approximated by the employment absorption rate, yield contrasting results. For example, while the African growth rate was higher than White employment growth, the employment absorption rate tells a very different story. Hence, we see that the relative performance of African employment, when considering the new African entrants into the labour market, was actually far poorer. While African employment should have grown at about 40 percent to absorb all the new entrants, White employment only needed to expand by 9 percent. The gap between the actual and desired job performance for Africans (25.1 percent) was far wider than that for White workers (70.4 percent). Put differently, employment was generated for only 25.1 percent of all new African entrants into the labour market, relative to 70.4 percent of all White new entrants. The generic point though is that while positive employment growth was reported for all race

[5] The decomposition exercise in the following section takes a similar approach in that it measures relative, rather than absolute, demand shifts. This is crucial in order to impart accurate information concerning labour demand shifts in the economy, beyond the basic growth rates of employment.

groups, relative to the growing labour force, all races yielded poor or inadequate labour demand growth.

Underlying these race-based shifts are the sectoral flows outlined in Table 1. Hence, closer examination of race-employment growth by sector reveals that sectors such as construction and internal trade were particularly important in increasing the demand for African (semi-skilled and unskilled) labour. For White workers, it was high-skill sectors such as financial services that explain much of the uptake in employment. Conversely the high attrition rate in the public service disproportionately affected African workers and is a core part of the poor relative performance for these workers. Ultimately, while the skills-biased labour demand shifts are not as intensive when examining the sectoral data, the race data suggests that even though some sectors are growing, they are clearly not expanding rapidly enough to absorb the increasing numbers of new entrants entering the labour force.

Table 6 follows the same reasoning as that of Table 5, this time concentrating on the relative demand performance of male and female workers. It is evident at the outset that there was positive employment growth for both genders, with female workers gaining more than their male counterparts. This trend is reasoned through the sectoral data, which shows that the growth primarily of the Internal Trade sector, significantly benefited women workers. As is to be expected, the rapid rise of financial services was also a boon to female employment. In turn, male workers bore the brunt of the restructuring exercise in the public sector. Hence, while over 100 000 male workers lost their jobs in the sector, for females the figure was under 30 000. A combination therefore of high-growth sectors benefiting female workers equally or more than male employees, and declining sectors disproportionately impacting on males, led to a higher net demand growth for female workers.

As with the race figures in Table 6 though, it is the relative demand shifts that are important. Hence, we see that while the female employment growth rate outstripped that of males, the male labour force in fact grew less rapidly (16.11 percent) than the female EAP (29.63 percent). In other words,

Table 6 Employment and EAP Changes, By Gender

Race	Employment		EAP		Target Growth	Employment Absorption Rate
	Change	% Change	Change	% Change		
Male	287545.2	4.94	1205068	16.11	20.71	23.86
Female	676986.8	18.10	1766089	29.63	47.23	38.33
Total	971504	10.17	2980719	22.18	31.19	32.59

in relative terms, female employment needed to grow much faster than male employment. The desired, or target, employment growth as a result for males was 20.71 percent, while for females it was considerably higher at 47.23 percent. The employment absorption rate statistics show though that the relative performance of female workers was better than that of males, with 38.3 percent of female entrants finding employment, relative to 23.9 percent of males. Hence, since 1995 not only did female workers do better in absolute terms, but in terms of relative demand shifts, their job growth was superior to male employees.

Conclusions

The above sections have tried to provide a detailed empirical overview of labour demand trends by a series of cohorts. A few trends appear to be emerging in this post-apartheid period. Firstly, in some contradiction to the long-run labour demand of previous analysis, these results provisionally suggest that most non-primary main sectors of the economy are in fact creating employment. In this first result, the notion of 'jobless growth' for the South African economy is clearly erroneous. The important caveat to this reasoning though, is that the labour force has simultaneously grown at a higher rate than employment. In net terms then, employment expansion has been relatively poor. In addition, it is evident that across the different sectors, semi-skilled and skilled workers are gaining a fact contrary to the long-run labour demand analysis, which suggested that it was primarily skilled employees who were gaining. Indeed, some of the sectors, such as Wholesale and Retail Trade, revealed a rise in demand for unskilled workers as well. But the data continues to suggest that skilled workers are still undoubtedly gaining more than those below them in the occupational ladder.

The one result that is directly reflective of state policy is the process of public sector restructuring. It is the set of initiatives that have characterised this downsizing of the sector, which have resulted in some 145 000 jobs being shed over the 5-year period. It is clear then that the key domestic employment shift since 1995, has been the high rate of attrition amongst public sector employees. This would seem to be the dominant trend in explaining a number of the figures observed above. The poor net performance of Africans and male employees all to a large extent reveal a public employer that is attempting to drastically shrink its work force. Indeed, as we will see below, it is the public sector's large absolute shares of employment that have driven the relative demand shifts at the sectoral level.

Decomposing Relative Sectoral Labour Demand Shifts

The above descriptive statistics have provided a detailed analysis of the growth of employment since 1995, drawing on a set of covariates to illustrate these changes. In addition, the empirical overview tried to be diligent in measuring employment expansion relative to the growth of the labour force. This section attempts a more robust estimation of these relative demand shifts. Accordingly, we draw on the relative labour demand decomposition of Katz & Murphy (1992), which we elucidate on in detail in Appendix 2.

Relative Employment Shifts By Occupation, Race, Gender and Education

The following tables represent the results of the decomposition methodology outlined in Appendix 2. Each of the tables report the shifts as relative demand shifts, so trying to capture more accurately the magnitude of net sectoral employment growth, which absolute growth figures tend to mask. Secondly, the tables report the contribution of the between- and within-sector shifts to the total labour demand shift with the within-sector share represented as a percentage share of the total relative change in employment.

Table 7 undertakes the decomposition according to occupations.[6] It is evident that the relative demand for unskilled employees, notably operators, skilled farm workers and labourers, declined over the period. Note that, because we are measuring relative labour demand trends, we do not

[6] The 1995 and 1999 data sets report slightly different occupational categories, and hence a consolidated set of occupations was derived to ensure a match between the two data sets

have the difficulty of deriving conclusions from absolute growth rates. In turn, managers and semi-skilled staff such as clerks and sales personnel all saw a rise in their demand. This matches well with the notion in the above data of additional hiring of semi-skilled staff in growing sectors such as construction, internal trade and finance. The professional employment along with the figures for technicians may be explaining the decline in employment in the public sector. This is a point worth dwelling on, if only to differentiate between the pure growth rate figures from Table 1 and the weighted relative shares of employment that the decomposition technique offers. Thus, while the demand for professionals grew in the public sector in absolute terms, between 1995 and 1999, over the same period, the share of public sector professionals in total professional employment over the period in fact declined. Hence, we find that while public sector professionals were 72.2 percent of all professionals in 1995, in 1999, they constituted about 63.1 percent of professionals. This represents a drastic decline over a short period, by the single largest employer of professionals in the economy. It is precisely this dynamic which yields the negative relative demand shift for professionals in the decompositions – Tables 7 and 7a . In addition, as a share of total employment, public sector employment of technicians fell from 66.4 percent to 58.9 percent over the same period once again a huge act of job destruction in this occupation within the public sector.

In order to try and isolate the impact of this public sector restructuring from the relative demand shifts that may have been occurring elsewhere in the economy, we also ran the decomposition for all the employed, excluding Community, Social and Personal Services. This sector would of course be mainly constituted of public sector employees. This table – Table 7a – is represented to try and illuminate the extent to which government restructuring has influenced these labour demand results. It is evident, for instance, that the professionals and technicians results are reversed. We see a significant increase in the demand for both these occupations. The relative demand shift for professionals changes from a decrease in Table 7, to the largest increase over the period. A comparison of the data from the two tables therefore clearly illustrates the importance of the public sector in explaining the economy's labour demand shifts over the last 5 years.

The real value-added from the decomposition though is its ability to distinguish between-sector forces from within-sector influences in the observed labour demand trends. The evidence from both of the above tables, makes it clear that within-sector forces have been driving employment shifts in South Africa since 1995. The figures show that for all occupations, the share of within-

Table 7: Industry-Based Relative Demand Shifts, 1995-99, By Occupation

Occupation	Between	Within	Total	% of within
Managers	0.19	3.15	3.33	94.38
Professional	-0.09	-2.50	-2.58	96.64
Technicians	-0.29	-2.38	-2.67	89.07
Clerks	0.29	2.05	2.34	87.71
Sales	0.09	0.71	0.80	88.58
Skilled Agriculture	-0.06	-5.58	-5.64	98.85
Crafts	-0.05	-0.35	-0.39	88.40
Operators	-0.34	-2.68	-3.02	88.78
Elementary	-0.38	-0.86	-1.24	69.44
Unspecified	-0.09	-8.47	-8.56	98.93

Table 7a: Industry-Based Relative Demand Shifts, 1995-99, By Occupation, *excluding community services.*

Occupation	Between	Within	Total	% of within
Managers	0.14	1.90	2.03	93.36
Professionals	0.09	6.48	6.57	98.64
Technicians	0.20	3.76	3.96	94.84
Clerks	0.40	2.11	2.51	84.05
Sales	0.31	1.75	2.06	85.01
Skilled Agriculture	-0.11	-7.21	-7.31	98.54
Crafts	-0.32	-1.82	-2.14	85.20
Operators	-0.65	-3.89	-4.55	85.64
Elementary	-0.91	-1.40	-2.31	60.61
Unspecified	-0.13	-9.33	-9.46	98.63

sector forces in explaining overall relative demand shifts far outweighs that of the between-sector forces. For all occupations, barring that of elementary workers, within-sector influences from Table 7 constituted between 88 and 99 percent of the aggregate labour demand shifts. Hence, the forces of technological change, the greater preference for a specific factor mix and so on, have all catalysed firms into altering their labour demand specifications in a particular manner. Put simply, forces within each sector and firm have been the primary reason for the labour demand changes that have occurred in the period 1995-1999. This decomposition result was observed for the long-run data as well, and hence we see in the estimation here a continuation of this trend. It should be noted that the smaller within-sector share for elementary workers, is picking up the high attrition rate of these workers, in the two primary sectors which in the long-run remain in secular decline.

The decomposition results by race are presented in Table 8. Firstly, the table reflects the poor relative labour demand performance of African and Coloured workers. Hence, in terms of a weighted sectoral relative labour demand performance, these two groups have seen their labour in less demand than those of Asian and White workers. For the latter, their relative sectoral demand increased over the period. Interestingly, the influence of within-sector forces in explaining this shift was dominant for all non-African workers. Hence, within-sector factors helped explain between 79 and 96 percent of the aggregate labour demand changes observed for Coloureds, Asians and Whites.

Table 8: Industry-Based Relative Demand Shifts, 1995-99, By Race and Gender

	Between	Within	Total	% of Within
Race				
African	-1.04	-0.56	-1.60	34.87
Coloured	-0.04	-0.33	-0.37	88.14
Asian	0.06	1.56	1.63	96.18
White	0.27	1.02	1.29	79.26
Gender				
Male	-0.88	-0.59	-1.47	40.12
Female	0.13	0.20	0.33	60.19

For African workers however, it was between-sector shifts that were dominant, as they amounted to approximately 65 percent of the total relative demand shift. There would seem to be two immediate reasons for this. Firstly, the significant losses in the primary sectors of unskilled workers would have disproportionately affected African workers relative to other groups. Secondly, the high attrition in the public sector would also have impacted predominantly on African employees. While some of this public sector restructuring can be captured as a within-sector change, the sector is also declining in terms of its share in national output. For example, between 1995 and 1999, the share of general government services in national output fell from 14.75 percent to 13.73 percent (IDC, 1995). This shift in output shares has undoubtedly fed into the results reported above for African workers.

The gender figures do somewhat mirror the racial breakdowns. Here, the relative demand for male workers fell, while that of females increased. We see a reflection of the dominance of the African worker employment outcome, where the primary sectors' decline together with the public sector's falling share of output have disproportionately impacted on male African workers. In turn, the share of the within-sector component to overall labour demand shift is 40 percent, again reinforcing this reasoning. Female employment increased, with the between-sector explanation less dominant. It is likely that the influence of firms' changing production methods which is reflected in the main by the microelectronics revolution and a growing preference for machinery over labour, has resulted in lower entry barriers for women in the workplace. In addition of course, the growth over this short period in the clerical and sales staff occupations in certain sectors, has fed into this higher demand for female employees.

Ultimately though, it is evident that for African and male workers, the between-sector segment of this relative labour demand shift is the dominant factor in explaining their relatively poor performance in the jobs market since 1995. The decline as a share of GDP, and more than likely continued decline, of specific sectors that employ large numbers of African male workers, has induced this outcome. In turn, the dominance of certain sectors, notably the services sectors (excluding general government) has resulted in a disproportionate increase in the demand for female workers as well as Asian and White employees. For these winners though, the key cause for the increased preference for their labour has been the process of firms adopting new technologies as they strive to become internationally competitive. This internal restructuring process has meant, at the sectoral level, that female workers compete more equally for employment with males. Secondly, it does mean that skilled workers who in the South African labour market, tend to be Asian or White, will gain at the expense of unskilled employees. The dominance of the within-sector forces in these results therefore has yielded relative labour demand outcomes which are biased toward female workers and, as a marker for skilled workers, toward Asian and White employees.

Conclusion

The above empirical overview suggests that the South African labour market has been creating jobs. However, it is evident that the rate of job creation has been far below the growth rate of the labour force, irrespective of the covariates that are used to display these facts. Hence, by occupation, race and gender, the data makes it very clear that the number of new entrants outstrips the number of jobs being created for these cohorts. As such then, the domestic economy in this post-apartheid period continues to be a poor absorber of work-seekers generally, but a particularly poor creator of low-end jobs. The second segment of this paper applied a well-known decomposition technique to explain the causes for such labour demand changes. It is clear that the adoption of new technologies has remained as the dominant determinant of the economy's employment trajectory. In addition though, this shorter-run analysis did suggest that production method changes such as greater outsourcing and higher capital stock acquisition, have also contributed to the growing demand for high skilled and semi-skilled workers. The labour market environment South Africa faces in this post-apartheid period, is of a growing demand for skilled workers and in certain instances, semi-skilled workers combined with employment losses for unskilled employees. Overriding these shifts, has been the dominance of the process of public sector restructuring in explaining the aggregate occupational and other shifts, both according to the simple growth rates and the decomposition methodology. If there is one exogenous factor that marks this period of change in the South African labour market, then it is undoubtedly the impact of the restructuring process in the economy's single largest employer.

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APPENDIX 1

Table 2A: Employment Shifts by Sector, 1995 and 1999 (OHS, 1995 and 1999)

Sector	Unspecified		Agriculture		Mining*		Manufacturing		Utilities		Construction		Trade	
Occupn./Year	95	99	95	99	95	99	95	99	95	99	95	99	95	99
Unspecified	75846	94314	775	3703	4598	5864	6103	34911	1339	3555	1195	2729	5115	9576
Managers	11674	12897	6574	30875	15644	17562	74665	112321	1964	6195	23060	43487	221437	211643
Profess.	1531	3918	677	2421	6490	9755	13503	34034	2826	3033	4815	4339	8156	18733
Technicians	4056	3733	3107	4006	17926	13262	79541	109861	10759	5105	14758	5272	49519	76444
Clerks	24681	17026	12102	11057	52712	22097	132022	122366	10921	9886	15071	15903	286255	299430
Serv&Sales	4781	7181	8636	18050	35978	17358	33487	37711	3855	5713	2039	5397	480733	623513
Skllagdomes.	738	0	103132	315460	1197	1801	5024	6128	0	330	264	435	3901	11640
Craft	6278	5345	14604	28863	218096	172285	306129	384438	26911	22299	265629	371780	192313	244781
Mach. Oper.	25257	7250	129116	132585	130317	174420	497162	417473	14151	8927	24466	19674	84010	66291
Elementary	31759	8851	905989	598295	110043	43716	273320	256213	11315	13439	82195	100673	318578	546837
Total	**186601**	**160515**	**1184712**	**1145315**	**593000**	**478120**	**1420956**	**1515456**	**84041**	**78482**	**433492**	**569689**	**1650017**	**2108888**

Table 2A contd. : Employment Shifts by Sector, 1995 and 1999 (OHS, 1995 and 1999)

Sector	Transport		Finance		Services		Domestic		Total	
Occupn./Year	95	99	95	99	95	99	95	99	95	99
Unspecified	2648	7284	1819	7319	29388	15824	0	487	128826	185566
Managers	65898	75891	48966	104485	38372	80047	585	0	508839	695403
Profess.	4748	9606	48849	119965	233726	352406	0	93	325321	558303
Technicians	53867	40624	123229	174108	697731	620413	1180	973	1055673	1053801
Clerks	89420	95587	220060	243379	299072	239524	0	1178	1142316	1077433
Serv&Sales	13319	24805	73564	159147	405099	333491	12956	12999	1074447	1245365
Skllagdomes.	865	1876	737	11871	7960	29540	689893	938931	813711	1318012
Craft	49212	47176	18867	25218	54237	57785	1447	10168	1153723	1370138
Mach. Oper.	136861	190291	10103	19929	70095	55813	995	6121	1122533	1098774
Elementary	52362	49953	36703	75088	315702	223115	93831	9714	2231797	1925894
Total	469200	543093	582897	940509	2151382	2007958	800887	980664	9557185	10528689

Appendix 2

Decomposing Between- and Within-Sector Employment Shifts [Katz and Murphy (1992)]

The technique has its theoretical foundation in a set of labour demand equations, where labour is hired subject to a cost constraint, assuming constant returns to scale in the production function. The derivation allows the authors to arrive at a representation of labour demand where the total relative labour demand shift is represented according to a given group (occupation, for example), which is then readily decomposable into a between-sector and within-sector component. It should be remembered that both these shifts are to be understood under a regime of fixed relative wages. The total shift as well as the between-sector shift, according to occupation or socio-economic groups, are directly observable. Utilising this theoretical approach, one can then arrive at an empirically estimatable equation, to determine the size of these three segments of relative labour demand by any given cohort. The index of relative labour demand shifts is constructed as follows:

$$\Delta X_k^d = \frac{\Delta D_k}{E_k} = \sum_j \left(\frac{E_{jk}}{E_k} \right) \left(\frac{\Delta E_j}{E_j} \right) = \frac{\sum_j \alpha_{jk} \Delta E_j}{E_k} \qquad (1)$$

The subscripts k and j refer to occupation (or socio-economic) groups and sectors respectively. The total relative demand shift for group k in the period under consideration is measured by ΔX_k^d. Specifically, it is measured by, $\alpha_{jk} = \left(\frac{E_{jk}}{E_j} \right)$ which is group k's share in sector j, as a share of total employment in that sector, weighted by the percentage change in total sectoral employment, ΔE_j, in which the weight is the group-specific employment distribution, E_k. Note that the between sector component explaining part of the shift in relative demand for group k is given by ΔD_k, while the within-sector shift is simply the difference between the total- and between-sector shifts. As with the Katz & Murphy (1992) approach, we normalise total employment in each year to sum to one, and so obtain a measure of relative demand shifts. In addition, the values for α_{jk} and E_k are represented in base year, which in this case is 1995.