

## **Employment and skills in South African exports**

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## Preface

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The Employment and Economic Policy Research Programme of the Human Sciences Research Council publishes this Occasional Paper series. The series is designed to contribute to knowledge and stimulate debate on employment and unemployment dynamics. We invite comments and responses from readers.

## About the Author

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Having worked as an economic policy analyst at the University of Stellenbosch and the Policy Unit at the Development Bank of Southern Africa (DBSA) for more than a decade, Dirk Ernst van Seventer has operated as an independent consultant for the last eight years. His focus is trade, industry and macro-economic analysis in an economy-wide framework for South and southern Africa and occasionally this includes other economies. His target group includes private sector corporations, NGOs, as well as public sector policymakers.

## Abstract

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This paper reports on the labour absorption of South Africa's exports using a simple first-generation social accounting matrix-based configuration (SAM). In particular, we investigate the labour absorption of exports versus domestic demand and the labour absorption of exports by destination market. A distinction is made between full backward linkages and those where supply constraints are considered in the primary sectors. Moreover, we consider marginal versus average demand for labour responses to domestic and foreign demand injections. We find that on average, exports are more low-skill labour intensive compared to domestic demand, but if supply constraints are introduced and we only consider marginal increases, domestic demand appears to be more labour intensive. In terms of destination markets, we broadly confirm findings from the mid-1990s that South African exports to developed countries remain more low-skill intensive, while exports to developing markets are more high-skill intensive.



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### **Introduction**

Liberalisation of the trade regime has been and still is one of the main objectives of South Africa's policy-makers over the last ten years. If we are to believe the Heckscher-Ohlin theorem and, given the distribution of factors endowment, with capital and highly skilled labour in short supply and unskilled labour in abundance, one would expect South African trade to favour low-skilled labour-intensive manufacturing industries. Considerable attention has been given to this issue in the past and some of this analysis has been synthesised in TIPS' State of Trade Policy (Cassim, Onyango & Van Seventer 2002).

The HSRC has been conducting a wide-ranging programme of analysis of labour markets in South Africa, focusing on demand as well as supply. In the context of this programme there is a need for a more current view of the labour absorption of South Africa's trade. Earlier work by Edwards (2001) used a decomposition analysis based on methodologies advanced by Chenery, Robinson and Syrquin (1986). Fedderke, Shin and Vase (1999) have applied econometric techniques to examine the relationship between trade and employment in South Africa. Prior to that, Bell and Cattaneo (1987) utilised a factor content approach to South Africa's trade basket. These methodologies are beyond the scope of the current needs of the HSRC. In this paper a much simpler methodology is used to evaluate labour absorption of exports by skill category.

An important consideration is to account for direct as well as indirect labour usage. Moreover, the sources and destination of South Africa's exports by broad trading region can be an important factor as had previously been pointed out by Edwards (2001). Rather than attempting to undertake a full-scale employment decomposition analysis of South Africa's total trade, however, we examine the direct and indirect labour demand of South Africa's exports by destination in terms of skill category. The latter is defined according to the broad classification used in the Quantec South African Standardised Industry Database as well as the social accounting matrices (SAMs) used by Thurlow and Van Seventer (2002) and Thurlow (2004). We first present a model that can be considered for evaluating the demand for labour of South African exports. This is followed by a discussion of the data, after which results are presented. We end with conclusions.

## A model to examine the demand for labour of South African exports

Exports can be seen as a final demand stimulus to the South African economy. There are several ways of examining the impact of a demand stimulus on an economy. One way would be to estimate the necessary behavioural relationships econometrically and construct an econometric model of the South African economy. However, long-term trends are only available for a limited number of variables, which precludes accounting for detailed structures, and more importantly, the economy-wide evaluation of employment by skill category. For our purposes we make use of a model that is based on a single-point representation of the structure of the South African economy. Direct and indirect labour demand is estimated using a fixed coefficient SAM-based demand-driven model.

This brings us to the first and most important assumption of this class of models: the structure of this economy is assumed to be fixed, i.e. it is unaffected by whatever inputs are used. In our case this may be a problem as the size of South Africa's exports is sufficiently large to have economy-wide ramifications for economic structure, prices and supply. However, our aim is to evaluate and compare labour demand by skill and destination, while holding everything else constant or looking at marginal changes in exports.

The structure of this economy is captured by a SAM. This SAM was updated by Thurlow (2004) from an earlier SAM (with full description) for 1998 by Thurlow and Van Seventer (2002). A SAM essentially allows for a convenient, single-entry method of conventional national accounting practices with sectoral, factor market, household and other detail added in an internally consistent manner. The dimensions of the SAM used for our purposes are shown in Appendix A. In short, we identify 43 industries (and their associated primary products), 3 labour categories and 14 household income classes. Labour income earned by each labour category feeds into a fixed set of household income classes in addition to income derived from capital and other sources such as transfers as part of the household income distribution mapping.

This SAM is the underlying database for a fixed coefficient model which can be described as a single linear algebraically equation in the following way:

### Equation 1

$$X = (I - A)^{-1} * F$$

where

**X** is a column vector of endogenous variables, including industry output, demand for commodities, factor income and institutional income of aggregate enterprises as well as disaggregated households,

**F** is a column vector of exogenous variables including the government, aggregate investment demand and exports,

**I** is an identity matrix of appropriate size, and

**A** is a matrix of coefficients describing the inter-relationships amongst the endogenous variables in per unit terms.

Endogenous variables include:

- Supply of commodities.
- Each commodity can be produced by more than one industry.
- Each industry can produce more than one commodity (primary and secondary).

Each industry uses a range of commodities as intermediate inputs, these include:

- Factor incomes paid by industries.
- Income of institutions such as households.
- Indirect taxes.
- Trade and transport margins.

From Equation 1, we can set up a model that allows for the impact of a change in final demand  $\Delta \mathbf{F}$  to be evaluated for a change in the endogenous variables,  $\Delta \mathbf{X}$ . Our challenge is to represent exports by destination as final demand  $\Delta \mathbf{F}$ , which requires both  $\Delta \mathbf{F}$  and  $\Delta \mathbf{X}$  to be defined as a matrix with  $i$  rows for industries and  $k$  columns for destinations instead of a column vector as mentioned earlier (see Appendix B for a list of destinations).

### Equation 2

$$\Delta \mathbf{X} = (\mathbf{I} - \mathbf{A})^{-1} * \Delta \mathbf{F}$$

A number of auxiliary variables can be derived in a linear way from the change in the endogenous variable,  $\Delta \mathbf{X}$ , including imports and government revenue. Employment could also be one such variable as it is often assumed that, for all sectors that will indirectly receive a boost as a result of a stimulus (such as exports), average employment:output ratios of the relevant industries apply. This is highlighted by the following example. If a sector employs 20 000 workers and the gross value of production is R4 billion in a given year, the average employment:output ratio is 5 (workers per R1 million) in that sector. Suppose that as a result of an export stimulus, output of the sector increases by R5 million, employment is then assumed to increase by 25 workers.

However, there is substantial evidence of economies of scale in the usage of labour, especially when it involves the marginal expansion of output in a sector. It could well be the case that in our example, a rise in output is absorbed by more efficient use of existing labour, or by means of overtime. Following Bulmer-Thomas (1982), we can capture some of these behaviours by basing our computation of direct and indirect employment on economy-wide long-term econometric estimates of employment:output elasticities for the 43 production activities identified in our SAM (Moolman 2003). These elasticities generally result in lower marginal employment creation due to a demand injection such as the present one.

The above observations on potential labour utilisation are not only relevant for the analysis of the impact on employment but also, albeit to a lesser degree, for the additional impact on economic activity as a result of the household income-expenditure loop. As mentioned above, additional demand can be absorbed by means of overtime. However, without creating additional employment it is in principle possible that remuneration still increases as a result of higher labour productivity.

Input-output analysis assumes that there is sufficient capacity available in the backward linkages to satisfy the demand of the stimulus at hand and that prices will therefore remain constant. This may be true for most secondary and tertiary sectors, but not necessarily for primary sectors. It is possible that agriculture or mining will not expand their production to meet additional demand for their products that are related directly and indirectly to the stimulus. It may well be that those sectors will divert domestic demand to an expanding export market. Following suggestions by Millar and Blair (1985) we can accommodate this by imposing supply-side constraints on the multipliers for agriculture and mining. The values of supply-constrained output multipliers are usually lower than those of standard multipliers.

To conclude this theoretical overview, it should be noted that our main assumption is that the production structures of the economy remain constant following the modelled stimulus. Our SAM analysis is therefore comparatively static by nature and ignores any dynamic effects. It also ignores substitution between the production factors labour and capital and between domestic and imported intermediate purchases. In fact, our analysis has a very modest approach as it can answer ‘what if’ questions while holding other economic conditions constant. This approach is adequate for our purposes since we are interested in comparing the impact of exports for a range of destinations, but are not interested in any major policy issues that may or may not fundamentally change the structure of the present economy.

## Trade data

Apart from the SAM mentioned above, we need merchandise export data. This is available from Customs and Excise at the HS6 level and is mapped to South Africa’s Standard Industrial Classification used for the SAM. Exports in services are ignored at this stage, as there is no information on their destination. With export data available from 1988 it is also possible to examine demand for labour over the same period. We have selected the period 1998–2002 while keeping the basic SAM constant at the 2000 benchmark. In order to do this, export data, which are typically available in current prices from Customs and Excise, need to be converted to constant prices. Here we use the activity level deflators from the Quantec South African Standardised Industry Database that, in turn, are available from Statistics South Africa (Stats SA).

We compare direct with total (direct + indirect) impacts for *activities*. Exports are, however, expressed in terms of *commodities*. We employ the structure of the supply matrix of the SAM in order to determine the direct impact of exports by *commodity* on output and employment of *activities*. By doing so, we subtract imported commodities from both domestic and foreign demand in the same proportions. It could be argued that exports are less import intensive than domestic demand, but we have no information on this. The direct and indirect output and employment associated with foreign demand may therefore be understated. Moreover, we ignore monetary gold exports as there is no destination specified, but we include exports of minerals. For similar reasons, services exports are also omitted. The analysis can be extended to evaluate the same as described above for imports in order to examine the employment creation embodied in import substitution. This has not been attempted here, as it

is not clear what portion of each commodity's imports is competing with domestic supply and what proportion is not.

## Results

As an introduction, we examine the employment directly and indirectly associated with domestic and foreign demand. The question is whether domestic demand is more or less labour and skill intensive than foreign demand. We then continue with an evaluation of employment by skill associated with exports by destination market.

### *Comparing domestic and foreign demand*

Domestic demand includes household expenditure, demand by the public sector and investment demand. We have excluded changes in inventories as they could be kept for foreign and/or domestic demand. In the SAM it also includes a residual that is carried over from the supply-use table published by Stats SA. Aggregated across commodity groups, this residual is consistent with the national accounts, but takes on large values for some groups, such as processed food. Finally, we mentioned above that we would ignore gold and services exports due to the lack of information on destination. In this introductory comparison, however, we will include these exports, as we are not interested in their destination at this stage. Direct gross value of output by activity associated with domestic and foreign demand is shown in the first two columns of Table 1.

*Table 1: Direct impact of domestic and foreign demand on gross value of production (2000, R million current prices) and demand for labour by skill*

		Initial impact on activity output, domestic demand	Initial impact on activity output, foreign demand	Low-skilled Initial impact on employment, domestic demand	Low-skilled Initial impact on employment, foreign demand	Medium-skilled Initial impact on employment, domestic demand	Medium-skilled Initial impact on employment, foreign demand	High-skilled Initial impact on employment, domestic demand	High-skilled Initial impact on employment, foreign demand	All skills Initial impact on employment, domestic demand	All skills Initial impact on employment, foreign demand
		1	2	3	4	5	6	7	8	9	10
1	AAGRI	18,188	6,733	249,244	92,277	12,081	4,473	5,426	2,009	266,750	98,758
2	ACOAL	380	8,543	632	14,221	272	6,116	63	1,407	967	21,744
3	AGOLD	895	24,626	5,627	154,778	670	18,429	181	4,968	6,478	178,176
4	AOTHM	1,287	50,322	2,820	110,302	655	25,610	165	6,447	3,640	142,358
5	AFOOD	100,292	9,196	125,228	11,483	91,759	8,414	15,957	1,463	232,943	21,360
6	ABEVT	56,785	4,176	32,253	2,372	20,719	1,524	8,245	606	61,216	4,502
7	ATEXT	8,093	2,372	28,332	8,304	5,317	1,558	1,920	563	35,568	10,426
8	AAPPA	18,199	1,553	232,893	19,870	38,703	3,302	12,109	1,033	283,705	24,205
9	ALEAT	24	1,061	90	3,952	18	802	5	227	114	4,981
10	AFOOT	6,930	317	30,433	1,393	2,248	103	1,048	48	33,729	1,544
11	AWOOD	1,342	2,260	6,584	11,087	3,477	5,856	331	558	10,392	17,501
12	APAPR	3,871	6,052	4,220	6,598	1,988	3,109	564	882	6,772	10,588
13	APRNT	4,966	1,250	5,557	1,399	13,017	3,277	4,199	1,057	22,773	5,733
14	APETR	24,434	10,095	4,093	1,691	3,513	1,451	2,042	844	9,648	3,986



		Initial impact on activity output, domestic demand	Initial impact on activity output, foreign demand	Low-skilled Initial impact on employment, domestic demand	Low-skilled Initial impact on employment, foreign demand	Medium-skilled Initial impact on employment, domestic demand	Medium-skilled Initial impact on employment, foreign demand	High-skilled Initial impact on employment, domestic demand	High-skilled Initial impact on employment, foreign demand	All skills Initial impact on employment, domestic demand	All skills Initial impact on employment, foreign demand
		1	2	3	4	5	6	7	8	9	10
15	ABCHM	2,604	7,935	1,499	4,570	875	2,667	397	1,210	2,772	8,448
16	AOCHM	23,445	5,039	21,975	4,723	19,916	4,280	8,920	1,917	50,810	10,920
17	ARUBB	4,447	1,145	8,188	2,109	2,763	712	1,170	301	12,121	3,122
18	APLAS	1,816	1,185	6,407	4,182	2,162	1,411	916	598	9,484	6,190
19	AGLAS	203	369	405	737	104	189	42	76	550	1,001
20	ANMMP	594	925	1,251	1,948	320	499	129	200	1,700	2,647
21	AIRON	1,294	17,329	719	9,628	413	5,532	151	2,016	1,283	17,176
22	ANFRM	247	8,665	80	2,799	46	1,608	17	586	142	4,994
23	AMETP	7,075	4,407	17,418	10,851	7,660	4,772	2,131	1,328	27,209	16,951
24	AMACH	34,071	10,639	48,116	15,025	38,678	12,078	13,996	4,370	100,790	31,473
25	AELMA	6,543	2,265	23,031	7,974	8,689	3,008	6,806	2,356	38,526	13,339
26	ACOME	12,668	1,827	23,213	3,348	8,758	1,263	6,859	989	38,830	5,601
27	ASCIE	6,889	778	14,274	1,613	5,385	609	4,218	477	23,877	2,698
28	AVEHI	35,375	12,826	24,117	8,744	14,969	5,427	8,113	2,941	47,199	17,112
29	ATRNE	3,978	2,566	4,638	2,992	2,878	1,857	1,560	1,006	9,076	5,855
30	AFURN	8,514	2,476	38,386	11,165	13,661	3,973	2,826	822	54,873	15,960
31	AOTHI	5,704	3,395	7,781	4,631	7,520	4,476	1,395	831	16,697	9,938
32	AELEG	11,915	1,164	9,454	924	8,637	844	6,456	631	24,547	2,399
33	AWATR	2,351	48	739	15	675	14	505	10	1,918	39
34	ACONS	52,005	140	113,502	305	30,670	83	8,313	22	152,485	410
35	ATRAD	9,327	582	9,590	599	32,403	2,023	5,896	368	47,889	2,991
36	AHCAT	17,217	6,658	32,209	12,455	80,680	31,199	11,004	4,255	123,893	47,909
37	ATRAN	26,342	13,173	16,585	8,294	34,391	17,198	4,665	2,333	55,641	27,825
38	ACOMM	17,048	2,772	7,463	1,213	15,178	2,468	2,965	482	25,607	4,164
39	AFINS	46,276	7,577	2,471	405	47,488	7,775	18,294	2,995	68,254	11,175
40	ABUSS	48,115	2,223	22,049	1,019	79,040	3,652	20,931	967	122,021	5,638
41	AMAOS	26,419	864	3,459	113	79,632	2,603	78,639	2,571	161,730	5,287
42	AOTHP	28,911	1,502	541,470	28,140	163,146	8,479	23,615	1,227	728,232	37,845
43	AGOV5	167,752	29	221,942	38	608,388	105	518,460	89	1,348,790	233
44	Total	854,830	249,064	1,950,438	590,286	1,509,562	214,828	811,642	60,087	4,271,642	865,201
45	Employment per unit			2,281.67	2,370.02	1,765.92	862.54	949.48	241.25	4,997.07	3,473.82
46	Ratio foreign/domestic				1.04		0.49		0.25		0.70

Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)

It can be seen that coal (row 2) and gold (row 3) activities export most of their final demand. The opposite is true for food and beverages. Basic chemicals and basic metals, shown in row 16 and rows 21–22 respectively, are also large exporters relative to their domestic final demand (Table 1). In row 28 it can be seen that more than 25% of the

motor vehicles' final demand is exported. In other transport equipment this is even higher. Plastics export a large proportion of their final demand, but the foreign share of clothing's final demand is relatively low at less than 10%.

In terms of employment we use the fixed average employment:output ratios, which we prefer at this stage to the marginal ratios mentioned above because we are evaluating employment associated with existing demand and not hypothetical marginal increases. At the bottom of Table 1 it can be seen that we estimate that there are about two million low-skilled workers associated with the final stage of the production of domestic demand (as defined above), compared to 600 000 for foreign demand. To place this in the relevant context, we calculate the per unit employment for domestic and foreign demand in row 45 as the ratio of the third and first entry and the fourth and second entry of row 32 for domestic and foreign demand respectively. It can be seen in row 46 of Table 1 that foreign demand is about 4% more low-skilled labour intensive than domestic demand. Further down the same row it can be seen that the ratio shifts in favour of domestic demand for the higher-skilled categories, where the use of high-skill labour is about four times more intensive than that for foreign demand. This is mainly due to public sector employment, which involves teachers and nurses who are both classified as higher-skilled workers. As a result of the weights of the three labour categories in each activity, the total direct employment intensity of domestic demand is about 30% higher than that of foreign demand. The total employment directly associated with final demand is about five million workers with the additional two-and-a-half million workers associated with intermediate demand. Table 2 shows how the employment in upstream backward linkages is linked to the two elements of final demand.

Table 2: Direct and indirect impact of domestic and foreign demand on gross value of production (2000, current prices) and demand for labour by skill

		Direct + indirect impact on activity output, domestic demand	Direct + indirect impact on activity output, foreign demand	Low-skilled	Low-skilled	Medium-skilled	Medium-skilled	High-skilled	High-skilled	All skills	All skills
				Direct + indirect impact on employment, domestic demand	Direct + indirect impact on employment, foreign demand	Direct + indirect impact on employment, domestic demand	Direct + indirect impact on employment, foreign demand	Direct + indirect impact on employment, domestic demand	Direct + indirect impact on employment, foreign demand	Direct + indirect impact on employment, domestic demand	Direct + indirect impact on employment, foreign demand
		1	2	3	4	5	6	7	8	9	10
1	AAGRI	37,458	29,321	513,328	401,824	24,881	19,476	11,174	8,747	549,383	430,047
2	ACOAL	6,202	14,849	10,323	24,717	4,440	10,631	1,021	2,445	15,784	37,792
3	AGOLD	1,213	24,678	7,623	155,107	908	18,469	245	4,979	8,775	178,554
4	AOTHM	10,737	42,877	23,536	93,984	5,464	21,821	1,376	5,493	30,376	121,297
5	AFOOD	53,777	35,189	67,148	43,939	49,202	32,195	8,556	5,599	124,906	81,733
6	ABEVT	22,445	13,902	12,749	7,896	8,189	5,072	3,259	2,019	24,197	14,988
7	ATEXT	6,767	5,504	23,689	19,268	4,445	3,616	1,606	1,306	29,740	24,189
8	AAPPA	4,927	3,164	63,051	40,483	10,478	6,728	3,278	2,105	76,808	49,316
9	ALEAT	685	1,299	2,553	4,838	518	981	146	278	3,217	6,096
10	AFOOT	1,875	1,066	8,232	4,681	608	346	284	161	9,124	5,188
11	AWOOD	4,527	5,109	22,214	25,069	11,733	13,240	1,117	1,261	35,064	39,571





		Direct + indirect impact on activity output, domestic demand	Direct + indirect impact on activity output, foreign demand	Low-skilled Direct + indirect impact on employment, domestic demand	Low-skilled Direct + indirect impact on employment, foreign demand	Medium-skilled Direct + indirect impact on employment, domestic demand	Medium-skilled Direct + indirect impact on employment, foreign demand	High-skilled Direct + indirect impact on employment, domestic demand	High-skilled Direct + indirect impact on employment, foreign demand	All skills Direct + indirect impact on employment, domestic demand	All skills Direct + indirect impact on employment, foreign demand
		1	2	3	4	5	6	7	8	9	10
12	APAPR	12,266	14,053	13,372	15,321	6,301	7,219	1,787	2,047	21,460	24,588
13	APRNT	7,713	5,526	8,629	6,182	20,214	14,482	6,521	4,672	35,365	25,337
14	APETR	19,278	18,715	3,229	3,135	2,772	2,691	1,611	1,564	7,612	7,389
15	ABCHM	11,745	15,015	6,764	8,647	3,948	5,047	1,791	2,290	12,504	15,985
16	AOCHM	18,739	14,259	17,564	13,364	15,918	12,112	7,129	5,425	40,610	30,901
17	ARUBB	2,830	2,632	5,210	4,847	1,758	1,636	745	693	7,713	7,176
18	APLAS	5,370	4,285	18,949	15,122	6,394	5,103	2,708	2,161	28,051	22,386
19	AGLAS	1,510	1,184	3,013	2,362	772	605	309	243	4,094	3,210
20	ANMMP	8,213	2,774	17,287	5,840	4,428	1,496	1,776	600	23,491	7,936
21	AIRON	11,406	22,685	6,338	12,604	3,641	7,241	1,327	2,639	11,306	22,485
22	ANFRM	5,509	12,680	1,780	4,097	1,023	2,354	373	858	3,175	7,308
23	AMETP	13,265	9,806	32,659	24,143	14,363	10,617	3,996	2,954	51,017	37,714
24	AMACH	15,191	7,876	21,453	11,123	17,245	8,942	6,240	3,236	44,939	23,301
25	AELMA	9,890	4,167	34,812	14,669	13,134	5,534	10,287	4,335	58,233	24,538
26	ACOME	3,665	1,119	6,715	2,051	2,533	774	1,984	606	11,233	3,430
27	ASCIE	1,226	480	2,541	994	959	375	751	294	4,251	1,662
28	AVEHI	30,914	19,958	21,076	13,606	13,082	8,445	7,090	4,577	41,247	26,629
29	ATRNE	2,262	1,586	2,637	1,849	1,637	1,148	887	622	5,162	3,618
30	AFURN	3,562	2,769	16,061	12,486	5,716	4,443	1,183	919	22,959	17,849
31	AOTHI	2,645	2,959	3,608	4,036	3,487	3,901	647	724	7,743	8,661
32	AELEG	16,848	14,842	13,368	11,776	12,213	10,759	9,129	8,042	34,710	30,577
33	AWATR	6,406	4,263	2,013	1,340	1,839	1,224	1,375	915	5,228	3,479
34	ACONS	66,833	4,556	145,864	9,943	39,415	2,687	10,684	728	195,963	13,358
35	ATRAD	97,281	70,455	100,024	72,441	337,963	244,767	61,495	44,538	499,482	361,747
36	AHCAT	12,039	12,019	22,522	22,484	56,415	56,320	7,694	7,681	86,630	86,485
37	ATRAN	44,656	49,010	28,116	30,857	58,300	63,985	7,908	8,679	94,325	103,521
38	ACOMM	27,696	18,690	12,125	8,182	24,659	16,640	4,817	3,251	41,602	28,073
39	AFINS	66,965	48,799	3,576	2,606	68,720	50,077	26,473	19,292	98,769	71,974
40	ABUSS	62,239	36,849	28,522	16,887	102,242	60,534	27,075	16,030	157,839	93,450
41	AMAOS	17,155	9,266	2,246	1,213	51,710	27,929	51,065	27,580	105,022	56,722
42	AOTHP	24,283	17,728	454,786	332,028	137,028	100,041	19,835	14,481	611,648	446,549
43	AGOV5	176,242	889	233,175	1,176	639,180	3,223	544,700	2,746	1,417,055	7,145
44	Total	956,456	628,854	2,044,480	1,509,218	1,789,873	874,924	863,455	229,812	4,697,808	2,613,953
45	Employment per unit			2,137.56	2,399.95	1,871.36	1,391.30	902.76	365.45	4,911.68	4,156.69
46	Ratio foreign/domestic				1.12		0.74		0.40		0.85

Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)

1 In Table 2 we take into account the direct and indirect backward linkage upstream knock-on effects of domestic and foreign demand. It can be seen that the gross value of production associated with domestic demand is estimated to be

R950 billion,<sup>1</sup> while that of foreign (non-gold merchandise) demand is R630 billion. The total gross value of production estimated by the SAM database is about R1 600 billion. In terms of employment it can be seen in row 44 that with 4,7 million workers domestic demand contributes about 64% of the total demand for labour in the South African economy, estimated here to be about 7,3 million workers.<sup>2</sup> The rest, i.e. 35% of employment, is associated with exports. The high intensity of low-skilled labour causes exports to make a much higher contribution to employment than to the GDP. In row 46 it is reported that exports are more unskilled labour intensive by 12%, while overall it is less labour intensive by 15%. The lower overall labour intensity is entirely due to the skilled and highly skilled labour, as they are required less for export than for domestic demand. Again, we would like to stress that the classification of nurses and teachers has a larger role to play in this outcome.

As a matter of interest we also consider the impact of a 1% marginal change in demand (domestic and foreign). Agriculture and mining are supply-constrained and the impact on employment is measured by using marginal employment:output ratios based on estimated employment:output elasticities, as explained earlier. Table 3 below shows the highlights of this exercise, but we only report the full impact summary results for reasons of convenience.<sup>3</sup> Although absolute values are not comparable to the values given in Tables 1 and 2, it can be seen that the combination of the supply constraint on primary sectors and marginal employment:output ratios has a significant impact on the outcome. The ratio of low-skilled labour intensity (the demand for low-skilled labour to the value of the initial impact) to domestic demand is now 600 (workers per R1 billion), compared to 2 100 in the full-average version (see row 45 of Table 2). Similarly, the low-skilled employment intensity of foreign demand is now 500 compared to 2 400. This suggests that per unit of initial demand, exports have become relatively less low-skilled labour intensive when marginal demand injections under supply constraint from primary sectors are compared with average unconstrained injections, as the ratio of foreign to domestic employment intensities drops from 1.04 to 0.82. The employment intensities are also lower for the other skill categories, and as a result, the overall labour intensity of exports drops to 57% of domestic demand compared to 85% in the full average configuration.

Table 3: Direct and total impact of domestic and foreign demand on gross value of production (2000, current prices) and demand for labour following a 1% increase in final demand and exports in 2000

	Impact on activity output		Low-skilled		Medium-skilled		High-skilled		All skills	
	Domestic demand	Foreign demand	Impact on employment Domestic demand	Impact on employment Foreign demand	Impact on employment Domestic demand	Impact on employment Foreign demand	Impact on employment Domestic demand	Impact on employment Foreign demand	Impact on employment Domestic demand	Impact on employment Foreign demand
	1	2	3	4	5	6	7	8	9	10
Direct + indirect	8,158	3,387	5,024	1,719	12,790	3,275	7,395	950	25,209	5,944
Employment per unit			615.78	507.50	1,567.82	966.84	906.45	280.31	3,090.04	1,754.66
Ratio foreign / domestic				0.82		0.62		0.31		0.57

Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)

The reason for the lower low-skilled employment intensities in particular is two-fold: firstly, by imposing supply-side constraints on the primary sectors, we are ignoring the impact on production and employment of agriculture, an important employer of

low-skilled labour. Secondly, the marginal employment:output ratios derived from employment:output elasticities, estimated at the sectoral level, implicitly give more weight to some compared to other sectors, the composition of which will differ when comparing domestic to foreign demand.

*Employment by skill associated with South Africa's exports to selected destinations*

Our next interest is in the employment by skill *embodied* in current South African exports by destination. As before, we are initially not concerned with the impact of a marginal change in final demand on the demand for labour, but rather measure the employment that corresponds to existing sets of final demand expenditures. For this purpose we start by employing the basic model as outlined above in Equation 1, i.e. without marginal employment:output ratios or supply-side constraints. Later we compare these results with the potential employment-creating effects on employment by skill of marginal changes in exports by destination.

To start with, we show the aggregate direct and indirect impact on output in Table 4.<sup>4</sup> In the last column of the first tableau it can be seen that the total value of exports at constant 2000 prices increased from R122 billion in 1998 to R160 billion in 2001, but subsequently fell back to R157 billion in 2002.<sup>5</sup> Note that we are dealing here (and in the rest of this paper) with merchandise exports, as opposed to exports in services in Tables 1-3. The lion's share of merchandise export is destined for the EU, with large shares also destined for East Asia, NAFTA and SADC, followed by the Middle East and the Rest of Africa. South Central and South East Asia, as well as South America and Australia & New Zealand play a less important role in the export basket of South Africa.

Applying Equation 1 to the export values in tableau 1 of Table 4 yields the gross value of production associated with the exports by selected destination and shown in tableau 2. The economy-wide gross value of production in constant 2000 prices associated with total exports peaks at around R385 billion in 2001, after which it appears to take a small step back to about R380 billion in 2002. The values in the second tableau include the initial exports shown in the first tableau. The difference between the values in the two tableaus can be attributed to the upstream backward linkage knock-on effects. The period average multipliers of exports shown in the first tableau are presented in the last row of the table. Note the variation in the multipliers. The reason is the result of the different composition of the export baskets to each destination. One possible explanation could be that higher-than-average multipliers are reported for exports to Asian and South American destinations, partly due to a relatively high proportion of basic metals in the export baskets to these destinations. The relatively high multipliers for these commodities could in turn be related to the relatively high use of local inputs such as electricity, coal and ore. On the other hand, exports to African destinations are characterised by relatively low multipliers. Here, there is a higher proportion of machinery and other products in the export basket, which tend to rely more on imported inputs, and as a result, the leakages are higher. Also note the decline in the gross value of production associated with exports in 2002.

Table 4: Direct and total (direct + indirect) gross value of production corresponding to South African (non-gold) exports to selected regions (R million, 2000 constant prices)

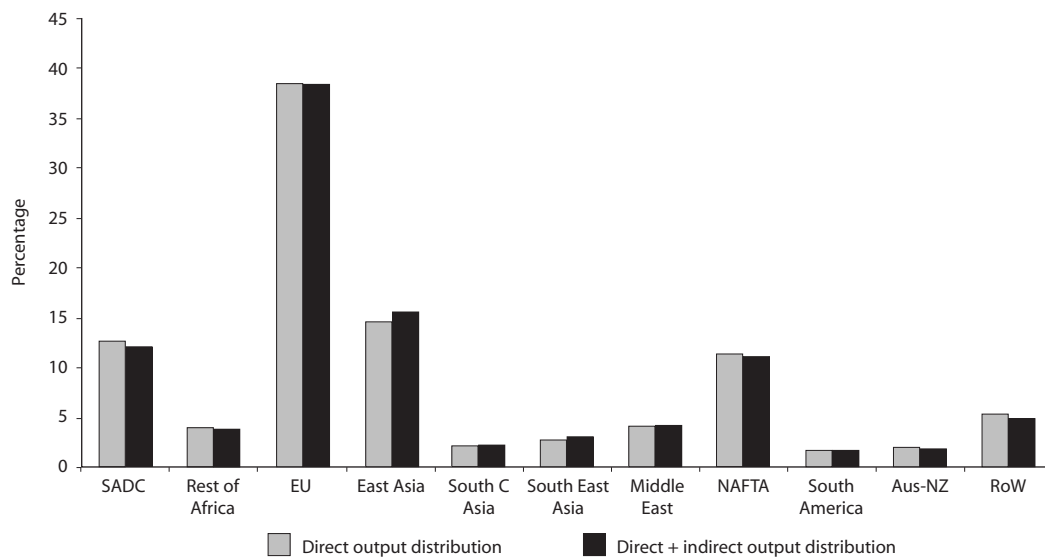
Region	SADC*	Rest of Africa	EU*	East Asia	South Central Asia	South East Asia	Middle East	NAFTA*	South America	Australia & New Zealand	RoW*	Total
Direct												
1998	16,846	4,830	48,314	18,240	2,558	2,729	4,713	14,091	2,807	2,288	5,041	122,457
1999	17,873	4,974	55,090	21,111	3,148	4,452	5,942	14,523	2,054	3,034	2,048	134,250
2000	20,202	5,708	58,190	24,177	3,573	4,681	7,199	18,968	2,519	3,597	8,195	157,008
2001	20,252	7,302	60,125	21,204	3,698	5,064	6,631	18,494	2,932	3,501	10,855	160,057
2002	16,572	6,925	59,223	22,494	3,182	4,459	6,619	17,321	2,105	3,450	14,908	157,258
Average share	12.6%	4.0%	38.6%	14.7%	2.2%	2.9%	4.2%	11.4%	1.7%	2.2%	5.4%	100.0%
Total (Direct + Indirect)												
1998	39,285	11,679	118,083	47,572	6,662	7,133	12,214	34,360	7,077	5,631	10,132	299,829
1999	41,873	11,858	132,049	54,953	8,262	11,260	15,020	35,226	5,158	6,965	3,055	325,679
2000	46,988	13,664	141,227	62,198	9,398	12,237	18,057	46,451	6,474	8,035	17,310	382,039
2001	46,870	17,205	144,782	54,000	9,523	13,232	16,530	43,700	7,480	8,113	24,168	385,604
2002	39,885	16,946	143,666	57,209	8,208	11,808	16,201	41,100	5,315	7,993	36,530	384,861
Average share	12.2%	4.0%	38.4%	15.6%	2.4%	3.1%	4.4%	11.3%	1.8%	2.1%	4.9%	100.0%
Average multiplier	2.34	2.40	2.42	2.57	2.60	2.60	2.51	2.41	2.54	2.33	2.06	2.43

Sources: SAM (output) and own calculations

Notes \* SADC = Southern African Development Community, EU = European Union, NAFTA = North American Free Trade Agreement, RoW = Rest of the World

The results for the period average distribution of the direct and total impact are also summarised in Figure 1.

Figure 1: Distribution of direct and total (direct + indirect) gross value of production corresponding to South African exports to selected regions (1998–2002 period averages)



Sources: SAM and own calculations

Next we present the same results for total employment but we disregard the skill dimension for the moment. The total number of person-year equivalents associated with total exports amounted to about 450 000 in 2000. This may seem a small number compared to the 865 000 reported in Table 1 (row 44). The reason is that firstly, we exclude gold exports as the destination is unknown, and secondly, we use trade data obtained from Customs and Excise which have not been scaled up to the export values of the SAM. In addition, we ignore labour that is employed in non-traded industries such as trade, accommodation, transport, financial and social services, government and domestic services, none of which is currently identified in any of the export baskets evaluated here. Still, we can note that we see a drop-off in 2002.

*Table 5: Direct and total (direct + indirect) employment corresponding to South Africa's exports to selected regions (person-year equivalents)*

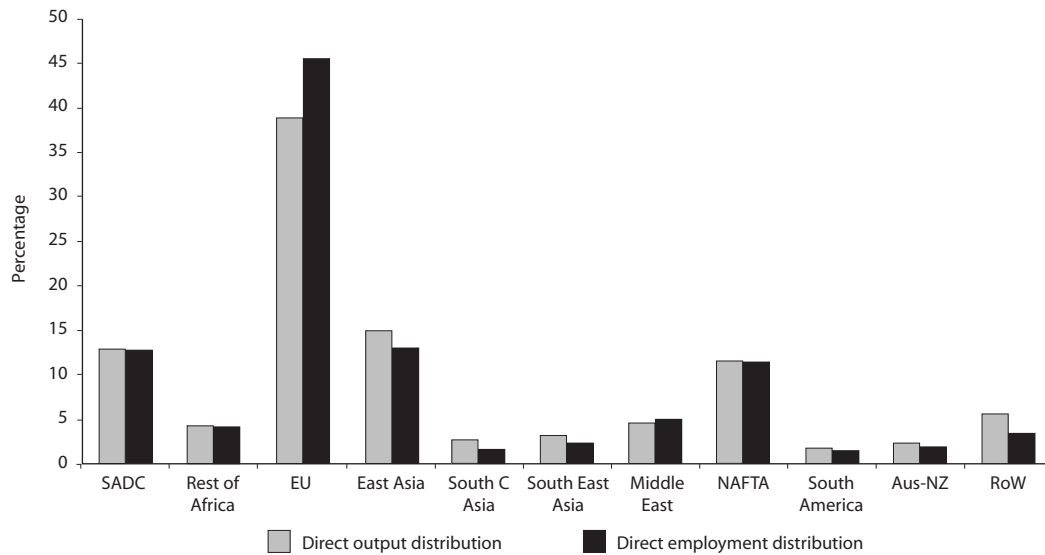
Region	SADC	Rest of Africa	EU	East Asia	South Central Asia	South East Asia	Middle East	NAFTA	South America	Australia & New Zealand	RoW	Total
Direct												
1998	50,675	12,877	166,343	45,284	4,796	5,807	15,079	36,980	5,797	5,168	11,823	360,627
1999	52,087	13,343	190,204	52,030	5,623	9,795	20,324	42,171	4,522	7,319	7,605	405,022
2000	51,017	17,825	196,454	58,035	7,119	8,546	22,527	51,373	5,062	8,265	13,481	439,704
2001	52,389	18,194	198,254	59,761	6,718	9,875	21,460	55,693	5,909	7,240	14,801	450,293
2002	53,992	17,790	189,663	52,525	6,028	8,400	19,901	48,523	4,114	7,497	18,955	427,388
Average share	12.6%	3.8%	45.2%	12.8%	1.4%	2.0%	4.7%	11.2%	1.2%	1.7%	3.2%	100.0%
Direct + Indirect												
1998	155,817	44,821	464,782	172,538	23,403	25,543	46,850	123,573	24,614	20,487	40,221	1,142,649
1999	163,969	45,559	521,849	197,214	28,160	39,727	58,795	129,264	18,070	25,576	19,524	1,247,707
2000	179,014	54,519	553,977	222,521	33,356	41,781	71,304	167,204	22,322	29,127	59,790	1,434,916
2001	179,392	64,643	565,543	202,766	33,166	46,240	63,625	162,135	25,789	28,935	77,909	1,450,140
2002	159,749	63,516	555,104	202,694	27,787	40,180	61,466	149,858	17,981	28,451	107,737	1,414,523
Average share	12.6%	4.1%	39.9%	14.9%	2.2%	2.9%	4.5%	10.9%	1.6%	2.0%	4.4%	100.0%
Average multiplier	3.22	3.42	2.83	3.74	4.82	4.56	3.04	3.13	4.28	3.75	4.27	3.21

Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)

In the second tableau of Table 5 we present the total impact on employment. This includes the direct effects of the first tableau as well as the upstream backward linkage effects. Total employment associated with the total export baskets, given in the last column, is estimated to be about 1,45 million person-year equivalents in 2000. Again, this is lower compared to Table 1 for the same reasons as mentioned above.

Interestingly, South Africa's exports to the EU embody a larger proportion of direct employment relative to direct output as can be seen in the last row of the first tableau of Table 5 compared to the same location in Table 4. Export to the EU would therefore seem to be relatively labour intensive, at least when looking at the direct effects. The opposite appears to be the case for exports to most of Asia and to a lesser degree to NAFTA, presumably because of more reliance on minerals and resource-based goods.

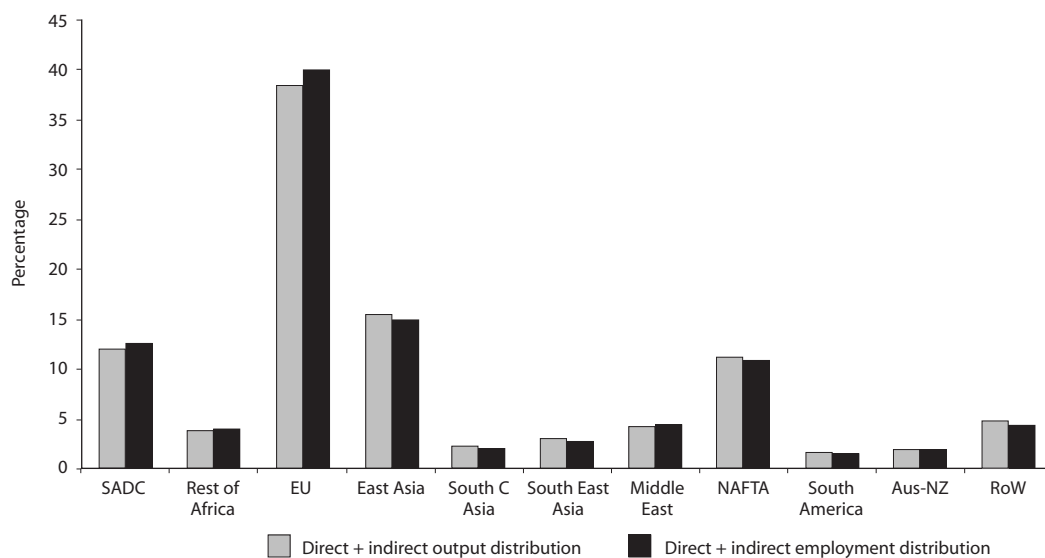
Figure 2: Distribution of direct output and employment corresponding to South African exports to selected regions (1998–2002 period averages)



Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)

After the backward linkages have been accounted for, the EU share of the contribution to employment by exports drops back to about 40% as can be seen in the second tableau of Table 5. It is then more similar to the direct and indirect impact on output, as can be seen in Figure 3. This suggests that the indirect employment impact of exports to the EU is relatively less labour intensive.

Figure 3: Distribution of direct output and employment corresponding to South African exports to selected regions (1998–2002 period averages)



Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)

Turning now to the skills composition, we present results in Table 6. It can be seen that two-thirds of the initial demand for labour associated with exports is low skilled, with another 20% medium skilled and the rest highly skilled. Again, exports to the EU stand out in that they account for almost 47% of low-skilled labour associated with total exports, and a relatively lower usage of higher-skilled labour appears to be the case. In the last row of each tableau we compare the contribution of each skill to total employment associated with exports to each region identified. If the ratio is larger than unity, the destination is more intensive in the relevant skill category. It can be seen that exports to Africa, developing Asia and South America are more directly skill intensive, while the opposite is true for exports to the EU and developed Asia. Exports to NAFTA are relatively neutral.

After taking indirect employment into account associated with the upstream backward linkages, the variation in the contribution that each selected region makes to employment by skill is considerably less. Exports to the EU still make up a larger proportion of low-skilled labour, but this has now dropped to 41% from 47% (see Table 7). Nevertheless, the broad pattern still remains, with exports to the developed regions more low-skill intensive and exports to developing regions more skill intensive.

*Table 6: Direct employment by broad skill level corresponding to South Africa's exports to selected regions (person-year equivalents)*

Region	SADC	Rest of Africa	EU	East Asia	South Central Asia	South East Asia	Middle East	NAFTA	South America	Australia & New Zealand	RoW	Total
Low-skilled												
1998	34,408	8,114	122,710	31,569	2,931	3,786	11,072	25,843	3,655	3,143	8,470	255,701
1999	34,554	8,450	139,540	36,578	3,476	6,830	15,290	29,795	2,926	4,553	5,416	287,410
2000	32,096	12,140	141,731	40,334	4,539	5,586	16,056	35,246	3,182	5,007	8,759	304,676
2001	33,758	11,293	140,142	42,677	4,037	6,441	15,336	38,192	3,709	4,240	9,188	309,013
2002	36,658	10,998	132,954	35,633	3,742	5,491	13,659	32,618	2,617	4,391	11,883	290,643
Average share	11.9%	3.5%	46.8%	12.9%	1.3%	1.9%	4.9%	11.1%	1.1%	1.5%	3.0%	100.0%
Contribution relevant to total export	0.95	0.92	1.04	1.00	0.89	0.95	1.04	0.99	0.91	0.86	0.96	1.00
Medium-skilled												
1998	11,811	3,492	33,312	10,889	1,410	1,505	3,108	8,344	1,590	1,477	2,503	79,441
1999	12,723	3,570	38,505	12,249	1,622	2,216	3,923	9,172	1,187	1,994	1,599	88,760
2000	13,719	4,121	41,375	13,791	1,948	2,182	5,062	11,910	1,394	2,310	3,474	101,285
2001	13,462	4,995	44,000	13,406	2,006	2,562	4,720	13,014	1,632	2,137	4,136	106,069
2002	12,546	4,941	43,248	13,233	1,699	2,135	4,883	11,771	1,101	2,209	5,317	103,085
Average share	13.5%	4.4%	41.9%	13.3%	1.8%	2.2%	4.5%	11.3%	1.5%	2.1%	3.5%	100.0%

Region	SADC	Rest of Africa	EU	East Asia	South Central Asia	South East Asia	Middle East	NAFTA	South America	Australia & New Zealand	RoW	Total
Contribution relevant to total export	1.08	1.15	0.93	1.04	1.25	1.09	0.95	1.00	1.18	1.25	1.08	1.00
High-skilled												
1998	4,456	1,271	10,321	2,826	455	516	898	2,793	552	548	849	25,484
1999	4,809	1,323	12,158	3,203	525	749	1,110	3,204	409	772	589	28,852
2000	5,202	1,564	13,349	3,911	633	778	1,409	4,217	486	947	1,248	33,742
2001	5,169	1,906	14,112	3,678	675	873	1,404	4,487	567	863	1,477	35,211
2002	4,787	1,850	13,461	3,658	587	775	1,360	4,134	395	897	1,755	33,660
Average share	15.7%	5.0%	40.5%	11.0%	1.8%	2.3%	3.9%	11.9%	1.6%	2.5%	3.7%	100.0%
Contribution relevant to total export	1.25	1.32	0.89	0.86	1.26	1.16	0.83	1.06	1.26	1.50	1.16	1.00

Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)

This pattern is confirmed by the contribution of each broad skill category to total employment associated with exports to each of the selected regions, now including the upstream backward linkages. In the last row of each tableau we present, as before, the deviation from the average contribution made by total exports. In the case of exports to SADC, it can be seen that the contribution to low-skilled labour is just below the contribution to low-skilled labour made by total exports. With a ratio of 1.02, exports to the EU are slightly more low-skilled labour intensive compared to total exports when taking direct as well as indirect employment into account, down from 1.04 in the case of direct employment alone (see Table 6).

Table 7: Direct and indirect employment by broad skill level corresponding to South Africa's exports to selected regions (person-year equivalents)

Region	SADC	Rest of Africa	EU	East Asia	South Central Asia	South East Asia	Middle East	NAFTA	South America	Australia-New Zealand	RoW	Total
Low-skilled												
1998	91,019	25,676	282,795	103,127	13,455	14,752	28,703	71,293	14,025	11,432	23,588	679,866
1999	94,857	26,029	316,888	117,764	16,171	23,310	36,588	74,797	10,357	14,355	11,585	742,702
2000	100,937	32,194	333,518	131,426	19,441	23,856	43,556	95,252	12,643	16,122	33,142	842,089
2001	101,951	36,772	337,916	121,930	19,011	26,654	38,422	91,772	14,611	15,840	42,595	847,475
2002	93,635	36,221	330,581	118,406	15,876	22,940	36,523	83,845	10,197	15,474	59,898	823,596
Average share	12.3%	4.0%	40.8%	15.1%	2.1%	2.8%	4.7%	10.6%	1.6%	1.9%	4.3%	100.0%
Contribution relative to total export	0.98	0.98	1.02	1.01	0.98	0.98	1.03	0.97	0.97	0.94	0.96	1.00



Region	SADC	Rest of Africa	EU	East Asia	South Central Asia	South East Asia	Middle East	NAFTA	South America	Australia-New Zealand	RoW	Total
Medium-skilled												
1998	51,290	15,159	144,776	55,327	7,894	8,542	14,448	41,486	8,377	7,157	13,359	367,814
1999	54,650	15,456	162,948	63,271	9,497	12,999	17,697	43,164	6,098	8,856	6,543	401,181
2000	61,772	17,661	175,125	72,377	11,034	14,171	22,150	56,939	7,655	10,243	21,217	470,345
2001	61,248	22,039	180,854	64,407	11,205	15,499	20,050	55,744	8,840	10,308	27,964	478,156
2002	52,185	21,558	178,519	67,040	9,410	13,619	19,893	52,241	6,147	10,201	37,492	468,305
Average share	12.9%	4.2%	38.6%	14.8%	2.2%	2.9%	4.3%	11.4%	1.7%	2.1%	4.7%	100.0%
Contribution relative to total export	1.03	1.03	0.97	0.99	1.03	1.03	0.96	1.04	1.04	1.08	1.06	1.00
High-skilled												
1998	13,507	3,985	37,211	14,085	2,054	2,248	3,699	10,794	2,212	1,897	3,274	94,969
1999	14,461	4,073	42,013	16,179	2,492	3,418	4,510	11,302	1,615	2,364	1,396	103,824
2000	16,304	4,665	45,334	18,717	2,881	3,754	5,598	15,013	2,024	2,762	5,432	122,483
2001	16,193	5,833	46,772	16,429	2,950	4,087	5,153	14,620	2,338	2,787	7,350	124,510
2002	13,930	5,737	46,004	17,248	2,500	3,621	5,050	13,773	1,637	2,776	10,347	122,621
Average share	13.2%	4.3%	38.3%	14.6%	2.3%	3.0%	4.2%	11.5%	1.7%	2.2%	4.7%	100.0%
Contribution relative to total export	1.05	1.05	0.96	0.98	1.04	1.04	0.94	1.05	1.06	1.12	1.02	1.00

Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)

#### *Demand for labour associated with marginal increases in exports by skill and selected region*

In order to evaluate a marginal change in exports we assume a 1% increase across the board. As before, this will obviously favour demand for labour by exports to the larger regions. However, we normalise these results at a later stage by comparing shares. First, we show the direct and indirect impact on output. In Table 8, we only report on values for the base year (2000) for reasons of convenience. In the first row of the first tableau it can be seen that the values of exports at constant 2000 prices are for obvious reasons much lower than the values reported in Table 5. This is because we are now dealing with a 1% increase in exports to the relevant regions instead of what effectively amounted to a 100% increase. It is therefore more relevant to consider the information in rows 2 and 3 of Table 8 below as we are comparing percentage contributions here. It can be seen that with the supply constraint on agriculture and mining in force, the contribution of EU exports to the direct impact drops considerably, compared to the unconstrained contribution shown in row 3. It would therefore seem that primary commodities are quite important to exports to the EU. Direct contributions to output by constrained exports to SADC, South East Asia and NAFTA are, on the other hand, relatively higher than the unconstrained exports to these destinations for the opposite reasons.

When taking into account indirect effects, the variation is less pronounced but still very much apparent as can be seen in rows 5 and 6 of Table 8. Rows 7 and 8 show the output multipliers in the constrained and unconstrained format respectively. If supply is binding in agriculture and mining, the gross output multipliers are considerably lower.

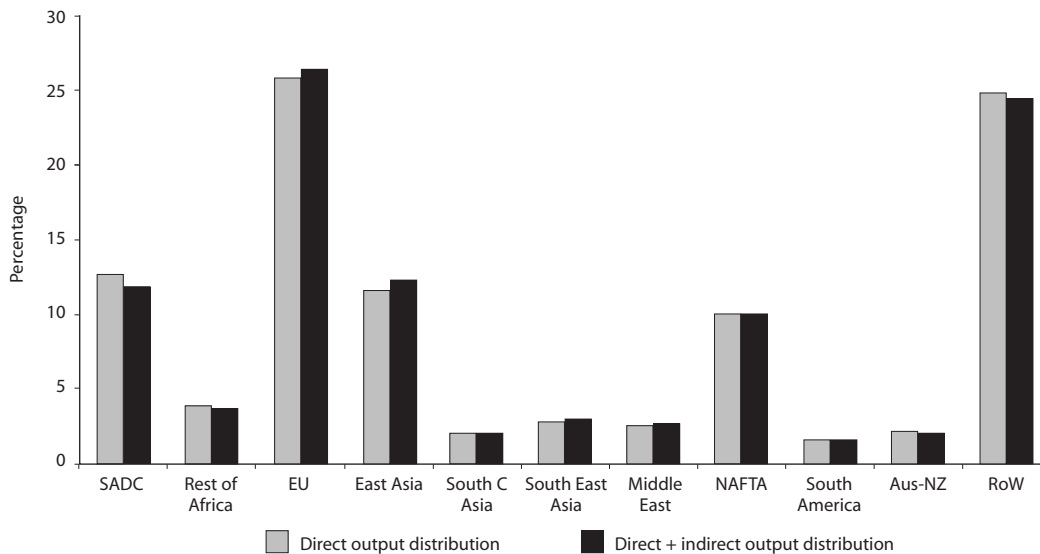
The results for the 2000 distribution of the direct and total impact are also summarised in Figure 4 below. It is interesting to note that the relative contribution to total output by EU exports is now slightly up compared to the contribution to direct output, suggesting that the imposed supply constraint is somewhat muted by the indirect effects. The opposite occurs for SADC exports, which initially do not appear to be as constrained by the primary sectors as the EU. When indirect effects are accounted for, the relative contribution by exports to SADC is brought back to some degree.

Table 8: Direct and total (direct + indirect) gross value of production corresponding to a 1% increase in South African (non-gold) exports to selected regions (R million, 2000 prices)

	Region	SADC	Rest of Africa	EU	East Asia	South Central Asia	South East Asia	Middle East	NAFTA	South America	Australia & New Zealand	RoW	Total
Direct													
1	2000	194	50	387	195	29	44	43	165	21	33	335	1,497
2	Share 2000 (constrained)	12.9%	3.4%	25.8%	13.0%	2.0%	3.0%	2.9%	11.0%	1.4%	2.2%	22.4%	100.0%
3	Share 2000 (unconstrained)	11.0%	3.1%	31.6%	13.1%	1.9%	2.5%	3.9%	10.3%	1.4%	2.0%	19.2%	100.0%
Direct + indirect													
4	2000	358	96	785	408	60	92	88	329	44	62	652	2,974
5	Share 2000 (constrained)	12.0%	3.2%	26.4%	13.7%	2.0%	3.1%	3.0%	11.1%	1.5%	2.1%	21.9%	100.0%
6	Share 2000 (unconstrained)	10.4%	3.0%	31.4%	13.8%	2.1%	2.7%	4.0%	10.3%	1.4%	1.8%	19.0%	100.0%
7	multiplier 2000 (constrained)	1.85	1.91	2.03	2.09	2.04	2.08	2.05	1.99	2.06	1.88	1.95	1.99
8	multiplier 2000 (unconstrained)	2.33	2.39	2.43	2.57	2.63	2.61	2.51	2.45	2.57	2.23	2.41	2.44

Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)

Figure 4: Distribution of direct and total (direct + indirect) gross value of production corresponding to a 1% increase in South African exports to selected regions (2000)



Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)

As before, we present the same results as in the previous table, but in this case for employment. For the moment we have ignored the skill dimension.

The total number of person-year equivalents associated with the marginal increase in exports under supply constraint and with marginal employment:output ratios is about 1 750 in 2000. Thirty-five per cent is associated with exports to the EU, which is considerably less than the 43% for the unconstrained, average set-up (Table 9). Higher relative contributions at the margin can be expected from exports to SADC and NAFTA.

*Table 9: Direct and total (direct + indirect) employment corresponding to a 1% increase in South African (non-gold) exports to selected regions (R million, 2000 prices)*

	Region	SADC	Rest of Africa	EU	East Asia	South Central Asia	South East Asia	Middle East	NAFTA	South America	Australia & New Zealand	RoW	Total
Direct													
1	2000	263	72	614	215	29	40	59	229	23	46	164	1,753
2	share 2000 (constrained)	15.0%	4.1%	35.0%	12.3%	1.6%	2.3%	3.3%	13.1%	1.3%	2.6%	9.4%	100.0%
3	share 2000 (unconstrained)	11.1%	3.9%	42.9%	12.7%	1.6%	1.9%	4.9%	11.2%	1.1%	1.8%	6.9%	100.0%
Direct + indirect													
4	2000	620	167	1,389	639	93	138	151	543	69	106	800	4,715
5	share 2000 (constrained)	13.2%	3.5%	29.5%	13.6%	2.0%	2.9%	3.2%	11.5%	1.5%	2.3%	17.0%	100.0%
6	share 2000 (unconstrained)	11.1%	3.4%	34.3%	13.8%	2.1%	2.6%	4.4%	10.4%	1.4%	1.8%	14.8%	100.0%

*Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)*

In Table 9 we present the total impact on employment of a marginal increase in exports. This includes the direct effects shown in Table 8 as well as the upstream backward linkage effects. Total employment associated with a marginal increase of 1% of the total export basket shown in the last column is estimated to be about 4 700 person-year equivalents in 2000.

The contribution to total employment (including backward linkages) of a marginal increase of South Africa's exports to the EU is seen to be lower than the unconstrained average configuration. Again the contribution made by exports to SADC, and to a lesser degree to NAFTA, is higher – suggesting that these exports are focusing to a lesser degree on resources and more on higher-value manufacturing.

Finally, we turn to the skill composition. The results of marginal increases in exports by destination market are given in Table 10. We present the destination market's share of total employment for each skill category associated with a 1% increase in exports. It can be seen that in the case of a 1% increase in exports to SADC, 44% of the impact on employment (as reported in Table 10) is accounted for by low-skilled labour, 40% by medium-skilled labour and the rest, 16%, by high-skilled labour. The average distribution is shown in the last column of the table, and rows 4–6 then show the deviation from that average. If the ratio in these rows is less than unity, the contribution by the relevant skill group is less than average. By doing this, we are evaluating skill composition independently of the value of exports to any one destination.

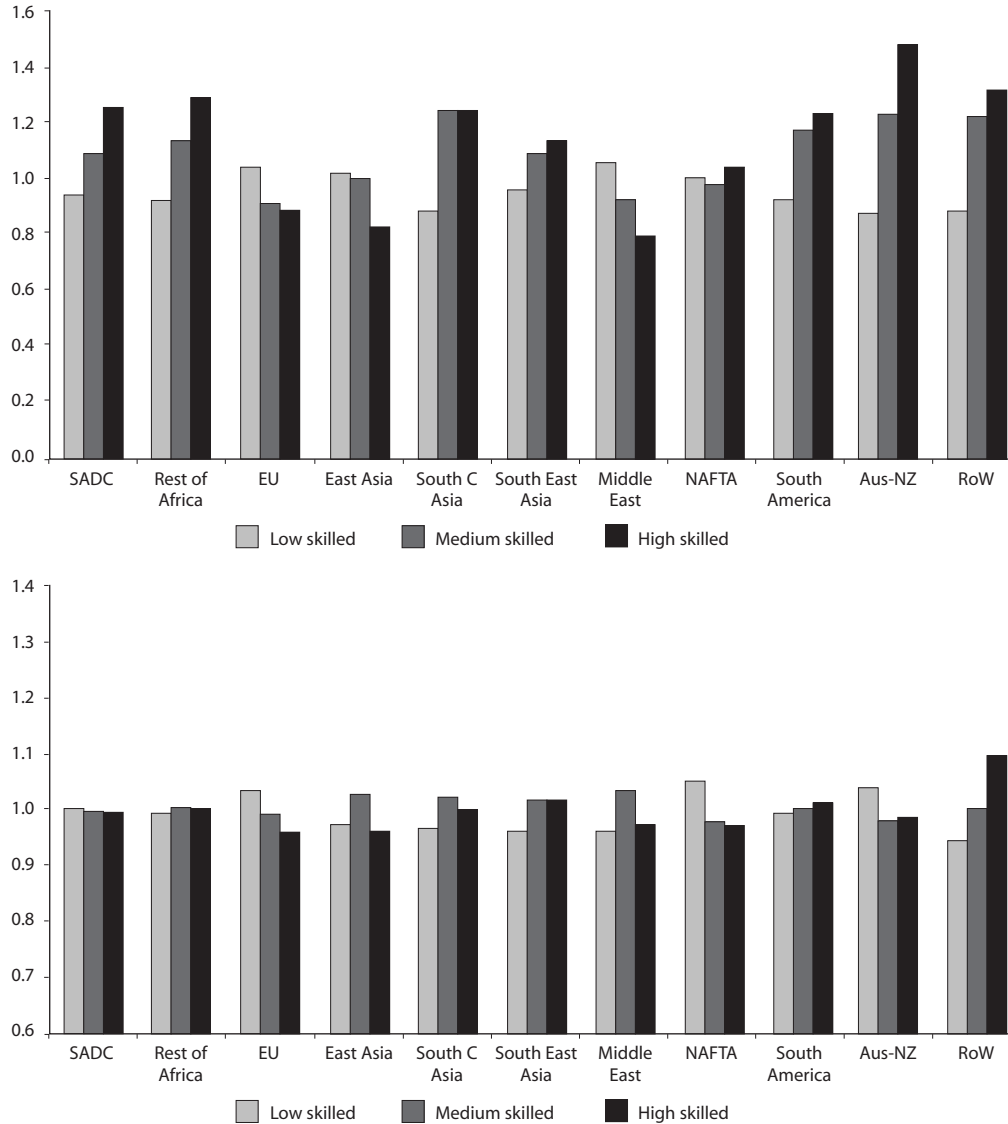
Table 10: Direct and total (direct + indirect) employment distribution across broad skill levels corresponding to a 1% increase in South African (non-gold) exports to selected regions (R million, 2000 prices)

	Region	SADC	Rest of Africa	EU	East Asia	South Central Asia	South East Asia	Middle East	NAFTA	South America	Australia & New Zealand	RoW	Total
Direct only													
1	Low-skilled share	43.6%	42.7%	47.5%	40.6%	39.5%	39.6%	38.6%	50.7%	42.4%	46.0%	40.3%	44.9%
2	Medium-skilled share	40.2%	41.0%	38.5%	46.7%	44.9%	44.3%	48.2%	35.2%	41.2%	38.8%	43.0%	40.5%
3	High-skilled share	16.1%	16.3%	14.0%	12.7%	15.6%	16.1%	13.2%	14.1%	16.4%	15.2%	16.7%	14.6%
Deviation from average													
4	Low-skilled deviation from average	0.97	0.95	1.06	0.90	0.88	0.88	0.86	1.13	0.95	1.02	0.90	1.00
5	Medium-skilled deviation from average	0.99	1.01	0.95	1.15	1.11	1.09	1.19	0.87	1.02	0.96	1.06	1.00
6	High-skilled deviation from average	1.10	1.12	0.96	0.87	1.06	1.10	0.90	0.96	1.12	1.04	1.14	1.00
Direct and indirect													
7	Low-skilled share	30.7%	30.2%	31.7%	30.2%	29.4%	29.3%	28.6%	32.1%	30.0%	31.9%	28.9%	30.6%
8	Medium-skilled share	53.5%	53.8%	53.0%	54.4%	54.7%	54.5%	56.1%	52.3%	53.9%	52.5%	53.6%	53.5%
9	High-skilled share	15.9%	15.9%	15.3%	15.4%	15.9%	16.2%	15.2%	15.6%	16.2%	15.6%	17.5%	15.9%
Deviation from average													
10	Low-skilled deviation from average	1.00	0.99	1.03	0.99	0.96	0.96	0.93	1.05	0.98	1.04	0.94	1.00
11	Medium-skilled deviation from average	1.00	1.01	0.99	1.02	1.02	1.02	1.05	0.98	1.01	0.98	1.00	1.00
12	High-skilled deviation from average	1.00	1.00	0.96	0.97	1.00	1.02	0.96	0.98	1.02	0.99	1.10	1.00

Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)

As with the full multiplier analysis based on average employment:output ratios, marginal primary sector supply-constrained exports to the EU tend to draw in relatively more low-skilled labour, while exports to African destinations, developing Asia and South America appear more high-skill intensive. But this only applies to direct labour requirements. Once we incorporate indirect labour, the deviations from the average become much smaller. The distribution of labour required to satisfy a 1% increase in exports to SADC is more or less the same as for the total export basket of South Africa.

Figure 5: Direct and total (direct + indirect) employment distribution across broad skill levels corresponding to a 1% increase in South African (non-gold) exports to selected regions (R million, 2000 prices), compared with the average



Sources: SAM (output), South African Standardised Industry Database (Quantec, employment and own calculations)

These patterns are repeated in the figures above. Broadly speaking, a similar pattern emerges in that exports to developed countries are slightly more low-skill intensive, while the opposite is the case for exports to developing countries. The deviations from the average are, however, less pronounced.

## Summary

The HSRC has been conducting a wide-ranging programme of analysis of labour markets in South Africa which is focused on demand as well as supply issues. In the context of this programme there is a need for a more current view of the labour

absorption of South Africa's exports. In this paper we have employed a simple methodology to examine the labour absorption of exports by skill category.

Our methodology differs from previous efforts in that it takes into account direct as well as indirect labour usage based on traditional as well as supply-constrained multipliers and employment:output elasticities estimated elsewhere. Moreover, the source and destination of South Africa's exports by broad trading region can be an important factor. We therefore examined the direct and indirect labour demand in terms of skill category of South Africa's export by destination.

We used a model that is based on a single-point representation of the structure of the South African economy. Direct and indirect labour demand were estimated using a fixed-coefficient, SAM-based, demand-driven impact analysis model. The main assumption of this class of models is that the production structures of the economy are assumed to remain constant following a modelled stimulus. Our SAM analysis is therefore comparatively static by nature and ignores any dynamic effects. It also ignores substitution between the production factors labour and capital and substitution between domestically and imported intermediate purchases. In fact, our analysis has a very modest approach as it can answer 'what if' questions while keeping other economic conditions constant. This approach is adequate for our purposes since we are interested in comparing the impact of exports for a range of destinations and not in any major policy issues that may or may not fundamentally change the structure of the existing economies.

Apart from the SAM mentioned above, we employed merchandise export data. This is available from Customs and Excise at the HS6 level by country of destination and is mapped to South Africa's Standard Industrial Classification used for the SAM. The aggregate export data by destination are, however, not consistent with the export data contained in the SAM. This is not a major problem, as we are only interested in variations in the shares across destinations.

As an introduction we examined the employment that was directly and indirectly associated with domestic and foreign demand. For this analysis we included gold and services, although later we excluded them because there is no information on the destination of their exports. The introductory question is whether domestic demand is more or less labour and skill intensive than foreign demand. Domestic demand includes household expenditure, demand by the public sector and investment demand. We then examined employment by skill associated with exports by destination market. The main findings can now be summarised as follows.

In terms of output or gross value of production at the sectoral level, we observe that coal and gold export most of their final demand. The opposite is true for food and beverages. Basic chemicals and basic metals are also large exporters relative to their domestic final demand. About 25% of motor vehicles' final demand is exported. In other transport equipment this is even higher. Plastics exports a large proportion of its final demand, but the foreign share of clothing's final demand is relatively low.

Regarding employment we used a fixed average employment:output ratio, which we prefer here to the marginal relationship explored later because we are evaluating employment associated with existing demand instead of hypothetical marginal increases. We estimate that about two million low-skilled workers are associated with

the final stage of the production of domestic demand (as defined above), compared to 600 000 for foreign demand. To place this in the relevant context, we calculated the per unit employment for domestic and foreign demand. This shows that foreign demand is about 4% more low-skilled labour intensive than domestic demand. However, domestic demand is about four times more intensive in the use of high-skill labour than foreign demand. This is mainly due to public sector employment which involves teachers and nurses who are both classified as higher-skilled workers. As a result of the weights of the three labour categories, the total direct employment intensity of domestic demand is about 30% higher than that of foreign demand. Total employment directly associated with final demand is about five million workers, of whom about one million are associated with exports, while the additional two-and-a-half million workers that make up total demand for labour are associated with intermediate demand.

Next we took into account the direct and indirect backward linkage upstream knock-on effects of domestic and foreign demand. It is shown that with 4,7 million workers, domestic demand contributes about 64% of total demand for labour in the South African economy, estimated here to be about 7,3 million workers. The rest, i.e. 35% of employment, is associated with exports. The high intensity of low-skilled labour causes exports to make a much higher contribution directly and indirectly to employment than to GDP, namely by 12%, but overall exports are less labour intensive by 15%. The lower overall labour intensity is entirely due to the skilled and highly-skilled labour, as it is required less for export demand than for domestic demand. Again, we need to stress that the classification of nurses and teachers has a larger role to play in this outcome.

As a matter of interest we also considered the impact of a 1% marginal change in domestic and foreign demand, with agriculture and mining being supply-constrained. The impact on employment was measured by using marginal employment:output ratios based on estimated employment:output elasticities. It is shown that the combination of the supply constraint on primary sectors and marginal employment:output ratios has a significant impact on the employment:output ratios. The ratio for low-skilled labour intensity (demand for low-skilled labour to the value of the initial impact) associated with domestic demand is now much lower compared to the full-average version. Similarly, the low-skilled employment intensity of foreign demand is now much lower. This suggests that per unit of initial demand, exports have become relatively less low-skilled labour intensive when comparing marginal demand injections under supply constraint from primary sectors with average unconstrained injections, as the ratio of foreign to domestic employment intensities drops from 1.04 to 0.82. The employment intensities are also lower for the other skill categories, and as a result, the overall labour intensity of exports drops to 57% of domestic demand compared to 85% in the full-average configuration.

The reason for the lower employment intensities for low-skilled labour is two-fold. Firstly, by assumption, we now ignore the impact of agricultural production—agriculture is an important employer of low-skilled labour. Secondly, the marginal employment:output ratios derived from employment:output elasticities, estimated at

the sectoral level, implicitly give more weight to some compared to other sectors, the composition of which will differ when comparing domestic with foreign demand.

When the total (direct plus indirect) impact on employment at the margin is taken into account with limited backward linkage upstream knock-on effects, it is shown that the employment intensity is also much lower compared to the unconstrained average employment:output ratios, although the employment effects of foreign demand are now much more similar to those of domestic demand. In particular, the results suggest that at the margin, taking into account limited backward linkage upstream knock-on effects, foreign demand has slightly lower employment requirements compared to domestic demand.

Next we focused on export to selected destinations. The lion's share of South African export is destined for the EU, with large shares also destined for East Asia, NAFTA and SADC, followed by the Middle East and the Rest of Africa. South Central and South East Asia, as well as South America and Australia and New Zealand play a less important role in the export basket of South Africa.

When taking into account the backward linkage we can derive the output multipliers of exports for selected regions. Some variation in the output multipliers was noted and the reason is the different composition of the export baskets to each destination. One possible and partial explanation for the higher-than-average multipliers reported for exports to Asian and South American destinations is that a relatively high proportion of the export basket of these destinations is basic metals, which have relatively high output multipliers in themselves.

The total number of person-year equivalents directly associated with total exports amounted to about 450 000 in 2000. This may seem low as this is about 6% of the total labour force, whereas total exports represent about 25% of GDP. The reason is that firstly, GDP is about 50% of gross value of production and secondly, most labour is employed in non-traded industries such as trade, accommodation, transport, financial and social services, and government and domestic services, none of which are currently identified in any of the export baskets evaluated here.

Once we have done the calculations, it appears that South Africa's exports to the EU embody a larger proportion of direct employment relative to direct output. Export to the EU would therefore seem to be relatively labour intensive, at least when looking at the *direct* effects. The opposite appears to be the case for exports to most of Asia and to a lesser degree to NAFTA, presumably because of more reliance on minerals and resource-based goods.

The EU's share of the contribution to employment by exports drops to about 40% when taking employment in the backward linkages into account, and is then more similar to the direct and indirect impact on output. This suggests that the indirect employment impact of exports to the EU is relatively less labour intensive.

Regarding the skill composition, we presented results that showed that two-thirds of the initial demand for labour associated with exports is low skilled, with another 20% medium skilled and the rest highly skilled. Again, exports to the EU stand out, as they account for almost 47% of low-skilled labour associated with total exports, whereas a relatively lower usage of higher-skilled labour appears to be the case. Exports to

Africa, developing Asia and South America, on the other hand, are more directly skill intensive, while the opposite is true for exports to the EU and developed Asia. Exports to NAFTA are relatively neutral.

When accounting for employment in the backward linkages – total employment associated with exports to each of the selected regions – the relative contribution to employment by the selected regions deviates less from the average of the total export basket. In the case of exports to SADC, it was shown for example that the contribution to low-skilled labour is just below the contribution to low-skilled labour made by total exports. Exports to the EU are slightly more low-skilled labour intensive compared to total exports when taking direct as well as indirect employment into account, but still slightly lower compared to direct employment alone. Broadly speaking, the same patterns emerge, but in a slightly muted way.

With the supply constraint on agriculture and mining in force, the share of marginal EU exports to the direct impact drops considerably, compared to the unconstrained contribution. It would therefore seem that primary commodities are quite important to exports to the EU. Direct contributions to output by constrained exports to SADC, South East Asia and NAFTA are, on the other hand, relatively higher than the unconstrained exports to these destinations for the opposite reasons.

The total number of person-year equivalents associated with the marginal increase in exports under supply constraint and with marginal employment:output ratios is about 1 750 in 2000. Thirty-five per cent is associated with exports to the EU, which is considerably less than the 43% with the unconstrained, average set-up. Higher relative contributions at the margin can be expected from exports to SADC and NAFTA.

In terms of skill composition, the same broad pattern emerges, as exports to developed countries are slightly more low-skill intensive, while the opposite is the case for exports to developing countries.

## Notes

- 1 This cannot be compared with the initial impact reported in Table 1 as household expenditure is an exogenous variable to these computations and an endogenous variable to the model computations of Table 2.
- 2 Based on the old SEE, total employment is estimated to be 7,4 million workers in 2000, but because we ignored the residual and changes in stocks, about 100 000 workers are not accounted for in the computations. Although we could have allocated these workers to domestic and foreign demand in proportion to their contribution to the GDP, in terms of per unit contributions the results will not change.
- 3 Detailed results are available on request from the author.
- 4 Sector level detail is available on request.
- 5 No effort is made to make the total value of export as measured by Customs and Excise in this section consistent with the exports reported in the SAM as presented in the previous subsection.

## Appendix A: Classification used in a 2000 SAM for South Africa

### Commodities and activities

		Commodities / activities			Commodities / activities
1	11-13	Agriculture, forestry & fishing	23	353-355	Metal products excluding machinery
2	21	Coal mining	24	356-359	Machinery & equipment
3	23	Gold & uranium ore mining	25	361-366	Electrical machinery
4	22, 24, 25, 29	Other mining	26	371-373	Television, radio & communication equipment
5	301-304	Food	27	374-376	Professional & scientific equipment
6	305-306	Beverages & tobacco	28	381-383	Motor vehicles, parts & accessories
7	311-312	Textiles	29	384-387	Other transport equipment
8	313-315	Wearing apparel	30	391	Furniture
9	316	Leather & leather products	31	392	Other industries
10	317	Footwear	32	41	Electricity, gas & steam
11	321-322	Wood & wood products	33	42	Water supply
12	323	Paper & paper products	34	51	Building construction
13	324-326	Printing, publishing & recorded media	35	52-53	Civil engineering & other construction
14	331-333	Coke & refined petroleum products	36	61-62	Wholesale & retail trade
15	334	Basic chemicals	37	63	Catering & accommodation services
16	335-336	Other chemicals & man-made fibres	38	71	Transport & storage
17	337	Rubber products	39	72	Communication
18	338	Plastic products	40	81-82	Finance & insurance
19	341	Glass & glass products	41	83	Business services
20	342	Non-metallic minerals	42	93-98	Medical and other services
21	351	Basic iron & steel	43	99	Other
22	352	Basic non-ferrous metals	44		

### Labour categories

	Description
Highly skilled	Professional, semi-professional and technical occupations Managerial, executive and administrative occupations Certain transport occupations, e.g. pilot, navigator
Skilled	Clerical occupations Sales occupations Transport, delivery and communications occupations Service occupations Farmer, farm manager Artisan, apprentice and related occupations Production foreman, production supervisor
Semi- and unskilled	The rest

## Household income classes

	Percentage of income earned		Percentage of income earned		Percentage of income earned
d0	0%-10%	d5	50%-60.0%	d921	95%-96.25%
d1	10%-20.0%	d6	60%-70.0%	d922	96%-97.50%
d2	20%-30.0%	d7	70%-80.0%	d923	98%-98.75%
d3	30%-40.0%	d8	80%-90.0%	d924	99%-100.00%
d4	40%-50.0%	d91	90%-95.0%		

## Appendix B: Regions for South African exports

Broad Region		Detailed Region			
1	Africa	1	Eastern Africa Rest	12	South-eastern Asia
2	Americas	2	Middle Africa Rest	13	Western Asia
3	Asia	3	Northern Africa	14	Eastern Europe
4	Europe	4	Western Africa	15	Northern Europe
5	Oceania	5	SADC	16	Southern Europe
6	Not allocated	6	Caribbean	17	Western Europe Rest
		7	Central America	18	European Union
		8	Northern America	19	Australia & New Zealand
		9	South America	20	Melanesia
		10	NAFTA	21	Micronesia
		11	Eastern Asia	22	Polynesia

## Appendix C: Sector classification by factor content

	Low technology		Medium technology		High technology
1	Food	12	Petrol refineries	20	Basic chemicals
2	Beverages	13	Rubber products	21	Other chemicals
3	Tobacco	14	Plastic products	22	Metal products
4	Textiles	15	Glass & products	23	Machinery
5	Clothing	16	Non-metallic minerals	24	Electric machinery
6	Leather products	17	Basic iron & steel	25	TV & communications
7	Footwear	18	Basic non-ferrous metals	26	Scientific
8	Wood & products	19	Other industries	27	Motor vehicles & parts
9	Paper & products			28	Other transport equipment
10	Printing				
11	Furniture				

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