SECTORAL LABOUR-INTENSITY IN SOUTH AFRICA

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0. EXECUTIVE SUMMARY

Labour-intensity varies widely across sectors of the South African economy. This implies that sectoral structure needs to be explicitly taken into account in the promotion of higher labour-intensity. For instance, industrial policies that target particular sectors need to take labour-intensity into account as one of the key factors in determining which sectors to prioritise. A prerequisite for this is detailed and reliable information as to the relative labour-intensity of different sectors. This research project thus seeks to investigate patterns of labour-intensity across sectors of the South African economy, and specifically to rank sectors in terms of their labour-intensity. The results should prove useful in determining which sectors to prioritise for support.

There are three main ways of measuring labour-intensity that are relevant to this research. Firstly, the ratio between employment and capital stock, which is the labour-capital ratio. This shows the relative factor utilisation in an activity, and the extent to which it is labour-intensive vs. capital-intensive.

Secondly, the ratio between employment and value-added, which shows the labour-intensity of production. This measure indicates how labour-absorbing an activity is for each unit of value-added. These two measures are different ways of measuring labour-intensity, neither is inherently superior, the choice of measure depends on the precise issue of interest.

A limitation of these two measures is that they only deal with direct labour-intensity in a sector itself. They do not include the extent to which activity in a sector is linked to other sectors of the economy, and the extent to which these other sectors are themselves labour-intensive. For instance, a certain sector may itself not be particularly labour-intensive, but it might utilise (as inputs) the output of other sectors that are highly labour-intensive.

In order to also consider the indirect labour-intensity and to compare this across sectors, this report also shows employment multipliers by sector. Employment multipliers can be

thought of as a broader measure of labour-intensity that also takes into account indirect employment absorption. Employment multipliers essentially indicate what increase (decrease) in economy-wide jobs could be associated with a given increase (decrease) in final output of a sector. Employment multipliers are calculated here both for total employment and for formal sector employment (which in general is somewhat more likely to be 'decent' than informal employment). They are also calculated adjusted for imported intermediate goods.

These three measures of labour-intensity bring different insights and are useful in different ways. In ranking sectors according to their labour-intensity, this report provides a ranking in terms of each measure as well as a composite measure. The composite measure averages the rankings of the three measures.

Table E1 summarises sector rankings using all the relevant measures of labour-intensity in a single table. The last column shows the ranking of sectors according to the composite measure. According to this composite ranking, the five most labour-intensive sectors, in order, are the following: other producers; clothing; catering and accommodation services; furniture; and textiles. The five least labour-intensive sectors, starting from the least, are: coke and refined petroleum products; electricity, gas and steam; coal mining; water supply; and basic chemicals.

Table E1: Summary of subsector rankings using various measures of labour-intensity

	LABOUR/CAPITAL RATIO (MEASURE 1)		LABOUR/VALUE ADDED RATIO (MEASURE 2)		EMPLOYMENT MULTIPLIERS (MEASURE 3)				COMPOSITE MEASURE
	2009	**Average 2006-9**	**2009**	**Average 2006-9**	**Total**	**Total import-adjusted**	**Formal**	**Formal import-adjusted**	
Agriculture	20	18	7	4	5	4	3	4	**10.3**
Coal mining	41	39	45	41	46	45	46	45	**43.7**
Gold mining	30	32	23	22	29	22	20	16	**25.0**
Other mining	37	36	37	36	41	37	40	33	**37.0**
Food	24	23	26	23	11	10	10	11	**20.0**
Beverages	26	26	32	30	19	17	25	18	**25.0**
Tobacco	27	28	46	46	27	25	29	27	**32.7**
Textiles	9	11	3	3	4	5	5	6	**5.7**
Clothing	2	2	2	2	2	2	2	2	**2.0**
Leather	6	7	4	9	7	9	7	8	**6.3**
Footwear	3	5	12	13	10	13	9	14	**9.3**
Wood & wood products	16	12	11	11	8	8	8	7	**11.7**
Paper & paper products	35	35	29	32	21	24	19	24	**29.3**
Printing, publishing & recorded media	19	17	19	18	17	18	14	13	**18.7**
Coke & refined petroleum products	46	46	43	45	42	46	42	46	**45.0**
Basic chemicals	43	43	42	43	38	41	37	40	**42.0**
Other chemicals & man-made fibres	32	33	38	37	33	35	34	35	**35.0**
Rubber products	22	22	28	26	25	29	27	28	**26.3**
Plastic products	14	13	35	29	34	33	33	32	**27.3**
Glass & glass products	34	31	25	24	26	27	26	25	**28.7**
Non-metallic minerals	33	29	18	14	31	30	32	31	**27.0**
Basic iron & steel	36	37	22	35	37	38	35	37	**32.0**
Basic non-ferrous metals	39	40	36	38	40	43	39	42	**39.3**

Metal products excluding machinery	11	10	14	12	15	15	17	17	**13.3**
Machinery & equipment	13	14	16	16	13	19	11	15	**16.0**
Electrical machinery & apparatus	15	16	20	21	24	28	23	29	**21.0**
TV, radio & communication equipment	18	20	31	31	22	31	21	30	**26.7**
Professional & scientific equipment	12	15	21	20	20	21	18	19	**18.0**
Motor vehicles, parts & accessories	23	25	15	17	12	20	12	23	**19.3**
Other transport equipment	25	24	34	33	32	36	31	34	**31.7**
Furniture	4	3	6	7	6	7	6	5	**5.7**
Other manufacturing	17	19	27	27	36	34	36	38	**26.0**
Electricity, gas & steam	44	44	44	44	45	44	45	44	**44.0**
Water supply	45	45	40	39	43	42	44	43	**42.3**
Building construction	7	6	9	6	14	12	22	20	**9.3**
Civil engineering & other construction	5	4	10	8	16	14	24	22	**9.7**
Wholesale & retail trade	10	9	8	10	9	6	16	12	**8.0**
Catering & accommodation services	8	8	5	5	3	3	4	3	**5.3**
Transport & storage	40	42	30	28	35	32	38	36	**34.0**
Communication	42	41	41	42	39	39	41	41	**40.7**
Finance & insurance	38	38	39	40	44	40	43	39	**39.0**
Business services	28	27	13	15	18	11	13	9	**17.3**
Medical, dental & veterinary services	21	21	24	25	28	23	28	21	**22.7**
Other private services	29	30	33	34	30	26	30	26	**29.3**
Other producers	1	1	1	1	1	1	1	1	**1.0**
General government	31	34	17	19	23	16	15	10	**21.3**

The empirical results presented here clearly indicate the high degree of heterogeneity in the degree of labour-intensity across sectors. This underlines that looking through a sectoral lens is essential when considering the issue of labour-intensity. Given the crisis of unemployment in South Africa, the labour-absorbing capacity of sectors must clearly be a key consideration in prioritising sectors. One way of thinking about this is that, in order to increase the aggregate level of labour-intensity in the economy, either the share of relatively labour-intensive sectors needs to increase, or the degree of labour-intensity within sectors needs to increase (or both). However, labour-intensity would need to be just one of the criteria taken into account when prioritising sectors. The empirical findings of this report – in particular the ranking of sectors according to their degree of labour-intensity – can provide an information base for prioritising sectors according to their labour-intensity.

This report includes the following:

- ❖ A discussion of what labour-intensity means, why it matters, and how it should appropriately be measured;
- ❖ An empirical overview of economy-wide trends in the labour-intensity of the South African economy over time;
- ❖ Empirical analysis of the current level and historical trends in labour-intensity, at the most disaggregated subsectoral level permitted by the data, using three alternative measures of labour-intensity;
- ❖ Rankings of sectors according to their degree of labour-intensity, using alternative measures as well as a composite measure;
- ❖ Discussion of implications and conclusions.

This report is accompanied by an Excel workbook summarising relevant empirical findings, as well as a document store.

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1. INTRODUCTION

A central challenge facing South Africa is the extremely high rate of unemployment. One dimension of this is that production is insufficiently labour-absorbing. This observation points to the need for a better understanding of labour-intensity, and the possibilities of increasing the labour-absorbing capacity of the economy.

Labour-intensity varies widely across sectors of the South African economy. This implies that sectoral structure needs to be explicitly taken into account in the promotion of higher labour-intensity. For instance, industrial policies that target particular sectors need to take labour-intensity into account as one of the key factors in determining which sectors to prioritise. A prerequisite for this is detailed and reliable information as to the relative labour-intensity of different sectors. This research project thus seeks to investigate patterns of labour-intensity across sectors of the South African economy, and specifically to rank sectors in terms of their labour-intensity. The results should prove useful in determining which sectors to prioritise for support.

Section 2 provides some background on the concept of labour-intensity, discussing what it means, alternative approaches to measuring it, and the approach taken here to prioritising sectors in terms of their relative labour-intensity. This section also gives an overview of the methodology used. Section 3 gives an overview of aggregate trends in labour-intensity in the South African economy, to contextualise the sectoral analysis that follows. Section 4 sets out the empirical results that are at the heart of this study. Sectors are compared in terms of their relative labour-intensity both at the level of the nine major sectors of the economy and the 46 subsectors. Results are shown using the three measures of labour-intensity used in this study. Furthermore, results are shown both in terms of trends over time and the current situation. Based on the results shown in section 4, section 5 provides rankings of the subsectors in terms of their relative labour-intensity. Rankings are shown for all three measures as well as for a composite measure. Finally, section 6 discusses some implications of the findings, and concludes.

This report is also accompanied by a set of Excel spreadsheets with relevant quantitative information and a document store of reference documents relevant to this subject.

All data utilised in the analysis come from Quantec.

2. LABOUR-INTENSITY: MEANING AND MEASUREMENT

There are three main ways of measuring labour-intensity that are relevant to this research. Firstly, the ratio between employment and capital stock, which is the labour-capital ratio. This shows the relative factor utilisation in an activity, and the extent to which it is labour-intensive vs. capital-intensive.

Secondly, the ratio between employment and value-added, which shows the labour-intensity of production.[1] This measure indicates how labour-absorbing an activity is for each unit of value-added. These two measures are different ways of measuring labour-intensity, neither is inherently superior, the choice of measure depends on the precise issue of interest.

It should be noted that the second measure – the ratio between employment and value added – is the inverse of labour productivity, which is typically measured as the ratio between value added and employment. This relationship draws attention to the fact that labour-intensity is not necessarily a completely desirable characteristic when a holistic approach is taken. The most labour-intensive sectors, according to this measure, also by definition have the lowest levels of labour productivity. The broader implications of these issues are discussed further in section 6.

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[1] Note that it is appropriate to use value-added rather than total output, since output measures the total of the output of the sector rather than the actual contribution of that sector in terms of what it directly produces. For example, a car plant might purchase inputs such as tyres and other components of a car; the cost of these input are included in the total output, but to measure what the car plant actually 'produces' these costs need to be deducted. So to calculate the labour-intensity of the car plant (in terms of this measure of labour-intensity), the employment of the plant needs to be divided by its own value added.

Both of these measures are important in quantifying labour-intensity and are useful in comparing labour-intensity across sectors. However, a limitation is that they only deal with direct labour-intensity in a sector itself. They do not include the extent to which activity in a sector is linked to other sectors of the economy, and the extent to which these other sectors are themselves labour-intensive. For instance, a certain sector may itself not be particularly labour-intensive, but it might utilise (as inputs) the output of other sectors that are highly labour-intensive. This would mean that expansion (contraction) in that sector could have a strong stimulatory (contractionary) impact on employment overall, once these indirect effects are factored in. For this reason it is inadequate to simply look at labour-intensity using the two standard measures mentioned above.

In order to also consider the indirect labour-intensity and to compare this across sectors, this report also shows employment multipliers by sector. Employment multipliers can be thought of as a broader measure of labour-intensity that also takes into account indirect employment absorption.

The methodology for computing employment multipliers will be briefly described here. The technical details are provided in Appendix 2. These are calculating using input-output data, which show how much output goes from each sector as input to the activities of another sector. For example, the input-output data shows how much the mining sector purchases from the agricultural sector as inputs for mining, and conversely how much the agricultural sector purchases from the mining sector as inputs for agriculture; these figures show us the linkages between mining and agriculture. From the input-output data we can calculate something called the Leontief inverse, which is a matrix showing the strength of backward linkages between sectors. This basically shows, for each sector, the strength of its 'backward' linkages to other sectors, in terms of how much an extra unit of production in the sector would require from other sectors (where the output of those other sectors are inputs for the sector of interest). By combining the Leontief inverse with data on the direct labour-intensity of each sector (calculated as the ratio between employment and value added) the employment multipliers can be calculated. Employment multipliers essentially

indicate what increase (decrease) in economy-wide jobs could be associated with a given increase (decrease) in final output of a sector.[2]

An important issue to take into account when calculating employment multipliers is that some of the intermediate inputs to production are imported. Some of the backward linkages are thus not to the rest of the domestic economy but instead to production outside South Africa. Ignoring this issue would mean an overstatement of employment multipliers, especially for sectors which source a significant proportion of their inputs outside South Africa. To take account of this issue, employment multipliers are calculated and shown here 'in total' (i.e. not distinguishing between domestically produced and imported intermediate inputs) and 'import adjusted' (excluding imported intermediate inputs).

These three measures of labour-intensity bring different insights and are useful in different ways. In ranking sectors according to their labour-intensity, this report provides a ranking in terms of each measure as well as a composite measure. The composite measure averages the rankings of the three measures.

What is important is not just the creation of any jobs, but the creation of *decent* jobs. What constitutes decent jobs and how to create them is outside the parameters of this research. When comparing labour-intensity across sectors, the employment could be decent or otherwise. There is not a close relationship between the concepts of labour-intensity and decent work. A certain sector might be highly labour-intensive (according to one or more of the three measures discussed), but employment in the sector could be predominantly of poor quality (for instance in terms of low wages, poor job security, poor benefits, weak enforcement of labour legislation). Perhaps a separate study might be needed that compares sectors in terms of the extent to which employment in those sectors is 'decent'.

In response to the initial consultation with the labour constituency, as part of this project, some initial attempt has been made to proxy decent work by looking specifically at formal

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[2] Although note that, because the analysis is average and not marginal, projections of how many new jobs could arise from an increase in production would generally be most accurate for short- to medium-term analysis and for relative small changes in demand.

employment across sectors and using this to compute measures of labour-intensity using only formal employment. This is a highly imperfect measure, in the first instance since data separating out formal and informal employment is very unreliable and there is no accurate data on formal employment specifically. Secondly, formal employment is a very inadequate proxy for decent work. It goes without saying that much of formal employment (arguably even the majority of formal employment) falls far short of being decent. Taking cognisance of these limitations, the reason for using formal employment here is that there is no national data quantifying formal employment, let alone disaggregating this at a sectoral level, which would be prerequisites for undertaking any kind of empirical analysis of labour-intensity in terms of decent work. It is actually impossible to compare sectors in terms of their 'labour-intensity of decent work', even if we could coin such a measure. The reason for providing some preliminary results here in terms of formal employment specifically is that informal employment is much less likely to be decent than is formal employment, and calculating measures of labour-intensity specifically in terms of formal sector employment can at best provide some initial hint concerning decent work in relation to labour-intensity across sectors. To this end, measures of labour-intensity are also provided calculated using estimates of formal employment as well as total employment.

3. EMPIRICAL OVERVIEW OF LABOUR-INTENSITY IN THE SOUTH AFRICAN ECONOMY

Figure 1 shows the aggregate trends in labour-intensity in the South African economy, using the labour/capital ratio and the labour-value added ratio, over the period 1970-2009. The overall decline in overall labour-intensity is clearly visible. In the case of the employment/value added ratio, this decline is particularly pronounced from 1992 onwards.

**Figure 1: Economy-wide trends in labour-intensity, 1970-2009**
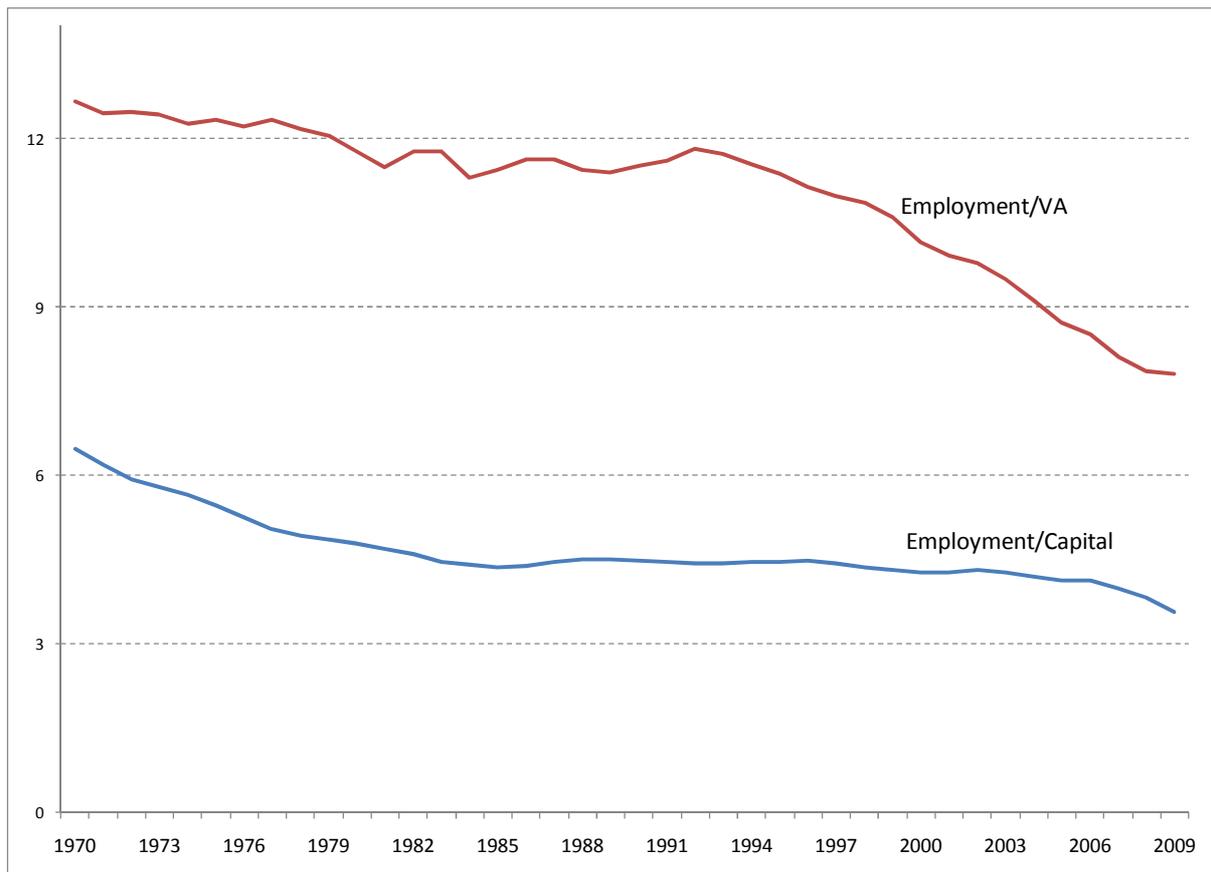
4. LABOUR-INTENSITY BY SECTOR

This section shows the level of labour-intensity compared across sectors of the economy. First, labour-intensity is shown as measured by the labour-capital ratio; second by the labour-value added ratio; and third by employment multipliers.

4.1 Measure 1: Labour-Capital ratio

Figure 2 shows the historical trends in the labour-capital ratio, by the nine major sector of the economy. Figure 3 shows the same data, but excluding the construction sector so that the other eight sectors can be seen more clearly.

Figure 2: Labour-Capital ratio by major sector, 1970-2009
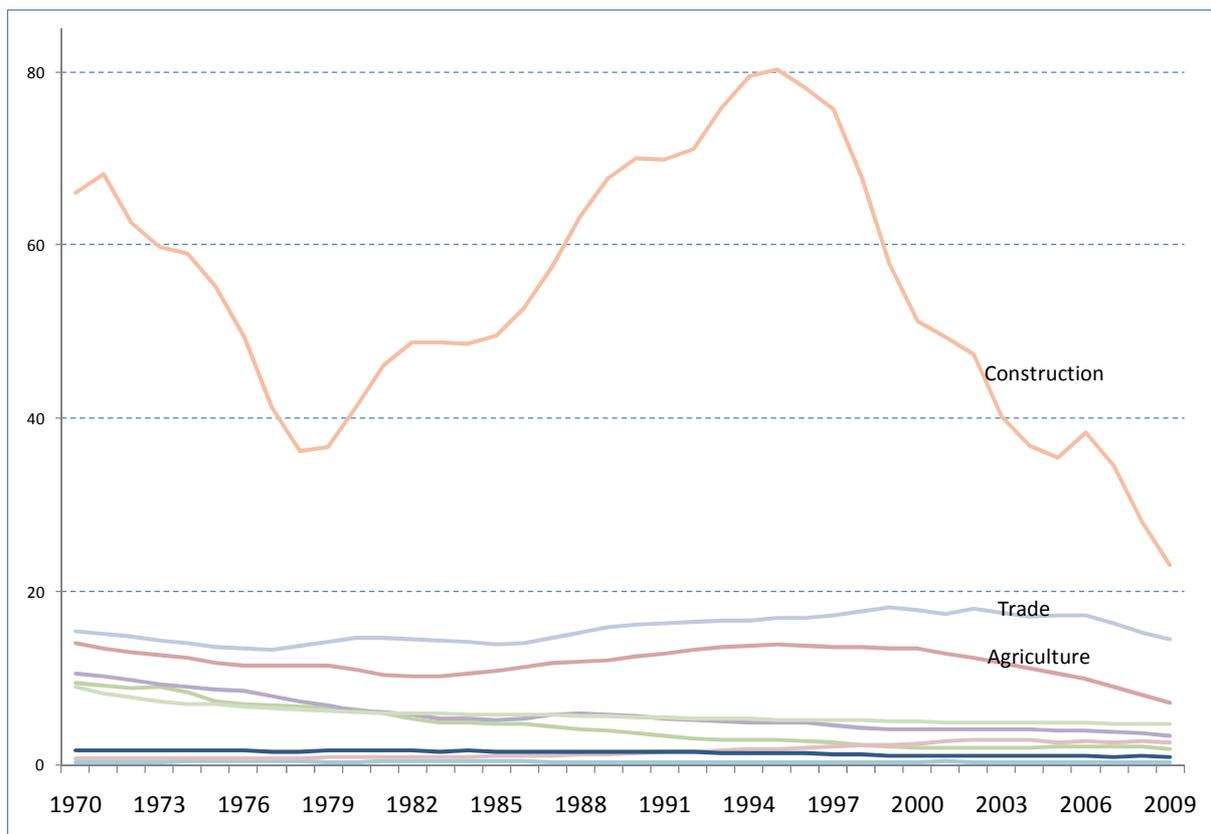
Note: calculated in constant R2000 prices. Agriculture = agriculture; Construction = construction; and Trade = trade, catering and accommodation services. Other sectors not labelled here because of the proximity of lines, but see figure 3 below.

Figure 3: Labour-Capital ratio by major sector, excluding construction, 1970-2009
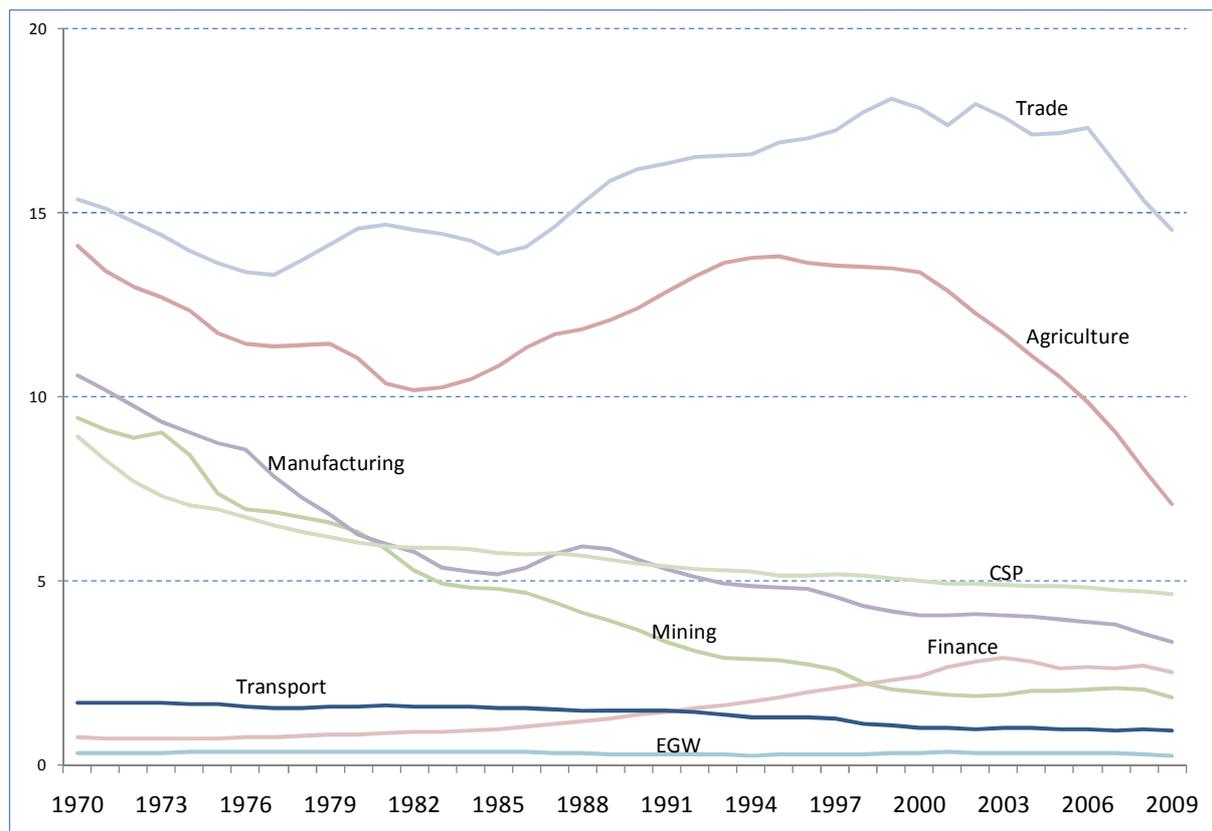

Note: calculated in constant R2000 prices. Mining = mining; Manufacturing = manufacturing; EGW = electricity, gas and water; Construction = construction; Trade = trade, catering and accommodation services; Transport = transport, storage and communication; Finance = financial intermediation, insurance, real estate and business services; and CSP = community, social and personal services.

Figure 4 shows the same measure of labour-intensity – the labour-capital ratio – at a higher level of disaggregation. All 46 subsectors of the economy are shown (this is the highest level of disaggregation for which data is available). It should be borne in mind that some of these subsectors are very small (e.g. tobacco, leather) and account for very small employment and value added.

The most highly labour-intensive subsector by far is "other producers". This subsector includes the following activities: washing and (dry-) cleaning of textiles and fur products; hairdressing and other beauty treatment; funeral and related activities; and other service activities not elsewhere classified. Apart from other producers, the subsector with the highest labour-capital ratio by far is clothing. Other highly labour-intensive subsectors are footwear, clothing, furniture, and construction.

Figure 5 shows the same data, but excluding other producers in order to make the picture clearer for the other sectors. In both figures 4 and 5, data are averaged over the past four years, in order to avoid placing undue emphasis on recent dynamics that may have been affected by the recession.

Figure 4: Labour-Capital ratio by major sector, current
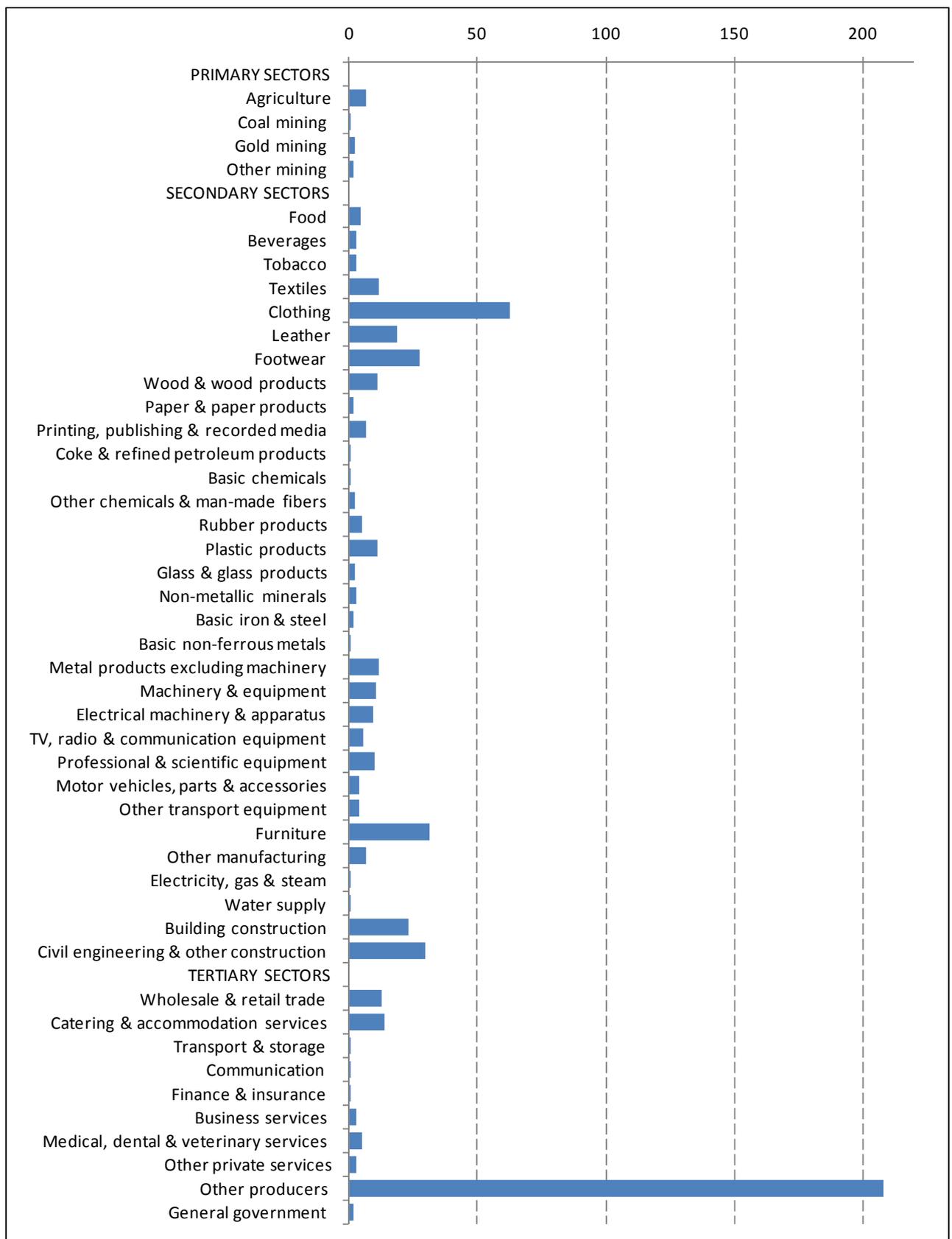
Note: Mean for 2006-2009, in current prices.

Figure 5: Labour-Capital ratio by major sector, excluding other producers, current
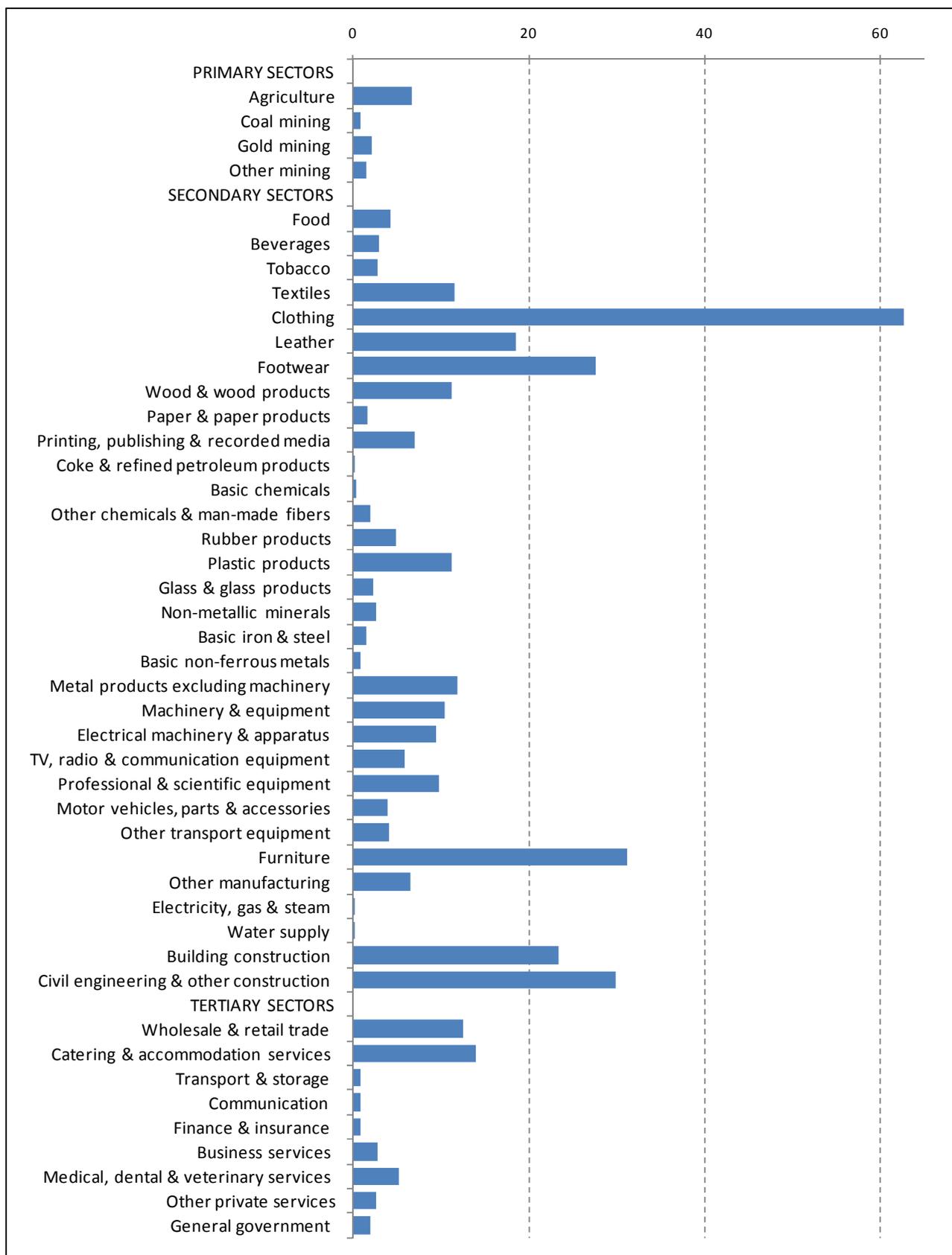
Note: Mean for 2006-2009, in current prices.

4.2 Measure 2: Labour-Value added ratio

Figure 6 shows the trends over time in labour-intensity for the nine major divisions of the economy, using the second measure of labour-intensity, namely the ratio between employment and value added. The same data is shown in figure 7 but omitting agriculture and construction so that other sector can be seen more clearly.

Figure 6: Labour-Value added ratio by major sector, 1970-2009
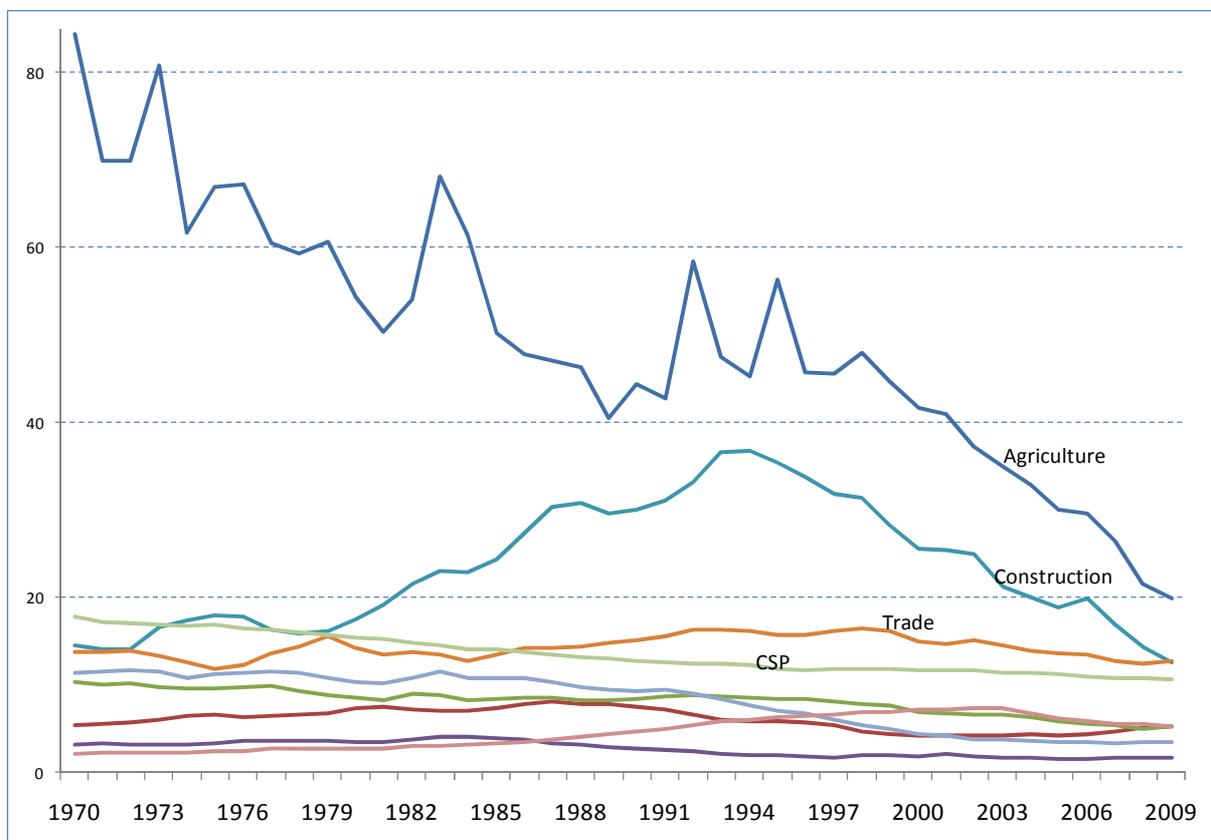
Note: calculated in constant R2000 prices. Agriculture = agriculture; Construction = construction; Trade = trade, catering and accommodation services; and CSP = community, social and personal services. Other sectors not labelled here because of the proximity of lines, but see figure 7 below.

In figure 7 below, agriculture and construction are excluded from the chart, in order to make the trends in the other subsectors more clearly apparent.

Figure 7: Labour-Value added ratio by major sector, excluding agriculture and construction, 1970-2009
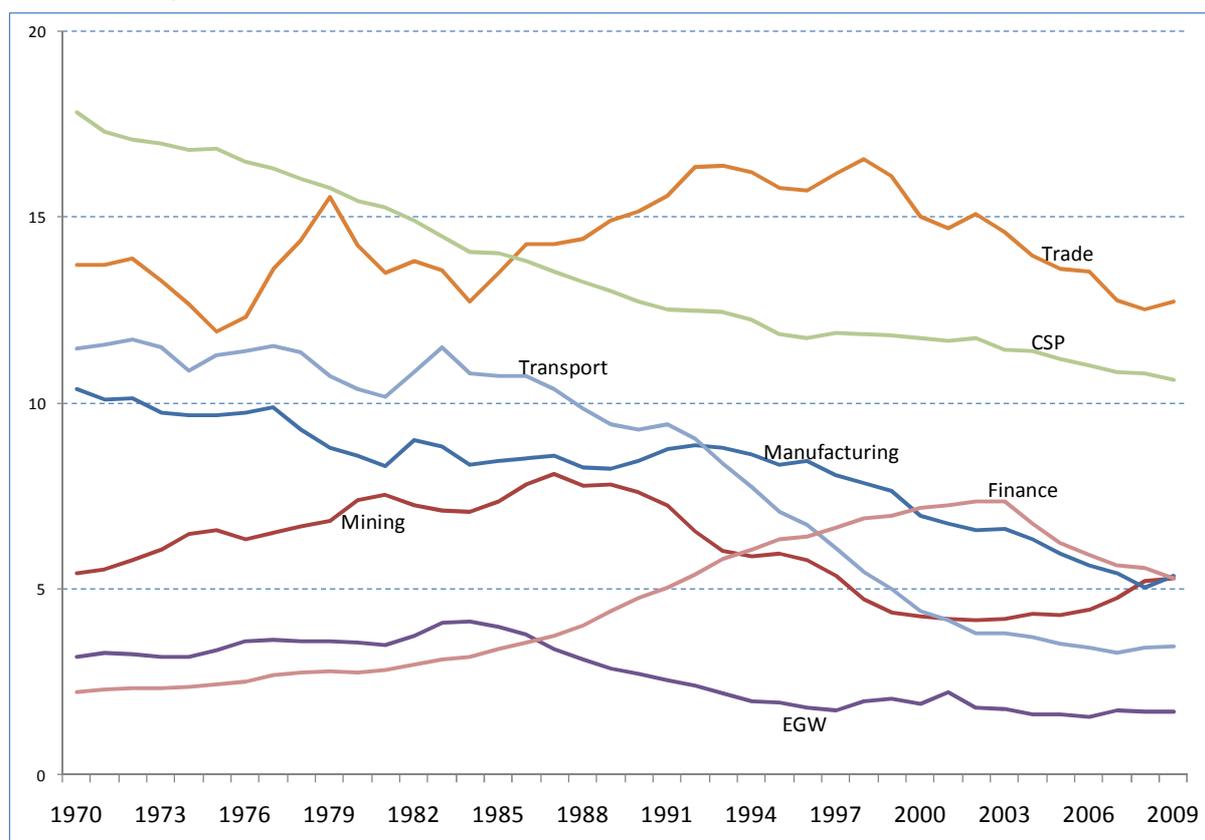
Note: calculated in constant R2000 prices. Mining = mining; Manufacturing = manufacturing; EGW = electricity, gas and water; Construction = construction; Trade = trade, catering and accommodation services; Transport = transport, storage and communication; Finance = financial intermediation, insurance, real estate and business services; and CSP = community, social and personal services.

Figure 8 shows the current level of labour-intensity, as measured by the labour-value added ratio, by all 46 subsectors of the economy. As with measure 1, the most highly labour-intensive sector by far is 'other producers' see the earlier discussion in this regard.

Figure 9 excludes 'other producers' so that the pattern for the rest of the economy is more readily apparent. It can be seen that the most highly labour-intensive subsectors are agriculture, a few manufacturing subsectors such as textiles and clothing, construction, and certain services subsectors notably wholesale and retail trade and catering and accommodation services.

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Figure 8: Labour-Value added ratio by major sector, current
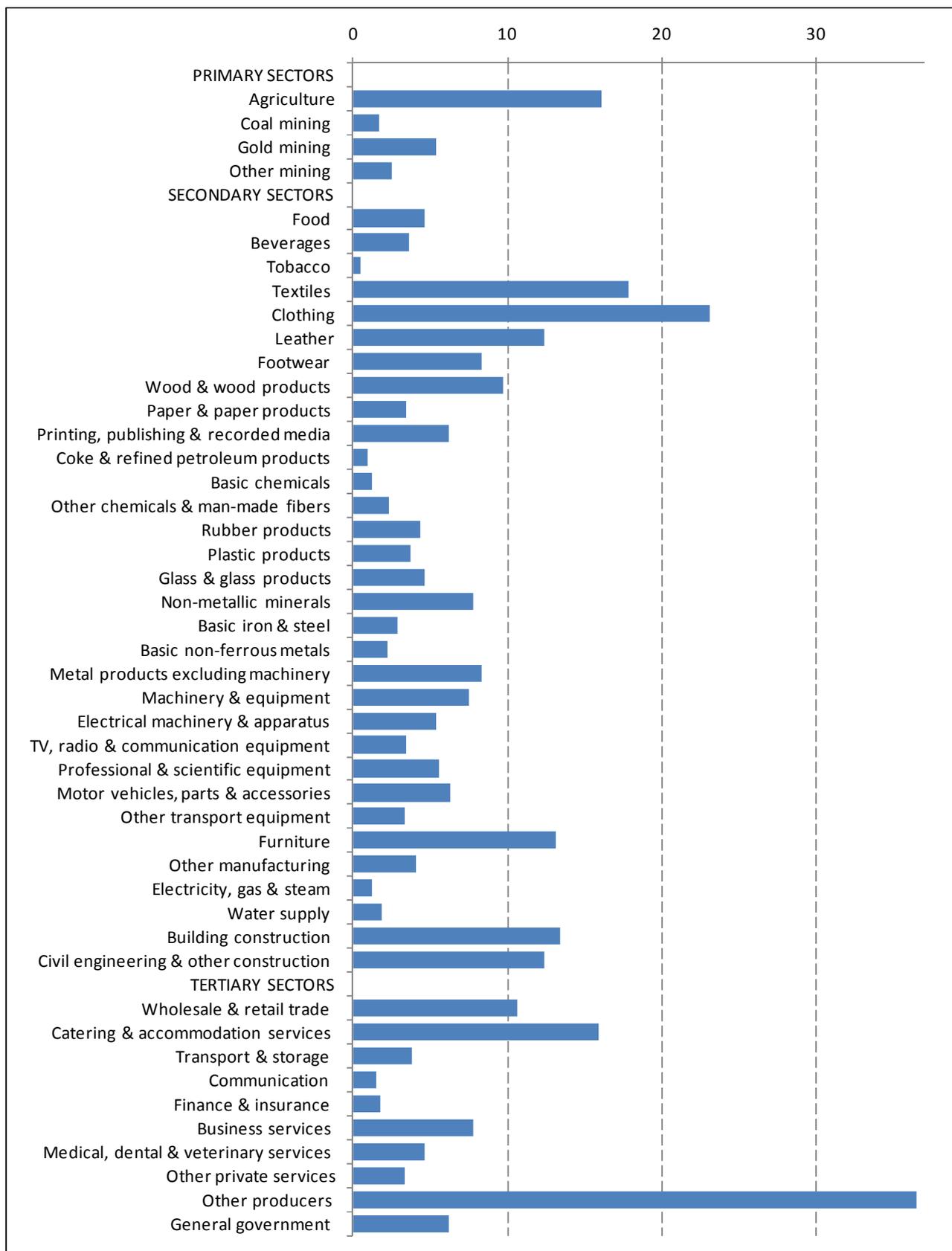
Note: Mean for 2006-2009, in current prices.

**Figure 9: Labour-Value added ratio by major sector, excluding other producers, current**
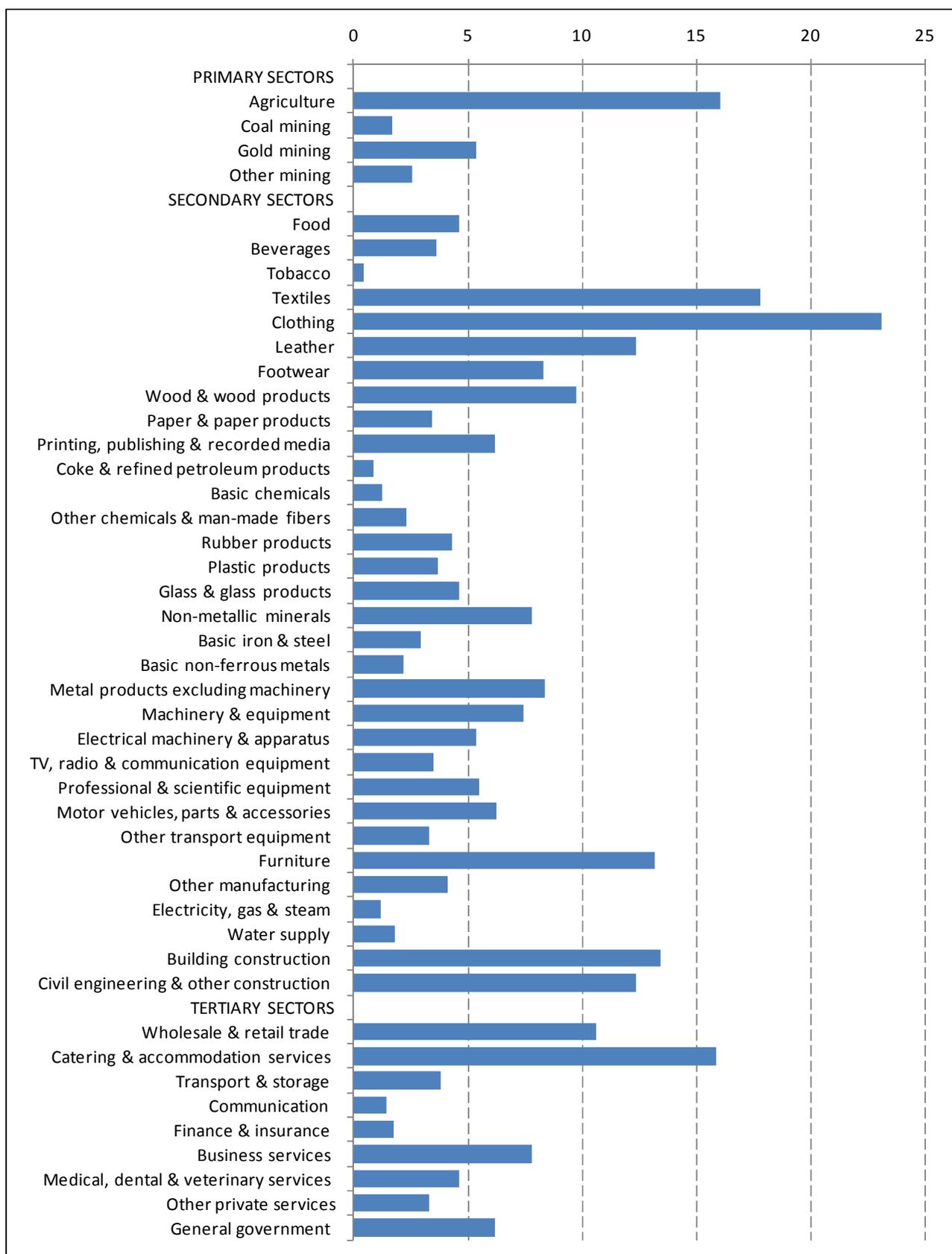
Note: Mean for 2006-2009, in current prices.

4.3 Measure 3: Employment multipliers

As discussed already, employment multipliers measure not only direct but also indirect labour-intensity, in the sense of how much economy-wide employment is associated with a given change in the output of a sector, taking into account the linkages between that sector and the rest of the economy. Figure 10 shows the employment multipliers for all subsectors of the economy. Figure 11 shows the same thing but excluding imported intermediates (see section 2 for a discussion of this issue). Again, other producers is by far the most labour-intensive subsector, even when indirect labour absorption is factored in.

Figure 10: Employment multipliers by subsector, 2009 (total)
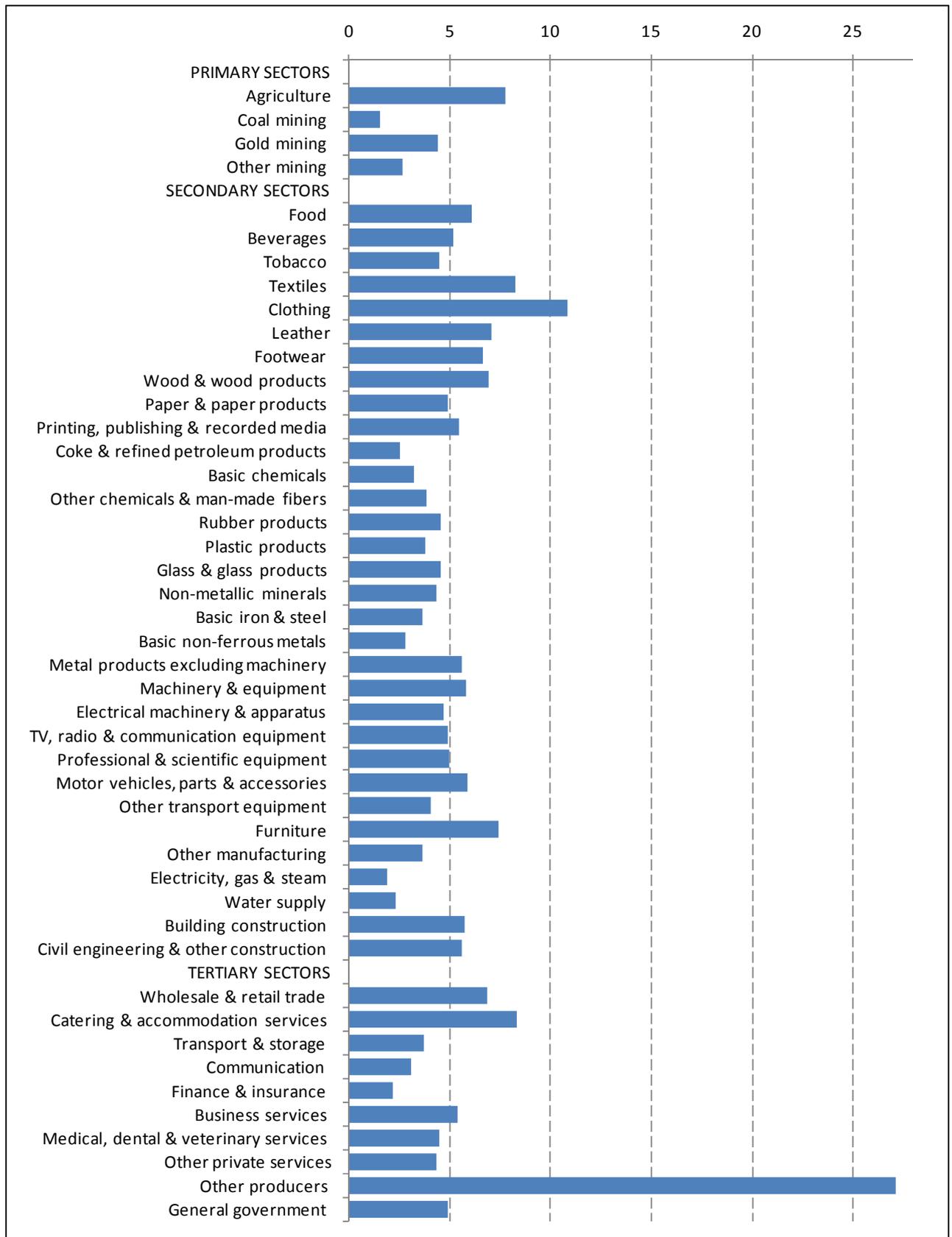
Figure 11: Employment multipliers by subsector, 2009 (import-adjusted)
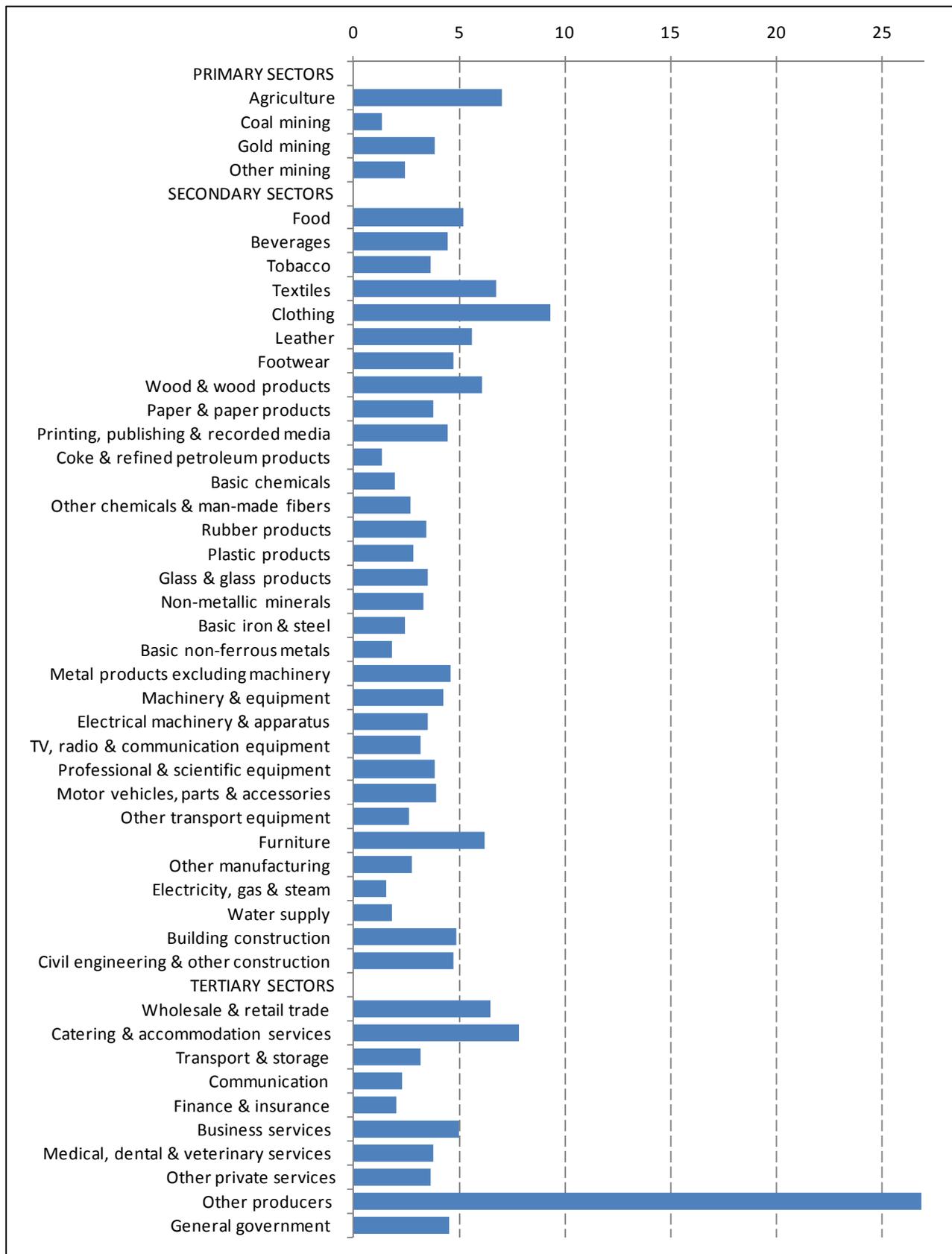
As discussed earlier, we can also look at employment multipliers for formal sector employment only. Given that it is not possible to calculate multipliers (or other measures of labour-intensity) for decent jobs only, it can be relevant to look at formal employment multipliers as an imperfect proxy for relatively decent jobs. Figure 12 thus shows total formal employment multipliers, and Figure 13 import-adjusted formal employment multipliers.

Figure 12: Formal employment multipliers by subsector, 2009 (total)
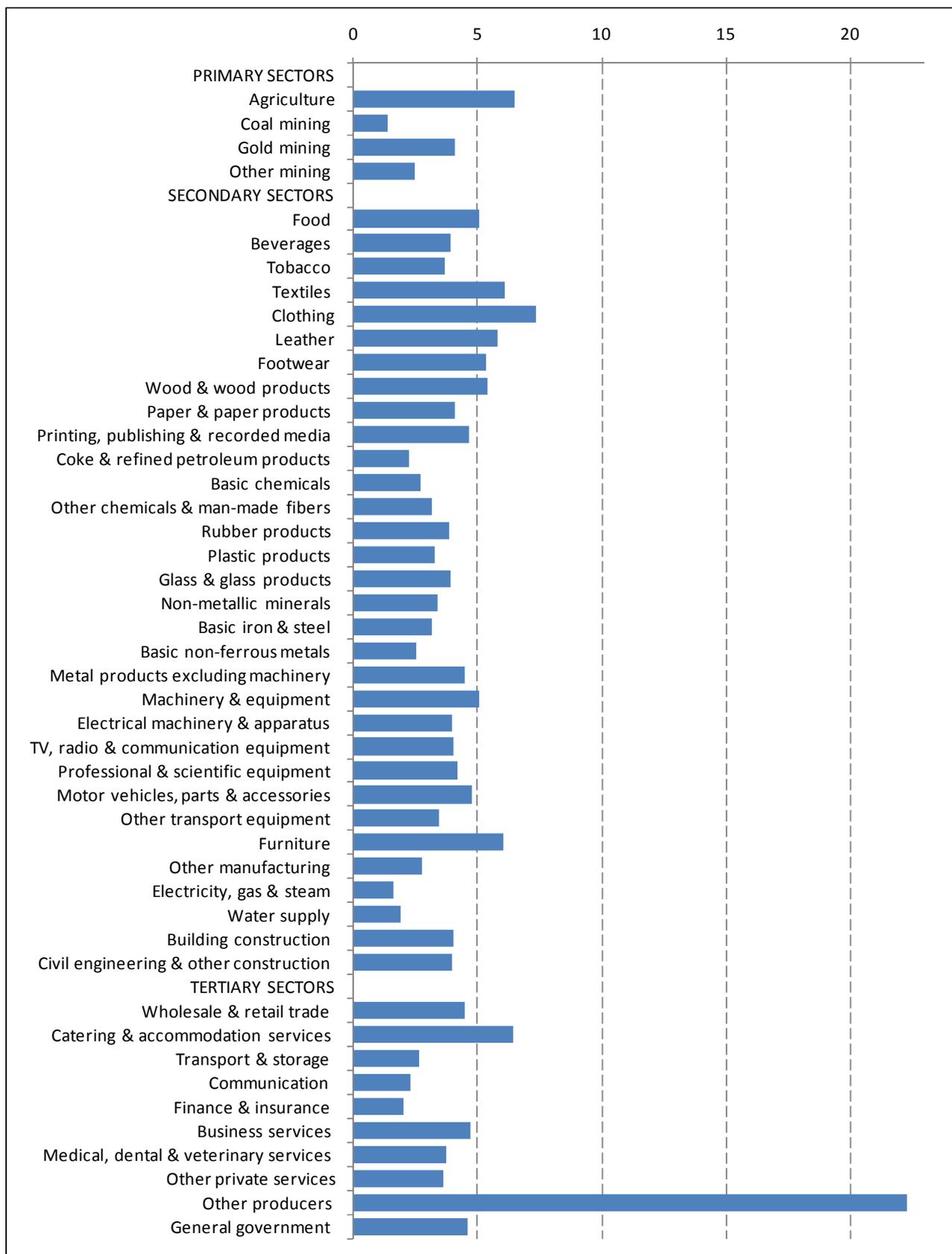
Figure 13: Formal employment multipliers by subsector, 2009 (import-adjusted)
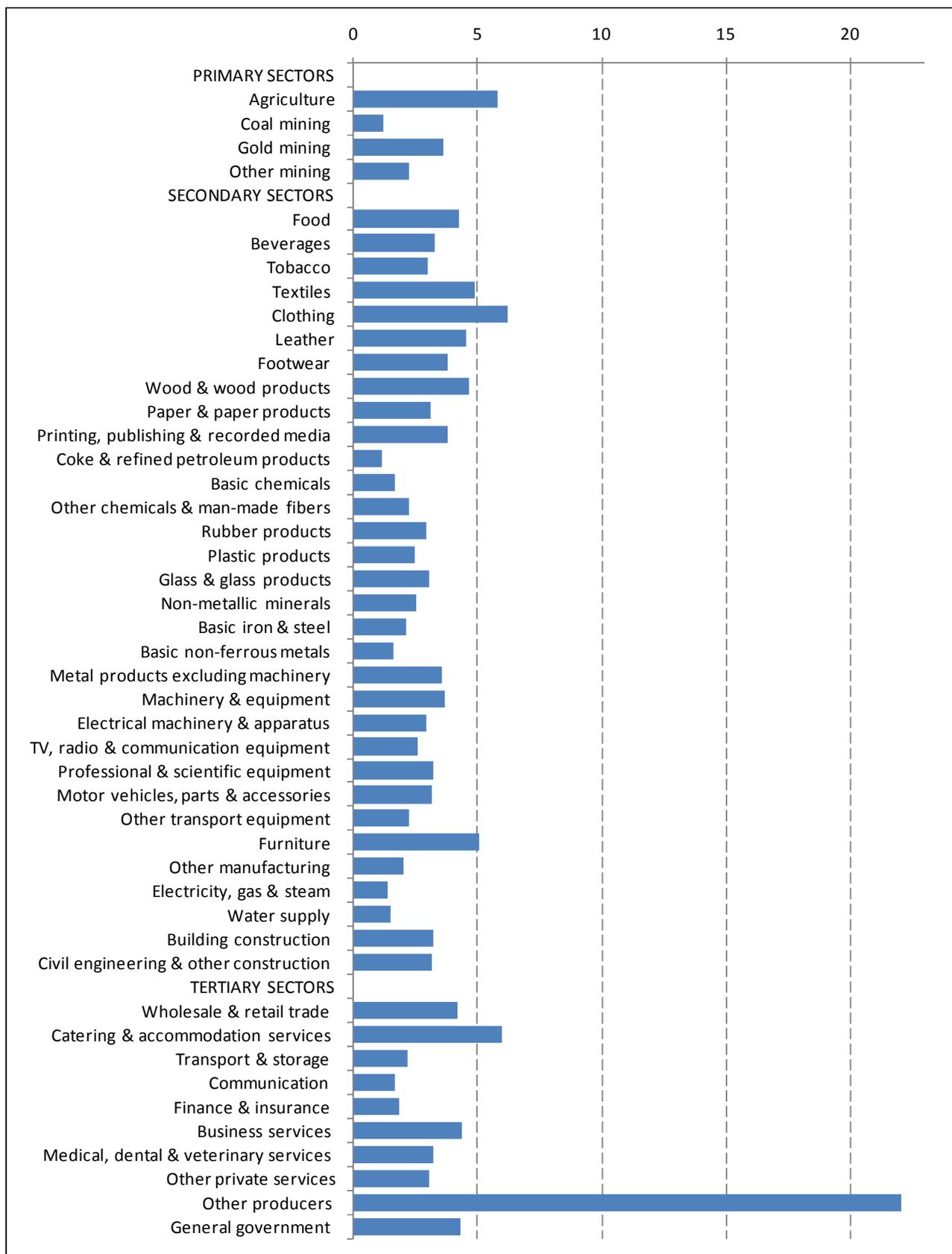
5. PRIORITISATION OF SECTORS ACCORDING TO THEIR LABOUR-INTENSITY

As discussed in section 2, this report provides a ranking of sectors' labour-intensity according to each of the three measures of labour-intensity used (labour-capital ratio; labour-value added ratio; and employment multipliers) as well as a composite measure that combines all three measures.

Table 1 ranks sector in terms of the labour-capital ratio, Table 2 in terms of the labour-value added ratio, and Table 3 in terms of employment multipliers (both total and import-adjusted). These rankings will have different relevance depending on the issue of interest.

Table 1: Ranking of sectors according to Labour-Capital Ratio

Other producers	207.92	1
Clothing	62.64	2
Furniture	31.21	3
Civil engineering & other construction	29.83	4
Footwear	27.53	5
Building construction	23.40	6
Leather	18.47	7
Catering & accommodation services	13.99	8
Wholesale & retail trade	12.49	9
Metal products excluding machinery	11.86	10
Textiles	11.52	11
Wood & wood products	11.29	12
Plastic products	11.23	13
Machinery & equipment	10.48	14
Professional & scientific equipment	9.73	15
Electrical machinery & apparatus	9.44	16
Printing, publishing & recorded media	6.93	17
Agriculture	6.69	18
Other manufacturing	6.45	19
TV, radio & communication equipment	5.81	20
Medical, dental & veterinary services	5.22	21
Rubber products	4.84	22
Food	4.29	23
Other transport equipment	4.04	24
Motor vehicles, parts & accessories	3.92	25
Beverages	2.93	26
Business services	2.76	27
Tobacco	2.73	28
Non-metallic minerals	2.66	29
Other private services	2.62	30
Glass & glass products	2.29	31
Gold mining	2.16	32
Other chemicals & man-made fibres	2.04	33
General government	1.90	34
Paper & paper products	1.71	35
Other mining	1.55	36
Basic iron & steel	1.46	37
Finance & insurance	0.90	38
Coal mining	0.87	39
Basic non-ferrous metals	0.84	40
Communication	0.80	41
Transport & storage	0.76	42
Basic chemicals	0.32	43
Electricity, gas & steam	0.23	44
Water supply	0.22	45
Coke & refined petroleum products	0.13	46

Note: Mean of 2006-2009, in current prices.

Table 2: Ranking of sectors according to Labour-Value added Ratio

Other producers	36.48	1
Clothing	23.07	2
Textiles	17.81	3
Agriculture	16.06	4
Catering & accommodation services	15.86	5
Building construction	13.43	6
Furniture	13.14	7
Civil engineering & other construction	12.38	8
Leather	12.38	9
Wholesale & retail trade	10.62	10
Wood & wood products	9.74	11
Metal products excluding machinery	8.35	12
Footwear	8.33	13
Non-metallic minerals	7.80	14
Business services	7.79	15
Machinery & equipment	7.45	16
Motor vehicles, parts & accessories	6.26	17
Printing, publishing & recorded media	6.20	18
General government	6.16	19
Professional & scientific equipment	5.53	20
Electrical machinery & apparatus	5.40	21
Gold mining	5.40	22
Food	4.65	23
Glass & glass products	4.63	24
Medical, dental & veterinary services	4.62	25
Rubber products	4.31	26
Other manufacturing	4.10	27
Transport & storage	3.83	28
Plastic products	3.71	29
Beverages	3.61	30
TV, radio & communication equipment	3.47	31
Paper & paper products	3.42	32
Other transport equipment	3.33	33
Other private services	3.33	34
Basic iron & steel	2.91	35
Other mining	2.55	36
Other chemicals & man-made fibres	2.33	37
Basic non-ferrous metals	2.22	38
Water supply	1.82	39
Finance & insurance	1.76	40
Coal mining	1.70	41
Communication	1.45	42
Basic chemicals	1.23	43
Electricity, gas & steam	1.20	44
Coke & refined petroleum products	0.91	45
Tobacco	0.48	46

Note: Mean of 2006-2009, in current prices.

Table 3: Ranking of sectors according to Employment Multipliers

Sector	Rank (import-adjusted employment multiplier)	Rank (total employment multiplier)
Other producers	1	1
Clothing	2	2
Catering & accommodation services	3	3
Agriculture	4	5
Textiles	5	4
Wholesale & retail trade	6	9
Furniture	7	6
Wood & wood products	8	8
Leather	9	7
Food	10	11
Business services	11	18
Building construction	12	14
Footwear	13	10
Civil engineering & other construction	14	16
Metal products excluding machinery	15	15
General government	16	23
Beverages	17	19
Printing, publishing & recorded media	18	17
Machinery & equipment	19	13
Motor vehicles, parts & accessories	20	12
Professional & scientific equipment	21	20
Gold mining	22	29
Medical, dental & veterinary services	23	28
Paper & paper products	24	21
Tobacco	25	27
Other private services	26	30
Glass & glass products	27	26
Electrical machinery & apparatus	28	24
Rubber products	29	25
Non-metallic minerals	30	31
TV, radio & communication equipment	31	22
Transport & storage	32	35
Plastic products	33	34
Other manufacturing	34	36
Other chemicals & man-made fibres	35	33
Other transport equipment	36	32
Other mining	37	41
Basic iron & steel	38	37
Communication	39	39
Finance & insurance	40	44
Basic chemicals	41	38
Water supply	42	43
Basic non-ferrous metals	43	40
Electricity, gas & steam	44	45
Coal mining	45	46
Coke & refined petroleum products	46	42

Table 4 shows a combined ranking that takes the average of sectors' ranks in the three separate measures. For the third measure (employment multipliers), the import-adjusted measure is used. According to this composite ranking, the most labour-intensive sector is other producers, which in fact was ranked as the most labour-intensive according to each of the individual measures used. The second most labour-intensive sector according to the composite measure is clothing, which was also ranked as such using each of the individual measures. The other sectors making up the top five most labour-intensive sectors when using the composite ranking are: catering and accommodation services; textiles; and furniture. The least labour-intensive sectors according to the composite measure, starting from the bottom, are as follows: coke and refined petroleum products; electricity, gas and steam; coal mining; water supply; and basic chemicals.

Table 4: Composite ranking of sectors according to all three measures of labour-intensity (2009)

Other producers	1.00
Clothing	2.00
Catering & accommodation services	5.33
Textiles	5.67
Furniture	5.67
Leather	6.33
Wholesale & retail trade	8.00
Footwear	9.33
Building construction	9.33
Civil engineering & other construction	9.67
Agriculture	10.33
Wood & wood products	11.67
Metal products excluding machinery	13.33
Machinery & equipment	16.00
Business services	17.33
Professional & scientific equipment	18.00
Printing, publishing & recorded media	18.67
Motor vehicles, parts & accessories	19.33
Food	20.00
Electrical machinery & apparatus	21.00
General government	21.33
Medical, dental & veterinary services	22.67
Gold mining	25.00
Beverages	25.00
Other manufacturing	26.00
Rubber products	26.33
TV, radio & communication equipment	26.67
Non-metallic minerals	27.00
Plastic products	27.33
Glass & glass products	28.67
Paper & paper products	29.33
Other private services	29.33
Other transport equipment	31.67
Basic iron & steel	32.00
Tobacco	32.67
Transport & storage	34.00
Other chemicals & man-made fibres	35.00
Other mining	37.00
Finance & insurance	39.00
Basic non-ferrous metals	39.33
Communication	40.67
Basic chemicals	42.00
Water supply	42.33
Coal mining	43.67
Electricity, gas & steam	44.00
Coke & refined petroleum products	45.00

6. CONCLUSIONS

There is a high degree of heterogeneity in the labour-intensity of subsectors in South Africa. When labour-intensity is measured as the labour-value added ratio, the most labour-intensive sector (other producers) is 77 times as labour-intensive as the least labour-intensive sector (tobacco), meaning that 77 times as many jobs are (directly) associated with each R1 of value added in the most labour-intensive sector as in the least. The variation is even more pronounced when labour-intensity is measured as the labour-capital ratio: the most labour-intensive sector (other producers) is 1 585 times as labour-intensive as the least labour-intensive sector (coke and refined petroleum products), meaning that a massive 1 585 times as many jobs are (directly) associated with each R1 of capital stock in the most labour-intensive sector as in the least. The differences are less stark in the case of employment multipliers (as would be expected, since these include economy-wide impacts). Nevertheless, the sector with the highest employment multipliers (other producers) has a multiplier over twenty times as strong as the sector with the lowest multiplier (coke and refined petroleum products).[3]

The empirical results presented here clearly indicate the high degree of heterogeneity in the degree of labour-intensity across sectors. This underlines that looking through a sectoral lens is essential when considering the issue of labour-intensity.

According to the composite measure of labour-intensity, the five most labour-intensive sectors in South Africa are (in the following order): other producers; clothing; catering and accommodation services; furniture; and textiles. The five least labour-intensive, starting from the lowest, are: coke and refined petroleum products; electricity, gas and steam; coal mining; water supply; and basic chemicals.

Sectoral targeting is a key dimension of industrial policy. Indeed, the current Industrial Policy Action Plan (IPAP2) has a strong element of sectoral targeting, with employment being one of the considerations taken into account in that targeting. While developing the

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[3] These figures refer to import-adjusted employment multipliers.

full policy implications of the results found here on labour-intensity falls beyond the scope of this report, some brief comments will be offered regarding the policy implications of the differing labour-intensity across sectors for sectoral targeting.

Given the crisis of unemployment in South Africa, the labour-absorbing capacity of sectors must clearly be a key consideration in prioritising sectors. One way of thinking about this is that, in order to increase the aggregate level of labour-intensity in the economy, either the share of relatively labour-intensive sectors needs to increase, or the degree of labour-intensity within sectors needs to increase (or both). The empirical findings of this report – in particular the ranking of sectors according to their degree of labour-intensity – can provide an information base for prioritising sectors according to their labour-intensity.

However, labour-intensity cannot be the only criterion for prioritising sectors. From a broader perspective, other criteria would also need to be taken into account. These might include the foreign exchange generating capacity of a sector, the degree of technological advancement in the sector, and the trend in the international demand for the products of the sector. While employment absorption is obviously important, it would be short-sighted to only prioritise sectors according to their degree of labour-intensity. A certain sector might be relatively labour-absorbing but might not be going anywhere in the sense that global demand for the products of that sector are relatively declining and that lower-cost producers are taking an increasing share of that declining demand. Industrial policy thus needs to take a range of criteria into account when prioritising sectors, with one of these criteria being the (direct and indirect) level of labour-intensity.

Another consideration concerning the policy implications of differential labour-intensity across sectors concerns the relationship between labour-intensity and productivity. As indicated in section 2, when labour-intensity is measured as the ratio between employment and value added, this is simply the inverse of labour productivity. That is, according to this measure, the most labour-intensive sector is also the sector with the lowest labour productivity. While the relationship is not as clear-cut when labour-intensity is measured through employment multipliers, since the calculation of these multipliers includes the employment-value added ratio it also enters in. Productivity is of importance for growth,

particularly for the sustainability of growth over time, and thus this issue of the relationship between labour-intensity and productivity also needs to be borne in mind when drawing out policy implications.

Having noted all these considerations, the importance of labour-intensity for maximising labour absorption remains. The results presented here compare labour-intensity across sectors and rank sectors according to their degree of labour-intensity, using three alternative measures and a composite measure. These findings can be used for determining how to prioritise sectors according to their degree of labour-intensity; how to balance this criterion with other criteria for prioritising sectors is an issue for constituencies to take their own positions on.

APPENDIX 1: LIST OF SUBSECTORS AND WHAT THEY INCLUDE

Table A1: List of subsectors

Sector	Activities included
Agriculture	Growing of cereals and other crops n.e.c; growing of vegetables, horticultural specialities and nursery products; growing of fruit, nuts, beverage and spice crops; farming of cattle, sheep, goats, horses, asses, mules and hinnies; dairy farming; other animal farming; production of animal products n.e.c.; growing of crops combined with farming of animals (mixed farming); agricultural and animal husbandry services, except veterinary activities; game propagation; hunting and trapping, including related services; production of organic fertilizer; forestry and related services; logging and related services; ocean and coastal fishing; fish hatcheries and fish farms
Coal mining	Coal mining
Gold mining	Gold mining
Other mining	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying; mining of iron ore; mining of non-ferrous metal ores, except gold and uranium; stone quarrying, clay and sand-pits; mining of diamonds (including alluvial diamonds); mining of chemical and fertilizer minerals; extraction and evaporation of salt; mining of precious and semi-precious stones, except diamonds; asbestos; other minerals and materials n.e.c.; service activities incidental to mining of minerals
Food	Production, processing and preserving of meat and meat products; processing and preserving of fish and fish products; processing and preserving of fruit and vegetables; manufacture of vegetable and animal oils and fats; manufacture of dairy products; manufacture of grain mill products; manufacture of starches and starch products; manufacture of prepared animal feeds; manufacture of bakery products; manufacture of sugar, including golden syrup and castor sugar; manufacture of cocoa, chocolate and sugar confectionery; manufacture of macaroni, noodles, couscous and similar farinaceous products; manufacture of other food products n.e.c.
Beverages	Distilling, rectifying and blending of spirits; manufacture of beer and other malt liquors and malt; manufacture of soft drinks; production of mineral waters
Tobacco	Tobacco
Textiles	Preparation and spinning of textile fibres; weaving of textiles; finishing of textiles; manufacture of made-up textile articles, except apparel; manufacture of carpets, rugs and mats; manufacture of cordage, rope, twine and netting; manufacture of other textiles n.e.c.
Clothing	Manufacture of knitted and crocheted fabrics and articles; manufacture of wearing apparel, except fur apparel; dressing and dyeing of fur; manufacture of articles of fur
Leather	Tanning and dressing of leather; manufacture of luggage, handbags and the like, saddlery and harness
Footwear	Footwear

Wood & wood products	Sawmilling and planing of wood; manufacture of veneer sheets; manufacture of plywood, laminboard, particle board and other panels and boards; manufacture of builders' carpentry and joinery; manufacture of wooden containers; manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials
Paper & paper products	Manufacture of pulp, paper and paperboard; manufacture of corrugated paper and paperboard and of containers of paper and paperboard; manufacture of other articles of paper and paperboard
Printing, publishing & recorded media	Publishing; publishing of books, brochures, musical books and other publications; publishing of newspapers, journals and periodicals; publishing of recorded media; other publishing; printing; service activities related to printing; reproduction of recorded media
Coke & refined petroleum products	Manufacture of coke oven products; petroleum refineries/synthesisers; processing of nuclear fuel
Basic chemicals	Manufacture of basic chemicals, except fertilizers and nitrogen compounds; manufacture of fertilisers and nitrogen compounds; manufacture of plastics in primary forms and of synthetic rubber
Other chemicals & man-made fibres	Manufacture of pesticides and other agro-chemical products; manufacture of paints, varnishes and similar coatings, printing ink and mastics; manufacture of pharmaceuticals, medicinal chemicals and botanical products; manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations; manufacture of other chemical products n.e.c.; manufacture of man-made fibres;
Rubber products	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres; manufacture of other rubber products
Plastic products	Plastic products
Glass & glass products	Glass and glass products
Non-metallic minerals	Manufacture of non-structural non-refractory ceramicware; manufacture of refractory ceramic products; manufacture of structural non-refractory clay and ceramic products; manufacture of cement, lime and plaster; manufacture of articles of concrete, cement and plaster; cutting, shaping and finishing of stone; manufacture of other non-metallic mineral products n.e.c.
Basic iron & steel	Basic iron and steel
Basic non-ferrous metals	Basic non-ferrous metals
Metal products excluding machinery	Casting of iron and steel; casting of non-ferrous metals; manufacture of structural metal products; manufacture of tanks, reservoirs and similar containers of metal; manufacture of steam generators, except central heating hot water boilers; forging, pressing, stamping and roll-forming of metal; powder metallurgy; treatment and coating of metals; general mechanical engineering on a fee or contract basis; manufacture of cutlery, hand tools and general hardware; manufacture of other fabricated metal products n.e.c.
Machinery & equipment	Manufacture of engines and turbines, except aircraft, vehicle and motor; cycle engines; manufacture of pumps, compressors, taps and valves; manufacture of bearings, gears, gearing and driving elements; manufacture of ovens, furnaces and furnace burners; manufacture of lifting and handling equipment; manufacture of other general purpose machinery; manufacture of agricultural and forestry machinery; manufacture of machine-tools; manufacture of machinery for metallurgy; manufacture of machinery for mining, quarrying and construction; manufacture of machinery for food, beverage and tobacco processing; manufacture of machinery for textile, apparel and leather production; manufacture of weapons and ammunition; manufacture of other special purpose machinery; manufacture of household appliances n.e.c.; manufacture of office, accounting and computing machinery

Electrical machinery & apparatus	Manufacture of electric motors, generators and transformers; manufacture of electricity distribution and control apparatus; manufacture of insulated wire and cable; manufacture of accumulators, primary cells and primary batteries; manufacture of electric lamps and lighting equipment; manufacture of other electrical equipment n.e.c.
TV, radio & communication equipment	Manufacture of electronic valves and tubes and other electronic components; manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy; manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods
Professional & scientific equipment	Manufacture of medical and surgical equipment and orthopaedic appliances; manufacture of instruments and appliances for measuring, checking, testing, navigating and for other purposes, except industrial process control equipment; manufacture of industrial process control equipment; manufacture of optical instruments and photographic equipment; manufacture of watches and clocks
Motor vehicles, parts & accessories	Manufacture of motor vehicles; manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers; manufacture of parts and accessories for motor vehicles and their engines
Other transport equipment	Building and repairing of ships; building and repairing of pleasure and sporting boats; manufacture of railway and tramway locomotives and rolling stock; manufacture of aircraft and spacecraft; manufacture of motor cycles; manufacture of bicycles and invalid carriages; manufacture of other transport equipment n.e.c.
Furniture	Furniture
Other manufacturing	Manufacture of jewellery and related articles; manufacture of musical instruments; manufacture of sports goods; manufacture of games and toys; other manufacturing n.e.c.; recycling of metal waste and scrap n.e.c.; recycling of non-metal waste and scrap n.e.c.
Electricity, gas & steam	Production, collection and distribution of electricity; generation; distribution of purchased electric energy only; generation and/or distribution for own use; manufacture of gas; distribution of gaseous fuels through mains; steam and hot water supply
Water supply	Water supply
Building construction	Building of complete constructions or parts thereof; civil engineering; construction of buildings; construction of homes; construction of other buildings; construction of other structures; construction by specialist trade contractors
Civil engineering & other construction	Site preparation; construction of civil engineering structures; building installation; plumbing; electrical contracting; shopfitting; other building installation n.e.c.; building completion; painting and decorating; other building completion n.e.c.; renting of construction or demolition equipment with operators
Wholesale & retail trade	Wholesale trade and commission trade, except of motor vehicles and motor cycles; retail trade, except of motor vehicles and motor cycles; repair of personal and household goods; sale, maintenance and repair of motor vehicles and motor cycles; retail trade in automotive fuel
Catering & accommodation services	Hotels, camping sites and other provision of short-stay accommodation; restaurants, bars and canteens
Transport & storage	Railway transport; other land transport; other scheduled passenger land transport; other non-scheduled passenger land transport; freight transport by road; transport via pipelines; sea and coastal water transport; inland water transport; air transport; cargo handling; storage and warehousing; other supporting transport activities; travel agency and related activities; activities of other

	transport agencies
Communication	National postal activities; courier activities other than national postal activities; telecommunications
Finance & insurance	Monetary intermediation; central banking; other financial intermediation n.e.c.; lease financing; other credit granting; other financial intermediation n.e.c.; life insurance; pension funding; medical aid funding; other insurance n.e.c.
Business services	Administration of financial markets; security dealing activities; activities auxiliary to financial intermediation n.e.c.; activities auxiliary to insurance and pension funding; real estate activities with own or rented property; renting of land transport equipment; renting of water transport equipment; renting of air transport equipment; renting of agricultural machinery and equipment; renting of construction and civil engineering machinery and equipment; renting of office machinery and equipment (including computers); renting of other machinery and equipment n.e.c.; renting of personal and household goods n.e.c.; hardware consultancy; software consultancy and supply; data processing; data base activities; maintenance and repair of office, accounting and computing machinery; other computer related activities; research and experimental development on natural sciences and engineering; research and experimental development on social sciences and humanities; legal activities; accounting, book-keeping and auditing activities; tax consultancy; marketing research and public opinion polling; business and management consultancy activities; architectural and engineering activities and related technical consultancy; technical testing and analysis; advertising; labour recruitment and provision of personnel; investigation and security activities; building and industrial plant cleaning activities; photographic activities; packaging activities; other business activities n.e.c.
Medical, dental & veterinary services	Hospital activities: medical and dental practice activities; other human health activities; supplementary health services or paramedical staff (practitioners); clinics and related health care services; nursing services; chiropractors and other associated health care services; other health services; veterinary activities; social work activities
Other private services	Education; sewage and refuse disposal, sanitation and similar activities; activities of business and employers' organisations; activities of professional organisations; activities of trade unions; activities of religious organisations; activities of political organisations; activities of other membership organisations n.e.c.; motion picture and video production and distribution; motion picture projection; radio and television activities; dramatic arts, music and other arts activities; other entertainment activities n.e.c.; news agency activities; library and archives activities; museum activities and preservation of historical sites and buildings; botanical and zoological gardens and nature reserve activities; sporting activities; other recreational activities
Other producers	Washing and (dry-) cleaning of textiles and fur products; hairdressing and other beauty treatment; funeral and related activities; other service activities n.e.c.
General government	General government

NOTE: n.e.c. means not elsewhere classified.

APPENDIX 2: METHODOLOGY FOR CALCULATING EMPLOYMENT MULTIPLIERS

This sets out the technical details of the methodology used to calculate employment multipliers, set out here as the third measure of labour-intensity.

Let $F_{(nxn)} \equiv$ the intermediate input flow matrix, which shows the inputs from and to each of the sectors (inputs from the factors of production and excluding final outputs). f_{ij} is the value of the intermediate inputs flowing from sector i to sector j, i.e. the payment for intermediate inputs that flows from sector j to sector i.

$X_{(nx1)} \equiv$ the total output flow vector, where x_i is the total output of sector i (the sum of intermediate and final output).

$DIAG(X)_{(nxn)}$ is a diagonal matrix where $DIAG(x)_{ij} = x_{ij}$ for all i=j, 0 otherwise.

$Y_{(nx1)} \equiv$ the intermediate output flow vector, where y_i is the intermediate output of sector i (that is, output which goes as intermediate inputs into other sectors).

$DIAG(Y)_{(nxn)} \equiv$ a diagonal matrix where $DIAG(y)_{ij} = y_{ij}$ for all i=j, 0 otherwise.

$I_{(nxn)} =$ identity matrix and $1_{(nx1)} =$ unity column vector.

then

$A_{(nxn)} \equiv F DIAG(X)^{-1}$. This is the input coefficient matrix or the technical coefficient matrix in the Leontief system.

$Z \equiv (I - A)^{-1}$, the input inverse or Leontief inverse, is a matrix of technical input coefficients that show intermediate inputs as a share of all inputs (including the value added components). z_{ij} is the value of the additional output that would be required from the ith sector to produce the necessary inputs for one unit of final demand of the jth sector. The jth column sum $\sum_{i=1}^{n} z_{ij}$ is the total increase in output that would be required to supply the necessary inputs for an initial unit in increase in sector j. Z thus represents the effects of expansion on suppliers. It is a measure of *backward linkages.*

All of the above vectors and matrices were also calculated using an adjusted intermediate input flow matrix $\hat{F}$ that excludes *imported* intermediate inputs. Following all the above

steps, all vectors and matrices can be derived adjusting such that the intermediate inputs on which they are based are only domestically produced.

The employment multipliers were then calculated as follows (shown here for the import-adjusted figures, as in the results presented in the article).

$P_{(nx1)}$ is the employment vector, where p_i is the number of people employed in sector i (actually the number of full-time full-year equivalents).

Similarly $P^F_{(nx1)}$ is the vector for formal employment and p^F_i is the number of people employed in sector i in the formal sector.

$DIAG(P)_{(nxn)} \equiv$ a diagonal matrix where $DIAG(p)_{ij} = p_{ij}$ for all i=j, 0 otherwise.

$\hat{N}_{(nxn)} = DIAG(P)(DIAG(\hat{X})^{-1})$, a diagonal matrix in which the diagonal elements are the employment/value added ratios of each sector i.

Then $\hat{M}_{(nxn)} = \hat{N}\hat{Z}$ where $\hat{m}_{ij}$ is the number of additional jobs (full-time full-year equivalents) in sector i that would be associated with one additional unit of final demand in sector j. The column totals $\sum_{i=1}^{n}\hat{m}_{ij}$ show the total number of additional jobs associated with an additional unit of final demand in sector j. Similarly for $\hat{M}^F$ for formal sector jobs.