

Chapter 7

Data Base Summary:

Input-Output Multipliers

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For many purposes it is useful to know the answer to the following question: “If the final demand for a given commodity rises by \$1 million, what will be the impact on the profile of factor demands?” This chapter aims to answer this question by providing a summary of the direct and total requirements coefficients. This information is generated from the GTAP 6 Data Base without formal simulation of the GTAP model. In the book version of this chapter, we report only data for the world aggregate.

7.1 Direct Requirements Coefficients

Table 7.1 reports the direct requirements coefficients, whereby demand is attributed to both domestic intermediate inputs and the “primary” factors of production.¹ The columns in table 7.1 correspond to domestic intermediates, imported intermediates, unskilled labor, skilled labor, capital, natural resources, land, and indirect taxes. These coefficients sum to 100, since sectoral revenue must equal cost (inclusive of taxes) in the balanced GTAP Data Base. Rows in the table correspond to “sectors”, or columns in the input-output (I-O) table. This includes the activities in final demand, including private and government consumption, investment and exports.

The direct requirements coefficients indicate that a \$100 million increase in the sales of sugar (processed) to final demand in the world would increase the demand for domestic intermediates by \$63.3 million, imported intermediates by \$6.7 million, unskilled labor by \$8.9 million, skilled labor by \$2.7 million, and capital by \$13.6 million. \$4.8 million of indirect taxes will also be generated. There will be no increase in the demand for land and natural resources since land is only a direct requirement in the agricultural sectors and natural resources is a direct requirement only in the extractive sectors. (Recall the discussion in chapters 2 and 3.)

The splits for the other primary factors in agriculture are almost identical. This is by construction, since we only have primary factor splits for the aggregate agricultural sector (see chapter 18.c).

¹For the purposes of this calculation, “primary” factors include not only the conventional primary factors - labor, capital, and land - but also indirect taxes and imports, which are external to the one region I-O model.

The next point to note about the global direct requirements coefficients is that the final demand activities — consumption, investment and exports — do not employ primary factors of production. This follows from I-O accounting. Furthermore, the domestic, import and tax intensities of these final demands also differ widely. Investment is the most import-intensive of the final demand activities, while government consumption is very intensive on domestic inputs. Private consumption is the most heavily taxed (4.3 per cent direct consumption taxation), whereas government consumption is typically not taxed at all or lightly taxed.

Turning to the productive sectors of the economy, we see that the food processing and the manufacturing sectors show high shares of intermediate inputs, while extractive sectors, services and primary agriculture show relatively low shares. Primary agriculture and services are also quite intensive in total labor. The private and government service sectors show the highest intensity for skilled labor. In terms of direct requirements coefficients, the sectors which show the highest coefficients for capital are forestry, oil and gas, services and dwellings. The latter absorbs capital 77 per cent of total costs. Finally, we note from the last column that beverages and tobacco products are the most highly taxed on a global basis while wheat, other grains, oilseeds, and cattle/sheep are highly subsidized, as indicated by the large negative tax rates.

7.2 Total Requirements Coefficients

Table 7.2 reports the total requirements coefficients, whereby all derived demands are attributed only to the “primary” factors of production. Here, a \$100 million increase in the sales of sugar (processed) to final demand in the world is shown to increase the demand for imports by \$14.3 million, unskilled labor by \$26.8 million, skilled labor by \$8.4 million, capital by \$34.0 million, and indirect taxes by \$11.2 million. Additionally, it will increase the demand for land by \$5.0 million and for natural resources by \$0.3 million.

Because labor intensive activities also demand some capital intensive intermediates, and vice versa, the factor intensities in table 7.2 tend to be somewhat less diverse than those in table 7.1. This is particularly noticeable in the case of land. Here, the direct requirements are zero outside primary agriculture, but because other sectors, such as processed rice, meat products, and milk products, use a great deal of agricultural inputs, they exhibit significant total requirements for land. The same is true in the case of taxes. The direct requirements tax rate for a number of the agricultural sectors was negative in table 7.1, indicating the presence of a subsidy. The total requirements tax rates in table 7.2 are also negative for these agricultural sectors indicating that the derived demand for taxed intermediates did not generate sufficient revenue to offset these subsidies.

It is also interesting to compare the primary factor intensity of total requirements for final demand. The high domestic input intensity of government consumption in table 7.1 translates to high skilled and unskilled labor intensity, higher than that for private consumption. Private consumption is the most capital-intensive of the final demand activities. Exports are more intensive in capital, skilled labor and natural resources than investment.

In summary, examination of the direct and total requirements coefficients and can give the reader some important insights into the structure of the GTAP Data Base, and hence the likely outcomes when the data base is used in model simulation.

Table 7.1 Direct Requirements Coefficients, World (per cent)

GTAP Commodity	Domestic Products	Imported Products	Unskilled Labor	Skilled Labor	Capital	Natural Resources	Land	Indirect Tax
Paddy rice	26.1	4.4	32.6	0.3	12.9	0.0	24.3	-0.5
Wheat	48.2	4.7	21.9	0.6	11.1	0.0	26.1	-12.6
Other grains	45.0	5.2	22.7	0.7	12.6	0.0	27.1	-13.3
Vegetables, fruit	27.5	3.8	33.1	0.7	13.6	0.0	18.4	2.9
Oil seeds	36.2	4.3	27.1	0.8	16.8	0.0	25.2	-10.4
Sugar cane	32.5	4.6	26.2	0.5	15.0	0.0	19.8	1.4
Plant-based fibers	44.7	6.7	22.1	0.5	11.8	0.0	16.1	-1.9
Other crops	31.8	4.6	26.7	0.9	15.9	0.0	18.2	1.9
Cattle, sheep	55.2	4.8	17.6	0.6	16.9	0.0	9.2	-4.3
Animal products	57.9	4.0	17.9	0.4	7.4	0.0	10.4	2.0
Raw milk	52.1	5.0	18.2	0.6	11.7	0.0	12.1	0.2
Wool	53.4	6.2	19.4	0.4	8.1	0.0	10.0	2.6
Forestry	33.6	3.3	23.1	0.6	28.4	6.8	0.0	4.2
Fishing	33.2	5.1	16.4	0.5	17.2	22.4	0.0	5.1
Coal	36.7	5.3	14.7	2.5	14.5	22.5	0.0	3.8
Oil	33.6	7.4	5.2	1.6	25.7	22.1	0.0	4.5
Gas	25.9	5.0	4.5	1.2	32.7	22.0	0.0	8.7
Other minerals	49.8	5.7	11.8	3.1	17.8	6.2	0.0	5.5
Cattle, sheep meat	69.8	6.2	9.4	2.0	9.3	0.0	0.0	3.2
Other meat	71.2	5.6	8.2	1.9	10.1	0.0	0.0	3.0
Vegetable oils	61.2	12.9	6.0	1.7	14.1	0.0	0.0	4.2
Dairy products	67.4	5.3	8.0	2.0	14.0	0.0	0.0	3.3
Processed rice	72.9	3.7	7.9	1.6	12.3	0.0	0.0	1.5
Sugar	63.3	6.7	8.9	2.7	13.6	0.0	0.0	4.8
Other food	56.7	10.0	9.4	3.1	15.5	0.0	0.0	5.2
Beverages, tobacco	48.7	6.4	6.8	2.3	22.0	0.0	0.0	13.9
Textiles	54.7	14.2	12.0	2.6	11.2	0.0	0.0	5.4
Wearing apparel	50.5	13.7	15.2	3.1	11.3	0.0	0.0	6.2
Leather products	53.9	15.1	12.0	2.3	11.2	0.0	0.0	5.5
Wood products	52.8	10.6	14.0	3.5	14.1	0.0	0.0	5.1
Paper, publishing	49.9	9.3	13.1	6.2	15.2	0.0	0.0	6.4
Petroleum	50.5	39.5	1.3	0.5	4.2	0.0	0.0	3.9
Chemicals, rubber	51.0	13.8	8.6	4.8	14.4	0.0	0.0	7.4
Mineral products	52.6	7.7	13.0	3.9	15.7	0.0	0.0	7.2
Ferrous metals	62.3	10.5	9.7	3.0	8.7	0.0	0.0	5.7
Other metals	58.8	16.3	8.4	2.7	9.2	0.0	0.0	4.6
Metal products	50.8	10.3	15.3	5.4	11.2	0.0	0.0	7.0
Motor vehicles	58.5	16.6	9.1	4.3	7.4	0.0	0.0	4.2
Transport equip	49.0	13.9	14.5	7.1	9.7	0.0	0.0	5.7
Electronic equip	43.7	23.7	9.6	5.9	11.8	0.0	0.0	5.3
Machinery, equip	46.3	14.3	12.5	8.1	12.7	0.0	0.0	6.1
Other manufactures	46.2	13.9	12.8	3.7	16.8	0.0	0.0	6.6
Electricity	41.2	6.4	6.9	4.4	33.0	0.0	0.0	8.0
Gas distribution	43.3	4.4	9.9	5.8	30.6	0.0	0.0	6.1

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Table 7.1 Direct Requirements Coefficients, World (per cent) (Contd)

GTAP Commodity	Domestic Products	Imported Products	Unskilled Labor	Skilled Labor	Capital	Natural Resources	Land	Indirect Tax
Water	37.1	3.7	16.4	9.1	26.2	0.0	0.0	7.5
Construction	49.2	6.7	18.2	6.4	12.8	0.0	0.0	6.6
Trade	34.6	3.3	23.4	7.8	21.4	0.0	0.0	9.5
Other transport	39.4	4.5	18.3	6.3	20.1	0.0	0.0	11.4
Water transport	38.0	19.3	12.3	4.4	14.2	0.0	0.0	11.9
Air transport	43.9	11.9	15.6	4.6	12.5	0.0	0.0	11.5
Communication	33.2	4.2	10.7	11.6	33.1	0.0	0.0	7.1
Financial services	37.2	2.5	13.2	16.6	22.6	0.0	0.0	7.9
Insurance	49.4	3.3	14.1	17.1	8.3	0.0	0.0	7.7
Business services	32.4	3.0	9.2	10.9	36.4	0.0	0.0	8.1
Recreational services	37.2	4.3	10.9	12.6	24.8	0.0	0.0	10.2
Education, health	25.5	3.2	24.1	25.6	12.1	0.0	0.0	9.6
Dwellings	14.5	0.3	3.3	0.0	76.7	0.0	0.0	5.2
Private Consumption	87.5	8.2	0.0	0.0	0.0	0.0	0.0	4.3
Govt Consumption	97.2	2.7	0.0	0.0	0.0	0.0	0.0	0.1
Investment	82.1	15.2	0.0	0.0	0.0	0.0	0.0	2.8
Exports	99.8	15.2	0.0	0.0	0.0	0.0	0.0	0.2

Table 7.2 Total Requirements Coefficients, World (per cent)

GTAP Commodity	Imports	Unskilled Labor	Skilled Labor	Capital	Natural Resources	Land	Indirect Tax
Paddy rice	7.9	39.6	2.9	21.1	0.1	26.3	2.0
Wheat	11.8	34.5	5.2	26.6	0.4	30.4	-8.9
Other grains	12.0	34.4	5.6	26.7	0.3	30.5	-9.5
Vegetables, fruit	7.7	40.5	3.6	22.2	0.2	19.8	6.0
Oil seeds	9.6	36.3	4.8	28.7	0.3	27.2	-6.8
Sugar cane	9.3	34.3	4.0	25.7	0.3	21.4	5.0
Plant-based fibers	13.8	32.8	6.0	26.3	0.4	17.3	3.4
Other crops	8.9	35.2	4.3	25.9	0.2	20.2	5.2
Cattle, sheep	11.7	33.7	5.8	34.3	0.3	14.7	-0.5
Animal products	11.8	34.6	5.4	25.4	0.4	16.6	5.8
Raw milk	11.6	33.3	5.4	27.8	0.3	17.6	4.0
Wool	13.0	35.4	5.1	24.1	0.3	15.3	6.8
Forestry	7.2	32.1	5.1	39.6	7.5	0.3	8.2
Fishing	10.5	24.2	4.3	27.7	23.7	0.6	9.0
Coal	10.5	23.0	7.1	27.7	22.9	0.1	8.7
Oil	11.7	13.0	6.3	37.5	22.4	0.1	9.0
Gas	7.8	10.6	4.7	42.1	22.5	0.2	12.1
Other minerals	13.0	23.0	8.7	35.5	7.6	0.2	12.0
Cattle, sheep meat	14.5	30.7	8.0	32.8	0.3	6.3	7.4
Other meat	14.3	30.2	7.7	31.5	0.3	7.1	8.9
Vegetable oils	20.9	22.9	7.4	34.3	0.4	5.3	8.7
Dairy products	13.6	27.1	8.2	36.1	0.3	5.4	9.3
Processed rice	10.8	33.2	5.8	31.1	0.6	12.7	5.8
Sugar	14.3	26.8	8.4	34.0	0.3	5.0	11.2
Other food	17.2	24.8	8.7	34.1	0.9	3.4	10.9
Beverages, tobacco	12.4	18.9	7.4	38.9	0.2	1.9	20.2
Textiles	24.4	25.6	8.1	28.4	0.2	1.1	12.0
Wearing apparel	23.4	27.9	8.4	27.3	0.2	0.4	12.6
Leather products	24.8	26.0	7.6	28.3	0.2	1.3	11.8
Wood products	18.0	28.0	9.0	32.3	0.9	0.2	11.6
Paper, publishing	16.3	24.9	12.5	32.8	0.3	0.2	12.9
Petroleum	50.3	8.2	4.0	21.1	7.4	0.1	9.0
Chemicals, rubber	22.6	19.5	10.9	31.8	0.6	0.4	14.2
Mineral products	15.4	25.4	10.0	33.9	0.8	0.2	14.3
Ferrous metals	21.6	24.0	9.7	29.6	0.9	0.1	14.2
Other metals	26.3	21.6	9.0	29.6	1.1	0.1	12.3
Metal products	18.9	27.5	11.4	27.8	0.3	0.1	13.9
Motor vehicles	28.3	22.9	11.7	25.1	0.2	0.1	11.7
Transport equipment	22.7	26.4	13.7	24.8	0.2	0.1	12.0
Electronic equip	32.1	19.5	11.8	25.5	0.1	0.1	10.8
Machinery, equipt	22.3	23.4	14.2	27.6	0.2	0.1	12.2
Other manufactures	21.4	24.0	9.0	32.3	0.3	0.3	12.6
Electricity	12.7	15.3	9.0	47.6	2.4	0.2	12.9
Gas distribution	9.5	20.0	11.3	46.0	1.2	0.3	11.6

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Table 7.2 Total Requirements Coefficients, World (per cent) (Contd)

GTAP Commodity	Imports	Unskilled Labor	Skilled Labor	Capital	Natural Resources	Land	Indirect Tax
Water	8.3	24.8	14.1	40.1	0.3	0.2	12.3
Construction	13.6	30.5	12.7	29.5	0.3	0.1	13.3
Trade	6.9	31.0	12.9	34.9	0.1	0.2	14.0
Other transport	11.2	26.9	11.2	33.5	0.6	0.1	16.5
Water transport	26.2	20.3	9.3	26.6	0.5	0.1	16.9
Air transport	20.2	24.7	10.3	26.6	0.8	0.1	17.3
Communication	7.6	17.8	17.1	46.0	0.1	0.1	11.4
Financial services	5.2	20.8	23.7	37.5	0.1	0.1	12.7
Insurance	7.3	24.9	27.1	26.3	0.1	0.1	14.3
Business services	6.4	16.2	15.9	49.0	0.1	0.1	12.3
Recreatl services	8.3	19.2	17.9	39.0	0.2	0.4	15.1
Education, health	6.1	29.8	29.5	21.4	0.1	0.1	12.9
Dwellings	1.7	6.8	2.6	81.9	0.0	0.0	7.0
Private Consumption	16.9	20.6	11.9	34.1	0.4	1.1	15.0
Govt Consumption	9.8	28.2	26.2	22.9	0.1	0.2	12.7
Investment	28.1	22.8	10.6	24.8	0.2	0.2	13.4
Exports	20.6	22.6	11.6	30.4	1.5	0.9	12.4