Russian Federation

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1. Introduction

The input-output table for the Russian Federation (RF) in the GTAP 7 Date Base was constructed on the basis of Rosstat input-output tables published in "The system of input-output tables for 2003" (Rosstat, 2006). The data were disaggregated, reclassified and balanced to meet the GTAP requirements stated in Huff, McDougall, and Walmsley (2000).

This paper describes the construction of the Russian data for the GTAP 7 Date Base. The provision of the data for Russia was a part of the ENEPO research project supported by the European Union's 6th Framework Program[1].

The data supplied for Russia are presented in the Table 0.1.

Table 0.1. Russian Input-Output Tables: GTAP Unified Format

	Dimensions (r, c)	Description
UF	2*40+2, 40+5	Usage of 40 products and two primary factors of production (labor and capital), commodity tax excluded.
UP	2*40+2, 40+5	Usage of 40 products and two primary factors of production (labor and capital), commodity tax inclusive
OP	40	Output of 40 sectors, non-commodity indirect tax included
MF	40	Imports of 40 products, import duties excluded
SSET	40	Sector (product group) names (Table A.1)
SMAP	57, 2	Map from standard GTAP sectors (Table A.2)

Row dimension of tables UF and UP (2*40+2) reflects the fact that both intermediate and final use is distinguished between 40 product groups of domestic and imported goods, plus two primary factors. Column dimension of these tables (40+5) reflects number of producing sectors (40) and five final use categories: household consumption, government consumption, investment, change in stocks and exports.

Due to differences in industrial classification between Russian I-O and GTAP, we implemented a step-wise procedure constructing the Russian I-O for GTAP 7 Data Base. At the first step we constructed a transition matrix with 59-sector detalisation, based on old Russian classification that is compatible with the source Russian input-output table. At the second step we aggregate transition matrix to the GTAP sectoral classification, achieving detalisation of 40 GTAP sectors. At the third stage we transformed the resulting matrix in order to match GTAP requirements. At the fourth stage we calculated imports use and tax table in GTAP format.

[1]EU Eastern Neighborhood: Economic Potential and Future Development (http://enepo.case.com.pl/)

The paper is organized as follows: section 2 describes the Russian official input-output tables, which is the key data source; section 3 contains an overview of processing of the source data into a form corresponding to the GTAP requirements; section 4 outlines how we split the source 2003 I-O table; section 5 follows steps of reconciling Russian data with the GTAP structure. Section 6 is focused on imports and tax table creation. Section 7 notes diagnostics tests applied to the data base before its distribution.

2. Original Data

The source table is a symmetric input-output table (SIOT) grouped commodity by commodity. It represents 22 "single-product" producing sectors[2], data is measured in thousands of Russian rubles.

The symmetric input-output table is accompanied by non-symmetric supply and use tables, tables of domestic and imported products use, tables of transport and trade mark-ups, and a tax table. All these tables include 24 producing sectors[3] and commodity groups aggregated according to Russian national industrial classification (Obsherossiiskii klassifikator otraslei narodnogo hozaistva, OKONH[4]) on a commodity by industry basis. The full list of input-output tables published by Rosstat is presented in the Table A.3.

By the time of creation of the Russian I-O tables for GTAP, there were available only OKONH-based official I-O tables. There is no one-to-one mapping on the aggregated level from OKONH to standard international classification like ISIC or NACE. We had to disaggregate the source table in order to match GTAP sectoral classification. At this stage we need a more detailed version of input-output tables, like detailed 1995 Russian symmetric input-output table with 110 industries. This level of details permitted us to build a one-to-one mapping to GTAP.

The next step was to disaggregate Russian IO for 2003 with 22 sectors to 59[5] sectors. We used an entropy minimization technique, similar to Robinson, Cattaneo, and El-Said (2001). After obtaining a balanced I-O with 59 sectors for 2003 we aggregated it to GTAP format.

The same procedure was applied to imports and tax matrices.

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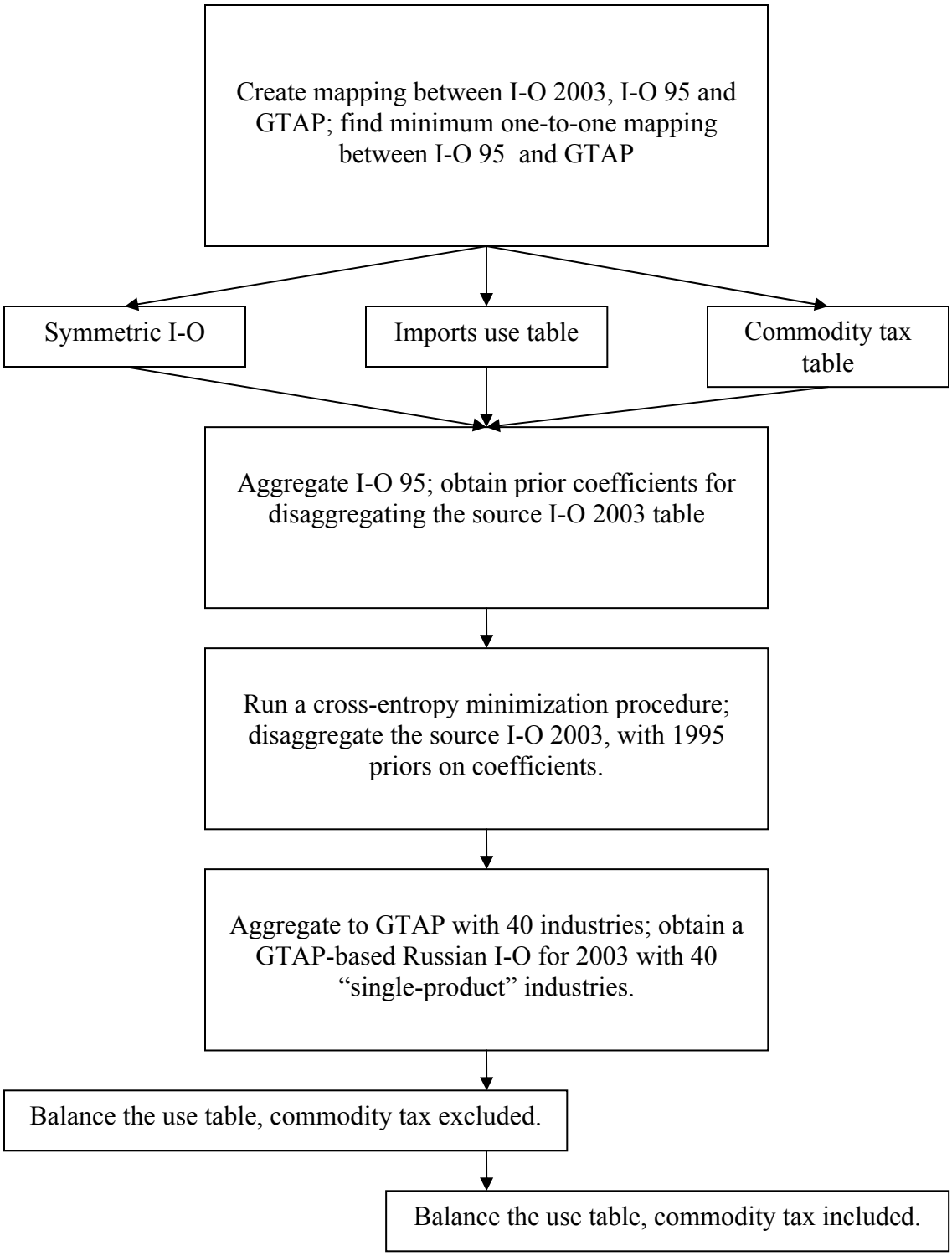
[2] Description of I-O tables methodology is published in Rosstat (1998), Chapter 5 "Input-Output Tables".
[3] Some differences in methodology should be noted, for instance, Rosstat does not calculate imputed rent for owner-occupied dwellings. "The value of housing services is treated as a sum of current expenditure of dwelling and consumption of fixed capital" (Masakova, 1998).
[4] OKONH classification (http://www.standard.ru/classif/okonh/okonh.phtml) was the official industrial classification in the Soviet Union and in Russia until recently (1976-2004). In 2004 Russia adopted a new classification OKVED based on "Statistical Classification of Economic Activities in the European Community" (NACE Rev. 2).
[5] Russian I-O tables report data in OKONH classification. In order to find a correspondence between I-O data and GTAP sectors we build a mapping from I-O sectors to OKONH, then from OKONH to ISIC. We base our classification on a mapping between OKONH and OKVED classifications, published by the Ministry of Economy of the RF and Rosstat in 2002. (http://okpd.org/product/okonh_okved.zip). The minimum common classification contains 59 sectors.

3. Data Processing

There are several major steps in construction of the Russian GTAP 7 I-O.

- Split sectors of the source table
- Reconcile auxiliary accounts with GTAP I-O table structure
- Estimate imports use table, domestic use table
- Estimate tax table
- Form data in GTAP unified format


Create mapping between I-O 2003, I-O 95 and GTAP; find minimum one-to-one mapping between I-O 95 and GTAP
Symmetric I-O
Imports use table
Commodity tax table
Aggregate I-O 95; obtain prior coefficients for disaggregating the source I-O 2003 table
Run a cross-entropy minimization procedure; disaggregate the source I-O 2003, with 1995 priors on coefficients.
Aggregate to GTAP with 40 industries; obtain a GTAP-based Russian I-O for 2003 with 40 "single-product" industries.
Balance the use table, commodity tax excluded.
Balance the use table, commodity tax included.

4. Disaggregating the 2003 I-O Table

Russian I-O sectoral classification in 2003 tables does not have a one-to-one mapping to GTAP. Minimum number of I-O sectors that could be matched to GTAP is 59. We use a method, which is quite similar to entropy minimization technique described in Robinson, Cattaneo and El-Said (2001). The lack of row and column sums on a desired level of details made us modify the standard approach. We need to incorporate two data sources in a new detailed table. We have the aggregated source I-O table, and a detailed I-O table for 1995 (with 59 sectors presented in the Table A.4). We build constrains to ensure that splitted cells sum up to the source cell and structure match the same block in the detailed 1995 table.

5. Reconciling Russian I-O and the GTAP Structures

Structure of a Russian symmetric input-output table (RSIOT) is build on the basis of UN (1999) guidelines. It's structure did not change since 1995. Adjustments we made with 2003 SIOT are in line with Kiselev and Romashkin (2006) approach in preparing Russian 1997 dataset for GTAP 6 Data Base and Maidment and Gabbitas (2006) procedures in preparing Australian data for GTAP 5 Data Base.

There are some extra accounts that should be transformed to reach consistency with the GTAP structure:

- Purchases of residents abroad: should be distributed by commodity groups and added to the final demand by household and to imports in a separate row;
- Purchases of non-residents at home: should be distributed by commodity groups, added to exports column;
- Financial intermediation services indirectly measured (FISIM)[6] should be distributed across industries.

Primary factors of the GTAP Data Base are estimated on the basis of the value added division in the Russian symmetric I-O table. Elements of value added include: compensation of employees, gross mixed income, operating surplus. Compensation of employees includes wages and salaries in cash and in kind, employers' actual and imputed social contributions. In order to make this account compatible with the GTAP treatment of labor payments we split wages and social contributions.

Operating surplus "… is a balancing item, which is equal to value added minus compensation of employees, minus taxes less subsidies on production and imports" United Nations (1999). Gross mixed income "… contains an unknown element of remuneration for work done by the owner of the enterprise, or other members of the same household, as well as the [operating] surplus accruing from production" United Nations (1993). We treat both operating surplus and gross mixed income as payments for capital.

Final demand section of the Russian SIOT 2003 consists of: final consumption expenditures of the household sector, final consumption expenditures by non-profit institutions serving households (NPISHs), final consumption expenditures by general government, gross fixed capital formation, changes in inventories, acquisition, less disposal, of valuables. We treat final consumption expenditures of the household sector as regional household expenditures on final consumption in the GTAP database. We considered final consumption by NPISHs and general government as government final consumption in the GTAP. Summing up gross fixed

[6] Rosstat methodology of the FISIM calculations is described in Masakova (1998).

capital formation, changes in inventories and acquisition gives us estimated of the investment expenditures in the GTAP dataset.

6. Imports Use and Tax Tables

Creation of import use and tax tables took several steps:

- Data on final use of imported products were disaggregated to 40 GTAP sectors.
- Total intermediate use of imports was calculated as a difference between total value and final use of imports. Total intermediate use of imports (M_i^{INT}, i – commodity group; a row in the I-O table) was distributed between intermediate use of imports (M_{ij},.j – production activity; a column in the I-O table) in production according to share of use a production activity (K_{ij} - value of intermediate use of i-th commodity group in production of j-th commodity) in total intermediate use of this commodity group ($\sum_j K_{ij}$ - summation across all types of production activities):
    - $M_{ij} = M_i^{INT} * \frac{K_{ij}}{\sum_j K_{ij}}$
- Use of domestic products is a difference between total use and imports use tables.
- Taxes on final use were disaggregated to 40 GTAP sectors. Difference between total tax collection and taxes on final use was distributed along an I-O row between intermediate use proportionally.
- We used an assumption that taxes on imports and domestic use are levied in the same proportion.

7. Diagnostics

The Russia I-O table for the GTAP 7 Data Base went through a standard check (Huff, McDougall, and Walmsley (2000)., Maidment and Gabbitas (2006).). It was checked to ensure that

- there were no negative values;
- there is no re-export;
- total sales equaled total costs in total and by sector;

One of the standard check procedures is an entropy input-output cost shares measures calculation. As it is formulated in Maidment and Gabbitas (2006): “The entropy input-output cost shares measure the difference in cost shares for each industry in the … I-O table compared to a representative GTAP I-O table and highlight any unusual cost shares.”

In the case of the Russian I-O table there were a number of intermediate use coefficients that had high entropy scores. The fact that a coefficient in an I-O table differs a lot from a coefficient in a representative table could indicate different things. First of all, this difference could reflect a peculiarity of a production process in a given country, or it could be an outlier generated by a numerical procedure of updating or splitting the source data. In our case the majority of I-O coefficients with high entropy scores are very close to prior coefficients of the

1995 detailed I-O, thus reflecting peculiarities of observed production processes in Russia at that time. A detailed list of coefficients is presented in Table A.5.

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Appendix A.

Table A.1 Table SSET: Sector names in Russian Input-Output Tables supplied for GTAP 7 Data Base

#	Code RIO	Description
1	agrpl	Agriculture plants
2	agrhb	Agriculture animals
3	for	Forestry
4	fsh	Fishing
5	col	Coal
6	oil	Oil
7	gas	Gas
8	omn	Minerals nec
9	cmt	Meat: cattle, sheep, goats, horse
10	vol	Vegetable oils and fats
11	mil	Dairy products
12	sgr	Sugar
13	ofdp	Other food products
14	b_t	Beverages and tobacco products
15	tex	Textiles
16	wap	Wearing apparel
17	lea	Leather products
18	lum	Wood products
19	ppp	Paper products, publishing
20	p_c	Petroleum, coal products
21	crp	Chemical, rubber, plastic prods
22	nmm	Mineral products nec
23	i_s	Ferrous metals
24	nfm	Metals nec
25	fmp	Metal products
26	mvh	Motor vehicles and parts
27	otn	Transport equipment nec
28	ele	Electronic equipment
29	ome	Machinery and equipment nec
30	omf	Manufactures nec
31	ely	Electricity
32	cns	Construction
33	trd	Trade
34	otps	Transport nec
35	cmn	Communication
36	ofi	Financial services nec
37	isr	Insurance
38	obs	Business services nec
39	osg_ros	Recreation and other services; PubAdmin/Defence/Health/Educat
40	hous	Dwellings; Gas manufacture, distribution; Water;

Table A.2 Table SMAP: Map from standard GTAP sectors (GTAP 7 Data Base) to Russian Input-Output Table (RIO) supplied for GTAP 7 Data Base

#	57-sector	Description	Code RIO 40-sector	Description Russian IO sectors
1	pdr	Paddy rice	agrpl	Agriculture plants
2	wht	Wheat	agrpl	Agriculture plants
3	gro	Cereal grains nec	agrpl	Agriculture plants
4	v_f	Vegetables, fruit, nuts	agrpl	Agriculture plants
5	osd	Oil seeds	agrpl	Agriculture plants
6	c_b	Sugar cane, sugar beet	agrpl	Agriculture plants
7	pfb	Plant-based fibers	agrpl	Agriculture plants
8	ocr	Crops nec	agrpl	Agriculture plants
9	ctl	Cattle, sheep, goats, horses	agrhb	Agriculture animals
10	oap	Animal products nec	agrhb	Agriculture animals
11	rmk	Raw milk	agrhb	Agriculture animals
12	wol	Wool, silk-worm cocoons	agrhb	Agriculture animals
13	for	Forestry	for	Forestry
14	fsh	Fishing	fsh	Fishing
15	col	Coal	col	Coal
16	oil	Oil	oil	Oil
17	gas	Gas	gas	Gas
18	omn	Minerals nec	omn	Minerals nec
19	cmt	Meat: cattle, sheep, goats, horse	cmt	Meat: cattle, sheep, goats, horse
20	omt	Meat products nec	ofdp	Other food products
21	vol	Vegetable oils and fats	vol	Vegetable oils and fats
22	mil	Dairy products	mil	Dairy products
23	pcr	Processed rice	ofdp	Other food products
24	sgr	Sugar	sgr	Sugar
25	ofd	Food products nec	ofdp	Other food products
26	b_t	Beverages and tobacco products	b_t	Beverages and tobacco products
27	tex	Textiles	tex	Textiles
28	wap	Wearing apparel	wap	Wearing apparel
29	lea	Leather products	lea	Leather products
30	lum	Wood products	lum	Wood products
31	ppp	Paper products, publishing	ppp	Paper products, publishing
32	p_c	Petroleum, coal products	p_c	Petroleum, coal products
33	crp	Chemical, rubber, plastic prods	crp	Chemical, rubber, plastic prods
34	nmm	Mineral products nec	nmm	Mineral products nec
35	i_s	Ferrous metals	i_s	Ferrous metals
36	nfm	Metals nec	nfm	Metals nec
37	fmp	Metal products	fmp	Metal products
38	mvh	Motor vehicles and parts	mvh	Motor vehicles and parts
39	otn	Transport equipment nec	otn	Transport equipment nec
40	ele	Electronic equipment	ele	Electronic equipment
41	ome	Machinery and equipment nec	ome	Machinery and equipment nec
42	omf	Manufactures nec	omf	Manufactures nec
43	ely	Electricity	ely	Electricity
44	gdt	Gas manufacture, distribution	hous	Dwellings; Gas manufacture,

				distribution; Water;
45	wtr	Water	hous	Dwellings; Gas manufacture, distribution; Water;
46	cns	Construction	cns	Construction
47	trd	Trade	trd	Trade
48	otp	Transport nec	otps	Transport nec
49	wtp	Sea transport	otps	Transport nec
50	atp	Air transport	otps	Transport nec
51	cmn	Communication	cmn	Communication
52	ofi	Financial services nec	ofi	Financial services nec
53	isr	Insurance	isr	Insurance
54	obs	Business services nec	obs	Business services nec
55	ros	Recreation and other services	osg_ros	Recreation and other services; PubAdmin/Defence/Health/Educat
56	osg	PubAdmin/Defence/Health/Educat	osg_ros	Recreation and other services; PubAdmin/Defence/Health/Educat
57	dwe	Dwellings	hous	Dwellings; Gas manufacture, distribution; Water;

Table A.3 Tables in the system of input-output tables, Rosstat 2003

Division	#	Table description
1. Table of resources of goods and services in the Russian economy in 2003	1	1.1 Table of resources of goods and services in the Russian economy
2. Table of use of goods and services in the Russian economy in consumer prices in 2003	2	2.1 Table of use of goods and services in the Russian economy
3. Table of use of goods and services in the Russian economy in basic prices in 2003	3^+ 4^+ 5^+ 6 7 8^+	3.1 Table of use of goods and services in the Russian economy 3.2 Table of use of domestic goods and services 3.3 Table of use of imported goods and services 3.4 Table of transport mark-ups 3.5 Table of trade mark-ups 3.6 Table of net taxes on goods
4. Symmetric Input-Output matrix in basic prices in 2003	9*	4.1. Symmetric Input-Output matrix
5. Analysis of the Table of resources of goods and services in the Russian economy in 2003	10 11 12	5.1. Structure of production in the branches of economy 5.2. Structure of formation of recourses of goods and services in basic prices 5.3. Structure of consumer prices on goods and services
6. Analysis of the Table of use of goods and services in the	13 14 15	6.1. Structure of intermediate consumption 6.2. Structure of demand of intermediate goods 6.3. Structure of use of goods and services

Russian economy in consumer prices in 2003	16	6.4. Functional structure of final consumption
	17	6.5. Industrial structure of the functional elements of the final demand
	18	6.6. Distribution of value-added by industries of economy
	19	6.7. Structure of value-added in percentage points
	20	6.8. Share of import in the aggregated domestic demand in consumer prices
	21	6.9. Share of export in production in basic prices
7. Table of use of goods and services in the Russian economy in basic prices in 2003	22	7.1. Industrial structure of the intermediate consumption
	23	7.2. Structure of demand of intermediate goods
	24	7.3. Structure of use of goods and services
	25	7.4. Functional structure of final consumption
	26	7.5. Industrial structure of the functional elements of the final demand
	27	7.6. Industrial structure of use of domestic goods and services
	28	7.7. Industrial structure of use of imported goods and services
	29	7.8. Industrial structure of intermediate demand of domestic goods and services
	30	7.9. Industrial structure of intermediate demand of imported goods and services
	31	7.10. Structure of use of domestic goods and services
	32	7.11. Structure of use of imported goods and services
	33	7.12. Functional structure of final demand on domestic goods and services
	34	7.13. Functional structure of final demand on imported goods and services
	35	7.14. Industrial structure of functional elements of final demand on domestic goods and services
	36	7.15. Industrial structure of functional elements of final demand on imported goods and services
8. Coefficient of direct and full costs in 2000	37	8.1. Coefficient of direct and full costs in 2003

* - The source I-O table used in construction of the Russian I-O for GTAP 7.

+ - The table was used in the construction process

Table A.4 Mapping of the Russian symmetric input-output industrial classification into the standard GTAP industrial classification.

№ SIOT	Russian symmetric input-output tables sectors	№ TNM	Disaggregated sectoral classification in the transition matrix (TNM)	GSC	GTAP code	GTAP industry name
1	Electricity and heat	1	Electricity and heat	43	ely	Electricity
2	Products of Oil and gas extraction and refinery	2	Oil extraction	16	oil	Oil
		3	Natural gas	17	gas	Gas
		4	Oil refinery	32	p_c	Petroleum, coal products
3	Coal	5	Coal	15	col	Coal
4	Peat	6	Peat; Ferrous metals ore and non-ore materials for ferrous metallurgy	18	omn	Minerals nec
5	Ferrous metals	7	Coking industry	33	crp	Chemical, rubber, plastic prods
		8	Ferrous metals	35	i_s	Ferrous metals
		9	Refractory	37	fmp	Metal products
6	Nonferrous metals	10	Non-ferrous metals ore	18	omn	Minerals nec
		11	Non-ferrous metals	36	nfm	Metals nec
7	Products of Chemical industry and petrochemical industry	12	Chemicals fibers	27	tex	Textiles
		13	Heavy-chemicals; Plastics	33	crp	Chemical, rubber, plastic prods
8	Machinery and equipment, metal works	14	Metal and wood cutters, artificial diamonds, abradants and equipment with abradants; Metal constructions	37	fmp	Metal products
		15	Cars and parts	38	mvh	Motor vehicles and parts
		16	Railway machinery; Motorcycles, bicycles and parts	39	otn	Transport equipment nec
		17	Computers and office equipment; General machinery	40	ele	Electronic equipment
		18	Machinery misc	41	ome	Machinery and equipment nec
9	Products of Forestry, wood-processing and paper-pulp industry	19	Logging and sawing	13	for	Forestry
		20	Carpentry; Furniture	30	lum	Wood products
		21	Pulp and paper industry	31	ppp	Paper products, publishing
		22	Resin industry	33	crp	Chemical, rubber, plastic prods
10	Construction materials	23	Non-metallic	18	omn	Minerals nec

	(including glass, china and delftware)		construction materials			
		24	Building materials and polymers	33	crp	Chemical, rubber, plastic prods
		25	Construction materials misc	34	nmm	Mineral products nec
11	Products of Light industry	26	Fabric and other textile	27	tex	Textiles
		27	Wearing apparel; Garments	28	wap	Wearing apparel
		28	Other light industry products	29	lea	Leather products
12	Products of Food-processing Industry	29	Fish and fish products (including fish, sea animals and whale take)	14	fsh	Fishing
		30	Meet and meet products	19	cmt	Meat: cattle, sheep, goats, horse
		31	Fat-and-oil industry	21	vol	Vegetable oils and fats
		32	Milk and dairy	22	mil	Dairy products
		33	Sugar industry	24	sgr	Sugar
		34	Food processing misc	25	ofdp	Food products nec
		35	Alcoholic beverage industry; Wine industry	26	b_t	Beverages and tobacco products
		36	Detergent on fat basis; Perfumery and cosmetics	33	crp	Chemical, rubber, plastic prods
13	Products of all Other industries	37	Provender industry	25	ofdp	Food products nec
		38	Printing	31	ppp	Paper products, publishing
		39	Microbiology	33	crp	Chemical, rubber, plastic prods
		40	Manufactures nec	42	omf	Manufactures nec
15	Construction goods	41	Construction	46	cns	Construction
16	Agricultural goods and services in agriculture and forestry	42	Plant growing	1-8		Agricultural products
		43	Animal husbandry	9-12		Agricultural products
		44	Agricultural services	1-12		Agricultural products
		45	Forestry	13	for	Forestry
17	Transport cargo and communication	46	Transport	48	otps	Transport nec
		47	Communication	51	cmn	Communication
18	Trade (including catering)	48	Trade; Catering	47	trd	Trade
		49	Real estate; General activities for providing market operations	54	obs	Business services nec
19	Other services	50	Publishing	31	ppp	Paper products, publishing
		51	Other industries and	42	omf	Manufactures nec

			services			
		52	Procurement; Leasing; Information activities; Housing (Real estate activities on a fee or contract basis); Non-productive household services	54	obs	Business services nec
20	Housing	53	Housing (Real estate activities on a fee or contract basis); Non-productive household services; Communal services	54	obs	Business services nec
		54	Communal services	44,45,57		Gas manufacture, distribution; Water; Dwellings
21	Health, sports, social security, education, culture and arts services	55	Health, sports and social security; Education, culture and arts	55, 56		Recreation and other services; Public Administration; Defense; Health; Education
22	Science and scientific services, including geology and meteorology services	56	Geology and geodesy, hydrometeorology; Science and science services	54	obs	Business services nec
23	Finance, banking and insurance services, government and civil organizations	57	Finances, credit,	52	ofi	Financial services nec
		58	Insurance, and retirement insurance;	53	isr	Insurance
		59	Public administration and social associations	55, 56		Recreation and other services; Public Administration; Defense; Health; Education

Table A.5 The entropy input-output cost shares measure.

Inputs_Uses	Entropy measure to calculate differences	Input Share from representative table	Input share in R I-O table	Value of a prior 95 I-O coefficient
1 Agrh_Mil	*0.243*	*0.281*	*0.001*	*0.336*
2 Gas_Gas	0.236	0.011	0.316	0.308*
3 fsh_fsh	0.18	0.022	0.289	0.232
4 trd_Export	0.167	0.015	0.25	0.260*
5 cmt_cmt	0.136	0.056	0.323	0.349
6 For_ppp	0.093	0.02	0.174	0.139
7 lum_lum	*0.092*	*0.104*	*0*	*0.123*
8 Agrh_ofdp	0.082	0.108	0.003	0.004
9 dwe_Cons	0.076	0.086	0	not reported
10 nfm_omf	*0.075*	*0.025*	*0.163*	*0.072*
11 Gas_hous	0.073	0.189	0.037	0.040
12 i_s_ele	0.072	0.018	0.141	0.127

* - Data from 2003 I-O table.