

## Chapter 5. Calculation of elasticities of supply and demand and data of launching pad and climate

### 1. Elasticities of supply and demand

The commodities included in this model are shown in Table 5-1. The production and the quantities of other grains, other oil crops, other oils, and other oil cakes are summations of the commodities indicated in the table footnote.

The covered countries or regions in this model are shown in Table 5-2. This is equivalent to those of the GTAP9, which is shown in Narayanan and McDougall (2015), because the production cost and output data of the GTAP9 are used for calculation of the elasticities of supply and demand. The quantities and prices of supply and demand of the FAOSTAT are aggregated or averaged to the 140 countries and regions.

To calculate the elasticities of supply, cost shares to production values such as those shown in equation (1-24) are required. In this model, cost data are obtained from the NVFA file. The output value data are obtained from the VALUEOUTPUT file of GTAP9 in 2011. It will be divided into value of each commodity using production values calculated from data of FAOSTAT if the GTAP9 does not cover the commodity. The commodities covered by the GTAP9 are shown in Narayanan and McDougall (2015).

The cost and output values of grains and oil crops are the quantities of “pdr” for *RI*, “wht” for *WH*, “gro” for *MZ* and *XG*, and “osd” for *SB* and *XS* in the GTAP9. There are four inputs for grain and oil crop production and land is the number of “Land”, fertilizer and agrochemicals is the number of “crp”, labor is the number of “ag othlowsk”, and capital is the number of “capital.”

The cost and output values of meats, eggs, and raw milk are the number of “ctl” for *BF* and *SH*, “oap” for *PK*, *PM*, *XM*, and *EG*, and “rmk” for *MK* in the GTAP9. As inputs, this model has many feed items: “pdr” as *RI*, “wht” as *WH*, “gro” as *MZ* and *XG*, “osd” as *SB* and *XS*, “vol” as *CS* and *CX*, and “mil” as *SK*. The feed cost shares of *MZ* and *XG*, *SB* and *XS*, and *CS* and *CX* are divided by the production rates. The other inputs of meats, eggs, and milk production are land, labor, and capital, where land is the number of “Land”, labor is the summation of “off mgr pros” and “ag othlowsk”, and capital is the number of “capital.”

The costs of vegetable oils and oil cakes are the number of “osd” as crop input, the summation of “off mgr pros” and “ag othlowsk” as labor input, and the number of “capital” as capital input. The output value is the number of “vol”.

Similarly, the costs of dairy products are the number of “rmk” as milk input, the summation of “off mgr pros” and “ag othlowsk” as labor input, and the number of “capital”

as capital input. The output value is the number of “mil”.

To calculate the production value share for obtaining the food demand shown in equation (5-10), the number of the FAOSTAT, the average between 2010 and 2012 are used.

Calculated cost shares to the output values are shown from Table A-2-1 through A-2-7 in the Appendix 2. The supply and the input demand elasticities will be obtained if these cost shares are substituted into the equations in the tables in chapter 2. The calculated supply, input demand, and food demand elasticities are presented in Table A-3-1 through Table A-3-16 in Appendix 3. In the table of elasticities of input demand of livestock production, only rice (*RI*) input for beef (*BF*) production is shown in Table A-3-13 because the elasticities of input demand for output price and land, labor, and capital inputs take the same numbers. Similarly, only the food demand elasticities of rice are shown in Table A-3-16 because the cross-price elasticities take the same numbers in a country.

Tables 5-3–5-9 present elasticities of supply, input demand, and food demand of grains, oil crops, vegetable oil, oilcake, and livestock products. Dairy products in the U.S. are given as an example.

### 2. Changes in income elasticities of demand

In long run, the income elasticities of foods are expected to change according to the economic growth. Considering changes in food habits, the functions for which the dependent variable is the income elasticity and the explanatory variable is logarithmic per-capita income are estimated.

Table 5-10 presents results of estimation of the following equation:

$$IED_{ij} = \alpha_j + \beta_j \ln(GDP_i / POP_i) \quad (14-1)$$

where  $IED_{ij}$  is the income elasticity of demand of commodity  $j$  in country  $i$ ,  $GDP_i$  and  $POP_i$  respectively represent the gross domestic product and population in country  $i$ . Data of  $IED_{ij}$  are income elasticities of the IFPSIM (Oga and Yanagishima, 1996). In addition,  $GDP_i$  and  $POP_i$  are the average quantities of the 1990s World Bank data.

Equation (14-1) is estimated using OLS with cross sectional data and regional dummies.

The estimated income elasticities of demand, i.e.,  $IED_{ij}$ , are changed to slopes using the following equation. These elasticities are substituted into parameters of demand functions such as  $\gamma_{Mi}$  of equation (6-7) as

$$\frac{\partial QDF}{\partial GDPPC} = \frac{\partial \ln QDF}{\partial \ln GDPPC} \frac{QDF}{GDPPC}, \quad (14-2)$$

where  $QDF$  stands for food demand and  $GDPPC$  represents per-capita income. The left-hand side of the

equation is the slope. The first term of the right-hand side of the equation is the income elasticity.

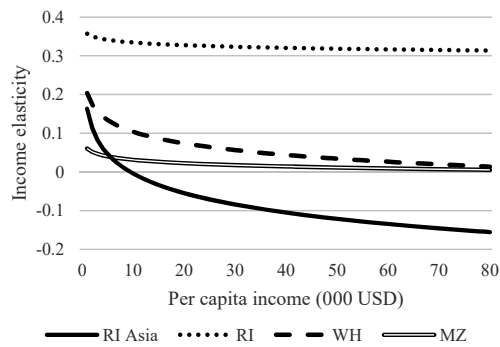


Figure 5-1. Changes in income elasticity of crops.

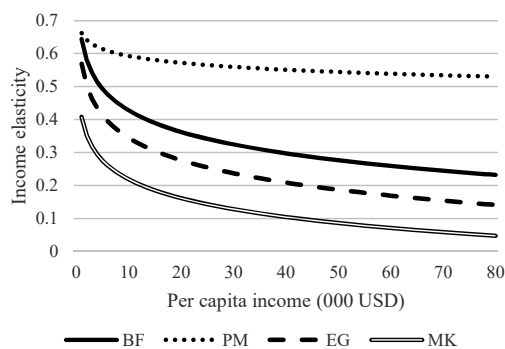


Figure 5-2. Changes in income elasticity of livestock products.

Figures 5-1 and 5-2 show changes in income elasticities according to increases in per-capita income.

### 3. Quantities of supply and demand and prices

The quantities related to production, i.e., yield, planted area, and production of crops are the quantities of the production section of the FAOSTAT. Furthermore, production per head, number of producing animals, and production of livestock animals are quantities of the same database.

Quantities related to supply and demand, i.e., imports, exports, stock change, feed demand, seed demand, process demand, food demand, losses, and other uses are quantities referred from the commodity balance section of the FAOSTAT.

Farm prices of cereals, oil crops, meats, eggs, and raw milk are data of annual producer prices referred from the FAOSTAT. The producer prices of vegetable oils and oil cakes are the same as those of oil crops as proxies. The producer prices of dairy products, i.e., skimmed milk, butter, and cheese, are the quantities referred from OECD-FAO Agricultural Outlook 2017-2026. Missing prices for some countries are replaced by prices from neighboring countries.

Launching pad data of the quantities and prices in the 140 countries and regions of the 20 commodities in 2010 are shown in Tables A-4-1–A-4-20 in the Appendix. These data are averaged for the three years around the year, i.e., data of year 2010 are the average of data of 2009–2011.

To make launching pad data, bulk data of the FAOSTAT are aggregated or averaged in the countries and regions for the commodities from years 1993–2013 using FORTRAN programs developed by the author. However, only launching pad data from 2006–2010 and 1999 are obtained as solutions of convergence in this model. This data matching problem is being investigated.

### 4. Climate and macro-economic data

Actual climate data are numbers from CRU-TS31 of the University of East Anglia during 1961–2009. The forecast climate data are numbers from the Representative Concentration Pathways (RCP) scenarios of the Model for Interdisciplinary Research on Climate 5 (MIROC5). Four RCPs exist: RCP2.6, RCP4.5, RCP6.0, and RCP8.5. Radiative forcing of RCP8.5 is highest in these scenarios. The original data are 0.5 degree gridded data. These data are nationally or regionally averaged (Yokozawa et al., 2003). The planting regions in a large country such as the U.S. are selected based on the table presented by Furuya and Koyama (2005).

The forecast data of GDP and population are referred from the Shared Socioeconomic Pathways (SSP) of the OECD. Five SSPs exist: SSP1–SSP5. Potential damage is greatest, and the cost of mitigation is highest in SSP3. Therefore, SSP3 is the worst scenario. SSP1 is the best scenario; SSP2 is the intermediate scenario. These five-year step data were converted using linear approximation.

Table 5-1. Goods in the model

Group of goods	Abbreviation	No.	Goods	Abbreviation	Use
Cereal	G	1	Rice	RI	Food, Feed
		2	Wheat	WH	Food, Feed
		3	Maize	MZ	Food, Feed
		4	Other grains	XG	Food, Feed
Oil crop	S	5	Soybeans	SB	Food, Feed
		6	Other oil crops	XS	Food, Feed
Vegetable oil	O	7	Soybean oil	OS	Food
		8	Other vegetable oils	OX	Food
Oil cake	C	9	Soybean cake	CS	Feed
		10	Other oil cakes	CX	Feed
Meat	M	11	Beef	BF	Food
		12	Mutton	SH	Food
		13	Pork	PK	Food
		14	Poultry meat	PM	Food
		15	Other meat	XM	Food
Egg	EG	16	Poultry egg	EG	Food
Milk	MK	17	Raw milk	MK	Food
Dairy products	D	18	Skim milk	SK	Food
		19	Butter	BT	Food
		20	Cheese	CH	Food

Note: *XG* comprises Barley, Millet, Oats, Rye, Sorghum, and Cereals other

*XS* comprises Castor oil seed, Coconut, Ground nuts, Hempseed, Jojoba seed, Kapok fruit, Karite nuts, Linseed, Melon seed, Mustard seed, Oil palm fruit, Olive, Poppy seed, Rape seed, Safflower seed, Seed cotton, Sesame seed, Sunflower seed, Tallow tree seed, Tung nuts, and Oil seeds nes.

*OX* comprises Coconut, Cotton seed, Ground nut, Maize germ, Olive, Palm, Palm kernel, Rape & Mustard, Rice bran, Sesame seed, Sunflower seed, and Oil crop other.

*CX* comprises Copra, Cotton seed, Ground nut, Perm kernel, Rape & Mustard, Sesame seed, Sunflower seed, and Oilseed other.

*PM* comprises Chicken, Duck, Goose & Guinea Fowl, Turkey, and Bird nes.

*XM* comprises Ass, Camel, Game, Horse, Mule, Other Camelids, Other Rodents, Rabbit, and Meat nes.

Table 5-2. Countries in the model and abbreviations.

No.	Code	Country and region	Member countries
1	AUS	Australia	Australia, Cocos (Keeling) Islands, Christmas Island, Heard Island and McDonald Islands, Norfolk Island
2	NZL	New Zealand	New Zealand
3	XOC	Rest of Oceania	American Samoa, Cook Islands, Fiji, Micronesia Federated States of Guam, Kiribati, Marshall Islands, Northern Mariana Islands, New Caledonia, Niue, Nauru, Palau, Papua New Guinea, French Polynesia, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, Wallis and Futuna, Samoa, Pitcairn, United States Minor Outlying Islands
4	CHN	China	China
5	HKG	Hong Kong	Hong Kong
6	JPN	Japan	Japan
7	KOR	Korea Republic of	Korea, Republic of
8	MNG	Mongolia	Mongolia
9	TWN	Taiwan	Taiwan
10	XEA	Rest of East Asia	Macao, Korea, Democratic Peoples Republic of
11	BRN	Brunei Darussalam	Brunei Darussalam
12	KHM	Cambodia	Cambodia
13	IDN	Indonesia	Indonesia
14	LAO	Lao People's Democratic Republic	Lao People's Democratic Republic
15	MYS	Malaysia	Malaysia
16	PHL	Philippines	Philippines
17	SGP	Singapore	Singapore
18	THA	Thailand	Thailand
19	VNM	Viet Nam	Viet Nam
20	XSE	Rest of Southeast Asia	Brunei Darussalam, Myanmar, Timor Leste
21	BGD	Bangladesh	Bangladesh
22	IND	India	India
23	NPL	Nepal	Nepal
24	PAK	Pakistan	Pakistan
25	LKA	Sri Lanka	Sri Lanka
26	XSA	Rest of South Asia	Afghanistan, Bhutan, Maldives
27	CAN	Canada	Canada
28	USA	United States of America	United States of America
29	MEX	Mexico	Mexico
30	XNA	Rest of North America	Bermuda, Greenland, Saint Pierre and Miquelon
31	ARG	Argentina	Argentina
32	BOL	Bolivia, Plurinational Republic of	Bolivia, Plurinational Republic of
33	BRA	Brazil	Brazil
34	CHL	Chile	Chile
35	COL	Colombia	Colombia
36	ECU	Ecuador	Ecuador
37	PRY	Paraguay	Paraguay
38	PER	Peru	Peru
39	URY	Uruguay	Uruguay
40	VEN	Venezuela	Venezuela
41	XSM	Rest of South America	Falkland Islands (Malvinas), French Guiana, Guyana, Suriname, South Georgia and the South Sandwich Islands
42	CRI	Costa Rica	Costa Rica
43	GTM	Guatemala	Guatemala
44	HND	Honduras	Honduras
45	NIC	Nicaragua	Nicaragua
46	PAN	Panama	Panama
47	SLV	El Salvador	El Salvador
48	XCA	Rest of Central America	Belize
49	DOM	Dominican Republic	Dominican Republic
50	JAM	Jamaica	Jamaica
51	PRI	Puerto Rico	Puerto Rico
52	TTO	Trinidad and Tobago	Trinidad and Tobago
53	XCB	Caribbean	Aruba, Anguilla, Netherlands Antilles, Antigua and Barbuda, Bahamas, Barbados, Cuba, Cayman Islands, Dominica, Grenada, Haiti, Saint Kitts and Nevis, Saint Lucia, Montserrat, Turks and Caicos Islands, Saint Vincent and the Grenadines, Virgin Islands British, Virgin Islands U.S.
54	AUT	Austria	Austria
55	BEL	Belgium	Belgium
56	CYP	Cyprus	Cyprus
57	CZE	Czech Republic	Czech Republic
58	DNK	Denmark	Denmark
59	EST	Estonia	Estonia
60	FIN	Finland	Finland, Aland Islands
61	FRA	France	France, Guadeloupe, Martinique, Reunion
62	DEU	Germany	Germany
63	GRC	Greece	Greece
64	HUN	Hungary	Hungary
65	IRL	Ireland	Ireland
66	ITA	Italy	Italy
67	LVA	Latvia	Latvia
68	LTU	Lithuania	Lithuania
69	LUX	Luxembourg	Luxembourg
70	MLT	Malta	Malta
71	NLD	Netherlands	Netherlands
72	POL	Poland	Poland
73	PRT	Portugal	Portugal
74	SVK	Slovakia	Slovakia

Table 5-2. Countries in the model and abbreviations (continued).

No.	Code	Country and region	Member countries
75	SVN	Slovenia	Slovenia
76	ESP	Spain	Spain
77	SWE	Sweden	Sweden
78	GBR	United Kingdom	United Kingdom
79	CHE	Switzerland	Switzerland
80	NOR	Norway	Norway, Svalbard and Jan Mayen
81	XEF	Rest of EFTA	Iceland, Liechtenstein
82	ALB	Albania	Albania
83	BGR	Bulgaria	Bulgaria
84	BLR	Belarus	Belarus
85	HRV	Croatia	Croatia
86	ROU	Romania	Romania
87	RUS	Russian Federation	Russian Federation
88	UKR	Ukraine	Ukraine
89	XEE	Rest of Eastern Europe	Moldova Republic of
90	XER	Rest of Europe	Andorra, Bosnia and Herzegovina, Faroe Islands, Gibraltar, Monaco, Macedonia the former Yugoslav Republic of, San Marino, Serbia, Guernsey, Isle of Man, Jersey, Montenegro, Holy See (Vatican City State)
91	KAZ	Kazakhstan	Kazakhstan
92	KGZ	Kyrgyzstan	Kyrgyzstan
93	XSU	Rest of Former Soviet Union	Tajikistan, Turkmenistan, Uzbekistan
94	ARM	Armenia	Armenia
95	AZE	Azerbaijan	Azerbaijan
96	GEO	Georgia	Georgia
97	BHR	Bahrain	Bahrain
98	IRN	Iran, Islamic Republic of	Iran, Islamic Republic of
99	ISR	Israel	Israel
100	KWT	Kuwait	Kuwait
101	JOR	Jordan	Jordan
102	OMN	Oman	Oman
103	QAT	Qatar	Qatar
104	SAU	Saudi Arabia	Saudi Arabia
105	TUR	Turkey	Turkey
106	ARE	United Arab Emirates	United Arab Emirates
107	XWS	Rest of Western Asia	Iraq, Lebanon, Palestinian Territory Occupied, Syrian Arab Republic, Yemen
108	EGY	Egypt	Egypt
109	MAR	Morocco	Morocco
110	TUN	Tunisia	Tunisia
111	XNF	Rest of North Africa	Algeria, Libyan Arab Jamahiriya, Western Sahara
112	BEN	Benin	Benin
113	BFA	Burkina Faso	Burkina Faso
114	CMR	Cameroon	Cameroon
115	CIV	Cote d'Ivoire	Cote d'Ivoire
116	GHA	Ghana	Ghana
117	GIN	Guinea	Guinea
118	NGA	Nigeria	Nigeria
119	SEN	Senegal	Senegal
120	TGO	Togo	Togo
121	XWF	Rest of Western Africa	Cape Verde, Gambia, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Saint Helena, Ascension and Tristan da Cunha, Sierra Leone
122	XCF	Central Africa	Central African Republic, Congo, Gabon, Equatorial Guinea, Sao Tome and Principe, Chad
123	XAC	South Central Africa	Angola, Congo the Democratic Republic of the
124	ETH	Ethiopia	Ethiopia
125	KEN	Kenya	Kenya
126	MDG	Madagascar	Madagascar
127	MWI	Malawi	Malawi
128	MUS	Mauritius	Mauritius
129	MOZ	Mozambique	Mozambique
130	RWA	Rwanda	Rwanda
131	TZA	Tanzania, United Republic of	Tanzania, United Republic of
132	UGA	Uganda	Uganda
133	ZMB	Zambia	Zambia
134	ZWE	Zimbabwe	Zimbabwe
135	XEC	Rest of Eastern Africa	Burundi, Comoros, Djibouti, Eritrea, Mayotte, Sudan, Somalia, Seychelles
136	BWA	Botswana	Botswana
137	NAM	Namibia	Namibia
138	ZAF	South Africa	South Africa
139	XSC	Rest of South African Customs Union	Lesotho, Swaziland
140	XTW	Rest of the World	Antarctica, French Southern Territories, Bouvet Island, British Indian Ocean Territory

Source: Narayanan and McDougall (2015)

Table 5-3. Elasticities of supply for grains and oil crops in the U.S.

Supply	Price of RI	Price of WH	Price of MZ	Price of XG	Price of SB	Price of XG	Price of XS	Price of chem.	Labor input	Capital input	Area $t-1$
RI	0.316	-0.023	-0.049	-0.004	-0.041	-0.007	-0.196	-0.120	0.027	0.238	0.320
WH	-0.001	0.295	-0.046	-0.004	-0.038	-0.006	-0.182	-0.113	0.025	0.221	0.800
MZ	-0.001	-0.020	0.392	-0.004	-0.035	-0.006	-0.178	-0.215	0.025	0.216	0.800
XG	-0.001	-0.020	-0.042	0.392	-0.035	-0.006	-0.178	-0.215	0.025	0.216	0.800
SB	-0.001	-0.023	-0.049	-0.004	0.330	-0.007	-0.200	-0.130	0.028	0.243	0.400
XS	-0.001	-0.023	-0.049	-0.004	-0.041	0.330	-0.200	-0.130	0.028	0.243	0.400

Table 5-4. Elasticities of supply for vegetable oils and oil cakes in the U.S.

Supply	Price of output	Price of SB, XS	Labor input	Capital input	Production $t-1$
OS, OX, CS, CX	0.691	-0.691	0.090	0.062	0.800

Table 5-5. Elasticities of supply for livestock products in the U.S.

Supply	Price of output	Price of RI	Price of WH	Price of MZ	Price of XG	Price of SB	Price of XS	Price of CS	Price of CX	Price of SK	Labor input	Capital input	Head $t-1, t-2$
BF, SH	0.490	-0.002	-0.004	-0.455	-0.019	-0.001	0.000	-0.009	-0.001	0.000	0.099	0.120	0.800
PK, PM, XM, EG	0.077	-0.001	-0.005	-0.047	-0.002	-0.001	0.000	-0.023	-0.002	0.000	0.064	0.078	0.700
MK	0.640	-0.002	-0.004	-0.615	-0.025	-0.001	0.000	-0.018	-0.002	0.000	0.095	0.115	0.700

Table 5-6. Elasticities of input demand for beef and mutton production in the U.S.

Input demand	Price of output	Price of RI	Price of WH	Price of MZ	Price of XG	Price of SB	Price of XS	Price of CS	Price of CX	Price of SK	Labor input	Capital input
RI	1.490	-1.002	-0.004	-0.455	-0.019	-0.001	0.000	-0.009	-0.001	0.000	0.099	0.120
WH	1.490	-0.002	-1.004	-0.455	-0.019	-0.001	0.000	-0.009	-0.001	0.000	0.099	0.120
MZ	1.490	-0.002	-0.004	-1.455	-0.019	-0.001	0.000	-0.009	-0.001	0.000	0.099	0.120
XG	1.490	-0.002	-0.004	-0.455	-1.019	-0.001	0.000	-0.009	-0.001	0.000	0.099	0.120
SB	1.490	-0.002	-0.004	-0.455	-0.019	-1.001	0.000	-0.009	-0.001	0.000	0.099	0.120
XS	1.490	-0.002	-0.004	-0.455	-0.019	-0.001	-1.000	-0.009	-0.001	0.000	0.099	0.120
CS	1.490	-0.002	-0.004	-0.455	-0.019	-0.001	0.000	-1.009	-0.001	0.000	0.099	0.120
CX	1.490	-0.002	-0.004	-0.455	-0.019	-0.001	0.000	-0.009	-1.001	0.000	0.099	0.120
SK	1.490	-0.002	-0.004	-0.455	-0.019	-0.001	0.000	-0.009	-0.001	-1.000	0.099	0.120

Table 5-7. Elasticities of supply for dairy products in the U.S.

Supply	Price of output	Price of MK	Labor input	Capital input	Production $t-1$
SK, BT, CH	0.462	-0.462	0.179	0.143	0.800

Table 5-8. Elasticities of input demand of dairy products in the U.S.

Supply	Price of output	Price of MK	Labor input	Capital input
SK, BT, CH	1.462	-1.462	0.179	0.143

Table 5-9. Price elasticities of demand in the U.S.

Food demand	P_RI Price of RI	P_WH Price of WH	P_MZ Price of MZ	P_XG Price of XG	P_SB Price of SB	P_XS Price of XS	P_OS Price of OS	P_OX Price of OX	P_BF Price of BF	P_SH Price of SH	P_PK Price of PK	P_PM Price of PM	P_XM Price of XM	P_XG Price of XG	P_MK Price of MK	P_SK Price of SK	P_BT Price of BT	P_CH Price of CH	IE Income elast.
RI	-0.994	0.053	0.177	0.011	0.087	0.009	0.009	0.015	0.128	0.000	0.047	0.071	0.001	0.023	0.100	0.118	0.009	0.054	0.200
WH	0.006	-0.947	0.177	0.011	0.087	0.009	0.009	0.015	0.128	0.000	0.047	0.071	0.001	0.023	0.100	0.118	0.009	0.054	-0.300
MZ	0.006	0.053	-0.823	0.011	0.087	0.009	0.009	0.015	0.128	0.000	0.047	0.071	0.001	0.023	0.100	0.118	0.009	0.054	-0.200
XG	0.006	0.053	0.177	-0.989	0.087	0.009	0.009	0.015	0.128	0.000	0.047	0.071	0.001	0.023	0.100	0.118	0.009	0.054	0.000
SB	0.006	0.053	0.177	0.011	-0.913	0.009	0.009	0.015	0.128	0.000	0.047	0.071	0.001	0.023	0.100	0.118	0.009	0.054	0.080
XS	0.006	0.053	0.177	0.011	0.087	-0.991	0.009	0.015	0.128	0.000	0.047	0.071	0.001	0.023	0.100	0.118	0.009	0.054	0.080
OS	0.006	0.053	0.177	0.011	0.087	0.009	-0.991	0.015	0.128	0.000	0.047	0.071	0.001	0.023	0.100	0.118	0.009	0.054	0.080
OX	0.006	0.053	0.177	0.011	0.087	0.009	0.009	-0.985	0.128	0.000	0.047	0.071	0.001	0.023	0.100	0.118	0.009	0.054	0.080
BF	0.006	0.053	0.177	0.011	0.087	0.009	0.009	0.015	-0.872	0.000	0.047	0.071	0.001	0.023	0.100	0.118	0.009	0.054	0.100
SH	0.006	0.053	0.177	0.011	0.087	0.009	0.009	0.015	0.128	-1.000	0.047	0.071	0.001	0.023	0.100	0.118	0.009	0.054	0.200
PK	0.006	0.053	0.177	0.011	0.087	0.009	0.009	0.015	0.128	0.000	-0.953	0.071	0.001	0.023	0.100	0.118	0.009	0.054	-0.200
PM	0.006	0.053	0.177	0.011	0.087	0.009	0.009	0.015	0.128	0.000	0.047	-0.929	0.001	0.023	0.100	0.118	0.009	0.054	0.100
XM	0.006	0.053	0.177	0.011	0.087	0.009	0.009	0.015	0.128	0.000	0.047	0.071	-0.999	0.023	0.100	0.118	0.009	0.054	0.200
EG	0.006	0.053	0.177	0.011	0.087	0.009	0.009	0.015	0.128	0.000	0.047	0.071	0.001	-0.977	0.100	0.118	0.009	0.054	0.100
MK	0.006	0.053	0.177	0.011	0.087	0.009	0.009	0.015	0.128	0.000	0.047	0.071	0.001	0.023	-0.900	0.100	0.009	0.054	0.100
SK	0.006	0.053	0.177	0.011	0.087	0.009	0.009	0.015	0.128	0.000	0.047	0.071	0.001	0.023	0.100	-0.882	0.009	0.054	0.100
BT	0.006	0.053	0.177	0.011	0.087	0.009	0.009	0.015	0.128	0.000	0.047	0.071	0.001	0.023	0.100	0.118	-0.991	0.054	0.100
CH	0.006	0.053	0.177	0.011	0.087	0.009	0.009	0.015	0.128	0.000	0.047	0.071	0.001	0.023	0.100	0.118	0.009	-0.946	0.100

Table 5-10. Estimation results of the function of income elasticity of demand to per-capita income.

Products	Region or country	Intercept	Parameter of ln(GDP/POP)	Adj. R <sup>2</sup>
RI	Asia	0.1632	-0.0727	0.41
RI	XSE	-0.3172	-0.0727	0.41
RI	EU, fmrUSSR	0.2481	-0.0099	0.37
RI	SSA	0.1770	-0.0099	0.37
RI	Other	0.3570	-0.0099	0.37
WH	XSE	-0.0611	-0.0433	0.14
WH	XNA	0.5135	-0.0433	0.14
WH	Other	0.2036	-0.0433	0.14
MZ	Indochina	-0.1559	-0.0125	0.07
MZ	XSE	-0.3139	-0.0125	0.07
MZ	Other	0.0601	-0.0125	0.07
XG	E Asia	0.2445	-0.0145	0.47
XG	Indochina	-0.4278	-0.0145	0.47
XG	XSE	-0.5144	-0.0145	0.47
XG	Baltic	-0.2202	-0.0145	0.47
XG	fmrUSSR	-0.3499	-0.0145	0.47
XG	SSA	0.3219	-0.0145	0.47
XG	Other	-0.0699	-0.0145	0.47
SB, XS	XSE	0.0022	-0.1656	0.54
SB, XS	XEF	1.5941	-0.1656	0.54
SB, XS	ME	1.3227	-0.1656	0.54
SB, XS	Other	1.0035	-0.1656	0.54
OS, OX	BRN	1.6289	-0.1367	0.45
OS, OX	XSE	0.2078	-0.1367	0.45
OS, OX	XNA	1.6001	-0.1367	0.45
OS, OX	Other	1.0422	-0.1367	0.45
BF	JPN	2.0274	-0.0938	0.57
BF	XSE	0.2329	-0.0938	0.57
BF	C Asia	0.2892	-0.0938	0.57
BF	Other	0.6443	-0.0938	0.57
SH	E Asia	0.7341	-0.0382	0.28
SH	Indochina	0.1050	-0.0382	0.28
SH	XSE	-0.2605	-0.0382	0.28
SH	XSA	0.0399	-0.0382	0.28
SH	C Asia	0.2648	-0.0382	0.28
SH	ME	0.7893	-0.0382	0.28
SH	Other	0.4395	-0.0382	0.28
PK	BRN	0.4591	-0.0690	0.69
PK	EEU, fmrUSSR	0.2884	-0.0690	0.69
PK	Africa	0.8377	-0.0690	0.69
PK	Other	0.5281	-0.0690	0.69
PM, XM	XEA	0.3386	-0.0301	0.47
PM, XM	Indochina	0.1054	-0.0301	0.47
PM, XM	XSE	-0.3029	-0.0301	0.47
PM, XM	NPL	-0.4060	-0.0301	0.47
PM, XM	ME	0.8778	-0.0301	0.47
PM, XM	Other	0.6619	-0.0301	0.47
EG	BRN	1.0927	-0.0978	0.50
EG	XSE	0.2042	-0.0978	0.50
EG	XNA	1.5382	-0.0978	0.50
EG	fmrUSSR	0.3312	-0.0978	0.50
EG	Other	0.5695	-0.0978	0.50
MK, SK, BT, CH	HKG	0.9976	-0.0823	0.49
MK, SK, BT, CH	KOR	1.0022	-0.0823	0.49
MK, SK, BT, CH	TWN	0.9878	-0.0823	0.49
MK, SK, BT, CH	BRN	0.9403	-0.0823	0.49
MK, SK, BT, CH	XSE	0.0847	-0.0823	0.49
MK, SK, BT, CH	ME	0.6694	-0.0823	0.49
MK, SK, BT, CH	Other	0.4079	-0.0823	0.49

Note:

Asia: CHN, HKG, JPN, KOR, MNG, TWN, XEA, BRN, KHM, IDN, LAO, MYS, PHL, SGP, THA, VNM, XSE, BGD, IND, NPL, PAK, LKA, XSA

E Asia (East Asia): HKG, JPN, KOR, TWN

C Asia (Central Asia): KAZ, KGZ, XSU, ARM, AZE, GEO

Indochina: KHM, LAO, VNM

EU (Europe): AUT, BEL, CYP, CZE, DNK, EST, FIN, FRA, DEU, GRC, HUN, IRL, ITA, LVA, LTU, LUX, MLT, NLD, POL, PRT, SVK, SVN, ESP, SWE, GBR,

CHE, NOR, XEF, ALB, BGR, BLR, HRV, ROU

EEU (Eastern Europe): ALB, BGR, BLR, HRV, ROU, XEE, XER

fmrUSSR: RUS, UKR, KAZ, KGZ, XSU, ARM, AZE, GEO

Baltic: EST, LVA, LTU

ME (Middle East): BHR, IRN, ISR, KWT, JOR, OMN, QAT, SAU, TUR, ARE, XWS, EGY, MAR, TUN, XNF

SSA (Sub Saharan Africa): BEN, BFA, CMR, CIV, GHA, GIN, NGA, SEN, TGO, XWF, XCF, XAC, ETH, KEN, MDG, MWI, MUS, MOZ, RWA, TZA, UGA,

ZMB, ZWE, XEC, BWA, NAM

Africa: SSA, ZAF, XSC