

Chapter 16

Behavioral Parameters

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This chapter describes how we obtained the initial estimates for the Global Trade Analysis Project (GTAP) behavioral parameters file. These include the source substitution or Armington elasticities, the factor substitution elasticities, the factor transformation elasticities, the investment parameters, and the consumer demand elasticities. Table 16.1 summarizes for these parameters: the associated notation, the set over which they are indexed, and their description. In this chapter we explain the role of each parameter in the GTAP Model, and describe how we obtained the current settings.

Most of the parameters treated here enter directly into the GTAP Data Base. In contrast with the rest of the data file where an extensive and elaborate process of transformation is required to remove any inconsistencies, and repair the omissions in the initial data sets, no such processing is required here for most of the behavioral parameters. For the most part, each individual parameter is an independent datum, which stands or falls on its own, and does not require any consistency checks with other parameters. The one exception to this rule is the consumer demand parameters (see section E). Here we do need to check for consistency conditions — the triad of Engel aggregation, Cournot aggregation and symmetry condition. Also, there is a need to transform the data, from elasticities, for which we find empirical estimates, to the invariant parameters needed for our preferred functional form for the consumer demand system. Elasticities and parameters described in sections A, B, C and D have not been changed since the release of GTAP 6 Data Base, while the consumer demand parameters have been updated in this version.

A Source Substitution Elasticities

The GTAP Data Base contains two sets of source substitution elasticities. One relates to the substitution between domestic products and imports, and the other to the substitution between imports from different regions. To define these parameters precisely, we need to refer to the theoretical structure of the GTAP Model. In that model, the source substitution elasticities are defined separately for each of the representative agents within each region rather than referring to a single economy-wide demand behavior, as in the other models. This means that for each commodity within each region, the domestic-import mix is determined separately for each industry, and for each of the final demand categories, namely investment, household consumption, and government consumption. The sourcing of imports is also determined separately for intermediate usage (for all

industries together) and for each of the final demand categories. Finally, for cross-regional behavior, the GTAP Model assumes that for each commodity, all agents in all regions display the same substitution elasticity.

Table 16.1: Behavioral Parameters in the GTAP Model

	Parameter	Set index	Description
σ_D	ESUBD(c,r)	$c \in \text{COMM}$ $r \in \text{REG}$	Armington elasticity of substitution between domestic and imported goods at region level
σ_M	ESUBM(c,r)	$c \in \text{COMM}$ $r \in \text{REG}$	Armington elasticity of substitution of imports at region level
σ_{VA}	ESUBVA(a,r)	$a \in \text{ACTS}$ $r \in \text{REG}$	Elasticity of substitution between primary factors in the production at region level
	ESUBT(a,r)	$a \in \text{ACTS}$ $r \in \text{REG}$	Elasticity of substitution between composite intermediate inputs and value-added at region level
σ_T	ETRAE(e,r)	$e \in \text{ENDW}$ $r \in \text{REG}$	Elasticity of transformation for sluggish primary factor endowments
	ENDOWFLAG(e,t)	$e \in \text{ENDW}$ $t \in \text{ENDWT}$	Binary flag for endowment mobility (i.e., ENDWT is either mobile, sluggish, or fixed)
	RORFLEX(r)	$r \in \text{REG}$	Expected net rate of return flexibility parameter
	RORDELTA		Binary switch coefficient which determines the mechanism of allocating investment funds across regions
β	SUBPAR(c,r)	$c \in \text{COMM}$ $r \in \text{REG}$	The substitution parameter in the CDE minimum expenditure function
γ	INCPAR(c,r)	$c \in \text{COMM}$ $r \in \text{REG}$	The expansion parameter in the CDE minimum expenditure function

The source substitution elasticities used in previous versions of the GTAP Data Base were taken from the SALTER model (Jomini et al. 1991). The SALTER settings are based on a synthesis of estimates from the econometric literature and original econometric work for one country—New Zealand. Since GTAP Data Base 6, we incorporate source substitution elasticities obtained from econometric work done by Hertel et al. 2003. The authors estimated the elasticity of substitution among imports from different sources using the approach used by Hummels 1999, who identifies σ_i by exploiting cross-sectional variation in delivered prices.

The estimates of the elasticities of substitution among imports from different sources, σ_M , obtained by Hertel et al. 2003 are given in the second column of elasticities reported in Table 16.2. Compared to the trade elasticities used in previous versions of the GTAP Data Base, the simple average of the new trade elasticities, 7.0, is fairly similar to the previous average trade elasticity of 5.3. However, there is much greater sectoral variation in the econometrically estimated elasticities.

The substitution elasticities between domestic and imported commodities, σ_D , also reported in Table 16.2, are linked to the σ_M , by the “rule of two”, i.e. $\sigma_M = 2\sigma_D$. This rule was first proposed by Jomini et al. (1991) and was retained on the GTAP parameters file. This rule was

recently tested by Liu, Arndt, and Hertel 2004 in a back-casting exercise with a simplified version of the GTAP Model. While those authors reject the validity of the GTAP trade elasticities, they fail to reject the rule of two, thereby lending additional support to this approach.

B Factor Substitution Elasticities

The nested CES production functions in the GTAP Model are similar to those used in many other applied general equilibrium models. Primary factors of production are assumed to substitute for one another according to the constant elasticity of substitution, σ_{VA} , while composite value-added and intermediates are used in fixed proportions. The overall elasticity of substitution among primary factors determines the ability of the economy to alter its output mix in response to changes in relative prices, or changes in the endowments of these factors. These parameters also play an important role in determining the sectoral supply response in the presence of sector-specific and sluggish factors of production. For example, with the supply of agricultural land being fixed in the model, the ability to expand farm output can be directly linked to the ease of substitution between land and labor, and land and capital.

The third column of Table 16.2 reports the assumed values for σ_{VA} for each of the GTAP sectors. Like the trade elasticities, these are taken from the SALTER parameter file (Jomini et al. 1991). They are based on a review of the international cross-section studies which estimated this parameter, for various industries, using data from a wide range of countries. Note the relatively small elasticity of substitution in primary production. In light of the discussion regarding the linkage between this parameter and the sectoral supply response in the face of sector-specific factors, we can infer that whenever sector-specific, or sluggish factors of production are present in these sectors, this will significantly constrain the supply response of the sectors. Finally, we note that the greatest degree of substitutability (1.68) arises in the trade and transport sectors.

Although composite value-added and composite intermediate inputs are used in fixed proportions in the standard GTAP Model, a parameter specifying the elasticity of substitution (ESUBT) between composite intermediates and composite value-added has recently been introduced into the model. This modification allows the user to specify the elasticity of substitution at the top nest of the production structure. The default setting of the elasticity is zero for all commodities, hence the ratio of composite intermediate inputs and value-added used in production is fixed.

C Factor Transformation Elasticities

The third class of behavioral parameters in GTAP describes the degree of primary factor mobility between the sectors. Within each region, the model distinguishes between primary factors that are perfectly mobile across productive sectors and those that are sluggish. In an experiment with sluggish factor endowments, it is important to find out how much of a disparity in relative sectoral returns can be sustained over the simulation period. This result is governed by the value of the

elasticity of transformation, $\sigma_T < 0$. If σ_T is close to zero, then the allocation of factors across sectors is nearly fixed, and therefore factor supply is unresponsive to changes in relative returns. As σ_T takes on larger negative values, then the supply of factors will become more and more responsive to relative returns [see equation (51) in table 2.14 of chapter 2 in Hertel 1997]. In the limit, as $\sigma_T \rightarrow -\infty$, this factor is perfectly mobile and no differential return can be sustained over the time horizon envisioned in the simulation. In this case, the factor should be reclassified as a perfectly mobile factor.

In the default setting which is generated from a standard aggregation of the data base, all labor types and capital are treated as perfectly mobile, whereas natural resources and agricultural land are treated as sluggish factors of production. Since agricultural land is used only in primary agricultural activities, the sluggishness of land is relevant only if the aggregation in question contains more than one farm sector.

The binary matrix ENDOWFLAG allows users to change the default setting and switch the specification of an endowment from sluggish to mobile (or fixed) by editing the values in header EFLG in the parameter file.

D Investment Flexibility Parameters

Investment flexibility parameters refer to the degree of flexibility of regional investment. In the GTAP Model, if the user chooses to allow the allocation of global investment to regional economies to be responsive to region-specific rates of return on capital (parameter RORDELTA is 1), then the parameter RORFLEX(r) > 0 must be properly specified [equation (58) of table 2.15 in chapter 2 of Hertel 1997]. The smaller the value of RORFLEX(r), the greater the responsiveness of international investment to a change in the rate of return in region r. Because RORFLEX(r) is indexed over regions, it is possible to have some regions where investment is quite sensitive to changing rates of return, and others where this is not.

E Consumer Demand Elasticities

GTAP employs the constant difference of elasticities (CDE) functional form in the specification of private household demands. The CDE, introduced by Hanoch 1975, can be classified as somewhere between the non-homothetic CES and more flexible functional forms. It is based on the assumption of implicit additivity and allows for a richer representation of income effects on the demand system. The CDE implicit expenditure function is given by:

$$\sum_{i \in \text{TRAD}} B_{i,r} UP_r^{\beta_{i,r} \gamma_{i,r}} \left[\frac{PP_{i,r}}{E_r(PP_r, UP_r)} \right]^{\beta_{i,r}} \equiv 1$$

where $E_r(\cdot)$ represents the minimum expenditure required to attain a pre-specified level of private household utility, UP_r , given the vector of private household prices, PP_r . Individual prices are

normalized using minimum expenditure and then raised to the power $\beta_{i,r}$ and combined in an additive form. The calibration problem involves choosing the values of the substitution parameter, $\beta_{i,r}$ or $\text{SUBPAR}(i, r)$, to replicate the desired compensated, own-price elasticities of demand, then choosing the expansion parameters, $\gamma_{i,r}$ or $\text{INCPAR}(i, r)$ to replicate the targeted income elasticities of demand.

In previous versions of the GTAP Data Base, we obtained available estimates of income elasticities from cross-country demand studies. Two studies provided income elasticity estimates which have country and commodity coverage for use with the disaggregate GTAP sectors and region. These are the World Food Model of the Food and Agriculture Organization (FAO, 1993) and the cross-country demand study by Theil, Chung, and Jr. 1989. In GTAP Data Base 9, as we did in version 6, we draw on the work done by Reimer and Hertel 2004 who estimated an implicit, directly additive demand system (AIDADS) first using cross-country data on consumer expenditures from the International Comparison Project (ICP) and then using GTAP data. The authors found that the two data sets produced results that are quite consistent despite their differing origins and the fact that the ICP data are based on consumer goods that embody wholesale/retail margins, while margins demand are treated separately in GTAP. Given the similarity of the results, the estimation based on GTAP data was found to be favorable since it readily matched the input-output-based production and trade data.

The AIDADS demand system was estimated for 10 commodity categories following the procedure of Cranfield et al. The mapping between the categories and the GTAP commodities is given in Table 16.3. The AIDADS parameter estimates based upon GTAP 10 data are presented in table 16.4. The first two columns of table 16.4 report α_n and β_n , which represent the bounds of the marginal budget shares.

The parameter estimates appear to be quite sensible for all commodities. Consider, for example, the values corresponding to the “Grains, other crops” category in Table 16.4. Its α_n estimate indicates that at low income levels, this category accounts for 26 cents of each additional dollar of expenditure. However, its β_n estimate of zero suggests that at higher income levels, “Grains, other crops” is no longer part of any increases in expenditure. Note that α_n does not equal β_n for any category of expenditure. This suggests that there is a great richness of behavior that would have been missed had we assumed that α_n equal β_n such that marginal budget shares are constant, as in the LES demand system estimated by Hunter and Markusen (1988), among others. The estimated subsistence budget shares (γ_n) for “Meat, dairy, fish”, “Utilities, other housing services”, and “Transport, communication” are small while staple foods tend to have larger subsistence budget shares, at 0.122 and 0.031 for “Grains, other crops” and “Processed food, beverages, tobacco”, respectively. This indicates that staple food products are necessary for survival at the lowest levels of income, whereas utilities, transport, and communications are not.

The estimates α_n , β_n , and γ_n obtained by Reimer and Hertel 2004 were updated with GTAP data on private consumption (VPA) and imports at market and world prices to generate income elasticity estimates for the 10 commodity categories for each of the 160 regions in GTAP 11. Estimates of own-price elasticities of demand were generated using the relationship for directly additive preferences proposed by Frisch 1959 and embodied in the Linear Expenditure System (LES). As discussed in Huff et al. 1997, the CDE is a more flexible functional form than the

LES, and we could have used independent information on own-price demand elasticities in this calibration had it been available. In the future, we hope to supplement the elasticities file with cross-country studies of own-price responses. In addition, by using the CDE, GTAP modelers are given the flexibility to adjust commodity-specific substitution effects to conform with outside information on own-price elasticities of demand for key commodities in any particular application.

Using the income elasticity estimates, the values for own-price elasticities of demand were computed following the procedure and formula outlined in Zeitsch et al. 1991:

$$\varepsilon_{ii} = -s_i \eta_i \left(1 + \frac{\eta_i}{\omega} \right) + \frac{\eta_i}{\omega}$$

where ε_{ii} is the uncompensated own-price elasticity of demand for commodity i ; η_i is the income elasticity of demand for commodity i , s_i is the expenditure share of commodity i , and ω is the Frisch parameter, that is, minus the reciprocal of the marginal utility of income, or the money flexibility. The compensated own-price elasticities, ν_{ii} , are then computed as:

$$\nu_{ii} = -\varepsilon_{ii} + s_i \eta_i$$

Using the above methods, we end up with estimates for income and compensated own-price elasticities of demand for 10 commodity categories and 141 countries.¹ These are then used as targets in the CDE calibration procedure.

E.1 CDE Calibration Procedure

The calibration problem involves calculating the values of the substitution parameter, $\beta_{i,r}$ or referred to in the code as `SUBPAR(i, r)`, to replicate the desired compensated, own-price elasticities of demand, then calculating the expansion parameters, $\gamma_{i,r}$ or `INCPAR(i, r)` to replicate the targeted income elasticities of demand. The calibration of the CDE parameters for GTAP 10 follows the procedure used in the GTAP 4 data base which is discussed more fully in Liu, Surry, et al. 1999. The procedure is a modification of the Surry 1997 approach which uses maximum entropy to calibrate a non-homothetic CDE expenditure function with subsistence quantities for three goods. Surry's procedure was modified to accommodate a larger number of goods with widely varying budget shares.

The income elasticities, expenditure shares, and uncompensated direct price elasticities serve as target inputs into the calibration program. Fuzzy constraints were introduced into the model to permit departures from the target elasticities and to provide room for mutually inconsistent target inputs. The two constraints in the form of income elasticities of demand and uncompensated direct price elasticities of demand, became, respectively:

¹GTAP 11 describes 160 regions, 141 of these are countries for which we have an IO table; the remaining countries in the world have been aggregated into 19 regions.

$$\begin{aligned}\eta_i(\text{estimated}) &= \eta_i + \text{diff}1 = \frac{\sum_k s_k e_k \alpha_k + e_i(1 - \alpha_i)}{\sum_k s_k e_k} + \alpha_i - \sum_k s_k \alpha_k \\ \varepsilon_{ii}(\text{estimated}) &= \varepsilon_{ii} + \text{diff}2 = -\nu_{ii} + s_i \eta_i = s_i [2\alpha_i - \sum_k s_k \alpha_k] - \alpha_i + s_i \eta_i\end{aligned}$$

where η_i , s_i , e_i , α_i , ν_{ii} , ε_{ii} are income elasticity, expenditure share, expansion parameter, substitution parameter, compensated own direct price elasticity, and uncompensated direct price elasticity, respectively, for commodity i . We have target values for η_i , s_i , and ε_{ii} as inputs while e_i and α_i are positive variables in the program.

Harsh penalties were imposed on the absolute values of $\text{diff}1$ and $\text{diff}2$ to ensure minimal departures from the target elasticities. The approach turned out to be quite robust with respect to these departures.

Since the inclusion of more commodities increases the possibility that the program will not converge, we used the same 10 commodities categories for the CDE calibration. Tables 16.5 and 16.6 report the income and uncompensated own-price demand elasticity targets for all 160 regions and 10 commodity categories, respectively. After the estimation was done for the aggregated commodities, the CDE parameters for the aggregated system were then extended to the 65-commodity level by assuming that all in-group commodities have the same parameter estimates as their aggregated parents.

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Table 16.2: GTAP Substitution Elasticities

GTAP Commodities		Domestic/ Imported (σ_D)	Sourcing of Imports (σ_M)	Value-added ($\sigma_V A$)
pdr	Paddy rice	5.05	10.10	0.26
wht	Wheat	4.45	8.90	0.26
gro	Cereal grains nec	1.30	2.60	0.26
v_f	Vegetables, fruit, nuts	1.85	3.70	0.26
osd	Oil seeds	2.45	4.90	0.26
c_b	Sugar cane, sugar beet	2.70	5.40	0.26
pfb	Plant-based fibers	2.50	5.00	0.26
ocr	Crops nec	3.25	6.50	0.26
ctl	Bovine cattle, sheep and goats, horses	2.00	4.00	0.26
oap	Animal products nec	1.30	2.60	0.26
rmk	Raw milk	3.65	7.30	0.26
wol	Wool, silk-worm cocoons	6.45	12.90	0.26
frs	Forestry	2.50	5.00	0.20
fsh	Fishing	1.25	2.50	0.20
coa	Coal	3.05	6.10	0.20
oil	Oil	5.20	10.40	0.20
gas	Gas	17.20	34.40	0.20
oxt	Minerals nec	0.90	1.80	0.20
cmt	Bovine meat products	3.85	7.70	1.12
omt	Meat products nec	4.40	8.80	1.12
vol	Vegetable oils and fats	3.30	6.60	1.12
mil	Dairy products	3.65	7.30	1.12
pcr	Processed rice	2.60	5.20	1.12
sgr	Sugar	2.70	5.40	1.12
ofd	Food products nec	2.00	4.00	1.12
b_t	Beverages and tobacco products	1.15	2.30	1.12
tex	Textiles	3.75	7.50	1.26
wap	Wearing apparel	3.70	7.40	1.26
lea	Leather products	4.05	8.10	1.26
lum	Wood products	3.40	6.80	1.26
ppp	Paper products, publishing	2.95	5.90	1.26
p_c	Petroleum, coal products	2.10	4.20	1.26
chm	Chemical products	3.30	6.60	1.26
bph	Basic pharmaceutical products	3.30	6.60	1.26
rpp	Rubber and plastic products	3.30	6.60	1.26
nmm	Mineral products nec	2.90	5.80	1.26
i_s	Ferrous metals	2.95	5.90	1.26
nfm	Metals nec	4.20	8.40	1.26
fmp	Metal products	3.75	7.50	1.26
ele	Computer, electronic and optical products	4.40	8.80	1.26

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GTAP Commodities		Domestic/ Imported (σ_D)	Sourcing of Imports (σ_M)	Value-added ($\sigma_V A$)
eeq	Electrical equipment	4.40	8.80	1.26
ome	Machinery and equipment nec	4.05	8.10	1.26
mvh	Motor vehicles and parts	2.80	5.60	1.26
otn	Transport equipment nec	4.30	8.60	1.26
omf	Manufactures nec	3.75	7.50	1.26
ely	Electricity	2.80	5.60	1.26
gdt	Gas manufacture, distribution	2.80	5.60	1.26
wtr	Water	2.80	5.60	1.26
cns	Construction	1.90	3.80	1.40
trd	Trade	1.90	3.80	1.68
afs	Accommodation, Food and service activities	1.90	3.80	1.68
otp	Transport nec	1.90	3.80	1.68
wtp	Water transport	1.90	3.80	1.68
atp	Air transport	1.90	3.80	1.68
whs	Warehousing and support activities	1.90	3.80	1.68
cmn	Communication	1.90	3.80	1.26
ofi	Financial services nec	1.90	3.80	1.26
ins	Insurance	1.90	3.80	1.26
rsa	Real estate activities	1.90	3.80	1.26
obs	Business services nec	1.90	3.80	1.26
ros	Recreational and other services	1.90	3.80	1.26
osg	Public Administration and defense	1.90	3.80	1.26
edu	Education	1.90	3.80	1.26
hht	Human health and social work activities	1.90	3.80	1.26
dwe	Dwellings	1.90	3.80	1.26

Table 16.3: Mapping of GTAP Commodities with 10 Commodity Aggregates

GTAP Sectors	Aggregated Commodities	GTAP Sectors	Aggregated Commodities
pdr	GrainCrops	i_s	Mnfcs
wht	GrainCrops	nfm	Mnfcs
gro	GrainCrops	fmp	Mnfcs
v_f	GrainCrops	ele	Mnfcs
osd	GrainCrops	eeq	Mnfcs
c_b	GrainCrops	ome	Mnfcs
pfb	TextAppar	mvh	Mnfcs
ocr	GrainCrops	otn	TransComm
ctl	MeatDairy	omf	Mnfcs
oap	MeatDairy	ely	HousUtils
rmk	MeatDairy	gdt	HousUtils
wol	TextAppar	wtr	HousUtils
frs	Mnfcs	cns	HousUtils
fsh	MeatDairy	trd	WRTrade
coa	HousUtils	afs	WRTrade
oil	GrainCrops	otp	TransComm
gas	HousUtils	wtp	TransComm
oxt	Mnfcs	atp	TransComm
cmt	MeatDairy	whs	TransComm
omt	MeatDairy	cmn	TransComm
vol	OthFoodBev	ofi	FinService
mil	MeatDairy	ins	HousUtils
pcr	GrainCrops	rsa	FinService
sgr	OthFoodBev	obs	FinService
ofd	OthFoodBev	ros	HousOthServ
b_t	OthFoodBev	osg	HousOthServ
tex	TextAppar	edu	HousOthServ
wap	TextAppar	hht	HousOthServ
lea	TextAppar	dwe	HousOthServ
lum	Mnfcs		
ppp	Mnfcs		
p_c	Mnfcs		
chm	Mnfcs		
bph	Mnfcs		
rpp	Mnfcs		
nmm	Mnfcs		

Table 16.4: GTAP-Based AIDADS Estimates: Household Consumption Expenditures

Commodity Categories	α_n	β_n	γ_n
Grains, other crops	0.259	0	0.122
Meat, dairy, fish	0.153	0.053	0
Processed food, beverages, tobacco	0.248	0.054	0.031
Textiles, apparel, footwear	0.117	0.038	0
Utilities, housing services	0.027	0.068	0.042
Wholesale/retail trade	0.009	0.175	0
Manufactures, electronics	0.052	0.158	0.253
Transport Communication	0.104	0.133	0
Financial and business services	0.002	0.079	0.004
Housing, education, health, public services	0.029	0.243	0.24

Source: Author's calculations based on Reimer and Hertel (2004)

Table 16.5: GTAP Substitution Elasticities

GTAP Regions	Grain- Crops	Meat- Dairy	Other FoodBev	Text- Appar	Hous- Util	WRtrade	Mnfes	Trans- Comm	Fin- Service	Hous- OthServ
aus	0.000017	0.902422	0.839269	0.897152	1.007958	1.026873	1.007504	0.991625	1.02819	1.023131
nzl	0.004549	0.889671	0.815407	0.883387	1.018977	1.042854	1.018465	0.998515	1.044528	1.038113
xoc	0.25408	0.637842	0.534987	0.627534	1.0127	1.167479	0.995938	0.925555	1.178798	1.133153
chn	0.293961	0.702723	0.592832	0.691635	1.110108	1.281361	1.090575	1.014862	1.293868	1.243208
hkg	-0.002075	0.927508	0.870423	0.922783	1.020608	1.037012	1.020301	1.006392	1.038149	1.033774
jpn	0.004205	0.877273	0.795126	0.870259	1.0246	1.052427	1.024134	1.000888	1.054386	1.046884
kor	0.025303	0.826034	0.724405	0.817064	1.028626	1.070365	1.027675	0.994152	1.073335	1.061969
mng	0.498328	0.721383	0.650984	0.714433	1.057403	1.353243	0.988539	0.976624	1.373857	1.278091
twm	0.026191	0.818603	0.715206	0.809454	1.026984	1.070297	1.025979	0.99127	1.073385	1.061567
xea	0.51736	0.673462	0.623055	0.668795	0.908949	1.237719	0.81705	0.86429	1.258995	1.145752
brn	0.11221	0.685716	0.570759	0.674763	0.990332	1.07262	0.98685	0.93011	1.078585	1.055463
khn	0.638036	0.822896	0.762987	0.817531	1.090642	1.51142	0.959987	1.04674	1.537948	1.391538
idn	0.431202	0.712347	0.627532	0.703732	1.094273	1.337121	1.051588	0.998903	1.354582	1.27885
lao	0.594409	0.841532	0.763653	0.833839	1.21904	1.571072	1.137821	1.128957	1.595465	1.480183
mys	0.179307	0.696971	0.577236	0.685239	1.061858	1.177876	1.054168	0.984238	1.186337	1.153116
phl	0.414135	0.703281	0.617279	0.694506	1.087176	1.322565	1.047613	0.991464	1.339541	1.266488
sgp	-0.00126	0.913322	0.853943	0.908391	1.011132	1.028485	1.010816	0.996115	1.029691	1.025057
tha	0.286094	0.668369	0.564401	0.657849	1.064143	1.237151	1.04409	0.970268	1.249833	1.198292
vnm	0.518607	0.77109	0.692425	0.763222	1.146057	1.447885	1.081719	1.053449	1.469193	1.372075
xse	0.726236	0.884535	0.833255	0.881069	0.995046	1.567824	0.786473	1.047988	1.591225	1.372601
afg	0.750905	0.924759	0.870678	0.921723	0.965498	1.62163	0.708874	1.072983	1.637974	1.382278
bgd	0.651329	0.866466	0.797007	0.859994	1.193714	1.606489	1.062753	1.126002	1.633805	1.493249
ind	0.536023	0.726425	0.665546	0.720856	1.007816	1.35964	0.90673	0.949282	1.383073	1.263551
npl	0.678898	0.856915	0.798099	0.85216	1.082777	1.561904	0.901777	1.064496	1.589757	1.417337
pak	0.53632	0.737568	0.672931	0.731378	1.045094	1.376127	0.947148	0.976531	1.398538	1.288896
lka	0.335711	0.703381	0.598857	0.692836	1.123784	1.329252	1.092705	1.021271	1.344327	1.282176
xsa	0.390071	0.716261	0.620029	0.70655	1.121976	1.343524	1.078381	1.021799	1.359608	1.291818
can	0.00195	0.895527	0.82539	0.889627	1.015637	1.03755	1.015241	0.996795	1.039082	1.033205
usa	-0.004241	0.927032	0.877967	0.923009	1.005074	1.018599	1.004769	0.993318	1.019532	1.015935
mex	0.148234	0.714167	0.591848	0.702334	1.061834	1.163388	1.056348	0.990529	1.170775	1.14198
xna	-0.004839	0.919284	0.865925	0.914922	1.00461	1.019522	1.003387	0.991662	1.020554	1.016582
arg	0.062424	0.767959	0.652128	0.75734	1.031963	1.093263	1.028548	0.9837	1.097672	1.080735
bol	0.417639	0.70935	0.622105	0.700481	1.096662	1.332779	1.053205	1.000075	1.349812	1.276555

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GTAP Regions	Grain- Crops	Meat- Dairy	Other FoodBev	Text- Appar	Hous- Util	WTrade	Mnfcs	Trans- Comm	Fin- Service	Hous- OthServ
bra	0.134402	0.715365	0.592628	0.703567	1.055668	1.15239	1.04841	0.986696	1.159424	1.132077
chl	0.078094	0.767798	0.648053	0.756696	1.051483	1.11993	1.049444	0.99867	1.124855	1.105895
col	0.223062	0.672429	0.560445	0.661253	1.048247	1.183531	1.035818	0.964457	1.193415	1.154111
ecu	0.263873	0.67289	0.565548	0.662072	1.059766	1.214504	1.040164	0.970519	1.22581	1.180284
pry	0.247614	0.717324	0.599072	0.705505	1.118814	1.265904	1.104892	1.028813	1.276643	1.233834
per	0.260998	0.757937	0.633131	0.745456	1.181164	1.335774	1.168338	1.086396	1.347059	1.30208
ury	0.040944	0.821254	0.710163	0.811293	1.054951	1.105361	1.052977	1.014011	1.108964	1.095154
ven	0.130077	0.714963	0.591369	0.703084	1.057702	1.15507	1.049949	0.988183	1.162159	1.134619
xsm	0.180834	0.701165	0.579126	0.689194	1.077994	1.199818	1.066571	0.997145	1.208726	1.173744
cri	0.094295	0.748385	0.625948	0.736882	1.054705	1.132598	1.05169	0.995902	1.138234	1.116488
gtm	0.302238	0.719147	0.60759	0.707853	1.133683	1.307999	1.115312	1.03693	1.320711	1.269197
hnd	0.495778	0.752913	0.673621	0.744919	1.12825	1.413933	1.069382	1.034974	1.4342	1.342967
nic	0.570429	0.79116	0.721234	0.784342	1.130921	1.477156	1.046044	1.051878	1.500924	1.386025
pan	0.078026	0.743321	0.621373	0.731923	1.043161	1.118027	1.039593	0.98604	1.123449	1.102574
slv	0.338185	0.735277	0.626119	0.724175	1.158778	1.34992	1.136132	1.057956	1.363853	1.306798
xca	0.179528	0.761022	0.612417	0.747226	1.205764	1.353659	1.192087	1.108478	1.364591	1.321811
dom	0.193016	0.741871	0.614636	0.729381	1.131555	1.256058	1.122271	1.048499	1.265138	1.229469
hti	0.327654	2.037986	1.688863	2.004686	2.974795	3.231519	2.956792	2.787966	3.250183	3.177866
jam	0.210538	0.692577	0.574538	0.680887	1.076641	1.209677	1.061947	0.992144	1.219402	1.180922
pri	0.003584	0.878609	0.807685	0.872624	1.00108	1.023554	1.000701	0.981789	1.025127	1.019095
tto	0.054902	0.803281	0.680798	0.792108	1.08026	1.14423	1.077293	1.02969	1.148839	1.13116
xcb	0.221867	0.694982	0.577055	0.683291	1.085806	1.224939	1.068317	0.9989	1.235118	1.194725
aut	0.00416	0.895848	0.822062	0.889611	1.023891	1.047475	1.023484	1.003667	1.049127	1.042793
bel	0.002407	0.917472	0.845488	0.911414	1.040832	1.063349	1.040402	1.021475	1.064923	1.058884
bgr	0.181379	0.725161	0.601219	0.713027	1.098139	1.214704	1.09105	1.01941	1.223195	1.189894
hrv	0.095366	0.789611	0.662308	0.777696	1.103169	1.181671	1.100438	1.043489	1.187342	1.16547
cyp	0.048257	0.79089	0.679312	0.780795	1.032682	1.08621	1.031356	0.989672	1.090045	1.075337
cze	0.082069	0.779139	0.6568	0.767775	1.071245	1.14212	1.068986	1.016568	1.14723	1.127553
dnk	0.001341	0.917398	0.848538	0.911622	1.03422	1.055385	1.033836	1.015991	1.056863	1.051193
est	0.052594	0.84242	0.723559	0.831663	1.100205	1.157326	1.098769	1.054333	1.161417	1.145721
fin	0.003952	0.895941	0.82212	0.889702	1.024013	1.047602	1.023593	1.003784	1.049254	1.042919
fra	0.009117	0.886179	0.802931	0.879056	1.036074	1.064466	1.035572	1.011922	1.066464	1.05881
deu	0.006	0.894032	0.815985	0.887402	1.031555	1.057179	1.031091	1.009652	1.058978	1.052085
grc	0.039802	0.835679	0.724861	0.825762	1.066598	1.115954	1.065487	1.026375	1.119478	1.105973
hun	0.11788	0.744031	0.619715	0.732209	1.070754	1.158233	1.067077	1.006438	1.164572	1.140015

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GTAP Regions	Grain- Crops	Meat- Dairy	Other FoodBev	Text- Appar	Hous- Util	WRTade	Mnfcs	Trans- Comm	Fin- Service	Hous- OthServ
irl	0.007793	0.873649	0.794053	0.866859	1.015667	1.042378	1.015187	0.992897	1.044256	1.037062
ita	0.011819	0.870807	0.7843	0.863364	1.029376	1.059835	1.028827	1.003579	1.061983	1.053756
lva	0.059852	0.833159	0.712028	0.822123	1.102046	1.162897	1.100408	1.053615	1.167264	1.150503
ltu	0.055145	0.834319	0.715029	0.823494	1.095557	1.153953	1.094037	1.048832	1.15814	1.142077
lux	-0.005161	0.954007	0.915054	0.950849	1.013964	1.024142	1.013719	1.005102	1.024838	1.022144
mlt	0.008717	0.883415	0.80121	0.876389	1.030992	1.058883	1.030426	1.007252	1.060845	1.053329
nld	0.004482	0.897811	0.822123	0.891403	1.029883	1.054314	1.029436	1.008956	1.056027	1.049462
pol	0.08959	0.777686	0.653461	0.766088	1.080322	1.155236	1.077755	1.023065	1.160643	1.139798
prt	0.030482	0.844979	0.74045	0.835729	1.054698	1.09808	1.053818	1.018896	1.101167	1.089342
rou	0.130118	0.769762	0.640078	0.757381	1.116729	1.211459	1.112555	1.047775	1.21833	1.191679
svk	0.08535	0.788034	0.663728	0.77647	1.08653	1.159361	1.084176	1.030491	1.164613	1.144381
svn	0.029991	0.855272	0.750068	0.845968	1.065791	1.109233	1.064908	1.029907	1.112324	1.100486
esp	0.01884	0.849753	0.755539	0.841544	1.029541	1.065213	1.028871	0.999652	1.06774	1.058066
swe	0.004113	0.90055	0.82594	0.894241	1.030185	1.054086	1.029763	1.009694	1.055761	1.049341
gbr	0.001314	0.89752	0.829477	0.891809	1.0132	1.034191	1.012809	0.995127	1.035656	1.030032
che	-0.007414	0.94864	0.904991	0.945093	1.016574	1.028196	1.016323	1.006451	1.028995	1.025911
nor	-0.007535	0.936512	0.879034	0.931776	1.029732	1.046122	1.029439	1.015507	1.047259	1.042887
xef	-0.00688	0.937255	0.890176	0.93341	1.011452	1.024241	1.011186	1.000323	1.025122	1.021724
alb	0.28864	0.705817	0.595221	0.69464	1.110802	1.276871	1.093968	1.016812	1.28899	1.240016
srb	0.219879	0.707425	0.588347	0.695599	1.096047	1.230807	1.085939	1.010568	1.240647	1.201671
blr	0.332121	0.770759	0.65239	0.758765	1.216002	1.406659	1.194704	1.111329	1.420577	1.364021
rus	0.156253	0.698826	0.578377	0.687123	1.049961	1.155712	1.04259	0.976942	1.163415	1.13332
ukr	0.496636	0.724334	0.65294	0.717221	1.06709	1.356833	1.002403	0.983183	1.377167	1.283368
xee	0.415118	0.726084	0.634238	0.716718	1.129101	1.365366	1.089922	1.028804	1.382464	1.309503
xer	0.150982	0.728648	0.603235	0.716503	1.086897	1.19211	1.081358	1.013213	1.199769	1.169914
kaz	0.177706	0.711581	0.589533	0.69963	1.079887	1.195378	1.071938	1.002	1.203796	1.170782
kgz	0.580067	0.82413	0.747124	0.816506	1.197266	1.538665	1.116054	1.107611	1.562384	1.450758
tjk	0.710257	0.871816	0.819413	0.867869	1.032349	1.561152	0.83405	1.052294	1.587364	1.390271
uzb	0.596876	0.798664	0.73393	0.792547	1.107841	1.482504	0.995946	1.041985	1.507498	1.380458
xsu	0.566613	0.715263	0.667051	0.711071	0.92018	1.301432	0.803096	0.895049	1.324433	1.188932
arm	0.332167	0.769466	0.65126	0.757495	1.213916	1.404303	1.192347	1.109419	1.418202	1.361723
aze	0.414122	0.683646	0.602467	0.675392	1.050334	1.284665	1.003729	0.958722	1.301514	1.228376
geo	0.298059	0.732891	0.617883	0.721269	1.152897	1.324229	1.135856	1.055519	1.336735	1.286224
bhr	0.0395	0.789771	0.677508	0.779728	1.029085	1.081661	1.027514	0.98665	1.085431	1.070988
irn	0.300757	0.693542	0.58586	0.68268	1.103407	1.283809	1.074422	1.006125	1.29702	1.243263

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GTAP Regions	Grain- Crops	Meat- Dairy	Other FoodBev	Text- Appar	Hous- Util	WRTade	Mnfcs	Trans- Comm	Fin- Service	Hous- OthServ
irq	0.345253	0.659085	0.569262	0.649906	1.031718	1.22308	1.005946	0.940749	1.236968	1.178935
isr	0.001969	0.895079	0.81742	0.888491	1.031465	1.056808	1.031002	1.009769	1.058588	1.051771
jor	0.260828	0.692359	0.580199	0.6811	1.087833	1.243419	1.073717	0.998201	1.254709	1.209411
kwt	0.038751	0.797819	0.688016	0.787997	1.02918	1.079424	1.027734	0.98857	1.083015	1.069259
lbn	0.105658	0.72241	0.601587	0.710966	1.035729	1.118479	1.03176	0.974419	1.124477	1.101276
omn	0.106346	0.731738	0.610018	0.720229	1.045405	1.127759	1.041615	0.984231	1.133724	1.110653
pse	0.346108	0.675338	0.581709	0.665777	1.059561	1.252482	1.033636	0.966085	1.266501	1.208151
qat	0.025784	0.819387	0.717944	0.810455	1.021418	1.063068	1.020197	0.986981	1.066034	1.054682
sau	0.083563	0.774573	0.649254	0.762936	1.078128	1.153155	1.074964	1.020679	1.158578	1.137694
syr	0.568576	0.751598	0.692075	0.746213	1.024478	1.395871	0.904826	0.970991	1.420176	1.2923
tur	0.112998	0.723723	0.594363	0.711297	1.083184	1.185252	1.07849	1.009978	1.192723	1.163795
are	0.001006	0.902449	0.824814	0.895929	1.037012	1.061937	1.036432	1.015666	1.063686	1.056987
xws	0.634766	0.782462	0.73399	0.778769	0.937503	1.406105	0.771362	0.949789	1.430222	1.257489
dza	0.570344	0.839343	0.754717	0.830969	1.242808	1.581143	1.160171	1.14361	1.604977	1.495434
egy	0.435822	0.724961	0.635859	0.716077	1.119038	1.36999	1.071215	1.020628	1.388068	1.309829
mar	0.497764	0.767244	0.684226	0.75893	1.157475	1.452566	1.098516	1.060206	1.473592	1.379364
tun	0.376174	0.702657	0.608038	0.693009	1.106255	1.326412	1.073026	1.006343	1.342448	1.275007
xnf	0.361993	0.874973	0.738751	0.861196	1.375323	1.581371	1.354797	1.259059	1.596401	1.535599
ben	0.704572	0.918938	0.84883	0.912714	1.232889	1.699732	1.074025	1.176624	1.72968	1.567331
bfa	0.77894	0.954633	0.898763	0.951857	0.951652	1.656471	0.674764	1.092938	1.664773	1.38503
cmr	0.601349	0.785281	0.725045	0.780038	1.049246	1.453679	0.905055	1.003511	1.47946	1.33829
civ	0.587356	0.818546	0.74478	0.811434	1.173083	1.533312	1.072828	1.090376	1.558082	1.438513
gha	0.612473	0.895449	0.806387	0.886699	1.320734	1.690513	1.221834	1.216744	1.716495	1.596128
gin	0.872901	1.075224	1.008189	1.072143	1.062715	1.867245	0.735935	1.229254	1.874571	1.554583
mli	0.742436	0.908684	0.854791	0.905251	1.007275	1.61046	0.774171	1.071985	1.633237	1.401175
ner	0.820473	1.0335	0.964779	1.031398	0.865391	1.736518	0.540253	1.143582	1.691708	1.345479
nga	0.526949	0.758685	0.685272	0.751472	1.110234	1.42316	1.026664	1.025017	1.445012	1.342981
sen	0.668274	0.869172	0.80389	0.863391	1.157049	1.603912	1.011014	1.109566	1.632184	1.477436
tgo	0.745328	0.936643	0.872834	0.931593	1.173561	1.706443	0.976384	1.158936	1.736937	1.543664
xwf	0.758709	0.939118	0.87935	0.934828	1.114066	1.689626	0.889065	1.135363	1.718238	1.503407
caf	0.862025	1.091204	1.01497	1.089063	0.893558	1.827032	0.522905	1.203837	1.769544	1.400903
tcd	0.807558	0.998607	0.933491	0.996054	0.93596	1.716316	0.605339	1.1284	1.710089	1.39817
cog	0.803225	0.983874	0.923788	0.980242	1.07992	1.743915	0.813906	1.15759	1.767579	1.510917
cod	0.882563	1.126541	1.044654	1.12446	0.86921	1.874261	0.516516	1.236789	1.798375	1.413954
gnq	0.242611	0.668085	0.557232	0.657021	1.056901	1.207287	1.03328	0.967904	1.218309	1.174189

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GTAP Regions	Grain- Crops	Meat- Dairy	Other FoodBev	Text- Appar	Hous- Util	WTrade	Mnfcs	Trans- Comm	Fin- Service	Hous- OthServ
gab	0.308877	0.727232	0.613526	0.715779	1.152926	1.335244	1.123099	1.05267	1.348582	1.294452
xac	0.691793	0.933425	0.858008	0.926537	1.283087	1.742754	1.1383	1.212306	1.773104	1.61534
com	0.583304	0.788508	0.722037	0.782187	1.106152	1.463546	0.993891	1.03573	1.48763	1.367675
eth	0.81957	1.003636	0.94186	1.00038	1.04304	1.760491	0.748443	1.163035	1.777326	1.496596
ken	0.608195	0.839603	0.76525	0.832789	1.184775	1.582363	1.070382	1.108139	1.609359	1.474894
mdg	0.843346	1.048591	0.980823	1.046452	0.881395	1.76073	0.548596	1.160579	1.716993	1.367342
mwi	0.898841	1.093807	1.028982	1.090541	1.103292	1.902015	0.789527	1.255818	1.914144	1.5978
mus	0.086715	0.791267	0.665996	0.779608	1.092967	1.166819	1.090424	1.036225	1.172146	1.151622
moz	0.866264	1.087783	1.018178	1.085617	0.902193	1.822472	0.562023	1.201504	1.771312	1.406246
rwa	0.806438	0.98072	0.923014	0.977343	1.048244	1.729022	0.788744	1.144344	1.749469	1.48355
sdn	0.568016	0.787948	0.717391	0.781209	1.125638	1.47989	1.019262	1.047657	1.504191	1.386014
tza	0.754144	0.955111	0.894232	0.951565	1.047524	1.701365	0.793631	1.124906	1.724339	1.471092
uga	0.740543	0.92306	0.866548	0.919779	0.997163	1.634178	0.752903	1.081228	1.65462	1.406779
zmb	0.755004	0.921378	0.867368	0.917612	1.052653	1.638745	0.839382	1.097456	1.664343	1.441942
zwe	0.591964	0.751511	0.699506	0.746982	0.974675	1.372467	0.842165	0.944541	1.396766	1.255937
xec	0.812318	0.992078	0.933667	0.989076	1.005353	1.726339	0.69807	1.140633	1.738013	1.453296
bwa	0.315008	0.670427	0.572103	0.660415	1.055606	1.232432	1.03461	0.96357	1.245313	1.192426
swz	0.403238	0.727872	0.633225	0.718194	1.133372	1.357039	1.099986	1.033345	1.373228	1.304774
nam	0.293854	0.749859	0.630419	0.737817	1.179635	1.350973	1.16313	1.080611	1.363489	1.313105
zaf	0.238772	0.656108	0.54894	0.645354	1.03002	1.172358	1.015413	0.945049	1.182763	1.141128
xsc	0.681157	0.839543	0.78823	0.835517	1.013942	1.508733	0.847156	1.021185	1.534771	1.352205
xtw	0.001492	0.921658	0.853005	0.915901	1.037972	1.059021	1.037609	1.019838	1.06049	1.054852

Table 16.6: GTAP Substitution Elasticities

GTAP Regions	Grain- Crops	Meat- Dairy	Other FoodBev	Text- Appar	Hous- Util	WRtrade	Mnfcs	Trans- Comm	Fin- Service	Hous- OthServ
aus	0.000015	0.795784	0.746956	0.789818	0.892937	0.929248	0.893839	0.884746	0.909284	0.93288
nzl	0.003699	0.726263	0.680316	0.717326	0.831217	0.879981	0.837213	0.8265	0.859787	0.884696
xoc	0.108114	0.288505	0.267294	0.271459	0.444335	0.614622	0.568381	0.441011	0.551311	0.63134
chn	0.152723	0.374326	0.340433	0.348296	0.55427	0.666528	0.582821	0.532425	0.637897	0.731405
hkg	-0.001713	0.764297	0.722101	0.774321	0.840407	0.906942	0.865803	0.837407	0.852506	0.860225
jpn	0.003322	0.687073	0.641377	0.681596	0.817875	0.866036	0.809947	0.803607	0.825985	0.873825
kor	0.018906	0.611621	0.547291	0.611502	0.787283	0.835033	0.775875	0.754083	0.79446	0.844049
mng	0.191245	0.339669	0.303995	0.280018	0.526607	0.587123	0.38465	0.488406	0.511406	0.584309
twm	0.018323	0.564836	0.501537	0.554357	0.712404	0.802343	0.721432	0.695139	0.743133	0.821696
xea	0.193422	0.281671	0.265238	0.326367	0.363287	0.775823	0.348394	0.398792	0.487084	0.532045
brn	0.087116	0.532829	0.445339	0.529246	0.795928	0.926746	0.778975	0.759297	0.834696	0.826763
khn	0.24291	0.27538	0.298037	0.234347	0.300315	0.486662	0.329272	0.305523	0.377546	0.487965
idn	0.188786	0.298888	0.297838	0.268408	0.425482	0.620039	0.437807	0.474111	0.512742	0.583874
lao	0.339121	0.295941	0.24224	0.233571	0.377834	0.554269	0.371231	0.334252	0.445926	0.5173
mys	0.095095	0.373661	0.330325	0.364019	0.617777	0.699143	0.654325	0.550395	0.61319	0.648022
phl	0.160814	0.268696	0.30781	0.257193	0.397312	0.590458	0.432501	0.404035	0.494684	0.567745
sgp	-0.001161	0.836828	0.787586	0.832946	0.930673	0.951826	0.934627	0.922292	0.945717	0.95401
tha	0.140498	0.32922	0.29454	0.313958	0.517981	0.69845	0.551028	0.505347	0.599865	0.613844
vnm	0.212685	0.290308	0.267451	0.245401	0.407053	0.483784	0.408203	0.382338	0.458445	0.522908
xse	0.29528	0.290587	0.308539	0.237919	0.284588	0.44586	0.24481	0.292227	0.374483	0.501988
afg	0.222332	0.33275	0.240796	0.202114	0.19312	0.379572	0.235386	0.232461	0.299604	0.404935
bgd	0.306258	0.290453	0.273271	0.260268	0.337517	0.434481	0.321507	0.333151	0.409667	0.551134
ind	0.219663	0.268788	0.249322	0.258634	0.38394	0.547621	0.341517	0.364638	0.464067	0.572705
npl	0.286226	0.267213	0.212672	0.214978	0.300813	0.401366	0.29405	0.342112	0.351844	0.479692
pak	0.168937	0.276709	0.228461	0.267233	0.343972	0.55968	0.331895	0.430862	0.394424	0.452787
lka	0.145518	0.281363	0.273556	0.274274	0.485604	0.568834	0.416466	0.493043	0.493893	0.62193
xsa	0.188298	0.337272	0.308526	0.309442	0.513452	0.636489	0.487621	0.517988	0.566658	0.650713
can	0.001615	0.740197	0.693049	0.736198	0.849054	0.887217	0.851263	0.837246	0.864042	0.892005
usa	-0.003869	0.843591	0.803394	0.839688	0.920475	0.940964	0.918912	0.909478	0.929694	0.953417
mex	0.07288	0.377117	0.327608	0.35318	0.611843	0.668127	0.584429	0.571327	0.599356	0.594077
xna	-0.004926	0.933546	0.882809	0.928941	1.017225	1.026755	1.016709	1.005283	1.033389	1.019381
arg	0.035852	0.459589	0.39933	0.442677	0.615109	0.716174	0.619068	0.600888	0.646331	0.742847
bol	0.161195	0.319445	0.273838	0.261487	0.410877	0.547028	0.427096	0.454835	0.4856	0.611163

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GTAP Regions	Grain- Crops	Meat- Dairy	Other FoodBev	Text- Appar	Hous- Util	WRTade	Mnfcs	Trans- Comm	Fin- Service	Hous- OthServ
bra	0.069085	0.383877	0.328009	0.370142	0.573548	0.657129	0.593162	0.562887	0.602899	0.688088
chl	0.045056	0.453166	0.40154	0.445142	0.625467	0.721666	0.633827	0.629205	0.657105	0.718865
col	0.105508	0.323289	0.280236	0.311356	0.518451	0.6846	0.486203	0.513221	0.557524	0.628684
ecu	0.118286	0.338039	0.290797	0.304467	0.507246	0.647314	0.521011	0.51502	0.554468	0.647759
pry	0.102717	0.359648	0.293183	0.299382	0.47916	0.651514	0.536764	0.479095	0.509199	0.559747
per	0.113403	0.357542	0.309892	0.349068	0.508959	0.606185	0.556875	0.526309	0.546697	0.581459
ury	0.025126	0.51588	0.460409	0.497367	0.663363	0.718521	0.678719	0.644691	0.681847	0.754963
ven	0.063275	0.370469	0.318257	0.340593	0.526224	0.685204	0.531032	0.556354	0.563021	0.656215
xsm	0.087712	0.369078	0.321345	0.340413	0.550012	0.652689	0.572459	0.537943	0.589577	0.678507
cri	0.052252	0.418539	0.366697	0.397339	0.591217	0.695817	0.604475	0.586951	0.634139	0.70308
gtm	0.119509	0.30452	0.298122	0.284878	0.433247	0.536357	0.467643	0.409588	0.476446	0.678496
hnd	0.157659	0.295578	0.321812	0.265969	0.382901	0.507999	0.415371	0.373608	0.447518	0.539354
nic	0.181141	0.288525	0.313881	0.290797	0.408992	0.502615	0.378008	0.395233	0.442147	0.458856
pan	0.045993	0.456768	0.38595	0.433741	0.631037	0.747775	0.634336	0.626379	0.665146	0.73514
slv	0.135457	0.294259	0.260952	0.303135	0.417257	0.536222	0.51397	0.456507	0.470711	0.568369
xca	0.06696	0.298256	0.33363	0.291665	0.474514	0.514198	0.484159	0.441425	0.504046	0.609606
dom	0.091195	0.360585	0.328074	0.324069	0.502089	0.653298	0.530428	0.553591	0.545938	0.644078
hti	0.129191	0.4153	0.272584	0.329977	0.473169	0.521077	0.490851	0.449377	0.51484	0.505533
jam	0.093331	0.298932	0.276281	0.278967	0.466556	0.661512	0.49275	0.459076	0.504011	0.580599
pri	0.002623	0.644569	0.599578	0.64494	0.741236	0.824727	0.756671	0.73732	0.765488	0.837438
tto	0.031499	0.476058	0.459739	0.456749	0.647307	0.732997	0.648771	0.66564	0.684219	0.684127
xcb	0.103054	0.33184	0.299174	0.301198	0.493396	0.656162	0.52861	0.511274	0.542724	0.637271
aut	0.003498	0.750827	0.697786	0.74925	0.866619	0.90832	0.867776	0.8527	0.874995	0.894719
bel	0.001943	0.737101	0.701972	0.740041	0.846072	0.867448	0.858156	0.829741	0.853847	0.877886
bgr	0.085165	0.363826	0.332383	0.346198	0.560929	0.644074	0.579775	0.546387	0.562377	0.635466
hrv	0.051469	0.452758	0.39621	0.44464	0.611514	0.70485	0.634235	0.594954	0.631874	0.684026
cyp	0.030979	0.50031	0.441959	0.495839	0.665524	0.771758	0.680544	0.672278	0.687681	0.760118
cze	0.052164	0.50487	0.447731	0.488129	0.745245	0.759533	0.70551	0.705313	0.731044	0.727515
dnk	0.001201	0.811194	0.761072	0.809825	0.92236	0.940623	0.920043	0.903648	0.932961	0.939789
est	0.032979	0.530205	0.478157	0.51601	0.688215	0.75949	0.686176	0.661242	0.701076	0.745586
fin	0.0033	0.747813	0.693914	0.739696	0.861408	0.897142	0.85964	0.844474	0.869941	0.897906
fra	0.007145	0.69176	0.636496	0.682002	0.821893	0.858825	0.817585	0.800072	0.822819	0.85794
deu	0.00492	0.729409	0.681172	0.730078	0.856226	0.885102	0.856623	0.838062	0.86367	0.882852
grc	0.024374	0.509361	0.461282	0.504159	0.680613	0.746477	0.656573	0.676361	0.673067	0.695212
hun	0.068363	0.444641	0.386196	0.427893	0.641369	0.728365	0.648125	0.605212	0.666824	0.734715

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GTAP Regions	Grain- Crops	Meat- Dairy	Other FoodBev	Text- Appar	Hous- Util	WRTade	Mnfcs	Trans- Comm	Fin- Service	Hous- OthServ
irl	0.007596	0.846603	0.775559	0.841134	0.983898	1.004677	0.982106	0.966593	1.008056	1.001627
ita	0.008762	0.647046	0.588387	0.641046	0.771181	0.839009	0.773368	0.756904	0.778588	0.828176
lva	0.033689	0.475707	0.458822	0.465031	0.635935	0.713549	0.650239	0.601963	0.635942	0.703285
ltu	0.032031	0.496609	0.454632	0.483496	0.639484	0.745524	0.66659	0.630351	0.65308	0.684687
lux	-0.005767	1.061025	1.018053	1.057389	1.1091	1.104047	1.113555	1.099238	1.132648	1.129563
mlt	0.006143	0.632519	0.571392	0.624591	0.746911	0.815533	0.754698	0.752409	0.746353	0.756711
nld	0.003774	0.756491	0.703994	0.759065	0.87786	0.908571	0.875166	0.862138	0.884841	0.89904
pol	0.049462	0.452921	0.390933	0.433694	0.644916	0.694144	0.646414	0.60432	0.643138	0.668637
prt	0.019585	0.542785	0.491883	0.539384	0.702367	0.778842	0.695607	0.684032	0.701344	0.712476
rou	0.066587	0.411833	0.366046	0.387688	0.595013	0.667265	0.596288	0.554631	0.594802	0.671373
svk	0.050615	0.482895	0.425777	0.476663	0.695003	0.726428	0.683671	0.661898	0.694577	0.697265
svn	0.019769	0.56426	0.507817	0.56283	0.701266	0.767589	0.737441	0.691912	0.715799	0.759679
esp	0.01332	0.603862	0.551258	0.6009	0.742068	0.826491	0.737712	0.724829	0.749805	0.807647
swe	0.003604	0.785875	0.729037	0.781356	0.90542	0.929925	0.900212	0.888642	0.916097	0.927759
gbr	0.001053	0.716622	0.669572	0.714968	0.826167	0.872193	0.818315	0.810317	0.828039	0.8718
che	-0.007573	0.95636	0.915203	0.952955	1.02187	1.027916	1.021755	1.012574	1.03448	1.020341
nor	-0.007439	0.906665	0.8573	0.901911	0.995209	1.007892	0.994955	0.983565	1.010898	1.005551
xef	-0.006972	0.945375	0.901624	0.941887	1.015445	1.02248	1.017306	1.006607	1.030854	1.026002
alb	0.124882	0.320032	0.242577	0.29037	0.498729	0.649388	0.464661	0.490273	0.49356	0.50298
srb	0.103799	0.318996	0.297614	0.303531	0.548004	0.637484	0.501986	0.487168	0.535928	0.620817
blr	0.151035	0.397425	0.268389	0.303866	0.549953	0.567998	0.504119	0.493248	0.530936	0.586951
rus	0.083964	0.401857	0.335962	0.3727	0.612688	0.735233	0.584908	0.556954	0.628123	0.68035
ukr	0.184476	0.281374	0.286715	0.249883	0.431088	0.601369	0.407314	0.395016	0.449561	0.489536
xee	0.152679	0.284176	0.285796	0.242729	0.403171	0.587722	0.420327	0.401516	0.438204	0.501001
xer	0.075989	0.363094	0.330865	0.349293	0.569993	0.668508	0.546762	0.546702	0.578406	0.656035
kaz	0.090914	0.385489	0.305863	0.37098	0.570148	0.660121	0.556459	0.553242	0.597273	0.698609
kgz	0.14987	0.223858	0.199924	0.452006	0.376422	0.473642	0.27454	0.309276	0.342041	0.334495
tjk	0.232075	0.240549	0.262574	0.310007	0.294631	0.443362	0.214235	0.327323	0.32937	0.372699
uzb	0.273601	0.3	0.245603	0.281215	0.350721	0.550122	0.326813	0.318017	0.458969	0.473035
xsu	0.300876	0.409283	0.379834	0.365729	0.525193	0.749108	0.430617	0.559619	0.683639	0.737564
arm	0.126314	0.361113	0.288077	0.25967	0.476448	0.577092	0.466138	0.399523	0.467064	0.491422
aze	0.183967	0.312323	0.268971	0.287128	0.508794	0.673559	0.456983	0.442435	0.515466	0.563504
geo	0.114603	0.342493	0.2847	0.270775	0.444245	0.525615	0.474589	0.472825	0.474376	0.619366
bhr	0.027104	0.539509	0.467552	0.535656	0.718835	0.7527	0.748154	0.705513	0.791229	0.768277
irn	0.151013	0.334871	0.278782	0.301716	0.528474	0.655605	0.504162	0.478403	0.55201	0.659682

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GTAP Regions	Grain- Crops	Meat- Dairy	Other FoodBev	Text- Appar	Hous- Util	WRTade	Mnfcs	Trans- Comm	Fin- Service	Hous- OthServ
irq	0.146437	0.318563	0.271806	0.285009	0.481611	0.5331	0.467329	0.544574	0.532254	0.75359
isr	0.001567	0.711364	0.662878	0.704295	0.821307	0.864348	0.824619	0.81281	0.833965	0.883423
jor	0.104125	0.289065	0.250668	0.282674	0.497533	0.506622	0.519668	0.458277	0.481474	0.599938
kwt	0.028735	0.585643	0.511028	0.581747	0.768732	0.815992	0.788035	0.757578	0.819552	0.8195
lbn	0.051717	0.346097	0.302819	0.343056	0.52028	0.621863	0.548962	0.492588	0.54192	0.702442
omn	0.068015	0.459723	0.378938	0.446951	0.668711	0.731608	0.742276	0.663301	0.708187	0.741285
pse	0.145135	0.29944	0.246434	0.247956	0.462629	0.604037	0.397921	0.47613	0.481912	0.596679
qat	0.024122	0.762023	0.671344	0.754058	0.948056	0.983883	0.955388	0.922875	0.986198	0.979313
sau	0.054696	0.49592	0.435586	0.492848	0.707065	0.758993	0.753015	0.682915	0.746834	0.751981
syr	0.210256	0.218771	0.199899	0.196561	0.326213	0.430861	0.307645	0.313012	0.355108	0.530648
tur	0.059105	0.397193	0.332285	0.381853	0.573226	0.700251	0.586592	0.582065	0.612219	0.67975
are	0.000805	0.704719	0.652155	0.712365	0.818462	0.852277	0.866924	0.815863	0.841989	0.844818
xws	0.245254	0.229927	0.206088	0.202915	0.253576	0.441114	0.234714	0.263825	0.348926	0.565997
dza	0.266457	0.329664	0.300533	0.289019	0.456229	0.547315	0.465067	0.577805	0.522886	0.507803
egy	0.144343	0.273837	0.25899	0.281817	0.392686	0.503737	0.40501	0.41949	0.443977	0.529799
mar	0.198609	0.314034	0.304526	0.280321	0.404242	0.521891	0.423536	0.401274	0.4679	0.608566
tun	0.138392	0.301803	0.286726	0.287566	0.426684	0.582358	0.512197	0.419958	0.484099	0.569454
xnf	0.193846	0.398867	0.341484	0.3525	0.562491	0.637779	0.576909	0.665833	0.626077	0.621077
ben	0.280501	0.224494	0.33688	0.265879	0.260944	0.419993	0.252155	0.333813	0.35111	0.393101
bfa	0.244151	0.285282	0.339155	0.243087	0.20813	0.421463	0.222443	0.294582	0.339625	0.366859
cmr	0.273451	0.245187	0.251726	0.236638	0.299638	0.572084	0.295643	0.363309	0.392096	0.482417
civ	0.21714	0.287615	0.301325	0.239056	0.354694	0.448261	0.407721	0.451008	0.437949	0.481377
gha	0.25977	0.277355	0.290671	0.263652	0.340195	0.414029	0.414444	0.358143	0.418579	0.48354
gin	0.302599	0.327493	0.295843	0.312925	0.223011	0.348076	0.2472	0.286608	0.351841	0.326031
mli	0.327707	0.279499	0.279311	0.246449	0.227742	0.489466	0.210943	0.262776	0.338428	0.363016
ner	0.527677	0.248721	0.213254	0.192769	0.167235	0.434218	0.117618	0.26001	0.309521	0.285653
nga	0.197078	0.37075	0.221675	0.232213	0.361316	0.542397	0.375467	0.340574	0.460073	0.447471
sen	0.213945	0.305531	0.308513	0.245424	0.335349	0.40272	0.315484	0.37482	0.4137	0.387338
tgo	0.205485	0.234321	0.338256	0.331512	0.234373	0.34104	0.254996	0.317083	0.331234	0.353365
xwf	0.279924	0.256496	0.277119	0.237516	0.247235	0.396462	0.306762	0.303254	0.352187	0.335273
caf	0.517549	0.4293	0.231807	0.191384	0.148066	0.33185	0.088511	0.205854	0.297706	0.226256
tcd	0.335168	0.495779	0.249432	0.207626	0.183647	0.354501	0.126327	0.305617	0.321671	0.338137
cog	0.401715	0.36279	0.345582	0.286861	0.350071	0.516674	0.257688	0.409759	0.470213	0.427118
cod	0.312565	0.299169	0.389716	0.210266	0.147089	0.331348	0.156007	0.230681	0.281391	0.314665
gnq	0.128602	0.383196	0.306828	0.349048	0.577786	0.673709	0.687937	0.555214	0.641083	0.700107

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GTAP Regions	Grain- Crops	Meat- Dairy	Other FoodBev	Text- Appar	Hous- Util	WRTtrade	Mnfcs	Trans- Comm	Fin- Service	Hous- OthServ
gab	0.154873	0.352643	0.312062	0.332853	0.531443	0.640369	0.522415	0.534086	0.582492	0.685439
xac	0.390345	0.321928	0.274254	0.247787	0.385746	0.547979	0.313906	0.356267	0.448143	0.434076
com	0.181028	0.325988	0.220011	0.238479	0.317849	0.410938	0.294118	0.411025	0.394923	0.468164
eth	0.271546	0.271289	0.310675	0.29169	0.222397	0.342858	0.248722	0.261788	0.332309	0.403276
ken	0.208257	0.296811	0.331659	0.257037	0.329846	0.391981	0.328303	0.309871	0.417676	0.547072
mdg	0.274604	0.323875	0.359816	0.22481	0.230382	0.314509	0.127861	0.305404	0.33846	0.245591
mwi	0.583019	0.241956	0.21492	0.178591	0.178434	0.294842	0.144935	0.207343	0.282732	0.307338
mus	0.043032	0.409292	0.373054	0.392037	0.583085	0.598778	0.617583	0.588933	0.621802	0.59095
moz	0.37474	0.281477	0.269252	0.224679	0.184711	0.312663	0.142168	0.28057	0.29308	0.294315
rwa	0.39528	0.235854	0.298064	0.203698	0.210782	0.387547	0.22919	0.257177	0.328816	0.402412
sdn	0.233779	0.36436	0.326128	0.266463	0.418647	0.56954	0.394436	0.439439	0.551733	0.496178
tza	0.30265	0.289463	0.335381	0.265856	0.240536	0.466579	0.249169	0.25736	0.359257	0.378477
uga	0.241042	0.280807	0.294228	0.21309	0.248067	0.376737	0.258332	0.258946	0.326837	0.472686
zmb	0.233158	0.361124	0.43462	0.28485	0.311722	0.438441	0.245032	0.293739	0.410014	0.479421
zwe	0.198961	0.241837	0.256623	0.213444	0.316634	0.479399	0.369629	0.282543	0.446191	0.512353
xec	0.26067	0.256433	0.288819	0.21845	0.209429	0.334609	0.22298	0.291103	0.333089	0.298463
bwa	0.157219	0.342446	0.314656	0.329578	0.543123	0.697215	0.542402	0.519629	0.613187	0.663717
swz	0.166908	0.311078	0.28859	0.288608	0.428007	0.620574	0.51066	0.41464	0.503315	0.525428
nam	0.114745	0.324203	0.336521	0.312415	0.461016	0.522659	0.558681	0.449375	0.522505	0.637127
zaf	0.111212	0.318242	0.290761	0.317715	0.541561	0.62043	0.537745	0.504853	0.584441	0.684245
xsc	0.197063	0.277819	0.286278	0.273824	0.27086	0.510846	0.321284	0.329319	0.371165	0.385659
xtw	0.001158	0.710581	0.684152	0.699424	0.798094	0.841841	0.828532	0.792537	0.823269	0.849257