

## 15.D

# *Transport Margins and Modes*

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This chapter covers the development of the international transportation margins implicit in the merchandise trade data set (chapter 15.B), and estimates of modal shares in these margins.

### **15.D.1** *International Transportation Margins*

Transportation margins are relatively stable over time being driven mainly by technological change and the price of fuel, a major input. Transportation margins data for the GTAP 6 Data Base uses the same sources and methods as those used in GTAP 5. In updating transportation margins in GTAP 6 it was determined that there were no substantial margin changes to warrant the extra effort of switching to more recent margins data. The base year for transportation margins uses the same year (1997) for the GTAP 6 Data Base<sup>1</sup>. The reason is that there were similar economic conditions affecting bilateral commodity transportation margins in 1997 as in 2001. Freight rates for transatlantic and trans-pacific routes were similar in both years. In 2001 a global economic slow down diminished demand for transportation services as in 1997 when the Asian financial crisis began. Industry sources suggest that demand for container space in 2001 continued at a slow pace with excess shipping capacity as there was in 1997.<sup>2</sup> Oil prices, a major input for global shipping services, remained stable between 1997 and 2001.

In general, periods of weak economic growth but with stable or declining oil prices have lower transportation margins than periods of strong trade growth and high oil prices. When the price of oil increases relative to the cost of merchandise trade, margins rise but margins increase more on goods that are less oil dependent. The transportation margin for shipping oil is not likely to change since the price of the merchandise (oil) and of shipping service increase roughly proportionately. However, margins for shipping electronics are likely to change as the cost of shipping services increases relatively more than the cost of the goods being shipped. This indeed is the situation for the 2003-2005 period with bilateral transportation margins expected to change in fundamental ways for certain sectors and shipping routes. In addition, various risk surcharges are a growing trend since 2001 and increased use of carriers offering different pricing structures for delivery date guarantees will likely affect transportation margins in the future.

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<sup>1</sup>The United States Bureau of Census, Foreign Trade Statistics is the primary source of bilateral transport cost data.

<sup>2</sup>For annual ocean rates see <http://www.ams.usda.gov/tmd/ocean/index.asp>.

Transportation margins data for GTAP are obtained at the sub-sector level from U.S. bilateral trade sources. Numerous examples at the detailed commodity level are provided in the GTAP 5 documentation. The same margins are applied to GTAP 6. Differences in aggregate sector margins between GTAP 5 and 6 are due to different trade weights or compositional changes that took place from 1997 to 2001. Tables 15.D.1 and 15.D.2 provide examples of transportation margins by merchandise sector exports and imports, respectively. Margins (*cif/fob* value) vary by commodity and partner depending on the commodity characteristics and location of partners. Regional trading partners will generally have lower margins than non-regional partners. For the United States to export lumber to Mexico, a transport margin of 3.9 percent is refunded. But to export lumber to other countries outside of North America it would require on average a margin of 11.4 percent (table 15.D.1). The import and export margins for the same sector will also vary due the differences in the composition of trade. For example, when the United States imports lumber products from outside of North America the margin is lower (7.9 percent) than when it exports to countries outside North America (11.4). Bulky or perishable products such as vegetables and fruits and other crude minerals have higher margins than compact high-value merchandise such as electronic equipment.

The average margin for outbound trade and inbound trade will differ for the same country depending on what the country tends to specialize in exporting. For example, New Zealand's high share of exports of agricultural commodities such as meat, fruit, and dairy makes gives it a higher transport margins (table 15.D.3) for total merchandise exports (7.8 percent) than for merchandise imports (5.1 percent).

## ***15.D.2 Source Data for Modal Shares***

The primary source of data for mode of transportation for merchandise trade is the same source used for transport margins. This is supplied by the U.S. Census Bureau's Foreign Trade Statistics<sup>3</sup>. Information on how goods are carried by mode of transportation is collected with the bilateral trade flows for both U.S. exports and imports. The transportation modes are identified in terms of three categories: vessel, air, and other methods, which include mainly ground transportation (truck and rail). This data serves as a starting point for constructing a global data base.

Since mode of transport is identified for all trade flows, value of trade by mode can be aggregated. The value of trade by mode was obtained for all U.S. partners covering all commodities for GTAP merchandise sectors. Shares of total goods carried by each mode are calculated. This is carried out at the detailed U.S. 10-digit HS classification level using *fob* values of trade. One set of modal shares is calculated for the NAFTA partners and a second set was generated for all other

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<sup>3</sup>See <http://www.census.gov/foreign-trade/guide/sec2.html#classification> for further documentation and description of data.

countries not sharing a common border with the United States. These shares are shown in tables 15.D.4 and 15.D.5.

Most goods are carried by ground transportation for U.S. trade with Canada and Mexico. As shown in table 15.D.4 there is some variation by GTAP sector. Many of the agricultural sectors are transported entirely by ground (truck or rail) transportation. Time-sensitive goods are often carried by air despite the close proximity of trading partners. Electronic equipment has a relatively high share that is carried by air for this reason. Mode of transport share for non-NAFTA countries are shown in table 15.D.5. Clearly, ground transportation is not included. Bulky commodities tend to have a higher share transported on vessels. Coal, oil, and gas are good examples. Generally the higher the unit-value of the commodity, the greater share for air transport is observed.

Table 15.D.1 Transport Margins on U.S. Merchandise Exports (*cif/fob* value)

GTAP Sectors	Mexico	Canada	Rest of World
pdr	1.035	1.000	1.079
wht	1.022	na	1.053
gro	1.022	1.025	1.054
v_f	1.073	1.128	1.164
osd	1.024	1.028	1.054
c_b	na	na	1.000
pfb	1.022	1.031	1.053
ocr	1.032	1.051	1.102
ctl	1.150	1.136	1.046
oap	1.021	1.026	1.053
rmk	na	na	na
wol	na	na	na
frs	1.000	1.033	1.068
fsh	1.500	1.136	1.245
coa	1.073	1.086	1.197
oil	na	1.000	1.038
gas	1.053	1.026	1.128
omn	1.060	1.079	1.144
cmt	1.023	1.023	1.062
omt	1.029	1.031	1.051
vol	1.028	1.021	1.068
mil	1.029	1.029	1.065
per	1.125	1.091	1.184
sgr	1.037	1.061	1.168
ofd	1.033	1.036	1.083
b_t	1.033	1.036	1.051
tex	1.026	1.029	1.060
wap	1.020	1.018	1.038
lea	1.020	1.027	1.051
lum	1.039	1.042	1.114
ppp	1.044	1.039	1.080
p_c	1.033	1.042	1.067
crp	1.028	1.024	1.043
nmm	1.059	1.048	1.102
i_s	1.037	1.035	1.100
nfm	1.013	1.014	1.023
fmp	1.029	1.027	1.058
mvh	1.016	1.016	1.033
otn	1.009	1.008	1.009
ele	1.009	1.010	1.017
ome	1.014	1.016	1.028
omf	1.024	1.023	1.033
Total Merchandise	1.021	1.023	1.037

Table 15.D.2 Transport Margins on U.S. Merchandise Imports (*cif/fob* value)

GTAP Sectors	Mexico	Canada	Rest of World
pdr	na	1.000	1.049
wht	1.023	1.023	1.021
gro	1.017	1.023	1.034
v_f	1.149	1.101	1.155
osd	1.028	1.025	1.039
c_b	na	na	1.003
pfb	1.029	1.038	1.062
ocr	1.043	1.055	1.099
ctl	1.166	1.161	1.141
oap	1.037	1.025	1.042
rmk	na	na	na
wol	1.000	1.014	1.037
frs	1.077	1.028	1.029
fsh	1.101	1.154	1.197
coa	1.000	1.082	1.173
oil	1.027	1.027	1.053
gas	1.000	1.023	1.026
omn	1.141	1.163	1.191
cmt	1.022	1.024	1.052
omt	1.018	1.019	1.029
vol	1.023	1.028	1.067
mil	1.040	1.029	1.044
pcr	1.083	1.167	1.126
sgr	1.065	1.037	1.098
ofd	1.028	1.032	1.057
b_t	1.024	1.029	1.044
tex	1.021	1.027	1.048
wap	1.017	1.019	1.040
lea	1.029	1.029	1.072
lum	1.031	1.058	1.079
ppp	1.035	1.038	1.050
p_c	1.036	1.037	1.066
crp	1.027	1.029	1.034
nmm	1.064	1.060	1.114
i_s	1.041	1.042	1.078
nfm	1.017	1.013	1.020
fmp	1.028	1.030	1.053
mvh	1.012	1.012	1.019
otn	1.007	1.005	1.014
ele	1.010	1.010	1.018
ome	1.016	1.018	1.027
omf	1.023	1.021	1.039
Total Merchandise	1.020	1.026	1.036

Table 15.D.3 Transport Margins on New Zealand Exports and Imports (*cif/fob* value)

GTAP Sectors	Exports	Imports
pdr	na	1.030
wht	1.052	1.052
gro	1.075	1.054
v_f	1.239	1.153
osd	1.058	1.068
c_b	na	1.000
pfb	1.083	1.139
ocr	1.155	1.097
ctl	1.094	1.046
oap	1.053	1.071
rmk	1.000	1.000
wol	1.051	1.039
frs	1.057	1.077
fsh	1.279	1.097
coa	1.199	na
oil	1.061	1.063
gas	na	na
omn	1.297	1.199
cmt	1.074	1.058
omt	1.071	1.045
vol	1.018	1.075
mil	1.055	1.085
pcr	1.214	1.173
sgr	1.092	1.111
ofd	1.086	1.081
b_t	1.060	1.054
tex	1.070	1.058
wap	1.036	1.034
lea	1.040	1.070
lum	1.167	1.099
ppp	1.095	1.083
p_c	1.062	1.069
crp	1.058	1.058
nmm	1.137	1.134
i_s	1.090	1.085
nfm	1.029	1.050
fmp	1.059	1.062
mvh	1.036	1.023
otn	1.030	1.012
ele	1.022	1.024
ome	1.039	1.037
omf	1.064	1.048
Total Merchandise	1.078	1.051

Table 15.D.4 Share of Merchandise Transported by Mode: United States Trade with NAFTA Partners

GTAP Sectors	Ground	Vessel	Air
pdr	1.0000	0.0000	0.0000
wht	0.8925	0.1075	0.0000
gro	0.8200	0.1800	0.0000
v_f	0.9700	0.0292	0.0009
osd	1.0000	0.0000	0.0000
c_b	1.0000	0.0000	0.0000
pfb	1.0000	0.0000	0.0000
ocr	0.9911	0.0066	0.0023
ctl	0.9978	0.0005	0.0017
oap	0.9952	0.0001	0.0047
wol	1.0000	0.0000	0.0000
for	0.7658	0.2341	0.0001
fsh	0.9730	0.0123	0.0147
col	0.8340	0.1660	0.0000
oil	0.9703	0.0297	0.0000
gas	0.9995	0.0005	0.0000
omn	0.2880	0.6996	0.0124
cmt	0.9994	0.0001	0.0005
omt	0.9824	0.0155	0.0021
vol	0.9940	0.0059	0.0000
mil	0.9693	0.0305	0.0002
pcr	0.9840	0.0000	0.0160
sgr	0.9999	0.0000	0.0001
ofd	0.9828	0.0115	0.0057
b_t	0.9963	0.0035	0.0002
tex	0.9913	0.0004	0.0083
wap	0.9742	0.0016	0.0242
lea	0.9727	0.0014	0.0259
lum	0.9764	0.0230	0.0006
ppp	0.9379	0.0586	0.0036
p_c	0.2968	0.7032	0.0000
crp	0.9492	0.0408	0.0100
nmm	0.9052	0.0924	0.0024
i_s	0.9525	0.0465	0.0010
nfm	0.9308	0.0086	0.0606
fmp	0.9703	0.0079	0.0218
mvh	0.9993	0.0003	0.0005
otn	0.8422	0.0035	0.1543
ele	0.7097	0.0008	0.2895
ome	0.8897	0.0016	0.1088
omf	0.9089	0.0110	0.0801

Table 15.D.5 Share of Merchandise Transported by Mode: United States Trade with Non-NAFTA Partners

GTAP Sector	Vessel	Air
pdr	0.9637	0.0363
wht	0.8300	0.1700
gro	0.8702	0.1299
v_f	0.9245	0.0755
osd	0.9594	0.0406
c_b	1.0000	0.0000
pfb	0.9866	0.0134
ocr	0.8645	0.1355
ctl	0.0035	0.9965
oap	0.8040	0.1961
wol	0.9957	0.0043
for	0.9729	0.0271
fsh	0.0614	0.9386
col	0.9992	0.0008
oil	0.9665	0.0335
gas	0.9970	0.0030
omn	0.1964	0.8036
cmt	0.9642	0.0358
omt	0.9337	0.0663
vol	0.9903	0.0097
mil	0.9668	0.0333
pcr	0.9934	0.0066
sgr	0.9987	0.0013
ofd	0.9410	0.0591
b_t	0.9367	0.0633
tex	0.7868	0.2132
wap	0.7474	0.2526
lea	0.7784	0.2216
lum	0.9607	0.0393
ppp	0.8531	0.1469
p_c	0.9982	0.0018
crp	0.6447	0.3553
nmm	0.8293	0.1707
i_s	0.9739	0.0261
nfm	0.6456	0.3544
fmp	0.8085	0.1915
mvh	0.9741	0.0259
otn	0.5560	0.4440
ele	0.3230	0.6770
ome	0.6129	0.3872
omf	0.6427	0.3573