
# *International Marine Bunkers*

**An attempt to assign its usage to the right countries**

**By**

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**GTAP Research Memorandum No. 20**

**February 2009**

## 1 Introduction

A few years ago, a couple of energy modelers have inquired about the treatment of international marine bunkers in GTAP. The concerns of them can best be described as:

*How do you handle bunker fuels? Are they allocated on a countries purchase of bunker fuels or on a countries sale? For example, Norway has a large shipping industry and so Norwegian companies buy a lot of bunker fuels from other countries (in total about 20% of Norway's domestic emissions!). However, the sales of bunker fuels in Norway to foreign companies are relatively small. Depending on how you treat the bunker fuels will make some large differences for some countries. This would for instance have a big impact on the Netherlands.*

In the next section we give an overview the present treatment and in the final section of what we have done with a new method to correct the effects of the mishandling of the international marine bunkers.

## 2. Present treatment of International Marine Bunkers

The treatment of international marine bunkers is one area we don't handle well. This is because it's intrinsically complex, we don't have the data to handle it well, and it's only a small part of energy usage (not much above 1 per cent of global fossil fuel use).

International marine bunkers comprise mostly gas / diesel oil and heavy fuel oil. They map to petroleum products, "p_c", in the GTAP sectoral classification.

Our procedure so far is simple:

- Assign international marine bunkers to exports.
- Revise exports and imports of each GTAP commodity, so that global exports agree with global imports.

The effects are complex:

- We assign international marine bunkers to exports, but we make no corresponding assignment to imports. So the presence of bunkers in the source data tends to create a global excess of exports over imports in our intermediate data sets.
- To rectify the trade imbalance, we decrease each country's exports and increase each country's imports. This is part of a general adjustment procedure, removing imbalances from many sources not just marine bunkers.
- The trade rebalancing is liable to create supply / demand imbalances; for marine bunkers, specifically, to create excess supply. For this and other reasons, we combine the trade balance adjustment with a simultaneous supply / demand balance adjustment. Where supply exceeds demand, as in the present case, we reduce supply, by decreasing domestic

production and imports, and increase demand, by increasing intermediate usage, household consumption, and exports.

- The trade and demand / supply imbalance adjustments have opposite effects on exports and imports. In the present case, the trade imbalance adjustments dominate globally. So the net effect of the adjustments on global "p_c" exports is negative, and on imports positive.
- On the other hand, the trade imbalance arose in the first place because we did not record bunkers imports (purchases by a country's ship operators count as imports, even if the bunkers never go near the country's own territory). For countries that specialise in international shipping services, this initial non-recording of imports dominates the global upward adjustment. So for countries that supply international shipping services, we understate "p_c" imports, but for other countries, we overstate them.
- The non-recording of bunkers imports is matched by non-recording of bunkers usage. As with imports, for countries specialising in international shipping services, this initial non-recording dominates the subsequent general upward adjustment. So for countries that supply international shipping services, we understate "p_c" usage, but for other countries, we overstate it.
- At this point in the data processing, we do not work with the full 57-sector GTAP classification, but with an aggregated classification, in which the three GTAP transport sectors, water, air, and "other" transport, are grouped into one. So at this stage, the under- or over-statement of "p_c" usage applies to this aggregate transport sector. Later, we allocate energy usage values across the individual transport sectors. So in the final GTAP data base, the under- or over-statement of "p_c" usage affects not just water transport but all three GTAP transport industries.

Altogether then, we tend to distort the data as follows:

- In all countries, understate "p_c" exports, understate production, and overstate usage in non-transport industries;
- In countries more oriented toward supplying international shipping services, understate "p_c" imports and understate "p_c" usage in all transport industries;
- In countries less oriented toward supplying international shipping services, overstate "p_c" imports and overstate "p_c" usage in all transport industries;
- Globally, understate "p_c" imports and understate "p_c" usage in all transport industries.
- Globally, understate total "p_c" usage.

## 3. Proposed adjustment of treatment of International Marine Bunkers

As noted above, we handle this badly because handling it well is hard, and requires data we don't have. Nevertheless, even with the data we do have, we can handle it less badly in future data

bases[1]. Specifically, we can devise a treatment that will avoid the global distortions: that will remove the understatement of global "p_c" production, the overstatement of global "p_c" usage in non-transport industries, and the understatement of global "p_c" usage in transport industries.

To be more precisely, we have assigned international marine bunker usage to the right countries, on the basis of international services trade data. The assumption is that international marine bunker usage is proportional to water transport services exports. This is a better basis for assignment than GDP or aggregate non-bunker energy usage. Since the improvement of the quality of bilateral services trade in the GTAP-7 database, we are confident that this method corrects the above mentioned distortions in an acceptable way.

To visualize the effects of the adjustments, we show the results of the old and new method for two countries (Netherlands and Norway) and for total World. This is done for the data from IEA used for the GTAP-7 database.

**Table 2.1: Supply and demand of Gas, Diesel, Residential Fuel and total energy in Netherlands in 2004 (in Mtoe)**

| | IEA original | | | Old method | | | New method | | |
|---|---|---|---|---|---|---|---|---|---|
| | GasDies | ResFuel | Total | GasDies | ResFuel | Total | GasDies | ResFuel | Total |
| Domestic production | 20.9 | 12.6 | 189.1 | 20.7 | 12.5 | 188.6 | 20.7 | 12.5 | 188.6 |
| Imports | 10.4 | 14.8 | 148.6 | 10.2 | 14.8 | 148.3 | 11.2 | 19.2 | 153.6 |
| Supply | 31.3 | 27.4 | 337.7 | 30.9 | 27.4 | 336.9 | 31.9 | 31.8 | 342.2 |
| Exports | 20.9 | 12.7 | 118.9 | 22.8 | 25.4 | 133.6 | 22.8 | 25.4 | 133.6 |
| International Marine Bunkers | -1.9 | -12.7 | -14.7 | | | | | | |
| other users incl. Stch and SD | 7.9 | 2.0 | 201.6 | 8.2 | 2.0 | 202.5 | 9.1 | 6.4 | 207.8 |
| Demand | 30.6 | 27.4 | 335.2 | 30.9 | 27.4 | 336.1 | 31.9 | 31.8 | 341.4 |
| Total | 61.9 | 54.7 | 673.0 | 61.9 | 54.7 | 673.0 | 63.7 | 63.5 | 683.6 |

Source: IEA and own calculations
Note: Be advised that in all methods supply is not equal to demand. That will be dealt later on in the module. As noted before, the two mentioned products are the most important products linked to petroleum products, "p_c", in the GTAP sectoral classification.

Netherlands is a country where there is a substantial amount of energy supply in international marine bunkers. In the old method the absolute amount is simply added to the amount of exports. In the new method we notice an increase in the demand of energy equals the relative export of water transport services to the world. This results in an increase in imports on the supply side and a similar increase in the demand on what we have called International Navy, which will later on in the module, be mapped to the GTAP water transport sector.

[1] In the GTAP-8 database this method will be introduced using the 2007 IEA data. By then the data will also include the international aviation bunkers, which will be treated in the similar way described in this document.

**Table 2.2: Supply and demand of Gas, Diesel, Residential Fuel and total energy in Norway in 2004 (in Mtoe)**

| | IEA original | | | Old method | | | New method | | |
|---|---|---|---|---|---|---|---|---|---|
| | GasDies | ResFuel | Total | GasDies | ResFuel | Total | GasDies | ResFuel | Total |
| Domestic production | 6.5 | 1.8 | 261.5 | 6.4 | 1.8 | 261.0 | 6.4 | 1.8 | 261.0 |
| Imports | 0.8 | 1.4 | 6.6 | 0.8 | 1.4 | 6.6 | 2.3 | 8.3 | 15.0 |
| Supply | 7.3 | 3.1 | 268.1 | 7.2 | 3.2 | 267.5 | 8.7 | 10.2 | 275.9 |
| Exports | 2.8 | 1.7 | 217.5 | 3.1 | 1.9 | 218.7 | 3.1 | 1.9 | 218.7 |
| International Marine Bunkers | -0.3 | -0.2 | -0.5 | | | | | | |
| other users incl. Stch and SD | 3.8 | 1.5 | 46.5 | 4.1 | 1.3 | 48.1 | 5.5 | 8.3 | 56.5 |
| Demand | 6.9 | 3.4 | 264.5 | 7.2 | 3.2 | 266.8 | 8.7 | 10.2 | 275.2 |
| Total | 14.2 | 6.5 | 532.6 | 14.5 | 6.4 | 534.3 | 17.3 | 20.3 | 551.1 |

Source: IEA and own calculations
Note: Be advised that in all methods supply is not equal to demand. That will be dealt later on in the module. As noted before, the two mentioned products are the most important products linked to petroleum products, "p_c", in the GTAP sectoral classification.

Norway is a country which reports hardly any international marine bunkers, but according to new method is using a substantial amount of it, resulting in an enormous increase in imports of gas, diesel and residential fuel and which increases the domestic demand by more than 17% compared to the old method.

**Table 2.3: Supply and demand of Gas, Diesel, Residential Fuel and total energy , total World in 2004 (in Mtoe)**

| | IEA original | | | Old method | | | New method | | |
|---|---|---|---|---|---|---|---|---|---|
| | GasDies | ResFuel | Total | GasDies | ResFuel | Total | GasDies | ResFuel | Total |
| Domestic production | 1163.3 | 592.0 | 15508.0 | 1166.5 | 593.0 | 15510.4 | 1166.5 | 593.0 | 15510.36 |
| Imports | 214.2 | 190.4 | 4365.0 | 213.9 | 192.3 | 4343.0 | 242.2 | 329.2 | 4508.553 |
| Supply | 1377.5 | 782.4 | 19872.9 | 1380.3 | 785.3 | 19853.3 | 1408.6 | 922.2 | 20018.91 |
| Exports | 228.8 | 235.2 | 4331.5 | 256.9 | 371.6 | 4496.3 | 256.9 | 371.6 | 4496.292 |
| International Marine Bunkers | -28.5 | -135.6 | -164.4 | 1123.5 | 413.6 | 15168.1 | 1151.8 | 550.6 | 15333.68 |
| other users incl. Stch and SD | 1130.5 | 416.1 | 15161.4 | | | | | | |
| Demand | 1387.7 | 786.9 | 19657.3 | 1380.3 | 785.2 | 19664.4 | 1408.6 | 922.1 | 19829.97 |
| Total | 2765.2 | 1569.3 | 39530.2 | 2760.6 | 1570.4 | 39517.7 | 2817.3 | 1844.4 | 39848.88 |

Source: IEA and own calculations
Note: Be advised that in all methods supply is not equal to demand. That will be dealt later on in the module. As noted before, the two mentioned products are the most important products linked to petroleum products, "p_c", in the GTAP sectoral classification.

For total World we obviously notice an increase in both supply and demand equal to the total absolute amount of international marine Bunkers. That increase on the supply side can be found in the increase in imports. This new method reduces the world trade imbalance considerably and that was one of the goals of this exercise.

With this new method all effects mentioned in the previous section have been solved. What remains is that we have made an assumption of the assignment of international marine bunker

usage to the right countries, on the basis of international services trade data. Since these bilateral data have been improved considerably in the GTAP-7 Data Base, we are confident that we are not too far off the reality.

References


1. International Energy Agency. Energy balances of OECD countries (2006 edition), extended energy balances. http://wds.iea.org/wds/, 2006.

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3. Robert McDougall and Huey-Lin Lee. An energy data base for GTAP. In Global Trade, Assistance, and Production: The GTAP-6 Data Base, chapter 17. Center for Global Trade Analysis, Purdue University, 2006.