**Refining Savings in the GTAP Data Base**

The standard GTAP Data Base provides a snapshot of the global economy for a reference year (Aguiar et al., 2022). Aguiar et al. (2022) state that this consistent database underlies most if not all general equilibrium models. The level of savings in each country is among the information provided by the database. In previous versions, as in the latest version, several countries in GTAP report negative savings.

Aguiar et al. (2022) explain that the level of Savings is computed as a residual due to one of the macroeconomic conditions that need to be ensured by GTAP for economic modelling. Equation 1 below shows the macroeconomic condition that ensures that the savings-investment balance is equal to the trade balance is:

$$S - I = X - M \quad (1)$$

where S is Savings and I is Investment net of depreciation, X stands for exports and M imports. Because it accounts for depreciation, the level of savings in GTAP is not Gross Domestic Savings, but savings net of depreciation.

GTAP assumes that the depreciation rate is 4% of capital stock for all countries. Capital stock is calibrated based on information from the Penn World Tables (PWT, in Feenstra, Inklaar, and Timmer, 2015).

Exports and imports are targeted in the GTAP Data Base construction. Trade flows are reconciled so that they can be used for economic modelling. Further, investment adjusts to maintain GDP, this is why the level of savings is computed as a residual.

Savings is also computed as a residual in other GTAP data extensions such as the international labor migration extension (see GMIG, documented in Walmsley, Ahmed, and Parsons (2007); Aguiar (2020)) and one of the dynamic extensions (GDYN, documented in McDougall et al. (2012); Golub (2016)) where other elements of the external accounts are considered such as net remittances and net foreign payments, respectively. In both of these datasets, the level of savings is also computed as a residual.

In this study we look to refine Savings in the GTAP framework by considering remittances (in and out) sourced from the GMIG, foreign flows (receipts and payments) sourced from GDYN, and international foreign aid flows (in and out) sourced from the OECD. The latter information needs to be pre-processed in order to obtain a consistent bilateral matrix of foreign aid. Equation 2 displays the new macroeconomic condition:

$$S - I = X - M + REMI - REMO + INCI - PMTO + AIDI - AIDO \quad (2)$$

Where in addition to the previously defined variables, REMI are remittances in, REMO are remittances out, INCI are foreign income receipts, PMTO are foreign income payments, AIDI are foreign aid received and AIDO are foreign aid provided.

Another objective of this study is to further examine the assumption on the depreciation rate used and capital stock source. The PWT provides depreciation values by country that GTAP could be using instead of the current 4% assumption across countries. Alternatively, we could follow the IMF in considering depreciation rates that depend on country's income grouping (IMF, 2021). Both will be presented and analyzed.

In terms of the source for capital stock, we are going to consider alternative sources as initial comparisons against OECD sources show a large discrepancy, see Gouma and Inklaar (2021). PWT is an attractive source because of its geographic coverage. IMF may also provide the same coverage.

In terms of modelling, Savings take a more prominent role in dynamic analyses. Nevertheless, we plan to first modify the standard GTAP model (version 7). To at least consider the additional information which would be a first step to a more detailed implementation. We consider this worthwhile because of the close relationship that the standard model has with the recursive dynamics model (GTAP-RD). As a way to illustrate these changes, we plan to implement an stylized version of the EU-Canada Comprehensive Economic and Trade Agreement (CETA).

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