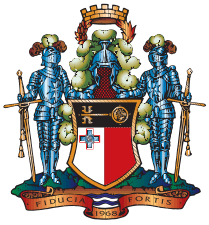

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A COMPARISON BETWEEN THE SYMMETRIC INPUT-OUTPUT TABLES COMPILED BY THE NSO AND THE WORLD INPUT OUTPUT DATABASE

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BOX 3: A COMPARISON BETWEEN THE SYMMETRIC INPUT-OUTPUT TABLES COMPILED BY THE NSO AND THE WORLD INPUT OUTPUT DATABASE[1]

Introduction

Since the 2016 Brexit referendum, a number of studies have been published to assess the potential long-term economic consequences of different Brexit scenarios on both the UK and the individual EU Member States, including Malta. In most of these studies, the main transmission channel is through the bilateral trade in goods and services between countries. In particular, most studies within this category rely on the publicly available World Input Output Database (WIOD) to calibrate the models used for the scenario analysis. Hence, the results – mostly in terms of the impact on GDP or welfare – are conditional on the quality of the underlying datasets. In the case of Malta, the results could be affected by some divergences between the WIOD and the symmetric input-output tables (SIOT) published by the National Statistics Office (NSO).

The aim of this Box is to identify and analyse the key differences between the SIOT for Malta present in WIOD, which is compiled by the University of Groningen in the Netherlands, and the SIOT for the year 2010 published by Malta's NSO in 2016.

Methodology and data analysis

The WIOD database currently presents two versions of SIOT time series for the Maltese economy. The first version was published in 2012 and presents annual industry-by-industry SIOT and Supply and Use Tables (SUT), disaggregated at a 35-industry level for the period 1995 to 2011. These tables adhere to the ESA 1995 methodology and are in line with NACE Rev. 1 statistical classification of economic activities in the European Community. The second version of the WIOD database, published in 2016, presents annual industry-by-industry SIOT and SUT, disaggregated at a 56-industry level, which adhere to ESA2010 methodology and the NACE Rev. 2 classification. This version covers the period 2000 to 2014.

Between 1995 and 2016, the NSO published various SUT, namely those for the reference years of 2000, 2001, 2004, 2008 and 2010. Over the same period the NSO published one SIOT for the Maltese economy, for the reference year of 2010, which follows ESA 2010 and is in line with NACE Rev. 2.

An analysis of the various data inputs and methodologies applied by the WIOD for the compilation processes of their SUT and SIOT put forward a number of points that users of such tables should be aware of. For instance, the WIOD does not directly estimate SIOT but rather takes the following approach: it first computes (or projects) annual SUT and the respective valuation matrices and imports use tables based on benchmark data and, subsequently, using roughly the same methodology as the NSO, it transforms the annual projected SUT into a SIOT. This in large part explains the various differences between the 2010 SIOT published by the NSO in 2016, and the 2010 SIOT produced by the WIOD

[1] Prepared by Dr Ian P. Cassar, Senior Lecturer at the University of Malta. This Box summarises the key findings of a technical report prepared by the author for the Central Bank of Malta, which report is available to bona fide researchers from Chief Officer Economics upon written request. Any errors, as well as the views expressed in this article, are the author's sole responsibility.

(2016 version). The 1995-2011 time series of SIOT in the WIOD (2012 version) uses as a benchmark the SUT for 2000 and 2001 published by the NSO. Studies that apply the most recent SIOT from the WIOD 2012 version should thus be evaluated with a certain degree of caution given the likelihood of possible significant structural changes that may have occurred from the reference year of the base SUT. The 2000-2014 time series of SIOT present in the WIOD 2016 version use as a benchmark the SUT for 2008 (in NACE Rev. 1) and 2010 (in NACE Rev. 2) also published by the NSO.

The times series of SUT and implicitly the SIOT are projected (estimated) utilising a mechanical iterative projection methodology called the RAS-SUT. The latter employs the RAS updating idea of the joint estimation of SUT. This application and the subsequent transformation from SUT to SIOT requires the input of various external time series data, whereby a number of data elements are either estimated using statistical methods or based on specific assumptions. Even for the year in which a benchmark SIOT is indeed available, that of 2010, the WIOD 2016 version of the 2010 SIOT is nonetheless still constructed by the WIOD on the basis of the SUT. To some extent, this helps to explain a number of observed differences between the two SIOT, given that the NSO also factors in the expert judgement of its statisticians for the treatment of a number of sector specific issues.

Divergences between different versions

Differences in the overall structure of the economy observed across the various SIOT are highlighted by the notable divergences in the magnitude of the sectoral output multipliers obtained from two 2010 WIOD SIOT compared to those obtained from the NSO SIOT for the same reference year of 2010. These variations imply that the different SIOT are portraying a slightly different picture in terms of the respective sectors' overall interconnectedness to the rest of the economy. Compared to the NSO SIOT for 2010, the largest variation in terms of the sectoral output production multipliers obtained were observed when compared to the WIOD 2012 version.

Divergences also emerge between the NSO SIOT for 2010 and the 2016 WIOD version (the reference years for both are 2010 and 2014). There are a number of key sectors in which the output multipliers obtained from the 2016 WIOD version of the SIOT are notably larger than those obtained from the NSO SIOT. Some of the sectors where such divergences are evident include:

- Creative, arts and entertainment activities (including gambling and betting activities);
- Financial service activities, except insurance and pension funding;
- Manufacture of food products, beverages and tobacco products.

On the other hand, some important sectors in which the output multipliers obtained from the WIOD 2016 SIOT (both 2010 and 2014) are notably smaller than those obtained from the NSO SIOT for 2010 are:

- Other professional, scientific and technical activities;
- Mining and construction activities;
- Land transport;

- Publishing activities and motion picture activities;
- Wholesale trade, except of motor vehicles and motorcycles;
- Retail trade, except of motor vehicles and motorcycles.

The reasons for the specific differences across input-output datasets in terms of the respective output multipliers obtained may stem from a number of factors. These include discrepancies in the levels of sectoral output, imports by sector, value added by sector and – crucially – sectoral intermediate input use. Indeed, significant discrepancies in terms of the levels of imports and exports of goods and services, intermediate input use and output between the WIOD 2016 tables and the NSO SIOT 2010 were observed in relation to the following sectors:

- Creative, arts and entertainment activities (includes gambling and betting activities);
- Financial service activities, except insurance and pension funding;
- Manufacture of food products, beverages and tobacco products;
- Other professional, scientific and technical activities;
- Manufacture of computer, electronic and optical products, electrical equipment, etc.

The widespread observed differences – both in terms of levels within the various elements of the SIOT, as well as in terms of the resulting sectoral output multipliers between the WIOD databases (both versions) and the NSO SIOT for 2010 – may thus have important implications within the context of their application to models that have their foundation in input-output analysis and therefore, the respective policy recommendations inferred from the results obtained.

Estimates of output multipliers that are larger than those obtained from the NSO SIOT, as is the case in the financial services and gaming industries, imply a higher level of backward linkages and interconnectedness with the domestic productive sector than what is actually observed from official data. This could lead to an overestimation of the impact that shocks to these sectors may have on the Maltese economy.

Conclusion

Studies that utilise WIOD SIOT aimed at assessing the impact on trade flows and the respective resulting economic impacts of specific scenarios should in the case of the Maltese economy acknowledge the limitations of the data input utilised. This is because the external time series input data employed for Malta, which is integral to the construction of the WIOD trade data within the WIOD, is generated via the application of projection methodologies and implicitly contingent on the assumptions employed. This fact is highlighted by the observed divergences in the levels of exports and imports of goods and services data between the NSO 2010 SIOT and the WIOD 2016 SIOT for 2010 within a large number of key sectors, particularly remote gaming, financial services and certain manufacturing sectors such as those related to food products, beverages and tobacco.

These considerations are especially relevant within the case of recent studies on the impact of Brexit.[2] These studies make use of the WIOD 2016 SIOT which are applied to computable general equilibrium (CGE) models to provide estimates of the impact on various EU countries, including Malta, of various possible Brexit scenarios. Within the CGE modelling framework, especially in studies that encompass trade flows, the SIOT and Imports matrix (and other trade data) are key datasets that are utilised to calibrate the model in such a way as to replicate the structure of the economy. Subsequently, these models are used by researchers to undertake specific scenario analysis. In light of the above discussion, researchers and policy makers should exercise a certain degree of caution when evaluating the policy implications of such studies, at least for the case of Malta, given the underlying data limitations of the WIOD 2016 database in relation to the Maltese economy.

[2] Felbermayr, G., Gröschl, J., Heiland, I., Braml, M., and Steininger, M. (2017), "Brexit's Economic Effects on the German and European Economy", study commissioned by the German Federal Ministry for Economic Affairs and Energy (BMWi), CESifo. Felbermayr, G., Gröschl, J., and Steininger, M. (2018), "Brexit through the lens of new quantitative trade theory", *IFO Institute Paper*. Bisciari, P. (2019), "A Survey of the Long term Impact of Brexit on the UK and the EU27 economies", *Working Paper* No. 366, National Bank of Belgium.