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MARSLAND PRESS
Multidisciplinary Academic Journal Publisher

Review Of Literature On Intermediate Input And Valuation

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Abstract: Measurement of value-added based productivity or gross-output based productivity requires information on prices and quantities of the flow of intermediate inputs bought by a firm, industry or sector. Even at the level of the entire economy, imported intermediate inputs constitute an important data element for productivity measurement. Yet, in many statistical systems, availability of a full set of intermediate input price and quantity indices is far from guaranteed. The main tool towards achieving this objective is the development and the maintenance of input-output tables. …input-output tables are key in this respect. Consistent KLEMS but also value-added calculations require that input-output tables are available to statisticians and researchers, as does the tackling of additional analytical issues. Although input-output tables are costly to produce and to maintain, their value as a tool for analysis is difficult to overstate and goes far beyond productivity analysis. Input output tables are also increasingly used as a tool for the construction of consistent national accounts. Such developments are highly welcome and, indeed, recommended in the SNA 93.

[Anju and Singh, G. **REVIEW OF LITERATURE ON** INTERMEDIATE INPUT AND VALUATION. *Rep Opinion* 2021;13(12):1-3]. ISSN 1553-9873 (print);ISSN 2375-7205 (online). http://www.sciencepub.net/report.
1. doi:10.7537/marsroj131221.01.

Keywords: Economics, Intermediate Input, Valuation

Introduction:

Multifactor productivity measurement – be it in the form of KLEMS or in the form of valueadded based measures of productivity – requires information on the flows of intermediate inputs: explicitly, as a factor of production in KLEMS; or implicitly, as a building block to construct measures of value added. In KLEMS measures, energy, materials and services are broken out separately. This ensures a consistent treatment of intermediate and primary inputs: quantity indices of intermediate products are weighted with their current-price share in total inputs, allowing for substitution effects between different inputs.

The level of aggregation at which intermediate inputs are identified is primarily governed by the availability of price and quantity series for intermediate inputs. Generally, the most detailed level 78 of aggregation should be used. Input-output tables are ideal tools for such purposes. They provide a consistent accounting tool where individual cells of matrices show the flow of different intermediate products to individual industries. Ideally, there is also an industry-product specific time series of price indices. The table below illustrates the use of industry-by-industry input-output tables. Each column depicts the deliveries of intermediate products from industry j to industry i, Xij, as well as primary inputs labour and capital.

The current-price deliveries of intermediate products.

When input-output tables are integrated with the system of national accounts, they are provide powerful tool for obtaining measures of value added and productivity.53 In the context of KLEMS productivity measures, they are an indispensable source for the identification, measurement and weighting of intermediate inputs. In the same context, they are also required to measure sectoral output, i.e. gross output by industry net of intra-industry deliveries.

An input-output framework for productivity measurement raises two major practical questions: − Availability and timeliness of input-output tables. Not every country's statistical system features input-output tables and where this tool is available, there is a significant time lag (often three to ten years) between the year of observation and the publication of the tables. In addition, benchmark tables are not established on a yearly basis, making it difficult to construct annual time series observations for intermediate inputs. Intermediate years between benchmark tables and recent years have to be estimated with interpolation methods such as the RAS procedure. Alternatively, it is possible to base productivity computations exclusively on available benchmark tables, calculating average annual rates of change of inputs, outputs and productivity between available years. In any event, the establishment and maintenance of inputoutput tables is costly for statistical offices. − Consistency with other statistical sources.

A second point of concern is the consistency of input-output tables with other statistical sources, in particular national accounts. In principle, consistency should prevail, and the link between input-output tables and national accounts is described in detail in the SNA 93. In a number of countries (e.g. Australia, Canada, France, United Kingdom, the Netherlands, Denmark), this integration exists but in other countries these statistical tools are only partly integrated. Inconsistency can lead to different sets of productivity figures, or biased results if sources are mixed.

Review of literature

As a consequence, countries specialize in one or more tasks of the production chain and the values of fi nal products are dispersed among countries (Baldwin, 2006). Under this background, the concept of "global value chain" is introduced, which describes the values generated along the production chain from raw materials to the fi nal product that ends in consumers' hands. Take the smartphone as an example. Suppose China exports a $300 smartphone to United States. China may only produce $10 of the total value of the phone. The rest of it is imported from other countries: graphic design from California, metals mined in Bolivia, Silicon chip from the factories in Singapore etc. (Xing and Detert, 2010). However, when the traditional trade statistical method is applied, the import of this phone increases the US trade defi cit with China by $300. Thus, the traditional trade data cannot refl ect the true story. To fully understand the trade, we need to trace the value added by countries in producing this phone. Due to the lack of aggregate data, the fi rst research works are limited to fi rm's or product's micro-level. For instance, Dedrick et al. (2010) and Xing and Detert (2010) investigate the value chain of Apple products. The fi rm-or production-level researches only consider the value added structure of fi rst tier suppliers and are limited to macroeconomic issues. Meanwhile, researchers find that the statistics of exports are misleading, so they switch their attention to a macro level to explore the value composition of exports. Large proportion of these researches focuses on measuring international fragmentation in value chains. The calculation of trade in value added requires data not only on production process, but also on the direction of trade in every stage of the production of goods. Hence, the input-output tables, which include imported input, output and exports, tend to be an appropriate analytic instrument. Lots of projects are set up to construct multinational input-output database in order to provide a consistent set of information to facilitate the comparison among sectors, countries and over time. Hummels et al. (2001) introduced the vertical specialization and developed two indicators to measure it. The primary measure (VS) measures the value of the imported inputs embodied in goods and services that are exported. VS equals to the total value of direct and indirect intermediate imported goods divide the gross export. The second measure (VS1) measures the value of exports that are embedded in a second country's export goods. Using the input-output matrices of 10 OECD countries and 3 non-OECD countries, they found the vertical specialization grew almost 30% between 1970 and 1990. Meanwhile, the growth in vertical specialization accounted for 30% of the growth in these countries' exports.

This kind of participation can be measured by "vertical specialization 1" in literatures (Hummels et al., 2001). Put this into consideration, Daudin et al. (2011) calculated the imported value embodied in exports (VS) and exports used by other imported countries to produce input for exports (VS1), using the database of the Global Trade Analysis Project(GTAP). They used the ratio of VS1 over VS to distinguish two types of participation in the international fragmentation of the production process. The VS1 to VS ratio for primary producers and producers of industrial input for processing countries took part in global value chains through the production of inputs for further exports, are bigger than one. Other countries as the fi nal exporters have VS1 to VS ratio smaller than one. Their paper confirmed that Asia, America and Africa relied more heavily on extra-regional final markets than standard trade statistics suggest. European Union is less dependent on vertical specialization trade. Koopman et al. (2010) further constructed a framework that can integrate both indicators. This framework divided exports into two value-added parts, domestic and foreign. Moreover, the domestic value-added component could be decomposed into three parts: absorbed value added exports, indirect value added exports and refl ected domestic value added. They applied the decomposition to compute revealed comparative advantages and construct an index to describe whether a country-sector is likely in the upstream or downstream of global value chain. As been pointed out in Koopman et al. (2010), this composition equation traced only the direct effect and the first round of the indirect effect, which meant that this method ignored a probability that the value added embodied in an intermediate could travel through many sectors before it is exported. Johnson and Noguera (2012) constructed another indicator to measure the "domestic content of exports"—VAX ratio. Using the GTAP database, VAX ratio is calculated for 87 countries and regions as a measure of the intensity of production sharing. Moreover, they investigated the direction of the bilateral trade—whether the exports were absorbed in the destination country, redirected to a third country, or refl ected to the origin export country. Results showed that China, as a production sharing hub, has a relatively lower absorption rate of imported goods and a high proportion of imported goods used for exports.

Previous studies concentrated on investigating the value added in direct tradespecific-relationship among countries, Meng et al. (2012) started to consider the intercountry production network among countries. He distinguished two concepts— value added in trade and trade in value added. The later one is expressed through two types of VAiT—value added embodied in its exports when the single I-O model is used and the value added induced by the trade in intermediate goods from exporters to importers. They applied the concept of trade in value added to study the evolution of regional economic integration and global value chains, answering questions "who produces intermediates for whom". Furthermore, they explored to evaluate comparative advantages on the basis of trade in value added.

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10/3/2021

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