

TRANSPORT SATELLITE ACCOUNTS: RECENT DEVELOPMENTS

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INTRODUCTION

The need to better understand the transport sector is arising from an increasing number of challenges such as capacity constraints, congestion and CO₂ emissions. This has led a number of countries to demand and develop expanded and improved statistics on both the transport industry and transport activity.

Transport satellite accounts (TrSA) promise a relatively new tool to measure and analyse the transport sector as a whole. Satellite accounts provide an accounting framework linked to the national accounts and which enable attention to be focused on a certain field or aspect of economic and social life. Common examples are satellite accounts for the environment and tourism.

Recently, a number of countries have started looking at the feasibility of transport satellite accounts to answer some of the key transport policy questions. TrSA have a potential to answer questions such as impact of transport policies (vehicle charges, fuel excise, congestion charges) on industries, regions, different users and consumers. They can also address issues on productivity, energy consumption, and employment, among others.

While traditional national accounts only include transport services rendered to third parties, satellite accounts can include own-account transport and even transport produced by households. They also provide data critical to economic modelling such as input-output or computable general equilibrium models (CGE) by presenting detailed transport supply and use of products by sector (e.g. business, government, households) and mode of transport. The main benefit of TrSA lies in their flexibility to take into account all transport supply and use and combine this information with other data, such as emissions or source of financing.

The purpose of this short paper is to introduce the concept of transport satellite accounts and present some of their applications. It also aims at giving an overview of international work to date on TrSA. This overview is based on a stocktake of International Transport Forum member countries and on an international literature review carried out by the Australian Bureau of Statistics and the ITF Secretariat.

The possible need for the development of international standards for TrSA is also discussed. A small number of transport satellite accounts are available but they are mostly carried out using different definitions and classifications, reducing the comparability of results. On the other hand, too strict

standards might reduce the analytical capabilities of TrSA to respond to exactly those questions considered important in the country. Taking into account the need for comparability and need to respond to national needs, this paper concludes with a proposal on steps forward to increase international co-operation and exchange of information on transport satellite accounts.

WHAT IS A SATELLITE ACCOUNT?

Satellite accounts are statistical tools that enable economic analysis of specific topics, not covered in the traditional national accounts. In the following, some basic concepts are reviewed, especially the system of national accounts (SNA), supply and use tables (SUT) and finally satellite accounts.

System of national accounts

The system of national accounts provides a comprehensive framework in which to present statistical data on economic transactions between establishments. The SNA consists of a “coherent, consistent and integrated set of macroeconomic accounts, balance sheets and tables based on a set of internationally agreed concepts, definitions, classifications and accounting rules” (SNA, 1993). They structure the costs of production and income generated in the production process, the flow of goods and services produced within the national economy, and the flow of goods and services with the rest of the world in a comprehensive way, and also provide the basic information for the derivation of detailed input-output tables that are extensively used for purposes of economic analysis and projection.

The accounts themselves include a great deal of detailed information on production, incomes and consumption, obtained from a variety of statistical sources and studies. The way they are organised makes it possible to present the working of an economy in a condensed way. They provide a comprehensive approach to the detailed recording of the complex economic interactions that take place between different actors on markets. The SNA gives information about the levels of economic activity surrounding an economy’s productive assets, and about the wealth of its inhabitants at particular points in time.

The central framework of the system of national accounts consists of detailed supply and use tables in the form of matrices that record the extent to which supplies of different kinds of goods and services originate from domestic industries and imports, and how these supplies are allocated between various intermediate or final uses, including exports. The same classification system, concepts and definitions apply to both supply and use and input-output tables as to the other aspects of national accounting.

The supply-and-use framework includes two tables: the supply table and the use table. These two are closely linked. The supply of every product in the supply table must be equal to the use of that product in the use table (measured at the same prices). Similarly, the output of an industry must be equal to the cost of its production.

The supply table describes the sources of supply of products to the economy. Total supply is separated into two different sources, domestic production and imports (Table 1). Matrix X describes the production of product c ($c = 1, \dots, k$) by resident industry j ($j = 1, \dots, n$). Vector M describes the foreign imports of products c . The total supply of the goods at basic prices is shown in $Q(b)$, which equals the supply from resident producers plus imports from abroad. The total output by industry $Q(b)$ is a $1 \times n$ matrix and is obtained by summing up the products c produced by industries j .

The total supply at purchasers' prices $Q(p)$ is obtained by adding to the total supply of products at basic prices $Q(b)$ their trade and transport margins (TM) and taxes minus subsidies (TX). It should be noted that the trade and transport margins are deducted from the trade and transport service industries at the same time. Therefore, the sum of the elements of vector TM equals zero.

Table 1. A Simplified Supply Table at Purchasers' Prices

	Industries	Imports (c.i.f.)	Total product supply at basic prices	Trade and transport margins	Taxes minus subsidies	Total supply at purchasers' prices
Products	X	M	Q^(b)	TM	TX	Q^(p)
Total industry output at basic prices	Q^(b)					

The use table, in turn, describes both the cost of production in every industry as well as the use (demand) of every product (both domestic and imported). The total use of a product is separated into three parts: 1) intermediate consumption, 2) final consumption, and 3) exports (Table 2). Matrix U describes the use of product c by industry j (intermediate consumption), while matrix Y represents the use of products according to final demand categories f (f = 1,...,t).

The final demand can be divided into household consumption, government final consumption, and gross capital formation (investments). Exports of products c are, in turn, marked E. The total demand at purchasers' prices by product c equals $Q(p)$. Matrix V describes the use of primary inputs h (h = 1,...,p) by industry (value-added and its components). The total use of inputs (intermediary and primary) is given by vector $Q(b)$, which equals the total industry output at basic prices.

Table 2. A Simplified Use Table at Purchasers' Prices Use Table

	Industries	Final Demand	Exports (f.o.b.)	Total use at purchasers' prices
Products	U	Y	E	Q^(p)
Gross value added	V			
Total industry output at basic prices	Q^(b)			

Satellite accounts

Despite the benefits, the central framework of national accounts described above can also be limiting because of strict definitions and coverage. Satellite accounts expand the national accounts to cover a specific area of concern. Simply put, satellite accounts supplement existing accounts and organise information in a consistent way that suits a particular analytical focus.

Satellite accounts enable a more comprehensive picture of an economic activity by bringing together components of that activity throughout the economy, including activities which are internal to the firm or for households and for which there are no observable prices. For example, in the traditional accounts, the output of transport services only includes services sold to third parties. Any transport

services produced by companies for their own-account are not included. Analysing then an impact of, let's say congestion charge on industries, would only include those industries that are purchasing transport services, while impact of the new charge on the cost of those industries producing their transport services own-account would be left outside. This is of course just one example.

Satellite accounts also present increased opportunities to link physical data with the monetary accounting of the SNA. From a transport perspective this physical data could represent data such as freight ton-kilometres, passenger kilometres, employment characteristics or number and type of transport vehicles. It also presents options to link transport use (by all sectors) to non-monetary accounts such as energy use.

Basically, two types of satellite accounts can be distinguished; narrow or broad satellite accounts (see also SNA, 1993). First type of accounts involves rearrangement of some classifications or introducing additional elements while maintaining links to the existing national accounts. They typically expand a particular segment of the existing accounts with more detail and additional information, including non-monetary information such as employment, numbers of visitors, or the physical volumes of energy use.

The second type of satellite account involves altering concepts normally used in the SNA and widening the production boundary. They may also use definitions and classifications that differ from those in the existing accounts. Depending on the analytical focus, the production boundary of the national accounts can be maintained or modified (i.e. presenting an alternative view).

Analytical use

Although useful for many analytical purposes, statistics based on 'what is transported' or 'mode of transportation' as measured in physical units such as tonne-kilometres have limited economic utility as the value of transported goods and the cost of transporting goods varies according to both what is transported and how it is transported. The use of monetary values makes it possible, for example, to add together the values of different goods and derive a single measure of the value of the entire transportation activity in the system. This data can then be used by itself or combined with other data to analyse changes in transportation services themselves (i.e. as commodities) and their relationships to other industries (e.g. which industries are the biggest users of transport services and which industries might be affected by particular transport policies or decisions).

A satellite account for transport has a potential to provide an overarching framework for the development of integrated statistics on transport and help to ensure consistency between data sets, over time and possibly within and between nations. A transport satellite builds on existing statistical work, making use of the existing statistical systems and classifications to provide a clear system for producing, presenting and analysing transport data. Such a system is helpful because at present the integration of transport, economic and environmental information necessary for informed policy development and government decision making is often weak.

Statistics on transport can be organised in many ways depending on how they are to be used. For example, statistics may be produced according to the type of transport service provided – freight for goods, passenger for people, and other transport services needed to support transport system infrastructure. They may be organised according to the type of transport equipment used (or mode of transport), such as aircraft, trains, buses and boats. Or they may be organised into groups of establishments with similar input structures (industries).

A TrSA therefore presents an excellent opportunity to draw together transport value and volume data (such as that outlined above) into a single accounting framework. Some of the other benefits of compiling a transport satellite account include:

- Enabling estimates of the contribution of total transport activity in the economy, including transport services provided in-house by businesses where transport is not their primary activity;
- Estimating total transportation values would not be affected when businesses switch from own-account to for-hire services or vice versa;
- Allowing estimation of the contribution of transport to GDP and other macroeconomic variables;
- Identifying products and services which are characteristic or connected to transportation (and which industries supply and use these). Links could also potentially be drawn between transport use and the environment (e.g. fuel use and links to carbon emissions);
- Providing an overarching framework for the collection of transport statistics;
- Providing data critical to economic modelling such as computable general equilibrium models by presenting detailed transport supply and use of products by sector (e.g. business, government, households) and mode of transport;
- Incorporating both volume (e.g. employment, freight movement data) and value data;
- Possibility of linking physical infrastructure data, and
- Providing a range of data which will also ensure improvements to the quality of transport data feeding into the system of national accounts, including the input-output tables.

INTERNATIONAL WORK

The International Transport Forum has undertaken an informal stocktake of its 52 Member countries to determine who has undertaken a TrSA or plan to do so in the immediate future. This stocktake has been complemented by an international literature review carried out by the Australian Bureau of Statistics and the ITF Secretariat.

Transport satellite accounts have been developed in a small number of countries to date. One of the first transport satellite accounts was constructed for the United States. As a satellite to the 1992 benchmark input-output tables, the primary purpose was to provide a systematic and consistent framework and data set for conducting analytical studies of the role of transportation in the economy on both an industry and commodity basis. Analysis focused on measuring the in-house transport of industries (BTS, 1999). An update was compiled with respect to 1997 and a 2002 benchmark is currently being compiled.

In France, TrSA were constructed for 1992, 1996 and 1998 (INSEE, undated). French studies present current spending and capital spending for each mode of transport. They expand the traditional production boundary by taking also into account the social costs of transport (externalities) and furthermore by considering also private purchase and use of cars as part of the accounts (INSEE, 1996).

In Belgium, the transport satellite accounts are drawn up at the national level for the years 1995 and 2000 while accounts for 2005 are currently underway. The construction of accounts follows the same frequency as that of the input-output tables and the methodology used follows, to a large extent, the methodology developed and applied in France (Hoornaert *et. al.*, 2009).

In Italy, the first transport satellite account was done for the benchmark year 1992. It focused on the calculation of the own-account transport similarly to that in the United States. The Italian analysis furthermore focused mainly on road transport (Putignano and Montella, 1993)

Preliminary research work has also been done to produce a transportation satellite account in Canada and Australia. Within Australia, the ABS and the Bureau of Infrastructure, Transport and Regional Economics (BITRE) have commenced discussions with state government agencies and industry associations to develop a more detailed understanding of the role transport satellite accounts can play in addressing transport information needs. At present, development of a satellite account by the ABS is currently unfunded.

To date, TrSAs have been constructed in response to demands for better understanding of the wider contribution and impact of transport on the whole economy. However, findings of the international literature search into TrSA revealed a number of challenges in compiling comparable transport satellite accounts. Some of these challenges are listed below.

- The scope and coverage of the satellite accounts varies considerably, depending on data availability and the policy questions each country wants to measure;
- Some of the measurement issues associated with transport are quite complex in comparison to alternative industry satellite accounts (e.g. tourism satellite accounts), due to the varied nature of the transport industry and the distribution of transport activity across the whole economy;
- Measurement issues arise where the national accounts production boundary is expanded to include the purchases of motor vehicles by households as a capital item, i.e. including the services of own account transport by households;
- There are no known regional TrSA estimates produced internationally. This is mainly due to the limited number of regional input-output tables and related data on interregional trade flows to support this;
- Some of the satellite accounts show the contribution of the various institutional sectors (e.g. government, business and households), transportation modes and types of expenditure (e.g. passenger and freight expenditure);
- In some cases, government enterprises are not included (e.g. postal services);
- It appears there has been very little work in the TrSA in estimating the wider concept of transportation employment across the whole economy;
- France and Belgium included consumption and capital expenditure on transportation related infrastructure and assets (e.g. household purchases of motor vehicles) in their accounts while others do not; and
- To date all work has focused on supply-use tables. As yet, there has been limited work on developing asset accounts or financing accounts (i.e. who is financing the expenditure on transport infrastructure) and developing transportation infrastructure in physical or volume terms (although Belgium have estimated transport expenditure by source of funding).

The findings clearly indicate that there is considerable variation in both the scope and treatment of transport activity in TrSA from country to country. The lack of international agreement on standards for transportation statistics and accounts means the scope and methodology of measuring transport activity is currently open to statistical agencies to define. The result is the transport satellite accounts prepared are not comparable.

IS THERE NEED FOR HARMONISATION?

In a global environment where transport is a key element for trade and environmental issues (e.g. carbon reduction) and nationally many countries face common problems (e.g. urban congestion), the need for comparable information to develop policies to address transport issues might become more important.

At this stage a formal international process for the standardisation of transport satellite accounts has not been established. Preliminary discussions have been held between some national institutions, the International Transport Forum and the OECD. In the meantime, the ITF Secretariat sent a small questionnaire to its data suppliers in the 52 Member countries, in order to undertake a stocktake of existing transport satellite accounts and to find out the extent to which countries would be interested in participating in a possible informal group to improve their comparability.

Answers from 29 countries were received of which 15 countries said they were interested in participating in an informal group to develop more comparable transport satellite accounts. Among them, four countries have already developed TrSA (Belgium, Canada, France and USA), one is studying the feasibility of TrSA (Australia) and ten do not have TrSA (Austria, Czech Republic, Germany, Greece, Hungary, Iceland, Ireland, Japan, New Zealand, Romania).

Internationally the United Nations Statistics Commission (UNSC) is the organisation ultimately responsible for adopting international statistical standards. For example, in recent years the UNSC has adopted two satellite accounting systems: the System of Environmental-Economic Accounting for Water (2007) and Tourism Satellite Accounts (2008). The Tourism Satellite Account was jointly developed by the OECD, UN Statistics Division, Eurostat and the World Tourism Organisation (see OECD 2001).

Working towards international standards for transport satellite accounts might help to resolve inconsistencies across countries in the longer term but in the interim, each country has a range of theoretical and practical issues that need to be addressed. These include:

- How best to measure transport activity - from the supply side only or also from the demand side? A demand side measure includes all purchases of transport related goods and services (e.g. motor vehicles, fuel and motor vehicle insurance) by consumers and other end users;
- Should transportation services provided by households for their own use be included in a TrSA? This would expand the production boundary of the national accounts to account for the production of 'unpaid household work' by households;
- Should own account transportation output be valued as the product of a quantity measure of output and the market price for a similar service (including profit margin) or valued on sum of the input costs?
- What is the scope of transportation – should it include off-road use of vehicles such as farm vehicles and on-site mine vehicles?
- Is there support for logistics and storage to be treated as a separate sub-industry in the TrSA?
- Should some estimate be made of the physical volume/value of transportation infrastructure and/or the capital stock of transportation assets in the economy?
- How and what types of employment should be measured in a TrSA? For example, data sources might dictate that employment estimates are only possible for the wider transport industry, or possibly by mode or selected occupations;
- National vs regional accounts. At present, many countries do not produce regional input-output or supply-use tables. As such for practical reasons it will not be possible to provide a breakdown of the TrSA by state and territory using the same compilation methodology.

The above issues are just some of the conceptual and methodological issues that need to be considered in compiling a TrSA. Statistical agencies will also need to consider the issue of whether a TrSA might be a one-off account or compiled with the intention of producing ongoing accounts. If the latter, there are issues to be considered such as the regularity of producing 'benchmarks' as opposed to deriving TrSA estimates using extrapolation techniques between benchmark years.

Decisions on scope and methodology are likely to be influenced by data availability but even more so by policy drivers and user priorities. A key issue will be to what extent should the current limitations on data sources and methods (i.e. the practical aspects), limit the development of the theoretical framework.

CONCLUSIONS

This paper introduced transport satellite accounts as a promising tool to better measure and analyse the transport sector. Transport satellite accounts are a flexible way to supplement existing national accounts and to reorganise available information in a consistent way to answer specific analytical questions.

It is hoped that this paper provides the impetus for transport agencies throughout the world to discuss the options for a transport satellite account with their own statistical agencies, with a view to expanded and more consistent transport data internationally in the future.

The paper also reviewed international work on transport satellite accounts to date based on a stocktaking of the International Transport Forum member countries and on an international literature review carried out by the Australian Bureau of Statistics and the ITF Secretariat. Few countries have constructed TrSA and a number of countries expressed interest to exchange information on current progress and in participating in an informal group to develop more comparable transport satellite accounts.

Based on responses, enough flexibility is still needed to enable TrSA to answer relevant policy questions. There is certainly room for informal exchange of best practises and results in order to increase comparability of results between countries and also to possibly save research efforts in solving some of the questions researchers are facing when constructing a transport satellite account.

In general, there is need to continue developing better data for improved analysis and as a part of this the International Transport Forum has established an informal e-mailing group to discuss further development of TrSA around the world. The aim is to provide an opportunity to exchange ideas on TrSA and learn how these have been used for policy purposes. The ITF website provides links and contacts to those institutions that have produced satellite accounts for transport. A dedicated website is available under www.internationaltransportforum.org/statistics/AddSurveys/TrSA.html

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