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## Conference Paper

# Estimating interregional trade flows in Andalusia (Spain)

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## **Estimating interregional trade flows in Andalusia (Spain)**

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### **ABSTRACT**

One of the most important tasks for constructing regional use and supply tables is the accurate estimation of interregional trade flows, which can be carried out indirectly by non-survey statistical and mathematical methods or directly by surveys. The former methods allow estimating interregional trade at a low cost though assuming many times certain arbitrary hypothesis. Nevertheless, the enlargement of a yearly yet existing survey with a wide coverage of firms, such as the Annual Regional Accounts in Andalusia (Spain), elaborated by the Institute of Statistics of Andalusia, can provide two important advantages at a low cost: the estimation of interregional trade for a certain region and the estimation of the structure of distributive channels for each product and industry, both on a yearly basis. With both purposes, this paper makes a proposal for incorporating interregional trade flows to the present yearly regional accounts survey for the Andalusian economy.

**KEYWORDS:** Interregional trade, trade margins, input-output analysis.

**JEL CODES:** D57; C82; F14.

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## 1. Introduction

One of the most important tasks for constructing regional use and supply tables is the accurate estimation of interregional trade flows. Besides, the precise knowledge of interregional trade not only is crucial for analysing interregional interdependencies but allows for knowing the actual spatial organization of markets within a regional economy. Moreover, there is an increasing interest in the literature for developing new procedures that may provide more accurate estimations of interregional trade and its consequences on regional economic development, i.e. Pulido & Llano (2002) and Llano (2004a, 2004b) for Spain, Kauppila (1999) and Piispala (2000) for Finland and Boomsma & Oosterhaven (1992) and Eding & Oosterhaven (1996), for the Netherlands.

Interregional trade can be estimated indirectly by non-survey statistical and mathematical methods<sup>1</sup> or directly by surveys. The former methods allow for estimating interregional trade at a low cost though assuming many times certain arbitrary hypothesis. For instance, in most of the outcomes of non-survey procedures no cross hauling is possible. That is, a region is either an exporter or an importer, but not both at the same time (Piispala, 2000). Therefore, these kinds of methods permanently underestimate interregional trade (Harris & Liu, 1998; Susiloto, 1996).

Additionally, there are national accounting based interregional trade estimates, which use ratios of e.g. production, value added and intermediate or final consumption. However, some *a priori* criteria are needed and sometimes these lead to unreliable and not accurate results. Nevertheless, there are recently published efforts to improve national interregional trade estimates (Llano, 2004a, 2004b) using physical interregional transport flows.

In this sense, we argue that non-survey methods or indirect procedures through proxy variables are indeed second best options. Given limited resources, it is the best choice for estimating interregional trade. In contrast, the enlargement of a yearly yet existing survey with a wide coverage of firms can provide two important advantages at a low cost: the estimation of interregional trade for a certain region; and the estimation of the distributive channels structure for each transaction, both on a yearly basis. This is the case of the Annual Regional Accounts in Andalusia (Spain), elaborated by the Institute of Statistics of Andalusia.

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<sup>1</sup> See e.g. Millar & Blair (1985, ch.9) for a full description of the methods.

Following Wilson (1970), Susiloto (1996), Kauppila (1999) and Piispala (2000), the best way to conduct accurate interregional trade flows estimates consists of surveying establishments at a low cost. This would lead to improvements not only in trade issues but in other economic figures including the whole national or regional accounting system. Thus, this paper proposes to enlarge the existing Annual Regional Accounts survey in Andalusia to include a limited number of new questions regarding trade flows.

## **2. Methodology**

Surveys are the most important instrument for collecting reliable information on interregional trade. However, we can design surveys directly to establishments asking for the geographical destination of the products they sell, or surveys to wholesalers and retailers, which would imply an indirect approach. But actually, both direct and indirect approaches do not need to be opposites. In the literature, we can find significant works by Siddiqi and Salem (1995) for Canada, Kauppila (1999) for Finland and Eding et al. (1999) for the Netherlands.

As a result of these experiences, some initial considerations should be taken into account in order to design and collect all the needed information in the Andalusian case.

### *Some initial considerations*

(a) The difficulty of estimating in a short period of time the geographical distribution by commodity of the total sales of surveyed establishments and the doubtful knowledge of that information by the own firms, make us adopt the industry approach. That is, we will be interested in the geographical distribution of the total sales of a firm instead of the total sales of each commodity produced by a firm. However, this would lead to introduce later additional assumptions about the geographical distribution of each produced commodity.

(b) Establishments know the geographical distribution of their sales better than the geographical origin of their purchases. This leads to assume an exporter approach, which is based on the destination of commodities produced rather than on the origin of purchases. Many times, the type of client is better known than geographical issues concerning sales.

(c) The geographical areas considered would be: Andalusia, rest of Spain, rest of the European Union and rest of the world. Alternatively, we can additionally consider rest of Spain in a more detailed way (NUTS 2 regions)<sup>2</sup> but however, this would be far beyond the purpose of this paper.

Similarly to what it is being done in the Netherlands (KvK, 1996), we propose to collect information on interregional trade flows within the framework of an existent and yearly survey with a wide coverage of firms. This is the case of the Annual Regional Accounts in Andalusia (Spain), which is elaborated by the Institute of Statistics of Andalusia (IEA, onwards). The below considerations should therefore be considered.

In addition, survey-based interregional trade information is not the only valid data source to be taken into account. Other sources such as transport statistics could be of much help. Actually, the accuracy and consistency of interregional trade estimates depend greatly on the variety of sources used for the analysis.

#### *Estimation procedure*

For a commodity  $j$ , let  $\mathbf{V}_j$  be its total production;  $\mathbf{ME}_j$  their total imports from the rest of Spain;  $\mathbf{MU}_j$  their total imports from the rest of the European Union and  $\mathbf{MM}_j$ , their total imports from the rest of the world. Then, it is verified that:

$$\mathbf{V}_j + \mathbf{ME}_j + \mathbf{MU}_j + \mathbf{MM}_j = \mathbf{U}_j + \mathbf{C}_j + \mathbf{I}_j + \mathbf{XE}_j + \mathbf{XU}_j + \mathbf{XM}_j \quad (1)$$

where for a commodity  $j$ ,  $\mathbf{U}_j$  is the total intermediate consumption;  $\mathbf{C}_j$ , the total final consumption;  $\mathbf{I}_j$ , total investments (including changes in stocks); and  $\mathbf{XE}_j$ ,  $\mathbf{XU}_j$  and  $\mathbf{XM}_j$  total exports to the rest of Spain, rest of the European Union and rest of the world, respectively.

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<sup>2</sup> NUTS (Nomenclature des Unités Territoriales Statistiques) is the regional classification system of the European Union. Level 2 regions in Spain would be: NORTHWEST (Galicia, Asturias and Cantabria), NORTHEAST (Basque Country, Navarra, La Rioja and Aragón), MADRID, CENTER (Castilla León, Castilla La Mancha and Extremadura), EAST (Catalonia, Valencian Community and Balearic Islands) and SOUTH (Andalusia, Murcia, Canary Islands, Ceuta and Melilla).

Within equation (1), all variables except for imports and exports are collected yearly by the Annual Regional Accounts survey (IEA) and, therefore, they are known. Regarding foreign exports and imports, information is also very well-known through the Spanish Institute of Foreign Trade (ICEX). However, we do not find accurate and reliable information about domestic exports and imports. To solve that, an enlargement of an existent survey is proposed to estimate  $\mathbf{XE}_j$  (exports to the rest of Spain) and then, residually, the total imports from the rest of Spain  $\mathbf{ME}_j$ .

Nevertheless, as a result of the residual difference, we know that it could be possible to find negative imports from the rest of Spain in some cases. Anyway, it would be advisable in those cases to look for other additional sources on imports or even asks for experts' opinions.

At this point, we are getting very near to the so-called double-entry methods for constructing regional input-output tables on the basis of not only exports but imports, using the latter to verify the accuracy of the former, or vice versa.

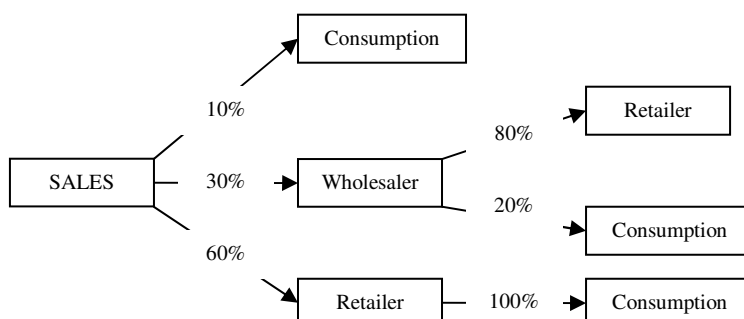
#### *Distributive channels*

Following the European System of Accounts (1996) consider a use matrix  $U$  with order  $(n \times m)$  comprising commodities  $i$  consumed by industries  $j$ , and a supply matrix  $V$  of order  $(m \times n)$  showing the produce of industries  $i$  in terms of commodities  $j$ . Notice that there are  $m$  industries and  $n$  commodities.

EUROSTAT imposes for each member state of the European Union and each region, the publication of a supply table at basic prices and two use tables which differ by valuation; one is valued at purchasers' prices and the other at basic prices. Particularly, net commodity taxes, and trade and transport margins matrices are needed to transform the former into the latter (see ten Raa and Rueda-Cantuche, 2004, for further details).

Trade margins are addressed in particular for the Andalusian economy in Asensio, Rueda-Cantuche and Titos (2005). These authors assume the most frequent distributive channel in each one of the types of transactions included in the use matrix. Besides, the type of channel involved in each transaction is estimated on the basis of a research carried out by the Finance Regional Ministry of Castilla-León (Spain) in 1990, which is not so satisfactory than it was fifteen years ago. Hence, new research urges.

Indeed, our proposal allows for collecting information about the share of each transaction that has been made directly to consumers or through wholesalers and/or retailers. For instance,



In this example, percentages (which can also be interpreted in probabilistic terms) would be survey-based estimates. Then, the share of total sales which has been made e.g. through wholesalers and retailers would be simply  $0.3 \cdot 0.8 = 0.24$ , i.e. 24%. The rest of figures would be 10% for directly consumed goods, and 6% and 60%, for those goods delivered only by either wholesalers or retailers, respectively. It is straightforward that the sum of all these percentages must be equal to a hundred. Notice that we assume implicitly that retailers always sell directly to consumers.

This procedure can be carried out as detailed as desired since it allows to distinguish for each transaction different shares of each distributive channel and not the most frequent, as it is being done so far.

*Information requirements*

The following scheme illustrates the additional required information on interregional trade to be included in the Annual Regional Accounts survey:

**Manufacturing industries:**

**Total sales**

<b>100%</b>
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Direct sales

Andalusia

Rest of Spain

Rest of EU

Rest of the world


Sales to wholesalers	
Andalusia	
Rest of Spain	
Rest of EU	
Rest of the world	
Sales to retailers	
Andalusia	
Rest of Spain	
Rest of EU	
Rest of the world	

**Wholesale industry:**

<b>Total sales</b>	<b>100%</b>
Ventas directas	
Andalusia	
Rest of Spain	
Rest of EU	
Rest of the world	
Sales to retailers	
Andalusia	
Rest of Spain	
Rest of EU	
Rest of the world	

**3. Conclusions**

The estimation of interregional trade is one of the most important issues and at the same time, one of the less frequently analysed features within a Regional Economic System of Accounts. The great difficulty and implicit cost of collecting the required information as well as the availability of interregional trade flows only every five years, due to input-outputs frameworks, motivate the search for new procedures that may improve the accuracy and reliance of interregional trade estimates at a reasonable cost.

Hence, the Annual Regional Accounts survey provides the best choice to additionally include the required information about trade, which would allow for:



- (a) Obtain on a yearly basis more accurate estimates of Andalusian exports and imports to and from the rest of Spain, rest of the European Union and rest of the world.
- (b) Estimate the shares of each type of distributive channel within each transaction of a regional use table. Even a geographical distinction can be derived.

Perhaps in the literature, other lower cost methods can be found but all of them are mainly statistical and mathematical devices that assume implicitly certain arbitrary hypothesis. Our proposal deals with real data and the results may provide accurate and reliable estimates as well as yearly information to include in annual regional statistics. Actually, all regional or national statistical offices may profit from adopting this procedure to improve the quality of their respective annual statistics.

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