

Analysis of intra-Community supply of goods shipped from Poland

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Abstract

After ceasing all customs duties at the borders between EU member states, the Community lost a viable source of data on international trade. This is why the Intrastat system was introduced. Poland's accession to EU imposed new duties on every entity selling goods to or buying them from other EU member states. Such businesses are required to submit INTRASTAT declarations to National Revenue Administration. Statistical data on international trade collected in the process are then combined at Eurostat. Such data are often incompatible. An example is the difference between two datasets: one containing data on intra-Community supplies (ICS) dispatched from Poland and the other containing data on intra-Community acquisitions (ICA) originating in Poland. The authors have examined such differences on Combined Nomenclature chapter (2-digit) level for both total figures and divided by country. The next part of the survey was to classify countries by the structure of ICS from Poland. The goals of the article were pointing out the CN chapters with the largest differences between ICS and ICA from Poland and what follows – that choice of the source of data on foreign trade may result in different outcomes and conclusions. We need to stress out that we will base our whole work on public statistics only. The very same data serve as the basis for all knowledge on EU intra-Community trade.

Keywords: *Intra-Community supply, cluster analysis, public statistics*

JEL Classification: C38, F14

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1 Introduction

One result of creation of the EU (and its predecessor, the EC) is that all customs duties at the borders between EU countries were revoked. At the same time all customs clearances stopped and Simple Administrative Documents (SADs) are no longer in use between EU members. Thus, the Community has been deprived of a viable source of data on international trade. It became necessary to introduce a new, common system of statistics of trade in goods. This is why on January 1st, 1993 the Intrastat system was introduced in the whole area of the European Single Market.

In Poland these regulations became effective on May 1st, 2004, i.e. Poland's accession to EU imposed new duties on every entity selling goods to or buying them from other EU member states. An entity trading in goods with other member states of the EU is required to

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submit INTRASTAT declarations on intra-community supplies and acquisitions to Revenue Administration Regional Office in Szczecin. Effective March 1st 2017 National Revenue Administration has taken over the collection process of data gathered through INTRASTAT declarations as well as data management and the process of creating a dataset for Central Statistical Office with the use of its own resources. Deploying the INTRASTAT system after the accession was a huge project and it still needs maintaining. A similar project, started in 2012 in Croatia, has lately been described in detail by Erceg (2015).

Statistical data on international trade collected from individual declarations are then combined at Eurostat (European Statistical Office) together with other countries' data. There are still works underway aimed at getting the datasets from different national statistical offices fully comparable and compatible. These works are of great importance since huge discrepancies still exist. An example is the difference between two datasets – first of them containing data on intra-Community supplies (ICS) dispatched from Poland (collected at national level) and the second containing data on intra-Community acquisitions (ICA) originating in Poland (aggregated by Eurostat from other EU members data) that will be addressed later in the article. The above-mentioned differences between datasets are hard to explain in terms of exchange rate or late collection of data. The authors have examined such differences on Combined Nomenclature chapter (2-digit) level for both total figures and divided by country. The next part of the survey was to classify countries by the structure of ICS from Poland. The goal of the article is to point out the CN chapters with the largest differences between ICS and ICA from Poland and what follows – that choice of the source of data on foreign trade even from the same database may result in different outcomes and conclusions. We need to stress out that we have based our whole work on public statistics only. The very same data serve as the basis for all knowledge on EU intra-Community trade.

2 Public statistics of foreign trade

EU member states data on international trade are collected within two parallel systems of collecting public statistics. These are: INTRASTAT system – a system of public statistics containing data on intra-community trade, which is based on data collected from Intrastat declarations, EXTRASTAT system – a system of public statistics containing all trade with third parties (that is countries other than EU members). Data obtained from these two parallel systems constitute homogenous set of statistical data on foreign trade turnover.

On June 1st 2016 Polish Ministry of Finance has deployed a new computer system AIS/INTRASTAT dedicated to process INTRASTAT declarations. Intrastat declaration form

contains the most important data on intra-Community transactions. For minimising overall burden of statistical reporting put on small businesses, only turnover above specified threshold needs to be registered. In 2016 statistical basic threshold was 3,000,000 PLN for arrivals, and 1,500,000 PLN for dispatches.

It is only for the last couple of years that Polish exports exceed imports in net balance of foreign trade. Namely, overall foreign trade net balance over the period 2004-2014 was negative (Fig. 1), and it became positive in 2015 for the first time. However, intra-Community trade was quite different. Polish exports to other EU member states have exceeded imports from them since the accession in 2004. In 2016 all Polish exports reached the net value of €184,842.9m (while imports were worth €180,924.6m), from which exports to Europe – €162,963.0m (88,2%), and to EU member states €147,563.6m (79,8%) (Ministry of Economic Development, 2017).

The discussion about the regulation of commercial barriers and the European Community's Value-Added Tax System has been going on for many years (MacLean, 1999; Hart, 1994). According to European Commission (2015), two fundamental issues were identified with the current taxation system. These are: 1 – the additional obligations and costs associated with VAT compliance for businesses engaging in cross-border trade, 2 – the existing levels of VAT fraud within the EU through fraudulent transactions such as MTIC ('Missing Trader Intra-Community') fraud (also known as carousel fraud).

There are many reasons, some of them mentioned above, for which generating reliable data on foreign trade isn't straightforward. Later in the article, there will be some research into discrepancies in public statistics presented.

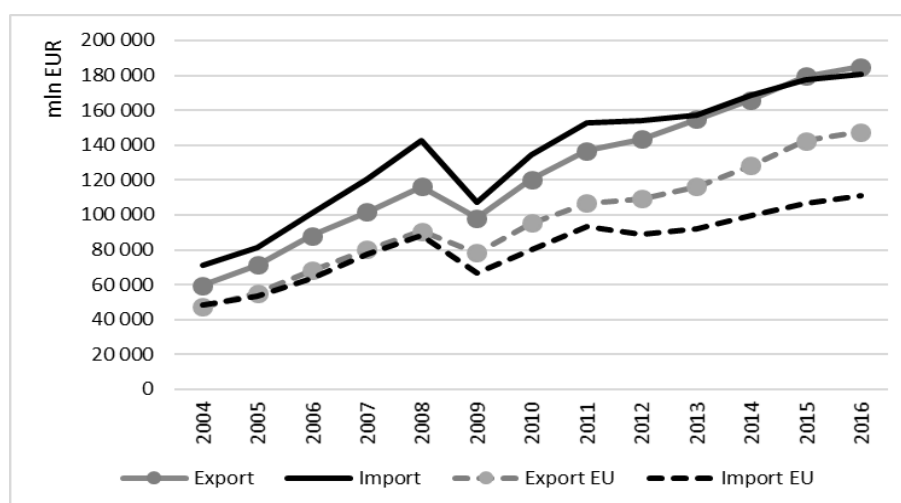


Fig. 1. Polish foreign trade turnover total and with EU member states (Data: SWAID, GUS).

3 Statistical data and research methodology

We used data from Eurostat's COMEXT database. Data on ICS originating from Poland in 2016 were analysed with regard to country and CN chapters. These were values declared by Polish entities mixed together with figures estimated in place of missing data according to methodology provided by Central Statistical Office. On the other hand, we considered data on ICA to EU member states from Poland, declared in 2016 by contractors of Polish businesses and again estimated by national statistical offices respectively. Of course, these data would not be 100% consistent, but it turns out that there exist certain chapters for which there are huge differences, both positive (by positive we mean predominance of exports declared by Polish entities) and negative.

There are several possible causes of differences between ICA and ICS. The main is introducing aforementioned thresholds for the obligatory declaration of foreign trade (these are different for export and for import and differ between member states). Some other are: concealing transactions from taxation (tax evasion), multiplying transactions and declaring fictitious ones (VAT carousels) or simple errors in declarations (e.g. wrong CN code or wrong value of traded goods).

In order to find structural misrepresentation in Comext data, we calculated fractions of ICS from Poland to every member state in all chapters. Then for every pair of member states we compared the structure with a structural similarity index:

$$W_{ij} = \sum_{d=1}^k \min_{i \neq j} (w_{id}, w_{jd}) \quad (1)$$

where:

i, j – EU country, $i, j = 1, \dots, l, l = 27$,

d – CN chapter, $d = 1, \dots, k, k = 97$,

w_{id}, w_{jd} – shares of CN chapter d in structures of trade with countries i and j , respectively.

The above-mentioned index is easy in terms of both computation and interpretation. It takes on values from the interval $[0; 1]$ (Chomątowski and Sokołowski, 1978) and reveals countries that have similar structures of acquisitions from Poland.

A unit of data under consideration contains all information on ICS from Poland to a specified member state as an observation of an object. Features are fractions of CN chapters within total trade hence it is a vector. A different, more complex approach, with exports from many countries (i.e. matrices of data) considered as data units, presents Salamaga (2017) to compare full structures of foreign trade of 18 EU member states.

Another approach to a similar problem is by Landesmann (2000), who refers to structural change in two ways: changes in compositional structures (of output, employment, exports, etc.) and changes in behaviour, that is in the ways in which variables relate to each other.

It is worth noting that this approach to structure similarity is just one of possible choices. A more general approach would be to understand it as a close relative to distance measures widely considered in multivariate statistical methods. Many such measures need data normalization as a prerequisite, yet features are subject to weighting procedures. The two steps are absent in the above method.

Aside of examining similarities for pairs of countries we have also undertaken an attempt to classify EU member states as destinations of Polish foreign trade. In order to show groups of countries with similar structure of goods bought in Poland we used hierarchical clustering. Agglomerative clustering methods have certain advantages, among them: one strict algorithm, results presented in a form of a series of classifications, possibility of graphical presentation with emphasis on sequence of classes generated (Gatnar and Walesiak, 2004). In the analysis, we used Euclidean distance, unitisation of features and Ward's linkage. More on methods and assumptions of classification of objects provide e.g. Anderberg (1973), Kaufman and Rousseeuw (1990), Gordon (1999), Jajuga and Walesiak (2000), Walesiak and Dudek (2010), Markowska et al. (2016).

4 Results of research

The authors calculated the differences between sum of ICS and ICA in 2016 by chapter. They are presented in Fig. 2. As we can see, there are several chapters in which there existed huge differences between figures declared in Poland (ICS dispatched from Poland) and collected from declarations from other member states (ICA originating in Poland). This means that goods from many CN chapters are misrepresented in either of these two datasets. The biggest positive (meaning there was more goods declared as shipped from Poland than those declared as acquired from Poland) and negative (meaning there was more goods declared as acquired from Poland than Polish exporters declared) differences are presented in Table 1.

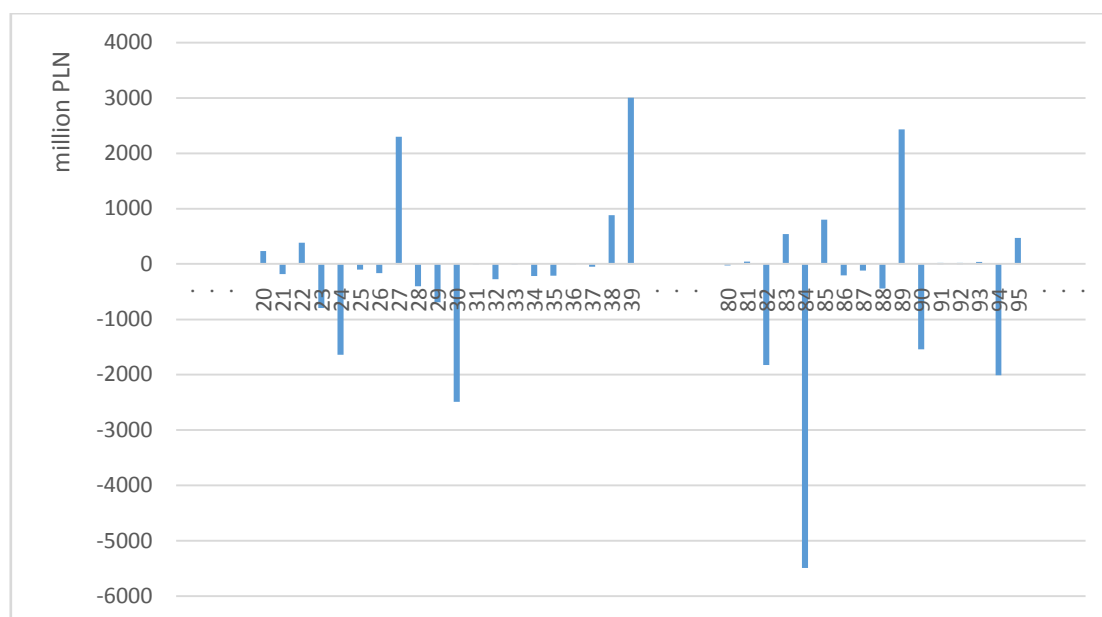


Fig. 2. Differences between ICS and ICA in 2016 by chapter (selection) (Data: Comext).

Table 1. CN Chapters with biggest differences between ICS and ICA.

Number of CN chapter	Description	Difference in bln PLN
39	Plastics and articles thereof	3.01
89	Ships, boats and floating structures	2.43
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	2.30
84	Nuclear reactors, boilers, machinery and appliances; parts thereof	-5.49
30	Pharmaceutical products	-2.49
94	Furniture; bedding, mattresses, cushions; lamps and lighting fittings; illuminated signs, nameplates; prefabricated buildings	-2.01
82	Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	-1.82
24	Tobacco and manufactured tobacco substitutes	-1.64
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	-1.54

Differences between ICS and ICA turnover have been converted to fractions of the sum of absolute differences, then structural similarity indices were calculated for every pair of EU

member states. Since there exist both positive and negative differences between declared ICS and ICA, the index (1) could not be used directly. Instead, we used a slightly modified version of it – we used absolute values of the differences, and we doubled the set of columns to preserve the negative values from being ruled out of the procedure. The whole matrix is too big to be displayed, thus only a selection of columns is presented in Table 2. There exist countries with similar structures, the two most similar are Greece and Cyprus ($W_{ij} = 0.55$), followed by Estonia and Latvia ($W_{ij} = 0.49$), Cyprus and Malta ($W_{ij} = 0.49$), and Greece and Croatia ($W_{ij} = 0.48$). Countries like Croatia or Sweden have structures similar to many others. Bulgaria is on the other end of the spectrum, with the structure being least similar to those of other countries.

Table 2. Structural similarities indices for ICS-ICA balance (selection).

	AT	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE	GR	...
AT	—	0.15	0.06	0.23	0.11	0.27	0.24	0.11	0.24	0.25	0.19	0.25	...
BE	0.15	—	0.16	0.13	0.19	0.15	0.26	0.27	0.13	0.19	0.24	0.19	...
BG	0.06	0.16	—	0.16	0.15	0.17	0.17	0.24	0.15	0.11	0.17	0.14	...
HR	0.23	0.13	0.16	—	0.31	0.29	0.28	0.26	0.37	0.34	0.31	0.48	...
CY	0.11	0.19	0.15	0.31	—	0.05	0.30	0.19	0.16	0.15	0.11	0.55	...
CZ	0.27	0.15	0.17	0.29	0.05	—	0.22	0.25	0.22	0.20	0.27	0.17	...
DK	0.24	0.26	0.17	0.28	0.30	0.22	—	0.24	0.35	0.19	0.25	0.32	...
EE	0.11	0.27	0.24	0.26	0.19	0.25	0.24	—	0.17	0.22	0.24	0.16	...
FI	0.24	0.13	0.15	0.37	0.16	0.22	0.35	0.17	—	0.28	0.30	0.25	...
FR	0.25	0.19	0.11	0.34	0.15	0.20	0.19	0.22	0.28	—	0.36	0.30	...
DE	0.19	0.24	0.17	0.31	0.11	0.27	0.25	0.24	0.30	0.36	—	0.19	...
GR	0.25	0.19	0.14	0.48	0.55	0.17	0.32	0.16	0.25	0.30	0.19	—	...
HU	0.35	0.15	0.14	0.36	0.07	0.25	0.27	0.24	0.28	0.25	0.40	0.17	...
IE	0.20	0.20	0.14	0.27	0.31	0.09	0.38	0.26	0.26	0.26	0.25	0.26	...
IT	0.25	0.42	0.21	0.18	0.05	0.39	0.14	0.19	0.18	0.23	0.28	0.16	...
LV	0.14	0.13	0.23	0.27	0.14	0.24	0.22	0.49	0.24	0.15	0.26	0.11	...
LT	0.32	0.19	0.23	0.38	0.08	0.30	0.34	0.30	0.31	0.27	0.28	0.25	...
LU	0.30	0.24	0.11	0.21	0.21	0.07	0.24	0.23	0.33	0.42	0.25	0.27	...
MT	0.19	0.25	0.11	0.17	0.49	0.13	0.31	0.20	0.17	0.30	0.19	0.39	...
□	□	□	□	□	□	□	□	□	□	□	□	□	

Because of the differences described above it is important to choose data source and provide research in the area of foreign trade with care. In the second part of the article, we provide an example of classification that is affected by the choice of data source.

First, we classified EU member states according to declared structure of goods sent from Poland (data on ICS from Comext). The results are presented on Fig. 3. There are three clusters of countries visible (cut off at height 5, which was chosen arbitrarily), one of them containing only Germany, the second containing six countries (Czech Republic, United Kingdom, Slovakia, France, Italy, and the Netherlands) and one with all the other member states. Fig. 4 is based on data regarding the same transactions (combined data on ICA from Comext) and reveals similar but significantly different division. The main difference is the absence of Slovakia in the second cluster. Southern neighbour of Poland was replaced by Spain, a country with very different characteristics regarding Poland's foreign trade. There were no changes in method applied, the only difference were the datasets. They were supposed to contain the same data beforehand.

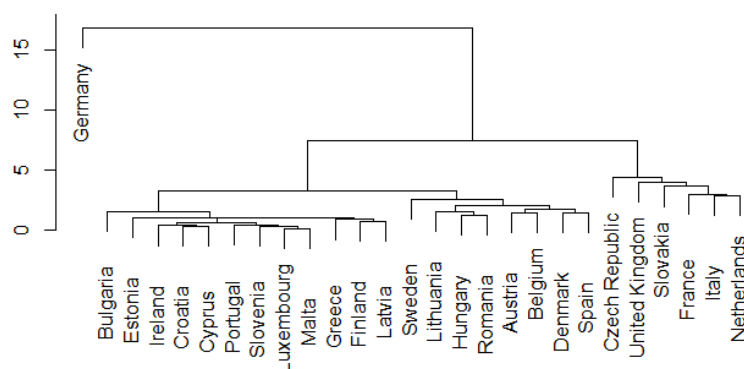


Fig. 3. Classification of EU member states by the structure of ICS from Poland.

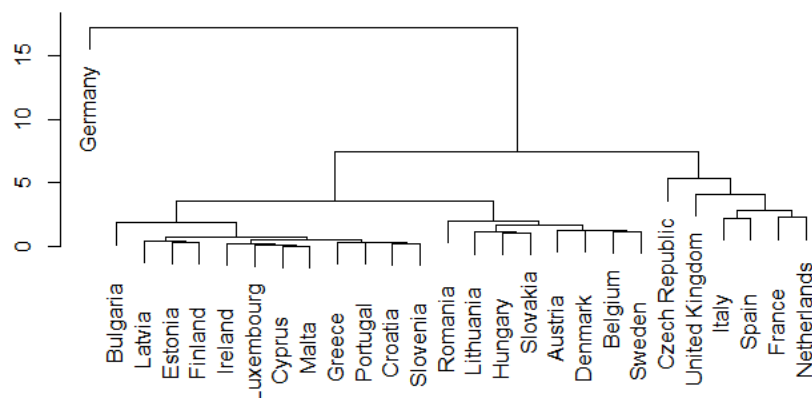


Fig. 4. Classification of EU member states by the structure of ICA from Poland.

Conclusions

Several CN chapters exist in which there are huge differences between figures declared in Poland (ICS) and collected from declarations from other member states (ICA). This means that goods classified in many chapters are misrepresented in either of these two datasets.

The differences tend to have structural nature. One evidence of it is that there are countries with similar structures of such differences.

Researchers need to be cautious with data collected from statistical declarations made by businesses. Since there are virtually no penalties, they may not be reliable. In the second part of the article, we provided an example of classification affected by the choice of data source.

Described differences can be a source of various and possibly vital consequences regarding economic research. They can also affect different aspects of economic policy of the state. These consequences include all possible use of inaccurate public statistics data on foreign trade or wrongly assessed GDP level and/or dynamics. Such a situation where there are no fixed or reliable foreign trade data can also make it hard to perform tax audit as well as to estimate state's tax revenues.

In authors' opinion, it would still be desirable to work on harmonising the system of collecting data on foreign trade, especially trade in goods between EU member states in order to minimise misrepresentation in databases.

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