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Subjective Export Network of EU-27:
Impact of European Integration on Internal Export from 2000 to 2009
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Summary:
The paper focuses on the export changes of EU-27 countries from 2000 to 2009. The core question is: How has the subjective export among the EU-27 countries changed from 2000 to 2009 during the integration process? In order to provide an answer the concept of subjective export is created. This is a filtered data from market size and export volume. As methodology I apply social network analysis. The subjective export data are transformed to a binary matrix, in which network measures are tested. My results show that subjective export network showed a significant increase until 2007; in the following two years, however, the network interconnectedness reached the level of 2000. And the set of core countries of subjective export was partially replaced.

Keywords: EU internal export, subjective export network

Subjektivní vývozní síť EU-27:
Dopad evropské integrace na vnitřní vývozy EU v období 2000–2009
Ádám Németh (nemeth_adam@student.ceu.hu)

Abstrakt:
Článek se zabývá změnami ve vývozech zemí EU-27 v období 2000–2009. Klíčovou otázkou je, jak se měnily subjektivní vývozy mezi zeměmi EU-27 v letech 2000 až 2009 během integračního procesu. Pro zodpovězení této otázky je vytvořen koncept subjektivních vývozů, který zahrnuje filtrované údaje o velikostech trhů a objemech vývozů. Metodou je analýza sociálních sítí. Údaje o subjektivních vývozech jsou transformovány do binární matice, ve které se měří a testují sítě. Výsledky analýzy ukazují, že subjektivní vývozní sítě vykazovaly značný růst až do roku 2007. V následujících dvou letech však síťová provázanost dosahovala pouze úrovní z roku 2000 a skupiny zemí subjektivních vývozů byly částečně nahrazeny.

Klíčová slova: vnitřní vývozy EU, subjektivní exportní síť

JEL: C45, F15

Contents

Introduction

As one of the most emphasized aims of the European integration, the internal trade among the EU-27 has always been enhanced. However, the opinions how my adhesions could integrate new counties within internal trade are diverse. (Corbet 1977; Giorgiu 2009; Glinskienė et al. 2007; Nello 2002; Salvador and Simon 2009; Wood 2003) Therefore, the prior purpose of my paper is examining how the internal export of the EU-27 countries has evolved from 2000 until 2009. Because of the large number of counties in the adhesions this era is crucial in the history of European integration. In my paper, I examine export has changed among those if we have the effect of market size and export volume filtered. From an economist perspective I follow a Wallersteinian path by stating that exports have to be considered as a complex system; the basis of my investigation is not a country, but a network of countries. That is why I have chosen social network analysis as methodological framework.

In my paper I follow a Wallersteinian path by stating that exports have to be considered as a complex system; the basis of my investigation is not a country, but a network of countries. The basis of investigation of economic relations among countries has shifted from country to a system from the late 70s. The theory of Wallerstein (1974, 1979) seals this change. I follow this logic in my paper by presuming that export is not only influenced by capacities, but the network the country acts within. An advantage of this perspective that the investigation of the export of one country and the dynamics of system is not separated.

The exact field of my analysis is exclusively the export among the EU-27 countries from 2000 to 2009. The core question is: *How has the subjective export among the EU-27 countries changed from 2000 to 2009 during the integration process?* To answer this question I propose the following three hypotheses:

1) The subjective export network among EU-27 reveals an increasing trend of relationships from 2000 to 2009.
2) The former EU-15 countries were in 2000 and remained until 2009 the core of EU-27 internal subjective export.
3) The subjective export from Bulgaria and Romania became more intense in 2008 and 2009 comparing to 2007.

In order to examine my question I created the concept of *subjective export*. The aim of this concept is to reveal export dynamics filtered from two effects: the size of the importing markets and the volume of export of each county. Since I intend to examine how the export of countries changed during the integration according to their possibilities, limits. The goal of subjective export is to measure interrelatedness, how countries "consider" each other in terms of export. Therefore, I transformed export data according to this concept.

Since this subjective export concept can be interpreted only if it is compared, I apply the method of *social network analysis* (SNA); an approach emphasizes the importance of connectedness rather than the role of individual actors. Therefore, one of the greatest advantages of using social network analysis to this phenomenon is focusing on the complexity of internal trade. This enables me to compare subjective export data. Since the aim of my paper to apply SNA to the concept of subjective export, my paper offers no explanation of reasons of export changes, explanations behind trends, and deep demonstration of SNA.

This paper will be structure in the following way. Firstly, I demonstrate the data, the transformation made according to the concept, and the process of building the model. Secondly, a longitudinal analysis is provided on the dataset in order to obtain answers for the hypotheses. Finally, I will examine the hypotheses in light of the results.

1. Trade and Networks

Immanuel Wallerstein (1974, 1976) was the by creating his influential World-System theory put aside the conception of former theories on how international economic relations were considered. He claimed that the basis of investigation should be the system states find operate in, not the state itself. He launched his influential new perspective which resulted in a shift of focus. Main questions of world-system theory are: What are distinguishing characteristics of core/periphery structure in comparison to other structures? How could we identify the transformation of these structures? (Breiger 1991: 112) The system-theory approach had an extreme by stating even claims that "it is world-systems that develop, not societies" (Chase-Dunn 1978: 164). My paper applies the Wallersteinian model in two aspects. It also focuses on the structure of states, how the structure has evolved. And the core – peripheral theory of states is also examined.

This shift of perspective was followed by a change of methodology. Snyder and Kick (1979) were one of the first social scientists who applied SNA, a methodology focusing on interrelatedness to international economic issues. Snyder and Kick claimed that economic relations are complex phenomena which also have to be seen in a system. They applied SNA models to narrow down the groups of core and peripheral countries. This methodology gave an impetus to the systematic approach. Kali and Reyes use volume data and examine central role from the ratio of import/export. (Kali and Reyes, 2007: 596) My paper follows the logic of Kali and Reyes, however, in a different concept.

2. Subjective Export Network Model

2.1 Database

For my analysis I used data obtained from database of the International Monetary Fund, called Direction of Trade Statistic Online (DOTs). All the export data are in million US dollars on current value of the certain year. This might be a weakness of the model, since it ignores the purchasing parity and the role of the individual currency. However, since social network models rather focus on the relational phenomena, measure of input variable values is less influential than e.g. in econometric models.

As export data I created matrices from 2000 to 2009 for each year. The two axes of a matrix were the EU-27 countries in the very same order. The matrix, for instance, for 2002 contains data for 27 countries including would-be EU members.

2.2 Concept of Subjective Export Network

The systematized concept of subjective export has one indicator that is meant to represent export purified from the impact of export volume and market size of the countries. In order to achieve this certain data the following transformations were made.

1) Normalize each data by population of the certain country.
2) Calculate the ratio of these normalized data over the total export of the country.
3) Create binary matrices by the mean-value of 2000.

Original data are the entire export of every country in million US dollars The goal of using the export data is to demonstrate how the EU-27 countries are interrelated to each other, to what extent they prefer exporting to the other country. Therefore, firstly the following problem had to be addressed: countries having smaller market are likely to be able be targeted to less export in volume. Market size could be perceived from numerous aspects. However, as the most basic one, I used population as the sole defining variable of market size. In my model market size is exclusively defined by population.[1] That is why, each entry is divided by the column – i.e. importing – countries' population.[2]

This new variable has its own advantages and drawbacks as well. However, since wealthier economies might actually export more than the poorer ones. Using this simplification would result in a still too complex system resemble to an

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1 This simplification could raise questions about adding further variables. Therefore, this can lead to systematic errors in case of smaller countries.

2 Unit of first filtered export variable is USD/capita.

analysis based on volume measures. Furthermore, I am seeking the subjective importance of countries. Therefore the certain ratio within its total export has to be taken into consideration as well. Finally, I obtained data that signify the importance of a country towards another member country as far as export is concerned. The data I transformed and gained, the descriptive statistics I apply, even might have explanatory attributes with no regard to the other values they take, but serve as a powerful toolkit if they are compared. Even their unit is hardly useful: *million USD/(population*total export)*. That is why I had to decode these data, and only use as the basis to my model, and call them subjective export matrices.

2.3 Building the Model

In order to transform these data into an understandable system I used the method of binary or logical matrices. A binary matrix consists of only two variables 1s or 0s. This form of matrix is one of the simplest ones, where 1 marks the presence of a tie, 0 the absence (Hannemann and Rider 2005).

The reason for choosing binary matrix approach lies in the nature of export data and the logic behind them. Since among any two countries of the EU-27 the volume of export is never zero, it results in the fact that one obtains an export network without normalization where all the possible ties are present. Therefore, despite one tie might represent a very low volume of export the density converges to a full graph. Therefore, this model needs some purification, which justifies the utilization of binary matrices.

To set up binary matrices I had to elaborate the following logic. Even the normalized data are purified from the impact of either the market size, either the export volume represent a network, but these data have to be compared. Therefore I decided to create binary matrices for each year along these principles:

1) Use the median value of the normalized data in 2000.
2) The cells representing a higher or equal value than the mean-value take *1s*, the ones below it get *0s*.
3) Take 2000 as a base year.
4) Apply the median value of 2000 for each year, from 2001 to 2009.
5) The cells representing a higher or equal value than the median value of 2000 take *1s*, the ones below it get *0s*.
6) Analyze and visualize the binary matrices.

The matrix transformation made of binary matrices is built up along the logic that we define a criterion and create a new image matrix. This new matrix is simplified to zeros and ones, the presence and absence of relationship (Wasserman and Faust 2009). The binary matrix of 2000 can be seen at Figure 1;

but the zeros are replaced by dots. Again let me draw the attention on the fact that if a tie between two nodes is zero, this value indicates exclusively that the tie does not meet the criterion, but there might be relationship. This transformed binary matrix is represented in the appendix Figure 1.

The criterion described above is therefore an ε criterion. If we define a value which determines the values the entries of binary matrix, this is called an ε criterion method. Commonly used way of defining ε is the median-value criterion[3]. Therefore all ties greater or equal to this ε value become *1s*, less than this ε value *0s* (Wasserman and Faust 2009: 400).

$$\mathrm{bi} = \begin{cases} 0 \; if \; \bar{x}i \; < \; \bar{x} \\ 1 \; if \; \bar{x}i \; \geq \; \bar{x} \end{cases} \tag{1}$$

Therefore, if the row country is A, the column is B, if the value is *1* we can claim that the relationship is more intense from A to B; else wise stated country A considers country B to play a more important role in its export than the average EU-27 country without the impact of market size and total export volume. The reason why I chose as a criterion the mean value of 2000, an applied to every year is that if the values increase – the relationships become more intense – than more and more entries will take one value than in 2000. That is why all the statements made are compared to 2000. Selecting the year of 2000, as base year has two reasons. The first is the availability of relevant data. The second reason is an individual decision to find the most relevant basis of comparison suitable for the two groups of the latest adhesions.

3. Longitudinal Analysis

3.1 Number of Ties

Table 1 in the Appendix demonstrates the changes of number of ties. It can be observed that ties have shown an interesting trend. As a basis value in 2000 the export network had 161 directed relations. No radical increase or decrease can be observed until 2006, which quite well reflects on the characteristic of binary matrix model, since the normalized data fluctuate about the cut-value resulting in sometimes having more ties than before, sometimes less. This might lead to the conclusion that in general moderate increase, with no radical change has affected the network structure. However, to surely say it we have to examine whether there was no arrangement occurred among the ties, and the identical ties that fluctuate about the cut-value. Since despite the number of ties

[3] By calculating the median of the values of all ties in 2000 we can define ε as this mean value. This value is exactly 0.00172397.

fluctuated around a value, the inner arrangement of ties could have faced radical changes.

3.2 Density

One of the most basic measures of the interrelatedness a network is density (Δ). Density is calculated as the ratio of the existing and theoretically maximal number of ties (De Nooy et al. 2004). However, in this case this is the density of a for my binary matrix model. Therefore, it does not measure the existing ties, since almost all ties in the original export network existed. Instead of it, this density measures a model variable, not a pure variable. It reveals how the number of closely related countries changed. Therefore, analyzing this density leads only conclusions on how the interrelatedness of the network has changed. Per se for one year it is biased by applying the mean value for cut-value, since a dividing point was within the database.

According to these two statistics there has not been significant change introduced to the EU internal export. As of 2000 EU-27 countries have not overcome the extent they were affiliated to each other in 2000. However, even these statistics have to be looked at from a closer angle. Despite the fact that by the end of 2009 the ties fell below the average but in 2007, in the year when Bulgaria and Romania joined the European Union a huge peak can be observed. As far as the established ties are concerned in 2007 we can observe a 23% growth compared to 2000, and a 19% to 2006. Therefore, I will apply centrality measures and core-periphery model.

3.3 Centrality

The term degree generally refers to the number of lines that are incident with the node. In case of directed network, as we have two directions, degree centrality is calculated for in- and out-degrees as well. Additionally, if computing centralization based on measuring degree two methods can be chosen: raw and normalized. Raw centralization is the one described in the formula above. Normalized centrality is the raw centralization divided by the theoretical maximal centralization (Freeman 1977: 38).

Distance related measures, however, provide us an insight to the changes of internal changes among the ties. The applied Freeman closeness centrality measure is based on an ego-network approach. This measures attempt to take into consideration that centrality does not solely depend on the number of direct ties a node has, but the ties of direct relations. It calculates the sum of distance from each actor to the other. If we take the reciprocal of farness we get closeness; as the further a node is, the larger the sum of ego-network paths are. Therefore, the reciprocal of the farness can be considered as a measure of closeness (Freeman 1977).

Using any distance related method in such simplified binary matrix based networks should be also treated extremely cautiously, since distance measures analyze the extent the nodes are interrelated or separated within the network. In my model, however, among the original data no ties were isolated; each one of them was connected to the other.

According to these two statistics there has not been significant change introduced to the EU internal export. As we can see from Table 3 in the Appendix EU-27 countries from 2000 have not overcome the extent they were affiliated to each other in 2000. Despite the fact that by the end of 2009 the ties fell below the average but in 2007, in the year when Bulgaria and Romania joined the European Union a huge peak can be observed. As far as the established ties are concerned in 2007 we can observe a 23% growth compared to 2000, and a 19% to 2006.

We can observe that from the 217 in 2000 the median value shows a decreasing trend.[4] The same trend can be seen in terms of sum of inFarness. Countries tend to stand closer and closer to each other. To be really precise Farness and Closeness measures reflect the following tendency: the distance among countries is the highest in 2002. However, after it they become the closest in 2006 with a quasi linear trend. However, the distance grew among them in 2007 and 2008; which again reached the second lowest degree by 2009. The Farness and Closeness measure for each country reflect that in 2000 it was Malta that took the most centralized position, after it the Netherlands, Germany, etc. However, this measure mean that e.g. Malta was considered to be the most preferred export target – normalized with population etc. – among the EU-27 countries

The disadvantages of binary matrix model also have to be taken into consideration. A binary matrix hides many details centrality measures built upon. That is why a more precise measure has to be applied. This model should incorporate the closeness and farness characteristics at the same time. Therefore, I set up another model, a core/periphery approach in order to narrow down the real core countries.

3.4 Core-Periphery

The model I apply is largely the outcome of the idea of Wallerstein (1974).[5] To understand how the EU-27 countries are interrelated to each other, I applied a core – periphery model. This method allows me to examine the countries fulfilling a central role in the network. This can be perceived as grouping the countries in the centre of the network as core nodes; while labelling as

4 Even after 2007 when the number of ties plummeted, which refers to a closing network.

5 Wallerstein claims that the world economy can be divided into core and peripheral countries.

peripheral nodes the ones outside of the central. The visualization of countries is based upon placing the nodes that have the most ties to the centre, and the ones possessing fewer relations take place around them.[6] The core-periphery model supposes the presumption that among the nodes we have few central ones, and the others are loosely connected (Borgatti and Everett 1999: 377). One such model for 2000 of EU-27 subjective internal export can be seen at Figure 3 in the Appendix.

As we can see the figure contains three types of regions: core/core (1/1), core/periphery (1/2 and 2/1) and periphery/periphery (2/2). The core/core is the left upper corner, including the countries from the UK to the Netherlands. The density matrix below it indicates that 58% of the possible ties are present. In a theoretically perfect core-periphery model the density of the core/core region would be 1, as all ties were made. But in practice we have to build models up along looking for far higher density. If we look at the periphery/periphery part (2/2), it includes far more countries that are far less connected. Only 16% of the possible relations are made. Other important facts can be observed if we examine the core/periphery part of the matrix. (NB: there are two regions of them!) The core countries possess very few relations with the peripheral ones, only 6% of them have ties towards the peripheral countries. However, the peripheral countries tend to have a really high density of relations towards to core countries, 37%. This datum demonstrates that core countries in 2000 consider peripheral countries to be less important players in their export. However, the reverse of it can be claimed to peripheral countries. This fact also highlights that the core countries rather attract than serve as an origin of ties.

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[6] UCINET elaborates an algorithm which can be summarized that UCINET follows. It "simultaneously fits a core/periphery model to the data network and estimates the degree of coreness or closeness to the core of each actor. This is done by finding a vector C such that the product of C and C transpose is as close as possible to the original data matrix. In addition a number of measures which try to assess the degree to which the network falls into a core/periphery structure for different sizes of core are calculated. Each measure starts with the actor with the highest coreness score and places them in the core and all other actors are placed in the periphery. The core is then successively increased by moving the actor with the highest coreness score from the periphery into the core. This is continued until the periphery consists of a single actor" (Borgatti and Everett, 1999: 389; Borgatti et al. 2002).

Table 1: List of Core Countries

2000	DEN FIN FRA GER IRL LUX NED SWE GBR
2001	DEN FIN FRA GER IRL LUX NED SWE GBR
2002	CZE DEN EST FIN FRA GER LUX NED SWE
2003	CZE DEN FIN FRA GER HUN LUX NED SLO SWE
2004	CZE DEN FIN FRA GER HUN LUX NED SLO SWE
2005	DEN FIN FRA GER LUX NED SLO SWE
2006	CZE DEN FIN FRA GER HUN ITA LUX MLT NED POL SVK SLO
2007	CZE DEN FIN GER HUN LTU LUX NED SLO SWE
2008	CZE DEN FIN GER HUN LUX NED SVK SLO SWE
2009	CZE DEN FIN GER HUN LUX NED POL SVK SLO SWE

Source: Own calculations by UCINET.

Table 1 shows how the core part (i.e. core/core regions) has changed from 2000 to 2009. For 2000 it can be definitely stated that the core was made up solely from EU-15 countries. Despite I included later joiners in the investigation no one of them was able to place itself in the core in 2000. Firstly the Czech Republic belonged to the core in 2002, followed by Hungary and Slovenia in 2003. But by 2005 EU-15 countries played the most central role again. However, from 2006 we find numerous new countries in the core. By 2009 we find that the core is formed equally by EU-15 countries and new joiners.[7]

The core/periphery analysis is likely to be the best way of reflecting on the central and peripheral nature of countries. We can definitely observe how the core has evolved and changed from 2000 to 2009. These changed hardly can be analyzed by usual descriptive statistics, like density or centrality. However, if we compare all these statistics, than this is the best way to gain a well-rounded picture from the EU-27 subjective internal trade networks. Therefore, I introduce a method based on a different approach, the clique analysis.

3.5 Clique-Methods

In the following section I am outlining how clique-approach can be used to understand certain characteristics of a network. First of all I must define what a clique is. In a directed network, cliques are those subsets of the network in which the ties among the nodes are reciprocated. Depending on what how many nodes do we expect to be in a reciprocated relation we could define three or more node-based cliques (Wasserman and Faust 2009). In my study I am

[7] This can be explained by the characteristics of the core/periphery model. As regional relations among new countries boosted this place some of them -which were originally oriented towards the core and had more ties than the others – to the core. Therefore, the increase of ties within periphery can result in getting countries into the core

applying the triad-based approach of cliques by looking at the nodes having two other nodes with reciprocated relations. Observing these cliques can let us understand the interrelatedness of the nodes

At this point of my paper, I apply clique analysis, a significantly different method from the ones introduced beforehand. Clique analysis is based on the triad approach, relations among at least three actors. Clique analysis also has to be cautiously applied because of binary matrices. Therefore, all possible ties are present among these nodes. Countries forming cliques in the transformed matrices can be observed at Table 4 in the Appendix.

From this tables one see how the groups of interrelated, closely connected countries have changed. These cliques mostly reflect the geographic barriers of the model. However, as these barriers are constant, we can see how the intensity among countries changed. In 2000, with the exception of Estonia, only the EU-15 countries were closely interrelated. However, even in 2001 the V4 countries – without Poland – form a clique. And this approximation continued until 2006, when from the peak 15 cliques the number of them fell to 7 in 2009. The decreasing number of ties from 2007 to 2009 is likely to have been caused by deliquescent cliques.

4. Interpretations and Hypothesis Testing

Due to the characteristics of SNA none of the methods outlined above, provides method, per se, accurately answering to my hypotheses. Therefore, for answering the question each of the methods have to be considered at the same time.

In my paper look for the answer of the following question: *How has the subjective export among the EU-27 countries changed from 2000 to 2009 during the integration process?* To answer this question I proposed the following three hypotheses, which I examine in light of the results of analysis.

Hypothesis 1: The subjective export network among EU-27 reveals an increasing trend of relationships from 2000 to 2009

This hypothesis is partially rejected. Until 2006 the subjective export network showed an increasing trend; number of ties rose by 20% from 2000 to 2006. Density and centrality indexes also reveal accession. From the starting 6 cliques to 2006 15 cliques came into existence. Therefore, the export network has demonstrated an intense proximity of relationships.

However, from 2007 a huge drop can be seen. This shrink resulted in having similar characteristics of the export network than in 2000. But one fact has to be highlighted that even the intensity of the network in 2009 in comparison the

2000 shows no significant changes, but its structure does. As we can see from the core/periphery analysis many new countries were able to join the core that European countries consider to be important in terms of export. Furthermore, the number of core countries increased from 2000. Therefore, I can securely claim that the integration from 2000 until the crisis resulted in a boost of relationship among EU-27 countries.[8]

Hypothesis 2: The former EU-15 countries were in 2000 and remained until 2009 the core of EU-27 internal subjective export

This hypothesis is also partially rejected. Since it is true from 2000 until 2007; however, in 2009 the new joiner countries fulfil the core positions. If we examine the core/periphery tests in 2000 the core of export was definitely split up among former member countries. However, progressively new countries could be found in the core. Czech Republic, Hungary, Poland, Slovakia and Slovenia take place in the core from 2007 until 2009. Therefore, almost half of the core is made up by new joiners.

Hypothesis 3: The subjective export from Bulgaria and Romania became more intense in 2008 and 2009 comparing to 2007

The presumption of this hypothesis for Romania has proven to be correct. But Bulgaria fails to show an increase of its subjective export network. The hypothesis is tested on the ego-networks of the two countries (Figure 5 and 6 in Appendix). Bulgaria's binary matrix remained 0 between 2007 and 2009. The outgoing ties were 5, 4 and 5 in the same period. Romania shows a bit more change: even the number of incoming ties of its binary matrix remained 3 in 2007 and 2008, and dropped to 2 by 2009; however, the outgoing ties increased from 4 to 6 from 2007 to 2009.

To answer my basic question according to the finding of the hypotheses, similar trend can be seen in the overall subjective export network. By the end of 2007 EU-27 countries had seen the member countries as the prior target of their export. However, after 2007 until 2009 a significant fall halted the approaches.

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[8] The problem with condemning the crisis as a reason of decreasing ties is that the export to EU-27 have to have had dropped more than the total export of a country. As the data are normalized with the total export it seems that the crisis made the internal export have a decrease higher than the export faced towards outside of Europe. Therefore it seems that EU internal export is more sensible for such crises, can be more involved. However, this statement of mine must fall under further analyses.

Conclusion

The aim of my paper was to answer whether economic relations among the EU-27 countries have become tighter during the integration. In order to answer this I created the concept of subjective export; and by using social network analytic toolkit created a network of this subjective export.

My findings show a trend marking significant changed within the system. Many countries of the 2004 adhesion sealed the subjective export of EU-27; after 2007 such a great shrinkage prevented further economic integration. However, the internal structure of the subjective export network fundamentally changed. Countries of the 2004 adhesion managed to fulfil core roles in European export. Other countries of the former EU-15, for instance, the United Kingdom, became peripheral subjective export players.

At this point I must also add that all the results outlined should be treated with considerations. As based upon rough simplifications, application of this binary matrix model, since it, inevitably results in inaccuracy to some extent. However, if we are aware of this fact, SNA represents an outstanding means to understand to world we are surrounded by.

The concept of subjective export network has to be more elaborated. Defining the market size exclusively by population, inevitably leads to a systematic bias. However, applying a more elaborated concept for further researches, especially in different economic sectors could lead to better understanding of the impact of European integration on internal trade.

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Appendix[9]

Table 1: Median Values of Normalized Data

Year	Median values [10^{-3}][10]	Standard Deviation
2000	1.724	0.0048212
2001	1.755	0.0049165
2002	1.676	0.0045296
2003	1.719	0.0045417
2004	1.737	0.0046916
2005	1.827	0.0054511
2006	2.315	0.0077369
2007	1.903	0.0061100
2008	1.893	0.0062330
2009	1.837	0.0063300

Table 2: Descriptive statistics from 2000 to 2009

Year	Number of Ties	Density
2000	161	0.2293
2001	167	0.2379
2002	160	0.2279
2003	166	0.2365
2004	164	0.2336
2005	167	0.2379
2006	198	0.2821
2007	162	0.2308
2008	156	0.2222
2009	154	0.2194

[9] All the tables and figures are the results of the author's calculations by using UCINET and Pajek.

[10] MedianSubjective export data for year 2000 is 0.001724.

Figure 1: Number of Ties (2000–2009)

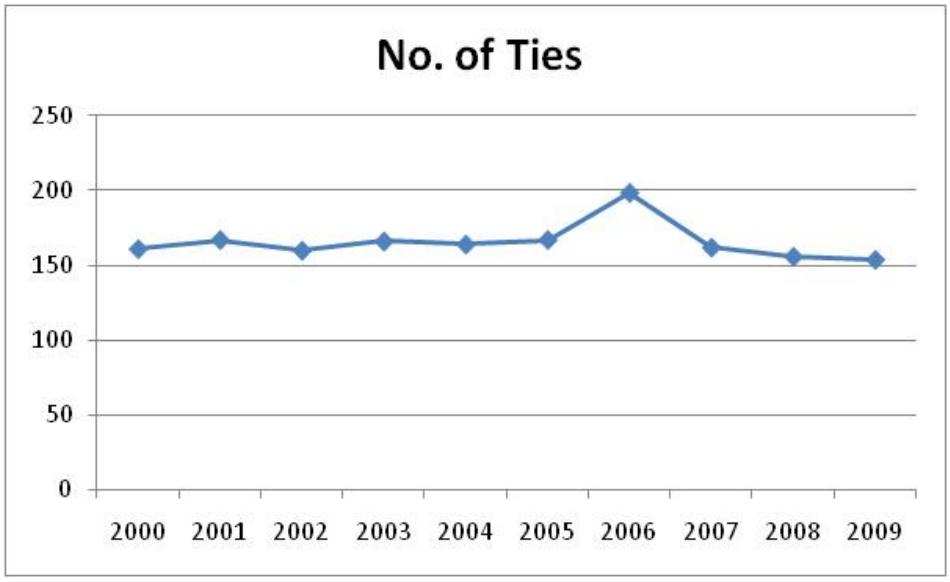


Figure 2: Density (2000–2009)

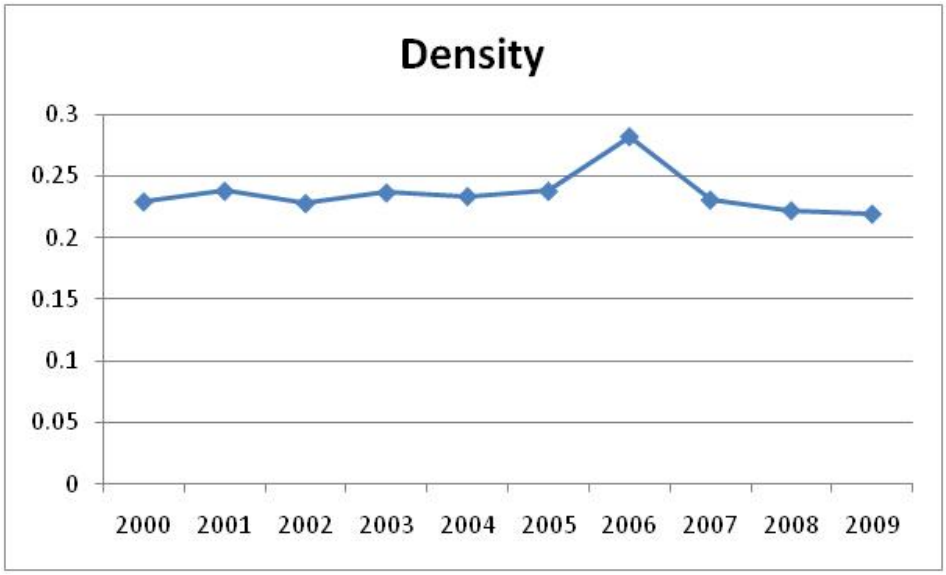


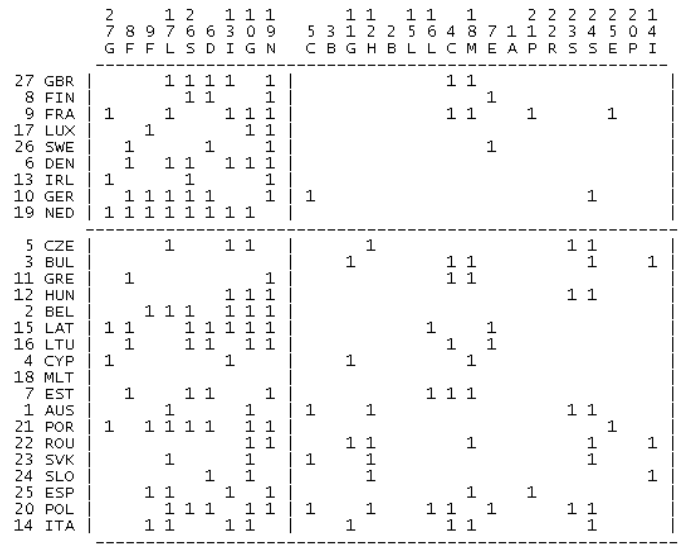
Table 3: Freeman Closeness Centrality Measures

		inFarness	outFarness	inCloseness	outCloseness
2000	Mean	216.778	216.778	27.786	12.838
	Std Dev	259.721	96.08	14.364	2.027
	Sum	5853	5853	750.221	346.629
	Variance	67455.211	9231.358	206.334	4.107
2001	Mean	175.741	175.741	41.67	14.862
	Std Dev	251.378	11.504	21.8	1.035
	Sum	4745	4745	1125.094	401.276
	Variance	63190.934	132.34	475.24	1.072
2002	Mean	222.259	222.259	38.306	11.747
	Std Dev	284.035	14.075	22.637	0.775
	Sum	6001	6001	1034.249	317.17
	Variance	80675.672	198.118	512.417	0.601
2003	Mean	196.444	196.444	41.453	13.291
	Std Dev	270.409	12.245	22.276	0.887
	Sum	5304	5304	1119.244	358.844
	Variance	73121.063	149.951	496.218	0.786
2004	Mean	195.444	195.444	41.392	13.377
	Std Dev	268.657	13.68	22.113	1.056
	Sum	5277	5277	1117.582	361.171
	Variance	72176.398	187.136	488.99	1.116
2005	Mean	172.296	172.296	43.285	15.157
	Std Dev	252.729	11.008	21.106	1.053
	Sum	4652	4652	1168.703	409.25
	Variance	63871.914	121.171	445.474	1.109
2006	Mean	145.556	145.556	48.079	17.967
	Std Dev	232.277	10.668	21.306	1.43
	Sum	3930	3930	1298.14	485.109
	Variance	53952.469	113.802	453.948	2.045
2007	Mean	173.593	173.593	42.659	15.051
	Std Dev	252.242	11.685	21.228	1.09
	Sum	4687	4687	1151.781	406.37
	Variance	63625.871	136.538	450.63	1.188
2008	Mean	176.296	176.296	40.561	14.806
	Std Dev	251.013	10.621	20.717	0.963
	Sum	4760	4760	1095.153	399.755
	Variance	63007.469	112.801	429.188	0.927
2009	Mean	153.667	153.667	41.063	17.024
	Std Dev	229.109	11.87	18.998	1.359
	Sum	4149	4149	1108.688	459.651
	Variance	52490.816	140.889	360.91	1.847

Table 4: Cliques from 2000 to 2009

	2000	2001	2002	2003	2004
1.	DEN FIN NED SWE	FRA GER LUX NED	DEN FIN NED SWE	FRA GER LUX NED	FIN LUX NED
2.	DEN GER NED	FIN LUX NED	DEN GER NED	FIN LUX NED	FRA LUX NED
3.	FRA GER LUX NED	IRL LUX NED GBRE	FRA GER LUX NED	IRL LUX NED GBR	GER LUX NED
4.	IRL NED GBR	DEN FIN NED SWE	FIN LUX NED	DEN FIN NED SWE	LUX NED GBR
5.	EST FIN SWE	DEN GER NED	CZE HUN SVK SLO	DEN GER NED	IRL NED GBR
6.	FRA POR ESP	CZE GER SLO	CZE GER SLO	CZE HUN SVK SLO	DEN FIN NED SWE
7.		CZE HUN SVK	DEN EST FIN SWE	CZE GET HUN SLO	DEN GER NED
8.		DEN EST FIN SWE	FRA POR ESP	DEN EST FIN SWE	CZE HUN SVK SLO
9.		FRA POR ESP		FRA POR ESP	CZE GER SLO
10.					DEN EST FIN SWE
11.					FRA POR ESP
12.					FRA LUX ESP
	2005	2006	2007	2008	2009
1.	DEN GER LUX NED	CZE GER LUX NED	DEN FIN NED SWE	CZE GER LUX SLO	CZE GER LUX SLO
2.	DEN FIN LUX NED	CZE GER LUX SLO	DEN GER NED	CZE GER HUN SLO	GER LUX NED
3.	FRA LUX NED	FRA GER LUX NED	IRL NED GBR	DEN GER NED	ITA LUX SLO
4.	LUX NED GBR	ITA LUX SLO	GER LUX NED	GER LUX NED	DEN FIN NED SWE
5.	ITA LUX SLO	ITA LUX ESP	CZE HUN SVK SLO	DEN EST FIN SWE	DEN EST FIN SWE
6.	GER LUX SLO	FRA LUX ESP	CZE GER HUN SLO	EST FIN LTU	DEN GER NED
7.	FRA LUX ESP	LUX NED GBR	DEN EST FIN LTU	DEN FIN NED SWE	CZE HUN SVK SLO
8.	CZE HUN SVK SLO	CYP MLT GBR	DEN EST FIN SWE	CZE HUN SVK SLO	
9.	CZE GER SLO	DEN EST FIN LTU	ITA LUX SLO		
10.	DEN EST FIN SWE	DEN EST FIN SWE	GER LUX SLO		
11.	EST FIN LTU	DEN FIN NED SWE			
12.	IRL NED GBR	DEN GER NED			
13.	DEN FIN NED SWE	CZE GER HUN SVK SLO			
14.		IRL NED GBR			
15.		CZE PPOL SVK			

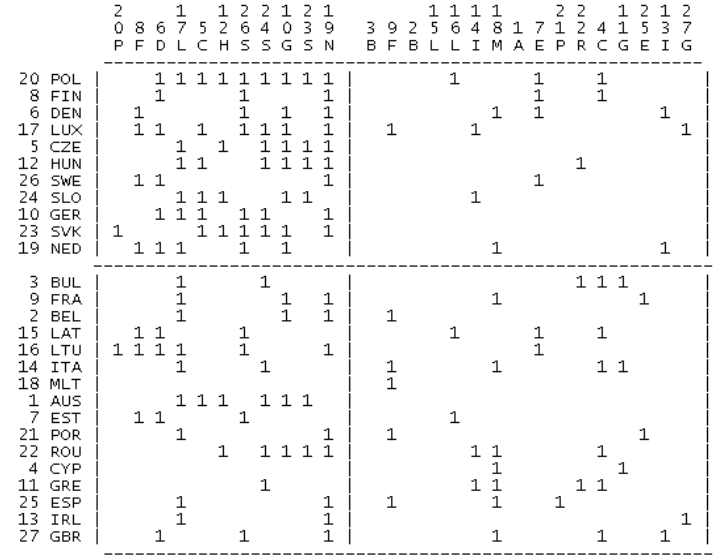
Figure 3: Core/periphery Model for 2001



Density matrix

	1	2
1	0.583	0.062
2	0.370	0.160

Figure 4: Core/periphery Model for 2009



Density matrix

	1	2
1	0.555	0.091
2	0.244	0.142

Figure 5: Ego Networks of Bulgaria and Romania 2007

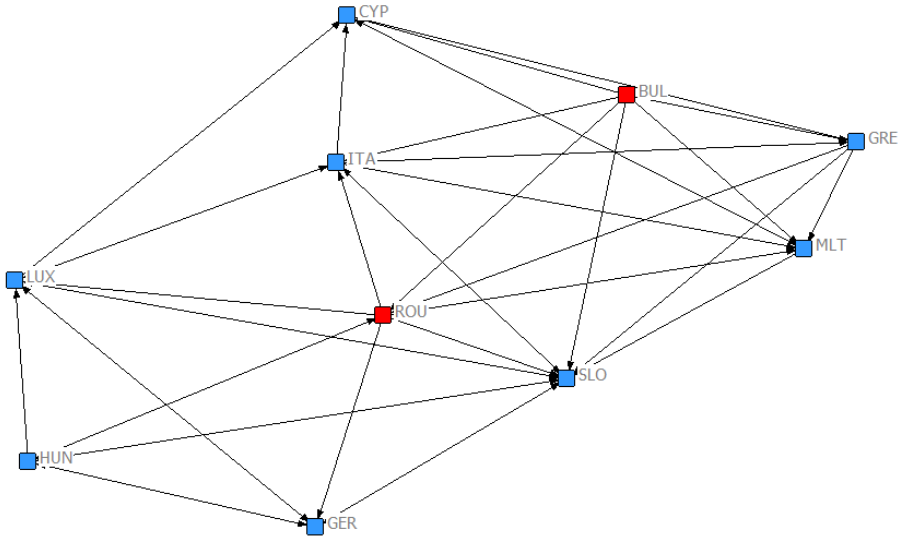


Figure 6: Ego Networks of Bulgaria and Romania 2008