INSTITUTE
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Faculty of Social Sciences
Charles University

TRADE NETWORKS IN MAIN CZECH EXPORT CATEGORIES

Jiří Teichman

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Institute of Economic Studies,
Faculty of Social Sciences,
Charles University in Prague

[UK FSV – IES]

Opletalova 26
CZ-110 00, Prague
E-mail : ies@fsv.cuni.cz
http://ies.fsv.cuni.cz

Institut ekonomických studií
Fakulta sociálních věd
Univerzita Karlova v Praze

Opletalova 26
110 00 Praha 1

E-mail : ies@fsv.cuni.cz
http://ies.fsv.cuni.cz

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Trade Networks in Main Czech Export Categories

Jiří Teichman[a]

[a]Institute of Economic Studies, Faculty of Social Sciences, Charles University Prague, Czech Republic. Email: jiri.teichman@fsv.cuni.cz

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Abstract:
The study uses network measures and visualisation to show alternative ways of exploring international trade and its structure. We specifically focus on trade networks in the largest export categories of the Czech Republic. Our results show the rising importance of the Czech Republic in the selected categories as measured by the trade weighted degree centrality. However, in several categories, this is not complemented by a similar increase in the number of trade partners. This lack of diversification could be a possible risk for Czech trade. While the results in categories related to electronics and information technologies showed increasing importance of China, categories connected to car manufacturing remain dominated by Germany and the United States.

JEL: F13, F14
Keywords: Czech trade, international trade, network theory, trade networks

I. Introduction and Motivation

The aim of this study is to explore the most important categories of Czech exports through network measures. The contribution of this article would be twofold. Firstly, it uses novel ways how to measure and visualize the Czech trade relationships. Secondly, it will broaden the range of goods and countries on which the network methods in trade data were used. The study builds on the network analysis of world trade using bilateral trade data obtained from the BACI dataset provided on the CEPII webpages [1]. The use of network measures to study trade relationships is relatively sparse and this article provides both a useful dataset and methodology outline that further studies could build on. The aim of our study is to show how policymakers could use the data and methodology to explore the characteristics of export markets in which they are interested through the statistics specific to trade networks. We choose categories of goods in which we are interested from the set of largest Czech export categories. However, we do not take simply all the largest, because of similarity among many categories at 6-digit detail of HS02 nomenclature.

The study is structured as follows: This section gives motivation and outline of the study, In the second section we provide an overview of network theory and measures along with a literature review of network analysis applied to international trade data. In the third, section we describe the dataset used in the study and the main Czech export categories on whose trade networks we will focus. The fourth section summarizes the key findings about the trade networks in the selected export categories. In the fifth section, we study eigenvector centrality to determine key variables that are influencing this network measure. The sixth section provides a conclusion for our findings.

II. Network theory and literature review

The network analysis focuses on the relationships among the members of the networks, therefore it offers a potential alternative way of exploring the trade relationships between countries. Previously network analysis was applied mainly in computer science, biology, and physics. An overview of its application in various fields is provided by Newman (2010). In social sciences, it was used by sociologists and anthropologists. Studies in sociology often focused on smaller networks with a more detailed description of relations.

Traditionally research with trade data usually focuses on specific country or trade pairs. Networks focus on the relationships of each member of the network and its trade partner, but they did not take this interaction in isolation. Instead, the statistics show how other members of the network affect the country or the relationship in bilateral trade pair. De Benedictis et al. (2014) claim that the notion of "structural view" in sense of a bilateral pair's interconnection to other

[1] http://www.cepii.fr/CEPII/en/bdd$_{m}odele/bdd_{m}odele_{i}tem.asp?id = 37$

countries is a crucial factor in network analysis and interdependence is hinge for the networks. Moreover, they emphasize the question whether the effect of others could be averaged out similarly to peer effect studies. In case we could assume homogeneity among the network members this averaging is a reasonable assumption, but in their study, they argue this is not usual for social networks with heterogeneity. In such a case, network analysis provides additional insight from relationships with specific members of the network. We believe that similar heterogeneity is present between countries participating in international trade and analyzing its network structure could provide a deeper understanding of trade flow patterns. The heterogeneity could be given by the size of the economy, location, institutional differences, etc. Their importance for trade patterns was shown by gravity models based on the work of Anderson and Van Wincoop (2003) and subsequent extensions of the model.

Development of network analysis in past years was allowed by increasing computational capabilities of computers as well as the development of specialized programs or ad-ins. We will use R language and package "igraph"[2] to visualize and describe the trade networks of interest.

As mentioned earlier the application on trade data is relatively recent and most of the studies focused on trade flows on the aggregate level. De Benedictis and Tajoli (2011) describe the international trading system through the exploration of network properties on aggregate trade data. More recent application on aggregate trade flows by Vidya and Prabheesh (2020) studies structure in trade network after the COVID-19 pandemic suggesting an unchanged role of China and a decrease of degree centrality for severely hit European countries such as Germany, Italy, France, and the United Kingdom, along with the United States. Amador and Cabral (2017) use a network of added value in international trade to map global value chains. Their results show the strong position of the USA and Germany in value-added networks and the increasing importance of China. Russia is identified as an influential supplier of input goods needed in the production of other countries' exports. More closely related to our study is the article by Cingolani et al. (2018) as they focus on specific categories of goods. They study how preferential trade links in textiles and apparel, and electronics, affect trade within the region and the rest of the world. Their results suggest high, but declining, regionalisation mainly in electronics. Smith et al. (2019) study international production network in the high tech industry using firm level data to provide insights on trade and investment patterns. The study is a natural extension of studies using trade data in industries where firm level data are available. Akerman and Seim (2014) study the network of trade in major conventional weapons between 1950 and 2007, suggesting that during the Cold war period there was a divide in the network between eastern and western blocs, but post 1990 the division slowly disappeared. The possible use of centrality measures in the empirical analysis is shown by Aller et al. (2015) who use aggregate trade network statistics calculated

[2]https://igraph.org

based on previous research similar to those stated above to evaluate the impact of trade on the CO_2 emission of a country. The study by Adarov (2021) describes the structure of global value chains in the information and communication technology sectors. The results suggest that the network is dominated by mutual connections between China, South Korea, and Taiwan in the value-added trade. Moreover, the development of the network shows the increasing importance of services in this category, where Ireland has a prominent role in connecting the markets.

In the following paragraphs, we will describe the network measures which will be used for analysis in further sections of this study. More detailed overview with possible applications in other fields see Newman (2010). The basic building blocks of networks are vertices and edges, and the network is a set of vertices connected by edges. For example, in the Neural network, the vertex is a neuron and the edges are synapses. In our specific case of trade network, the vertex is country and the edge is trade flow. When the network cares about the direction in which the edge is pointing we say that the network is directed. In our specification of a trade network, we use a directed network as we are interested in the direction of the trade flows between countries.

The most basic measure in network analysis is a degree of a vertex or alternatively referred to simply as degree centrality, which is the number of edges connected to the vertex. In directed networks, as is our case, we have in-degree and out-degree centrality showing the number of edges leading to vertex or going out of vertex. We will focus mainly on out-degree because we are interested in exports from the country. Although very simple, this measure could provide us information on whether a country's exports are well diversified across trade partners or regions. Similarly, we could assess the country's dependence on the sole importer or exporter. If we take into account all the countries, we could infer whether there is some region or cluster of countries crucial for world trade in a given category. Additionally, we should consider whether the number of connections is generally high or low across the countries because some industries might be dominated by large countries and the possibility for diversification is limited.

Eigenvector centrality expands the degree centrality by focusing on the centrality of the vertex's neighbors. Therefore, the importance of vertex rises when it is connected to other well-connected vertices. The following specification was developed by Bonacich (1987). The eigenvector centrality of a vertex is calculated using the following formula where k is the largest eigenvalue of A, A is the adjacency matrix and x is the vertex

$$x_i = \kappa_1^{-1} \sum_j A_{ij} x_j,$$

In international trade, it could help us determine whether large exporters are well interconnected between themselves and show which countries with not so large exports are important for connecting the trade networks for a given commodity.

The previous centrality measure suffers from certain problems in directed networks so we need to take an adjusted form which is called Katz centrality which was first introduced in the article by Katz (1953). This measure deals with the problem of vertices with zero inbound edges, in our case it could be a country that does not export given good. Such vertex contributes zero score to vertices to which it points to. We could argue that each connection should contribute at least something to the vertex's importance. In trade networks exports to a country that is not the exporter of the good should have some importance, because they still make such connection relevant to the importance of exporting country in a given network. Katz centrality adds a constant to the formula which means it gives some centrality for free to each vertex, additionally, it includes coefficient a which balances between eigenvector and constant term.

$$x_i = \alpha \sum_j A_{ij} x_j + \beta,$$

This ensures that the vertex pointed to by many other vertices has at least some importance even though they themselves are not important (have zero inbound edges).

We should also complement the above-mentioned measures with alternative ones that account for the number of outbound connections. This follows the notion that in certain cases importance derived from connection to an important vertex is diluted with the increasing number of outbound connections it has. Into this category belongs the PageRank algorithm used by Google based on the article Brin and Page (1998) and other similar algorithms powering search engines. These measures might be very relevant for trade networks as with a rising number of trade partners the exports are spread among trade partners and the importance in the network from such connection is limited.

Now we turn to measures studying paths and connections between vertices. At first, we introduce betweenness centrality which captures the degree to which a vertex lies on paths connecting other vertices. The first formal definition was proposed in Freeman (1977). The following formula serves for calculation where n is 1 when the vertex i lies on the path between s and t. In directed networks, if it lies on a path in both directions each one is counted.

$$x_i = \sum_{st} n_{st}^i,$$

Betweenness shows how much information or other flows pass through the vertex and thus show how important are for the interconnection of other members of the network. In the international trade context, this could show countries that are re-exporting a lot to other smaller countries or are themselves large producer which also imports a lot from other countries.

Another measure studying distance is closeness centrality which measures the average of shortest paths from vertex to other vertices. This measure was first formally introduced by Bavelas (1950) Due to the strong connections in international trade networks, this measure likely will not be useful for studying well-connected countries but could show us countries that are isolated and rely only on a small number of importers or export destinations.

The following paragraphs will focus on more specific measures that could be used to look at separate parts of the network and provide should be used when deeper insight into some patterns is needed.

The first such measure is the clustering coefficient which for each vertex is calculated as the number of connections between neighboring vertices divided by the total number of neighbor pairs of the vertex. The measure was introduced by Watts and Strogatz (1998) to provide further insight into networks that are neither completely regular nor entirely random. This could help us find the holes in the network and provide more detailed information on betweenness centrality as it shows the importance of vertex in connection to its immediate neighbors. In a trade network, we could use a clustering coefficient to determine trade relationships in specific regions or key players in global trade for a certain commodity.

The second is reciprocity measuring the share of edges that go in both directions between vertices on the total number of edges in the network. The statistical framework for this measure was developed by Holland and Leinhardt (1981). If we use this measure on the whole trade network, we could determine how frequent is intra-industry trade in the sector, which might be useful information for further analysis. We could possibly specify a cluster of interest and use this measure to see how well interconnected countries of interest are.

Vertex similarity measures give us information about the shared neighbors. The two alternative ways to view network similarity are Structural equivalence which focuses on the number of shared neighbors and Regular equivalence which looks at the properties of the neighbors and tells whether they are similar. This could provide us with information about the division of export markets between large exporters, whether they compete for the same markets or instead they each focus on their specific segment of the market.

Related to the equivalence measures discussed above is a notion of assortative and disassortative mixing which focuses on the number of connections with vertices of similar properties such as age, a field of research, race, language, etc. A detailed overview of different specifications and applications is provided by McPherson et al. (2001). In our context, we might look at countries sharing the same geographic location, language, economy size, and other relevant economic variables.

III. Data

The bilateral trade data are obtained from the BACI database which is built by CEPII from data directly reported by each country to the United Nations Statistical Division (Comtrade). The CEPII developed a procedure that reconciles the declarations of the exporter and the importer, which may be different from the original data. The methodology and data description is provided by CEPII in Gaulier and Zignago (2010) We are interested in product categories defined as items from the 2002 Harmonized System nomenclature[3], at the 6-digit level. The data we collected span the period 2002 to 2019. When describing the development of patterns within networks during the time period we will focus on years the 2002 and 2019 as the start and the end of the observed period. Moreover, we will add 2010 as a mid-point in our data and the first year where the impacts financial crisis of 2008 started to disappear. We end the period in 2019 as it was the last pre-COVID year. Further studies could explore how the trade patterns developed during and after the COVID when the data will be available.

Additional information about countries were taken from the Geodist[4] database of CEPII. We will use this data to map trade networks from among 20 largest export categories of the Czech Republic in the year 2019 to show how the networks in these categories developed and whether there are structural changes in those markets. The 20 largest Czech export categories are summarized in Table 3. We will also try to capture the dynamic development in time to see whether network analysis would be helpful in capturing changing patterns in international trade.

Because there is a similarity in the largest Czech categories due to the focus on car manufacturing, we decided to include no more than three subheadings per HS02 chapter. We have chosen the following ten largest categories for analysis using the rule stated above: Vehicles: compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity exceeding 1500cc but not exceeding 2500cc (HS-6 code: 870332), Transmission apparatus: for radio-telephony, radio-telegraphy, radio-broadcasting or television, with reception apparatus, with or without sound recording or reproducing apparatus (HS-6 code: 852520), Digital processing units: other than those of subheadings 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit: storage units, input units or output units (HS-6 code: 847150), Vehicles: spark-ignition internal combustion reciprocating piston engine, cylinder capacity exceeding 1500cc but not exceeding 3000cc (HS-6 code: 870323), Vehicles: parts and accessories, of bodies, other than safety seat belts (HS-6 code: 870829), Toys: n.e.s. in heading no. 9503 (HS-6 code: 950390), Seat: parts (HS-6 code: 940190), Data processing machines: portable, digital and automatic, weighing not more than 10kg, consisting of at least a central processing unit, a

[3] http://www.wcoomd.org/en/topics/nomenclature/instrument-and-tools/hs_nomenclature_previous_editions/hs_nomenclature_table_2002.aspx

[4] http://www.cepii.fr/CEPII/en/bdd$_{m}odele/bdd_{m}odele_{i}tem.asp?id = 6$

keyboard and a display (HS-6 code: 847130), Lighting or visual signalling equipment: electrical, of a kind used on motor vehicles (excluding articles of heading no. 8539) (HS-6 code: 851220), Medicaments: consisting of mixed or unmixed products n.e.s. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale (HS-6 code: 300490).

IV. Trade networks in the largest Czech export categories

The three graphs in Figure 1 show the development of a trade network for *Vehicles: compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity exceeding 1500cc but not exceeding 2500cc.* Because the network is very complex and trade large portion of countries are interconnected by some relations, we made simplification for graphical representation of this trade network to make it more comprehensible. Similarly to De Benedictis et al. (2014), we take only the two largest exporters for each importing country. However, the calculated measures presented in tables and figures with time series (e.g. Table 4 and Figure 2) are based on the full network without this simplification. This simplification does not bias the picture too much, because countries with the highest centrality measures tend to be among the top two exporters for many countries. However, even this simplified picture of trade in this category captures the development of the importance of exporters in time. Additionally, through color coding, the observer could easily see the interconnection between continents and main export markets on which each of the exporters focuses. This could be especially useful when inspecting how the regions interact with each other and which commodities are produced where and to which parts of the world are they exported. From the first graph, it is visible that in the year 2002 the largest exporters were Japan and Germany. From the graph is visible, that those two countries dominated the exports to countries outside Europe. Interesting is the position of Europe where there is intensive trade between countries within this region and also most of the exports to rest of the world come from European countries. The exceptions are strong international players Japan, Korea and, the USA, supplemented by regional players Australia, Russia, Brazil, and New Zealand. The findings confirm the position of Europe as the hub for automotive production in the world as most large exporters are located here. If we look at the development in time, we still see key role of Europe in this category. However, there are shifts in the relative importance of different players as Germany reduces its importance to benefit of other European countries. On the other hand, the international landscape shifted quite a lot as Japan's importance falls and Korea and Thailand emerge as leaders in Asia along with the rising importance of other smaller regional players as the United Arab Emirates, China, and India. In Africa, there emerges some regional players in Morocco and the Republic of South Africa.

From unweighted degree centrality which could be seen as an expansion of the graphical approach, because it counts the number of country's connections, we can see that the simplified approach was not far from results on the entire set of trade pairs and that markets are dominated by European countries with Japan, Korea, and Thailand as important players from Asia and USA from America. The pattern of decreasing prominence of Japan and the rising importance of Thailand and mainly Korea is clearly visible in the data. Moreover, the degree centrality provides clearer support for the increasing prominence of smaller European countries, as could be seen from the relatively large degree centrality. If we turn to export weighted degree centrality similar picture emerges, but some countries seem to have a much larger number of connections than the actual export volume. This is true mainly for countries outside Europe. One possible explanation could be heavy trade within the EU and reinspecting the data excluding intra-EU trade might be useful in showing the relative stance of EU countries. However, even small European players have much higher centrality than the largest actors from the rest of the world and in 2019 only non-European country in the top 20 is Korea. This strongly confirms the EU as the hub for car manufacturing.

If we look at the eigenvector centrality which shows how well connected the country is to large exporters, the outcome is similar to degree centrality, but the order at the top is slightly different as other large exporters such as France, Italy, and the United Kingdom have the highest eigenvector centrality likely due to large weight of connection to Germany. It also shows how much the country trades with other large players and suggests strong interconnection among European countries. Countries from the rest of the world such as Korea, Japan, and the US, have much smaller eigenvector centrality, likely because they are serving countries without much connection to the world market. This could show that they are primarily focused on countries without their own production and possibly suggest that their cars might not be as high quality to be demanded in other countries at the top of the exports in this category. This explanation might be the reason why some smaller less developed EU countries such as the Czech Republic and Slovakia rank lower in eigenvector centrality than degree centrality. Among the countries with a large degree centrality the large decrease is visible mainly for Korea and US. We can use this measure to determine which countries focus on markets in countries with large production and see the production core while the countries with large drop are the ones supplying markets outside the production core.

To supplement our analysis focused on the Czech Republic, we provide a time series of degree centrality, both unweighted and weighted, and eigenvector centrality in Figure 2. We observe rising eigenvector centrality and weighted degree centrality of the Czech Republic, with relatively stable unweighted degree centrality. This pattern suggests better interconnection to important countries in this trade network and rising volumes of trade. However, Czech exports did show only slow progress in terms of diversification due to stable unweighted degree centrality. The selected set of countries we compare with the Czech Republic consists of Germany and France as the two largest EU economies, US and China as the two largest global trade powers and Slovakia as similarly large and developed countries with a long shared history. From our set of comparison countries the US, China and Slovakia showed faster diversification the during observed period.

In the betweenness centrality, the largest values are for smaller European countries such as Norway or Bulgaria. They likely work as the connecting pieces in the European automobile production hub, importing from large producers and exporting or re-exporting to less connected countries.

For the second largest commodity of Czech exports *Transmission apparatus: for radio-telephony, radio-telegraphy, radio-broadcasting or television, with reception apparatus, with or without sound recording or reproducing apparatus*, we can see in Figure 3 much less concentrated international market with many regional players. This trend of dispersion among larger number of producers continues over time. In 2002 US, Japan, and some EU countries such as France, UK and Germany have a quite large share. However, in 2019, we observe dispersion of their share among other countries. Moreover, there is visible geographic relocation towards production in Asia and smaller usually Eastern European countries with the Czech Republic among them. The underlying cause for this pattern could be a transfer of production of originally more advanced devices that were manufactured in more developed countries to countries with a lower cost of production. As labour costs might be higher in Western EU countries and the US, the producers likely decide to transfer their factories or assembly lines to Asia and eastern Europe as the technology became more widely available causing increased competition and pushing the prices down ,therefore, producers had to look for cheaper way of production to remain profitable.

Again, the simplified version of degree centrality with a limited number of connections served quite well as an illustration of degree centrality with the full set of connections. The development is similar, where more advanced countries across the world were leading producers in the year 2002 and gradually, the share of other producers increased in time and massive transition of production to China and the rising importance of Central and eastern EU countries in Europe is visible in 2019.

Although in raw trade volume China overtook the US, its eigenvector centrality is not as high as could be expected. The trade is centered around the US and Hong Kong, showing a better connection to other large exporters. Moreover, results show higher prominence of Asian countries such as Hong Kong, Japan, and the United Arab Emirates.

In Figure 4, we observe steady growth of degree centralities with an upswing suggesting fast growth in interconnectedness in the last years of the studied period. The Czech republic also increases its prominence within the network as suggested by the rise of its eigenvector centrality along France and Germany. However, in terms of trade volumes, China remains dominant power as suggested by the weighted degree centrality.

A somewhat puzzling pattern is present for betweenness centrality as many of the countries with the highest centrality are African countries which could be possibly explained by their role in re-exporter to other less developed countries which could not produce transmission equipment themselves. Alternatively, they could assemble the final product from imported parts.

From Figure 5 for *Digital processing units: other than those of subheadings 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit: storage units, input units or output units* exports we again see the strong role of US, Canada and western European countries with some regional players in eastern Asia such as Singapore, Hong Kong, Japan, and China in the year 2002. As we could expect that this machinery is technically advanced and at first it was produced in developed countries and then some parts of the production chain were shifted to countries with lower labour cost. However, this is not entirely true as in Europe only two new countries emerge as relevant players in international markets namely the Czech Republic and Denmark. In Asia, the share of China grows and the United Arab Emirates emerged as a relevant regional player by 2019.

The notion from the visualization of degree centrality is confirmed as most of the countries we identified from figures with limited dataset have high degree centrality with the full set of connections and weighted degree centrality follows a similar pattern. However, in Eastern Asia, the countries rank close to each other in centrality and the differences are not as large as suggested by the graphic representation. Also, as visible from the table, the ordering is shifted compared to the graphic representation. In export weighted index the US dominate during the whole period, however, the role of Mexico and China is much larger in 2019 than suggested by graphical representation. This fact shows the importance of complementing graphs with more detailed calculations on full data.

Turning to the position of the country within the global markets we see from eigenvector centrality that the US is still the most important. However, we again see a drop of China in this measure suggesting its low connection to other large exporters. Even other smaller exporters such as Japan, Korea, India, and Singapore have a higher level of connection to other important exporters than China.

From Figure 6, we could observe both in diversification and trade volumes of the Czech Republic as suggested by the rising degree centralities. However, stable eigenvector centrality suggests there is no progress in connection with the most important countries in this category. On the other hand, this might be positive as the Czech Republic could have found diverse smaller markets as suggested by the other two measures.

Betweenness centrality again shows some small countries as relatively important points for connections in international markets (e.g. Cyprus, Luxembourg). However, some of the important exporters emerge as potential hubs interconnecting the markets among them are India, Singapore, Korea, and the United Arab Emirates.

In Figure 7, we can see the development of a trade network for *Vehicles: spark-ignition internal combustion reciprocating piston engine, cylinder capacity exceed-*

ing 1500cc but not exceeding 3000cc. In 2002 western European countries along with Japan, Korea and US were the largest exporters. However, in time the importance of Western Europe and Japan decrease, with Germany as one of the largest losers among the western European countries. In 2019, new players in Asia emerged, namely United Arab Emirates, Thailand, and China. In Europe, central European countries such as Slovakia, Hungary, and the Czech Republic increased in importance.

As visible from unweighted and weighted centrality in 2002 the graphical representation roughly represents the true state of the complete network in this category. However, in the weighted version Canada and Mexico, are more important than we can infer from figures, and also their unweighted centrality. This is a puzzling result that might suggest they have less numerous and more equally distributed exports across trade partners. They could be outweighed by the large volume of US exports which likely exports to the same countries thus lowering the possibility for Canada and Mexico being among the top 2 importers of a given country. If we look at development over time, it shows quite different results which are most visible in the weighted version as Japan and Korea are still dominant players in Asia, but they are joined by China whose weighted centrality is much larger than unweighted, but for Thailand, we can see the opposite. Additionally, Mexico's exports rise dramatically but it is not reflected in the pure count of trade connections. The emergence of central European countries is also visible from those statistics.

In eigenvector centrality, we see strong connections between the largest world exporters likely forming the core irrespective of their location unlike in the previous vehicle category as all the large exporters have large centrality. The only exception in 2002 is Mexico which has much higher centrality likely due to connections to US and Canada, two other large exporters in the same region. An interesting development in time is visible for China which becomes the country with the second highest centrality replacing Japan which is much lower than suggested by the raw strength of export connections showing the strong interconnection of China to global markets in this category.

Figure 8 shows no interesting development of trade statistics for the Czech Republic as they stay relatively stable over time. However, we could observe a remarkable rise of China across all measures. In contrast to previous categories, China also became well integrated with other main countries in this category as suggested by a large increase in eigenvector centrality.

Betweenness centrality is again not much telling except Italy, France, and the Netherlands are currently connections between different markets as other countries showing high betweenness are relatively small.

In 2002 *Vehicles: parts and accessories, of bodies, other than safety seat belts* network we see in Figure 9 again strong position Japan and Korea in Asia, US in Americas and largest exporters in Europe are in western part namely Germany, France, Netherlands, and Spain. In time the market becomes much more decentralized, and many new important exporters emerge. In Asia, the role of Korea declines dramatically, and the United Arab Emirates, China, and Thailand emerge. Turkey and United Kingdom gain importance in Europe.

While unweighted centrality on full set quite well reflects the graphical representation of a reduced set, there is a significant difference in export weighted degree centrality as Northern American countries have much higher weighted centrality. Also, some eastern European countries have a quite large centrality which increases over time, but the US, Canada, and Mexico are still the most important international players along with Germany and China.

The eigenvector centrality confirms the strong core in Northern America which has connections to the largest exporters. In 2002 the Asian countries have high values of centrality, but only China retains its position, while Germany, Russia and Thailand, overtake Japan.

In Figure 10, we observe a steady increase of interconnectedness of the Czech Republic as shown by both degree centralities. However, after 2010 the unweighted one suggests a slowdown in the diversification of trade partners.

Betweenness centrality in this category suggests that large countries such as France, Brazil, Belgium, and Poland are important for the interconnection of other countries.

In *Toys: n.e.s. in heading no. 9503* trade network we see in Figure 11 a relatively stable set of key exporters in time. In Europe, the biggest exporters tend to be the largest countries Germany, the United Kingdom, Italy, Spain, and France are the countries with the most connections along with Belgium and Netherlands. In Asia, China, Hong Kong, and Thailand were the largest exporters in 2002 and 2010 as visible form Figure 11. However, in 2019 the share of the two latter countries significantly diminished. Other important exporters are USA and Canada.

The above-mentioned patterns are visible in the degree centrality calculated on the whole set of countries. However, the US has in years 2002 and 2010 higher centrality than China, while the latter slowly gains more are more new trade partners. However, in the weighted version of degree centrality China and US are dominant players closely followed by western European countries. Hong Kong's role declines in time similarly to the graphical representation above. Czech Republic, Poland, and Vietnam are new players emerging after 2010 competing with western European countries and Japan.

Eigenvector centrality shows an interesting structure where European countries, the US, and Canada likely form a cluster of countries with strong connections as they are the ones connected to the most important exporters while large Asian exporters with exception of Hong Kong have low centrality suggesting that likely they export to countries which themselves have low production of toys.

Figure 12 shows a large relative increase for the Czech Republic along with Germany and France across all displayed network statistics. Czech unweighted degree centrality shows fast diversification across trade partners and the rise of eigenvector centrality for the mentioned countries shows their increased importance in the global Toys market.

Betweenness centrality has again limited explanatory value, but likely key connecting point in Africa is Ghana, in Asia Korea and Brunei and in Latin America Bolivia and Honduras, and in Europe Portugal and Switzerland. However, the leading countries change quite a bit between the years 2002 and 2019 which could be due to changing transportation paths.

In 2002, the Trade network of *Seat: parts* was predominantly centered around Western European countries and the US, with several smaller players in Asia namely China, Malaysia and Thailand, and South Africa from the rest of the world. However, in the following years China gained prominence and most other Asian countries slowly lost their importance along with most European countries. The only emerging exporter from Europe is Turkey as visible in Figure 13.

The unweighted degree centrality closely follows the patterns outlined in the figures above. However, the export weighted shows much different results as key players are the US, Mexico, and Germany with China slowly increasing in importance, while the role of Canada declines, Also the Czech Republic and Poland are much larger exporters than suggested by the unweighted version along with Slovakia and Japan. For central European countries, and also Canada and Mexico the pattern could be caused by large exports to several countries, which could be likely as their neighbors are among the largest manufacturers in seats and also vehicles. A large number of connections of China could be to Asian countries with less developed industries that could not manufacture the seats themselves due to insufficient scale that would cover domestic demand.

When we turn to connections to other important players measured by eigenvector centrality, we see a tight connections between northern American countries and also Japan. On the other hand, China is not as well connected to other large players, but slowly increases its centrality and by 2019 even overtakes western European countries.

Figure 14 again shows rising connectedness to the trade network, but again the relative growth of Czech unweighted degree centrality is steady while, weighted degree centrality grows rapidly after 2012.

Betweenness centrality is again quite puzzling as Costa Rica, Ecuador, Australia, Korea, and Belgium have the largest centrality. Some of them like Belgium, Australia, and Korea could be a port of entry to their regions, but the large role of Ecuador is puzzling as Brazil which had large centrality before 2019 declines. A possible explanation could be its geographic location benefits from the emergence of China as opposed to North America and western Europe.

From a graphical depiction of the trade network for *Data processing machines: portable, digital and automatic, weighing not more than 10kg, consisting of at least a central processing unit, a keyboard and a display* in Figure 15, we see again the strong role of US, Canada, and western European countries with some regional players in Asia namely Singapore, Japan and Korea in 2002. In time, however, the market becomes more decentralized and new exporters emerge such as China, Denmark, Australia, or the Netherlands.

Again, the degree centrality on the full set is relatively close to the reduced form depicted in the figures above, but China has lower importance than would be expected. However, this could be explained by its large weighted centrality showing larger exports than other countries thus having higher value per export and being likely among leading exporters to each other country. Continuing with the inspection of weighted centrality, Hong Kong and the Czech Republic emerge as large exporters, but they are not as well connected or significant exporters to other countries as they are not among key players in the network visualizations above.

European core along with the US, Canada, Hong Kong, and Japan seems to be well interconnected to other large players as visible from high eigenvector centrality. On the other hand, China has much less connection to other significant players than we would expect from its prominent role in this category.

In Figure 16, we observe a strange pattern for Czech degree centrality as it declines after 2014, while its weighted counterpart stays stable or slightly grows. An explanation could be the increase of trade in this category with large economies in this sector. This notion is supported by the rising degree centrality of the Czech Republic.

In betweenness centrality, we see large African countries such as the South African Republic and Ghana along with Nicaragua, Korea, and India from other regions.

In *Lighting or visual signalling equipment: electrical, of a kind used on motor vehicles (excluding articles of heading no. 8539)* trade network we see from Figure 17 that in 2002 Japan was the most important exporter followed by China, the US, Germany, and France. However, the importance of China rises and in 2010 and 2019 it is the country with the largest number of connections. Compared to 2002 and 2010, we see a more decentralized market in Europe as the importance of France and Germany decreases and we see a relatively large number of moderately important countries.

The degree centrality confirms the rising importance of China as measured by the unweighted degree centrality. Also, rising prominence of other European countries is confirmed by the rise of Belgium, the Netherlands, and Turkey. Japan has somewhat lower prominence than would be expected from a graphical depiction. A possible explanation could be that it exports higher volumes to a smaller amount of countries as supported by its weighted degree centrality. In weighted degree centrality, there is a visible rise in China's importance. However, Germany and the United States remain the key countries in this trade network measured according to this measure. The Czech Republic has again high weighted centrality which was not reflected in graphical depiction likely caused by its proximity to other large exporters with the same trade connections.

In eigenvector centrality, the results point to strong connections in northern

America, because the US, Canada, and Mexico have the highest centrality in all years, suggesting strong interconnection between them and also with other key countries. Germany and China also show high values of eigenvector centrality.

In Figure 18, we see again a steady increase of both degree centralities for the Czech Republic suggesting better interconnection to trade network in this category. However, in eigenvector centrality, we see large increase in US importance along with a decrease for other observed countries including the Czech Republic.

In betweenness, we see the relatively high importance of the following countries: Canada, Thailand, Switzerland, and New Zealand. However, their importance varies over time so we could not determine any clearly crucial country for connecting the trade network in this category.

From a graphical representation of *Medicaments: consisting of mixed or unmixed products n.e.s. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale trade network* in Figure 19, we see a very decentralized structure with many regional players across all continents. This structure is roughly stable in time. As in previous categories, China and India emerge in later years as important players in Asia.

We see that the best connected countries are the western European ones along with US and Canada, but in time the importance of India rises and it becomes the country with the largest number of connections in 2019. Its rising importance is also visible in the weighted version, but the US and European countries still dominate global markets.

Eigenvector centrality confirms the importance and tight connections between the European and American core of producers, but in time Japan and China became increasingly more prominent.

Figure 20 show slightly growing weighted degree centrality, but unweighted one becomes volatile after 2010 shows little progress in diversification of trade partners of Czech republic.

V. Determinants of Eigenvector centrality

This section of our study is dedicated to identifying key determinants of eigenvector centrality. The motivation for this is firstly showing possible framework for explaining network measures through statistical models. Secondly, offering a possibility to include network measures as explanatory variables in statistical models. As the main focus of our study is an exploration of network statistics, we try to determine variables that are contributing to the high eigenvector centrality of a country in a given export category. Given that this part serves more as an illustrative example for use of network statistics, we will use a similar set of explanatory variables for all categories. Further studies focused on more detailed categories would benefit from an expansion of explanatory variables for industry specific factors.

In the selection of explanatory variables, we will take inspiration from covariates utilized in determining aggregate exports as suggested by Redding et al.

(2004) and extended in UNCTAD (2005). We will consider two specifications where the base one will use the following covariates collected mainly from World Development Indicators database[5]: GDP per capita to control for the economic development of a country as well as for its current economic performance, we will complement this measure of economic performance by unemployment and HICP, Country risk index from Country risk guide for measuring the risk of doing business in a given country, the share of net FDI inflows on GDP is used as a proxy for technological environment and imports of new technologies from other countries. In the extended specification, we add the Economic freedom of the world indices[6].

The regression is estimated using the fixed effects method as the results of the F test showed statistically significant unobserved group specific effects. We use serial correlation and clustering robust standard error introduced by Driscoll and Kraay (1998) due to the presence of clustering and serial correlation in panel data across the studied categories.

The regression results show varying impacts across categories for GDP per capita with mostly statistically insignificant impact. However, some categories show the negative effect which could be possibly explained by less developed countries could have a comparative advantage due to cheaper labour force.

Foreign direct investments show to have a statistically significant positive impact in some categories. Therefore, foreign financing and experience transferred through them could have a positive impact on the country's significance within the sector. However, we see that relatively similar categories such as cars with different engine volumes show differing statistical significance, suggesting more detailed specification of such investments considering category specific environment could have an important role in determining eigenvector centrality.

The aggregate political risk indicator shows mixed results. However, it seems that for more technologically advanced products, we could observe positive statistically significant effects as in Vehicles, Data processing units, and Transmission apparatus. We observe the negative effect in seemingly less technology intensive categories such as Vehicle parts and seats. Additional institutional covariates from Economic freedom of the world indicators show varying results across categories. Studies focusing on the role of institutions and policies on a country's eigenvector centrality in trade network counterfactual studies would be an important addition to current knowledge about the structure of trade networks.

Unemployment has a negative impact on a country's eigenvector centrality as shown by statistically significant negative results in four of the studied export categories and two statistically significant results only in the base model at 10% confidence level. The negative effect could be possibly caused by lower trade competitiveness of countries facing higher unemployment in turn being less influential across studied export categories.

Inflation does not have statistically significant income across the studied cat-

[5]https://databank.worldbank.org/source/world-development-indicators

[6]https://www.fraserinstitute.org/economic-freedom/dataset

egories. Therefore, we could expect that monetary developments have a limited impact on a country position within the global market in studied categories. However, further studies could benefit from extending the covariates by measures of extraordinary monetary policy or circumstances, such as hyperinflation when studying the export position of a country facing such events.

	Vehicles 1500-2500cc		Transmission apparatus		Digital processing units		Veh. spark ign. 1500-3000cc		Vehicle parts	
	Base	Extended	Base	Extended	Base	Extended	Base	Extended	Base	Extended
GDPPC	0.000002***	0.000002***	−0.000000	0.000001	−0.000005***	−0.000004***	−0.000000	−0.000000	−0.000000	−0.000000
	(0.000000)	(0.000000)	(0.000003)	(0.000002)	(0.000001)	(0.000001)	(0.000000)	(0.000000)	(0.000000)	(0.000000)
FDI	0.000068**	0.000077**	−0.000044	−0.000040	0.000035*	0.000027	0.000011	0.000003	0.000005**	0.000006*
	(0.000022)	(0.000026)	(0.000073)	(0.000074)	(0.000017)	(0.000019)	(0.000009)	(0.000014)	(0.000002)	(0.000003)
PRI	0.009917	0.014373*	0.040193***	0.042714***	0.019964***	0.020363***	0.003328	0.001120	−0.006167**	−0.006536**
	(0.006124)	(0.007131)	(0.010868)	(0.010872)	(0.003900)	(0.005482)	(0.003304)	(0.004051)	(0.002315)	(0.002499)
Unem_ILO	−0.002815***	−0.003063***	−0.001449	−0.001413	−0.002048***	−0.001676**	−0.000886*	−0.000618	−0.000128	−0.000167
	(0.000675)	(0.000675)	(0.000910)	(0.000806)	(0.000567)	(0.000540)	(0.000359)	(0.000414)	(0.000073)	(0.000087)
CPI	−0.000008	0.000020	0.000037	−0.000044	0.000016	0.000117**	−0.000004	−0.000001	−0.000011	0.000006
	(0.000037)	(0.000052)	(0.000082)	(0.000103)	(0.000036)	(0.000043)	(0.000021)	(0.000029)	(0.000008)	(0.000007)
Gov_size		−0.001696*		−0.000651		0.005266***		0.008080***		0.000083
		(0.000781)		(0.003337)		(0.001247)		(0.001691)		(0.000476)
Legal_sys		−0.010837***		−0.006888		0.005250		0.001794		−0.002681***
		(0.001678)		(0.003975)		(0.003368)		(0.001833)		(0.000592)
Sound_money		0.001905		−0.004159***		0.001494		−0.001423*		0.000401*
		(0.000992)		(0.001050)		(0.001111)		(0.000647)		(0.000189)
Trade_freedom		0.002270		0.014470*		0.009860		0.003598		0.000519
		(0.001531)		(0.007192)		(0.005140)		(0.001985)		(0.000501)
Regulation		−0.002995		−0.007969		−0.012681***		0.001636		0.001248**
		(0.002816)		(0.006450)		(0.003088)		(0.001926)		(0.000441)

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table 1—: Eigenvector centrality regression results

	Toys		Seat: parts		Data processing machines		Lighting signaling equipment		Medicaments	
	Base	Extended	Base	Extended	Base	Extended	Base	Extended	Base	Extended
GDPPC	0.000001	−0.000000	−0.000001***	−0.000001***	−0.000003**	−0.000003**	0.000000	0.000000	0.000001	0.000001
	(0.000004)	(0.000003)	(0.000000)	(0.000000)	(0.000001)	(0.000001)	(0.000002)	(0.000002)	(0.000001)	(0.000001)
FDI	0.000116*	0.000112*	0.000000	−0.000000	0.000022	0.000018	0.000071***	0.000069**	0.000051	0.000055
	(0.000056)	(0.000053)	(0.000002)	(0.000002)	(0.000014)	(0.000017)	(0.000021)	(0.000027)	(0.000043)	(0.000045)
PRI	−0.021391	−0.023664	−0.003932**	−0.004695**	0.020533***	0.021541***	0.003227	0.005313	−0.013411	−0.013147
	(0.016859)	(0.018319)	(0.001443)	(0.001468)	(0.002206)	(0.003699)	(0.011527)	(0.013019)	(0.009510)	(0.009772)
Unem_ILO	−0.000436	−0.000450	−0.000219*	−0.000193	−0.002928***	−0.002750***	−0.000494	−0.000483	0.001399*	0.001297*
	(0.001416)	(0.001388)	(0.000085)	(0.000101)	(0.000594)	(0.000539)	(0.000660)	(0.000510)	(0.000614)	(0.000510)
CPI	−0.000077	0.000121	−0.000009	0.000010	0.000016	0.000082	0.000032	0.000076	−0.000050	0.000096
	(0.000069)	(0.000079)	(0.000006)	(0.000008)	(0.000034)	(0.000049)	(0.000048)	(0.000052)	(0.000035)	(0.000062)
Gov_size		0.002702		0.000683		0.003806***		0.003453		−0.001350
		(0.002407)		(0.000353)		(0.000796)		(0.003095)		(0.002274)
Legal_sys		0.016529***		−0.000310		−0.001227		0.004667		−0.005625
		(0.004001)		(0.000767)		(0.002613)		(0.004092)		(0.003425)
Sound_money		0.006898***		0.000195		0.000622		0.002153*		0.004660***
		(0.001504)		(0.000138)		(0.000940)		(0.001089)		(0.001100)
Trade_freedom		−0.018115*		0.001276**		0.009185*		−0.007491		−0.002413
		(0.008313)		(0.000482)		(0.004597)		(0.004990)		(0.003604)
Regulation		0.004134		0.000132		−0.006912***		−0.006532		0.006148
		(0.009488)		(0.000466)		(0.002080)		(0.006584)		(0.003933)

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table 2—: Eigenvector centrality regression results - cont.

VI. Conclusion

The study used bilateral trade data available in the BACI database to study trade networks in selected industries among the largest export categories of the Czech Republic. The results show the rising importance of China across all categories. However, in our studied markets of vehicles and their parts Germany and the US maintain a strong positions. This also holds true for the studied category of medicaments. In electronics, information technologies, and toys, China managed to gain a leading position as shown by the degree centralities. However, in many cases, it is not well connected to other important countries in a given market as suggested by lower eigenvector centrality.

The results for the Czech Republic suggest its increasing interconnection to international markets shown by rising weighted degree centrality across studied categories. However, in many categories (e.g. vehicles, vehicle parts, medicaments) this increase is not matched by an increase in diversification as measured by unweighted degree centrality. A limited number of trade partners in those important export categories is a possible risk for the Czech economy and an increase in diversification should be a key priority in those categories. Policymakers could potentially draw lessons from Data processing machines and Toys categories, where an increase of trade partners was remarkable during the observed period. In most cases, the Czech Republic is not an important actor in studied markets as measured by eigenvector centrality, but in some categories such as data processing machines, toys, or transmission apparatus it is quite well connected to important countries in a given trade network.

From regression of eigenvector centrality of exports, we see that Foreign direct investments are positively correlated in most cases with eigenvector centrality, while unemployment has a negative correlation. Thus attracting foreign investments and efficient utilization of labour force are important factors across industries. For institutional variables, we saw different effects and we should consider relevant variables given industry or relevant policy intervention to observe a conclusive effect.

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VII. Appendix

Table 3—: 20 Largest Czech export according to 6 digit categories of HS02 Nomenclature in 2019

1	Vehicles: compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity exceeding 1500cc but not exceeding 2500cc
2	Transmission apparatus: for radio-telephony, radio-telegraphy, radio-broadcasting or television, with reception apparatus, with or without sound recording or reproducing apparatus
3	Digital processing units: other than those of subheadings 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit: storage units, input units or output units
4	Vehicles: spark-ignition internal combustion reciprocating piston engine, cylinder capacity exceeding 1500cc but not exceeding 3000cc
5	Vehicles: parts and accessories, of bodies, other than safety seat belts
6	Vehicles: spark-ignition internal combustion reciprocating piston engine, cylinder capacity exceeding 1000cc but not exceeding 1500cc
7	Vehicles: spark-ignition internal combustion reciprocating piston engine, cylinder capacity not exceeding 1000cc
8	Vehicles: parts and accessories, n.e.s. in heading no. 8708
9	Toys: n.e.s. in heading no. 9503
10	Seat: parts
11	Data processing machines: portable, digital and automatic, weighing not more than 10kg, consisting of at least a central processing unit, a keyboard and a display
12	Lighting or visual signalling equipment: electrical, of a kind used on motor vehicles (excluding articles of heading no. 8539)
13	Medicaments: consisting of mixed or unmixed products n.e.s. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale
14	Electrical energy
15	Machines: parts and accessories of automatic data processing, magnetic or optical readers, digital processing units
16	Vehicles: brakes, servo brakes and parts, not mounted brake linings
17	Pumps: fuel, lubricating or cooling medium pumps for internal combustion piston engines
18	Machinery: for filtering or purifying gases, other than intake air filters for internal combustion engines
19	Air conditioning machines: with motor driven fan and elements for temperature control, parts thereof
20	Boards, panels, consoles, desks and other bases: for electric control or the distribution of electricity, (other than switching apparatus of heading no. 8517), for a voltage not exceeding 1000 volts

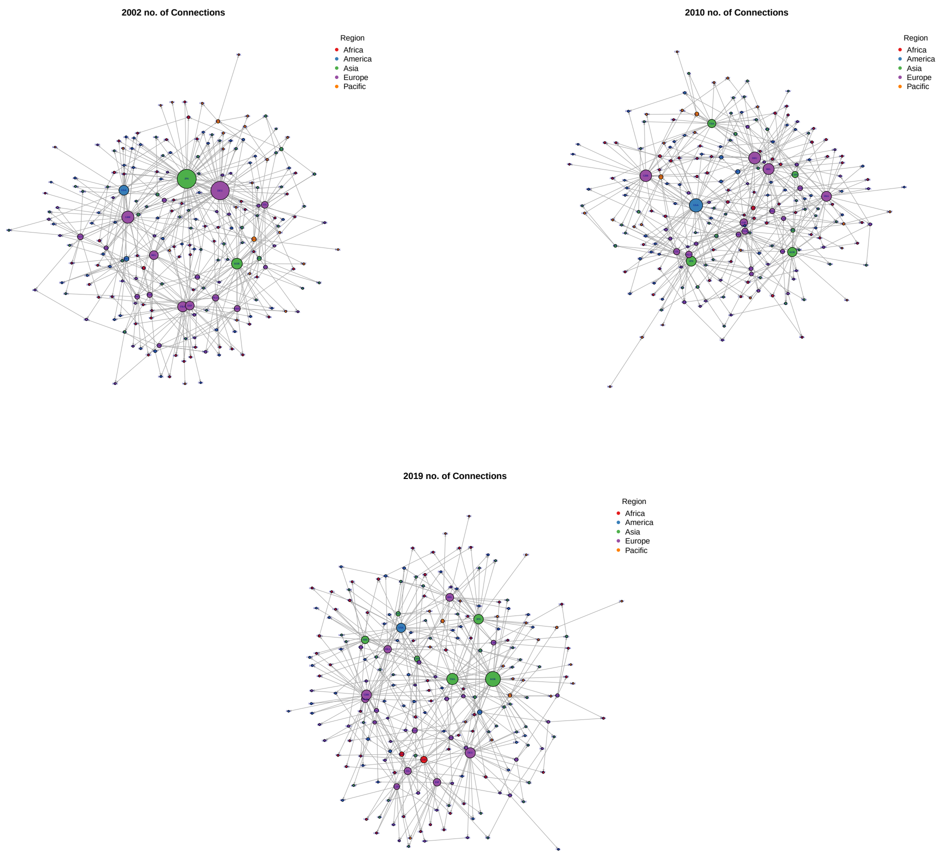

Figure 1. : Vehicles: compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity exceeding 1500cc but not exceeding 2500cc

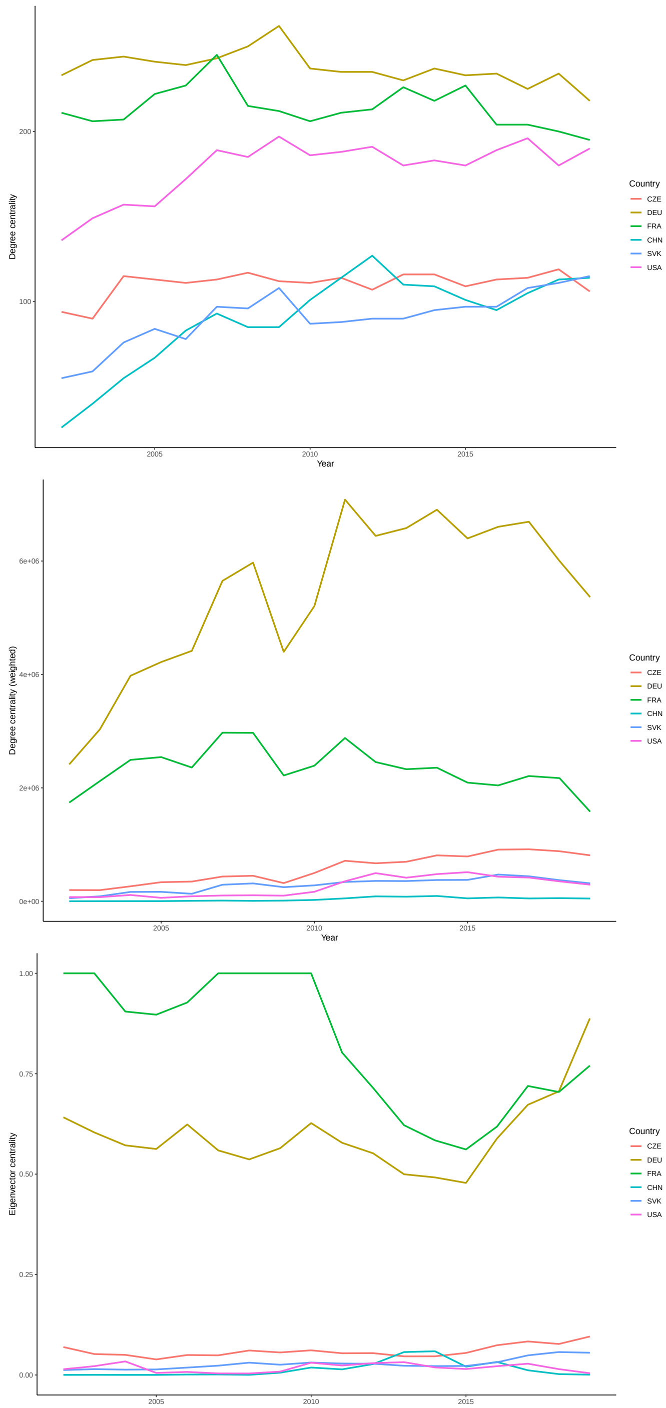

Figure 2. : Vehicles: compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity exceeding 1500cc but not exceeding 2500cc

Table 4—: Measures from year 2019 for Vehicles: compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity exceeding 1500cc but not exceeding 2500cc

	Degree Centrality		Degree Centrality (w)		Eigenvector Centrality		Betweenness Centrality	
1	DEU	218	DEU	5,363,602	ITA	1.0000	NOR	13,539.0
2	KOR	213	FRA	1,580,676	GBR	0.9054	NGA	7,105.0
3	BEL	196	BEL	1,377,938	DEU	0.8878	BGR	6,704.0
4	FRA	195	ESP	1,373,569	FRA	0.7702	LTU	5,974.0
5	USA	190	GBR	1,369,294	BEL	0.5844	CHE	5,388.0
6	GBR	190	ITA	1,353,907	ESP	0.4860	GRC	4,623.0
7	ESP	179	CZE	810,389	AUT	0.3007	ARE	4,606.0
8	JPN	166	SWE	604,736	SWE	0.2265	BEL	4,600.5
9	NLD	161	KOR	502,958	JPN	0.2260	TJK	4,427.0
10	ITA	157	AUT	475,861	KOR	0.1953	FRA	4,177.5
11	THA	145	JPN	438,176	CHE	0.1871	GEO	4,175.0
12	ARE	123	MEX	392,135	POL	0.1793	MKD	3,410.0
13	CHE	120	POL	372,775	PRT	0.1317	NLD	3,083.0
14	AUT	119	TUR	340,131	TUR	0.1284	DNK	2,819.0
15	TUR	117	PRT	320,812	DNK	0.1099	SVN	2,690.0
16	POL	116	SVK	316,822	NLD	0.1034	GBR	2,534.5
17	SVK	115	ZAF	312,571	CZE	0.0958	USA	2,385.0
18	SWE	115	USA	293,055	HUN	0.0832	CAN	2,381.0
19	CHN	114	HUN	290,745	MAR	0.0823	COG	2,174.0
20	CZE	106	CHE	243,602	NOR	0.0766	ZAF	2,145.0
21	CAN	105	NLD	222,345	RUS	0.0737	POL	2,079.0
22	SVN	98	THA	213,394	SVN	0.0715	ITA	2,045.0
23	PRT	95	SVN	195,363	LUX	0.0711	ZWE	1,978.0
24	NOR	95	FIN	169,614	IRL	0.0617	CZE	1,881.0
25	LTU	94	DNK	134,016	ROU	0.0568	IRL	1,879.0
26	ZAF	94	AUS	132,853	SVK	0.0554	LVA	1,805.0
27	HUN	92	MAR	131,766	FIN	0.0525	KOR	1,779.0
28	DNK	84	RUS	122,846	AUS	0.0483	MYS	1,775.0
29	BGR	82	LUX	98,524	HRV	0.0443	ESP	1,464.0
30	IND	82	NOR	90,740	ZAF	0.0413	DEU	1,443.0

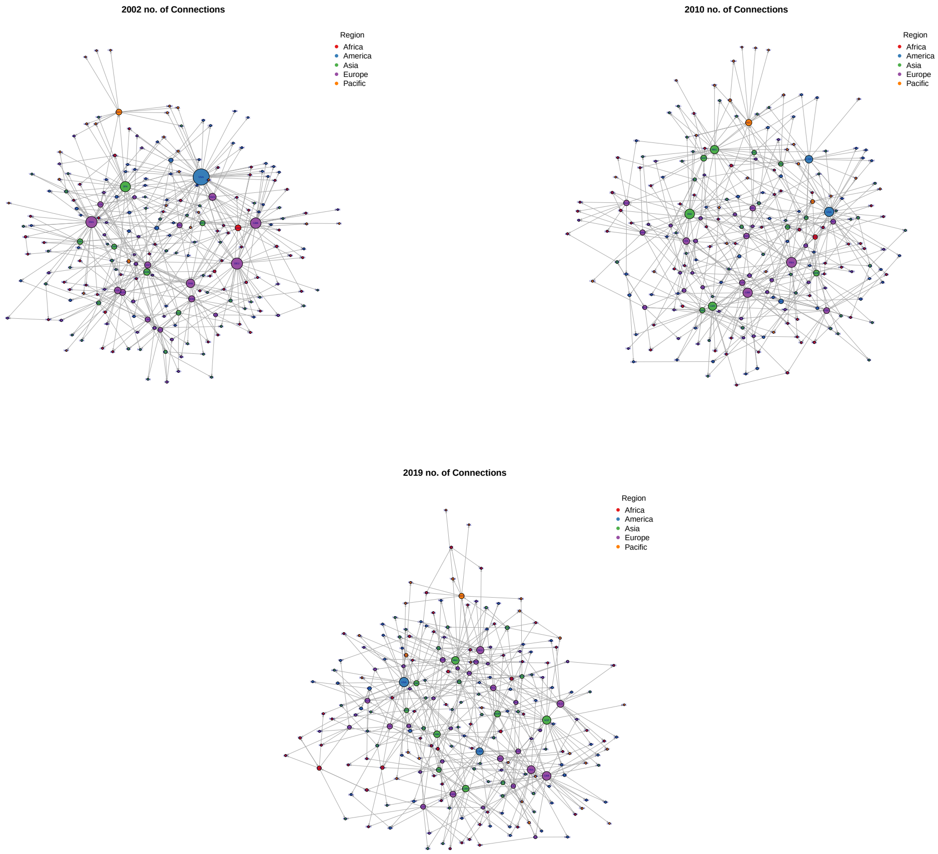

Figure 3. : Transmission apparatus: for radio-telephony, radio-telegraphy, radio-broadcasting or television, with reception apparatus, with or without sound recording or reproducing apparatus

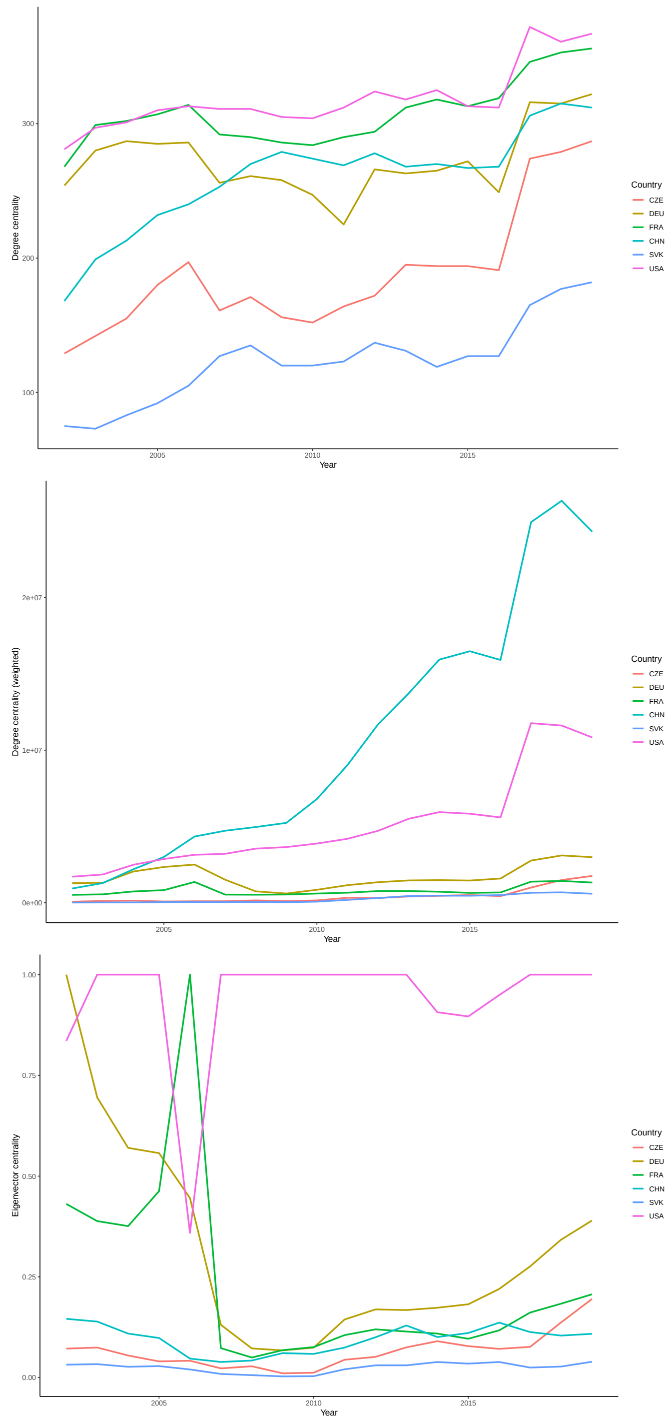

Figure 4. : Transmission apparatus: for radio-telephony, radio-telegraphy, radio-broadcasting or television, with reception apparatus, with or without sound recording or reproducing apparatus

Table 5—: Measures from year 2019 for Transmission apparatus: for radio-telephony, radio-telegraphy, radio-broadcasting or television, with reception apparatus, with or without sound recording or reproducing apparatus

	Degree Centrality		Degree Centrality (w)		Eigenvector Centrality		Betweenness Centrality	
1	USA	367	CHN	24,315,520	USA	1.0000	BWA	8,499.5
2	FRA	356	USA	10,831,544	HKG	0.8781	IRL	7,491.5
3	NLD	345	HKG	5,190,597	NLD	0.6130	ZAF	7,200.5
4	GBR	329	VNM	4,912,100	GBR	0.4304	BEN	6,258.0
5	DEU	322	NLD	3,387,784	DEU	0.3898	TTO	4,995.5
6	CHN	312	DEU	2,986,517	JPN	0.2759	CRI	4,334.5
7	HKG	309	ARE	2,820,366	ARE	0.2569	SWZ	3,959.5
8	SWE	309	JPN	2,288,625	CAN	0.2293	SLE	3,939.5
9	CAN	308	GBR	2,157,207	FRA	0.2067	CAN	3,930.0
10	KOR	298	CZE	1,760,650	CZE	0.1951	FIN	3,853.0
11	SGP	297	MEX	1,626,477	SWE	0.1904	KHM	3,472.0
12	CHE	294	KOR	1,375,001	ITA	0.1837	JAM	3,471.0
13	BEL	293	FRA	1,323,955	BEL	0.1540	RUS	3,371.0
14	ESP	288	CAN	1,144,269	SGP	0.1537	NAM	3,342.0
15	CZE	287	MYS	1,134,123	PRY	0.1373	DOM	3,291.0
16	HUN	281	SGP	1,088,032	AUS	0.1320	PHL	3,252.5
17	ARE	277	THA	1,036,822	MEX	0.1313	KOR	2,943.0
18	ZAF	270	ITA	938,514	ESP	0.1234	GTM	2,941.5
19	AUS	264	IND	922,182	IND	0.1149	LUX	2,921.0
20	ITA	262	SWE	853,500	MYS	0.1124	PRT	2,693.0
21	DNK	260	RUS	815,308	CHN	0.1086	KEN	2,670.5
22	AUT	259	AUS	774,854	RUS	0.0969	MOZ	2,446.0
23	POL	258	ESP	658,030	IRQ	0.0901	CHE	2,393.5
24	IND	250	POL	653,382	KOR	0.0877	ESP	2,238.5
25	FIN	240	SVK	590,633	POL	0.0849	VUT	2,192.0
26	LVA	239	IRL	443,847	HUN	0.0828	DNK	2,187.5
27	IRL	237	HUN	426,897	PHL	0.0796	MDG	2,066.0
28	JPN	227	AUT	403,676	AUT	0.0695	POL	2,013.0
29	MYS	226	BEL	400,778	DNK	0.0670	BHR	2,009.5
30	NOR	225	SAU	391,309	IRL	0.0667	COL	1,988.0

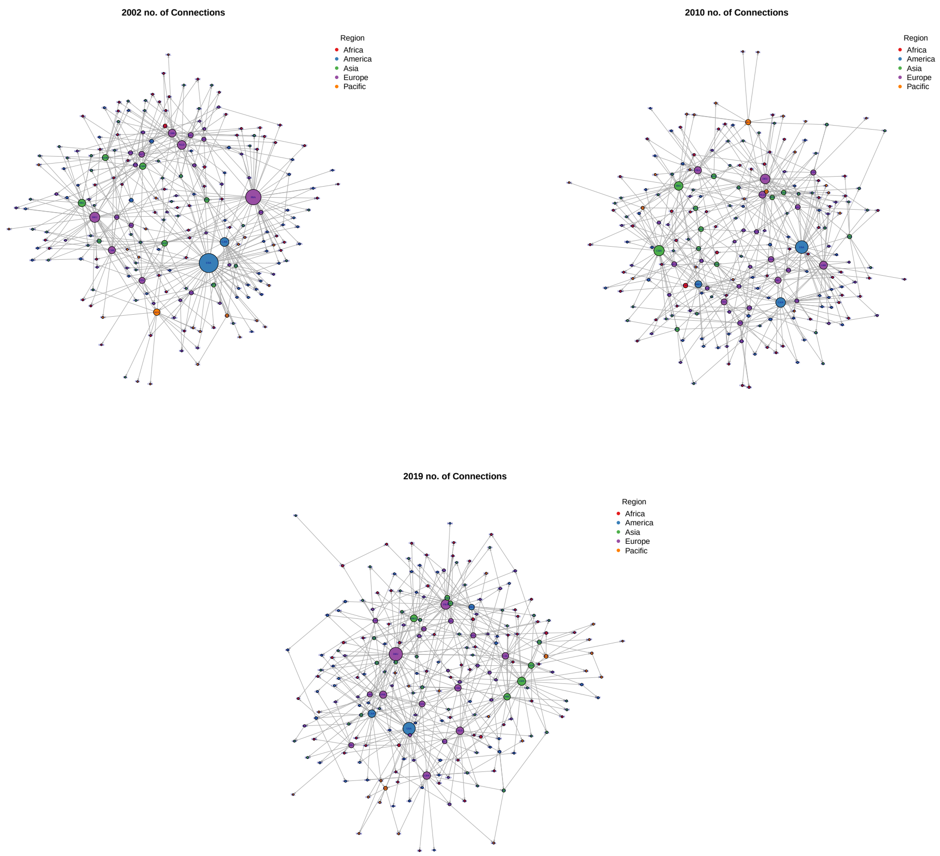

Figure 5. : Digital processing units: other than those of subheadings 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit: storage units, input units or output units

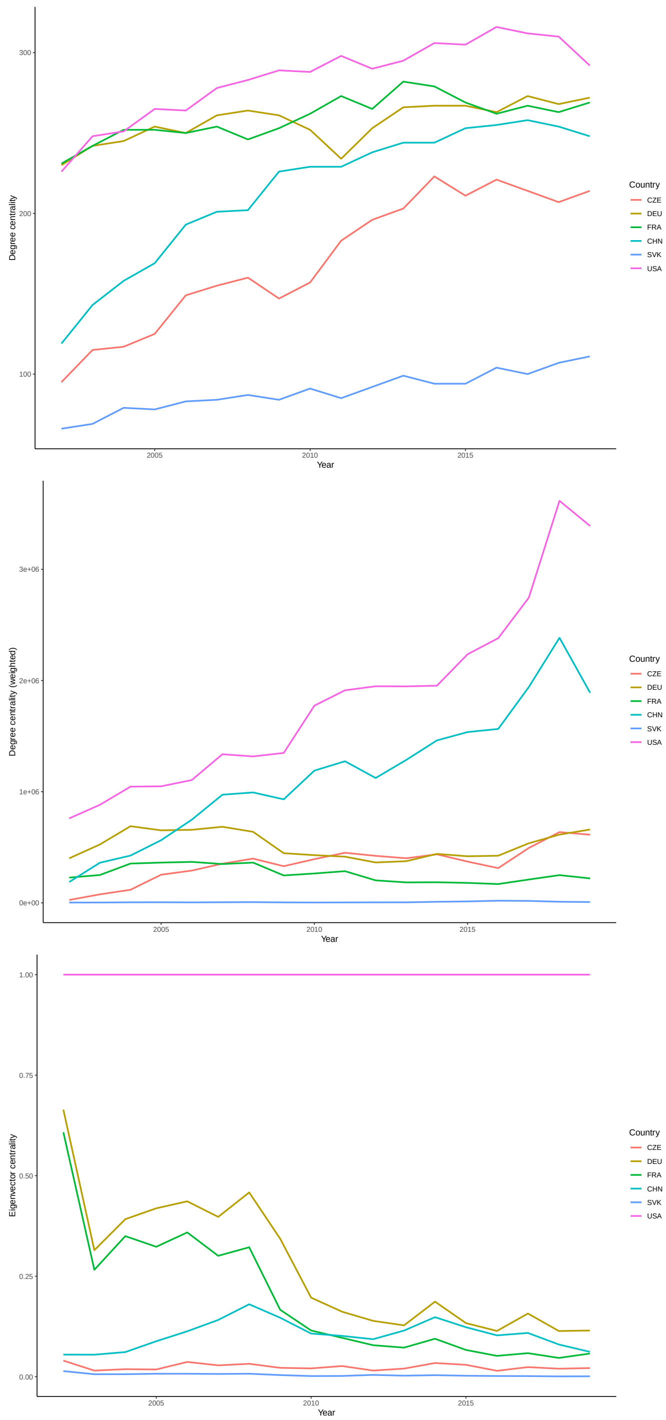

Figure 6. : Digital processing units: other than those of subheadings 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit: storage units, input units or output units

Table 6—: Measures from year 2019 for Digital processing units: other than those of subheadings 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit: storage units, input units or output units

	Degree Centrality		Degree Centrality (w)		Eigenvector Centrality		Betweenness Centrality	
1	USA	292	USA	3,389,482	USA	1.0000	CYP	8,434.0
2	NLD	274	MEX	2,882,978	CAN	0.2277	IND	7,366.0
3	DEU	272	CHN	1,889,636	JPN	0.2209	LUX	7,333.0
4	FRA	269	DEU	660,051	MEX	0.1679	SGP	7,098.0
5	GBR	259	CZE	613,301	NLD	0.1560	KOR	6,228.0
6	CHN	248	NLD	530,334	DEU	0.1149	ARE	5,849.0
7	HKG	230	SGP	472,951	GBR	0.0959	ZAF	5,447.0
8	DNK	225	JPN	466,873	IND	0.0901	BHR	4,660.0
9	IRL	224	HKG	382,305	SGP	0.0850	LVA	4,091.0
10	CAN	219	GBR	364,014	KOR	0.0793	BLR	3,916.0
11	SGP	217	CAN	269,464	AUS	0.0713	FIN	3,879.0
12	CZE	214	IRL	230,370	HKG	0.0689	SVK	3,461.0
13	ARE	208	FRA	220,148	CHN	0.0618	SLV	3,138.0
14	SWE	208	KOR	190,441	FRA	0.0576	GEO	3,024.0
15	CHE	202	HUN	180,401	IRL	0.0447	MDA	2,875.0
16	BEL	198	IND	173,300	ISR	0.0333	CHL	2,841.0
17	AUT	196	AUS	151,497	ITA	0.0307	MLT	2,810.0
18	HUN	192	RUS	141,095	BRA	0.0283	KEN	2,713.0
19	ITA	184	MYS	134,805	RUS	0.0273	POL	2,675.0
20	ESP	179	ARE	113,925	ARE	0.0258	BGR	2,653.0
21	POL	176	POL	111,869	CHE	0.0245	DNK	2,648.0
22	KOR	175	CHE	95,470	ZAF	0.0219	TUN	2,347.0
23	IND	167	ITA	89,750	CZE	0.0215	FRA	2,239.0
24	JPN	167	ISR	66,575	CHL	0.0201	MNG	2,235.0
25	THA	165	SWE	65,360	TUR	0.0174	GRC	2,082.0
26	MYS	164	BEL	65,260	THA	0.0169	BIH	2,037.0
27	MEX	160	ESP	60,171	SAU	0.0146	AUT	2,036.0
28	NOR	152	DNK	59,190	ESP	0.0146	SYC	2,033.0
29	TUR	152	THA	58,527	BEL	0.0144	BWA	2,027.0
30	AUS	150	ZAF	58,108	MYS	0.0124	SVN	1,996.0

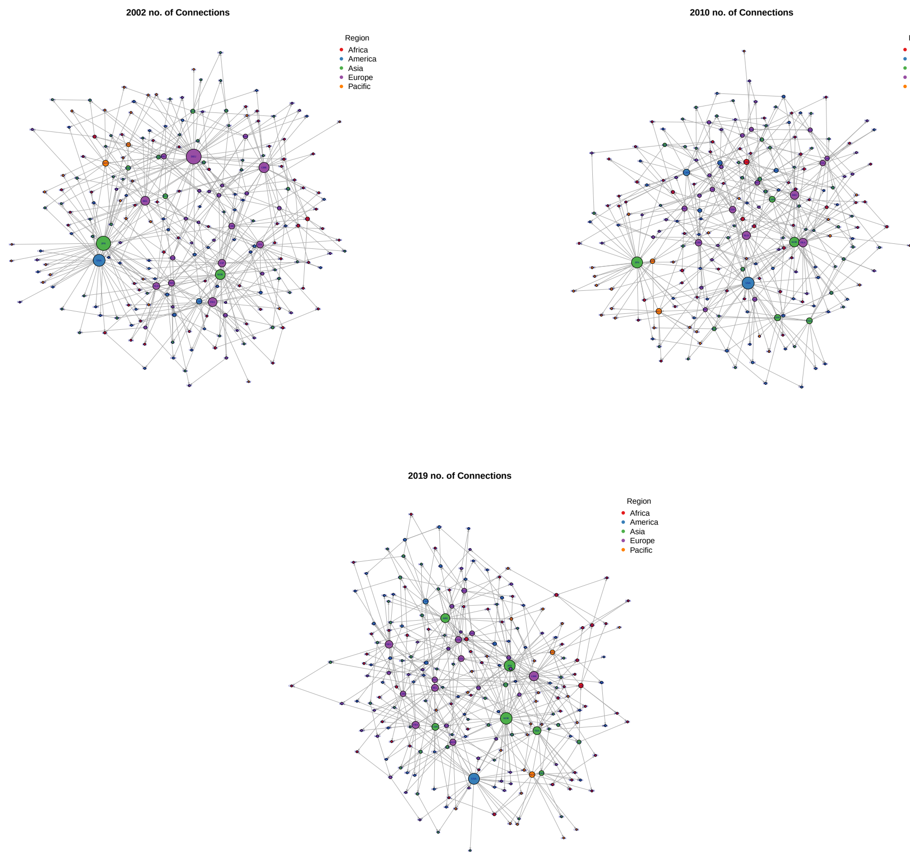

Figure 7. : Vehicles: spark-ignition internal combustion reciprocating piston engine, cylinder capacity exceeding 1500cc but not exceeding 3000cc

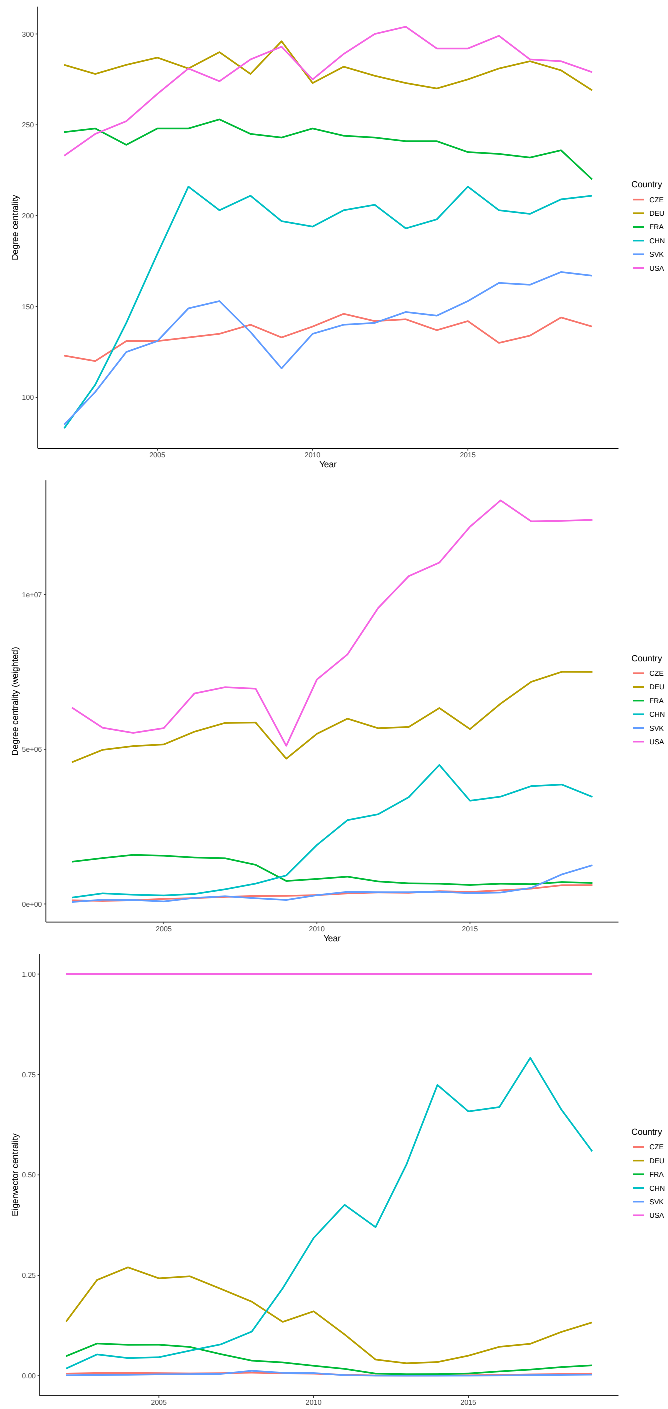

Figure 8. : Vehicles: spark-ignition internal combustion reciprocating piston engine, cylinder capacity exceeding 1500cc but not exceeding 3000cc

Table 7—: Measures from year 2019 for Vehicles: spark-ignition internal combustion reciprocating piston engine, cylinder capacity exceeding 1500cc but not exceeding 3000cc

	Degree Centrality		Degree Centrality (w)		Eigenvector Centrality		Betweenness Centrality	
1	USA	279	USA	12,413,593	USA	1.0000	NLD	6,064.0
2	DEU	269	DEU	7,501,302	CHN	0.5587	GRC	4,573.0
3	GBR	260	JPN	5,943,890	CAN	0.4096	NGA	4,510.0
4	BEL	258	MEX	3,485,280	DEU	0.1328	ITA	4,110.0
5	KOR	252	CHN	3,460,002	MEX	0.1048	NAM	4,036.0
6	JPN	242	CAN	3,022,250	ARE	0.0878	NIC	3,541.0
7	ARE	221	KOR	2,371,738	KOR	0.0745	ARE	3,363.0
8	FRA	220	GBR	2,085,254	BEL	0.0661	NZL	3,344.0
9	NLD	217	BEL	1,436,926	GBR	0.0657	FRA	3,296.0
10	ESP	215	SVK	1,252,884	AUS	0.0562	PRT	3,119.0
11	CHN	211	ARE	823,375	JPN	0.0476	BEL	3,004.0
12	CAN	201	AUS	775,242	RUS	0.0417	BGR	2,751.0
13	ITA	201	SWE	710,753	SAU	0.0393	ZAF	2,742.0
14	HUN	176	FRA	679,897	UKR	0.0351	MDG	2,697.0
15	CHE	175	CZE	607,881	CHE	0.0305	GEO	2,594.0
16	SWE	170	ITA	580,287	OMN	0.0266	CRI	2,560.0
17	SVK	167	ESP	579,053	FRA	0.0259	TUN	2,515.0
18	AUT	158	RUS	543,268	MYS	0.0250	GHA	2,473.0
19	THA	155	HUN	513,032	GEO	0.0234	NOR	2,414.0
20	IND	144	NLD	412,481	NGA	0.0211	MYS	2,351.0
21	CZE	139	AUT	380,521	ITA	0.0197	BIH	2,273.0
22	MEX	133	THA	362,000	NLD	0.0193	HRV	2,268.0
23	ZAF	133	POL	359,420	POL	0.0177	GMB	2,202.0
24	AUS	131	SAU	343,928	CHL	0.0171	GBR	2,172.0
25	TUR	130	BRA	331,583	GTM	0.0151	BWA	2,140.0
26	SGP	126	CHE	329,356	DOM	0.0149	AUS	2,054.0
27	POL	119	ZAF	301,234	KWT	0.0147	RUS	2,032.0
28	GEO	118	TUR	222,764	LBY	0.0145	SEN	2,006.0
29	GEO	118	IND	209,703	GHA	0.0137	BLZ	1,861.0
30	IDN	116	CHL	191,726	COL	0.0127	USA	1,824.0

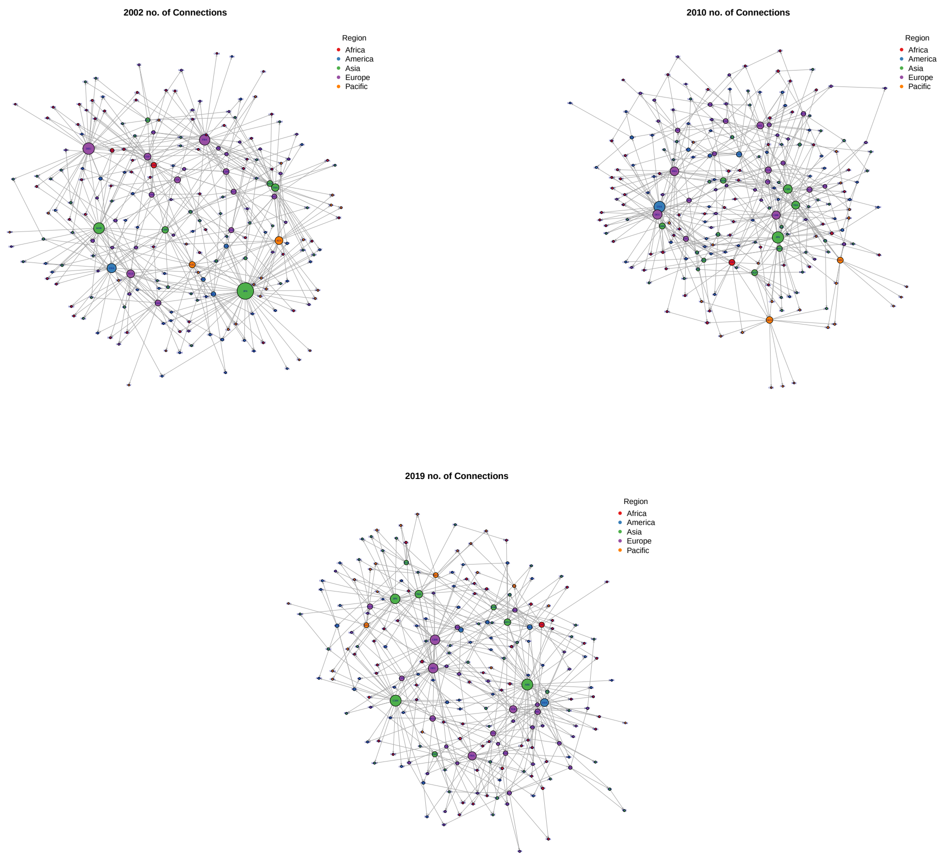

Figure 9. : Vehicles: parts and accessories, of bodies, other than safety seat belts

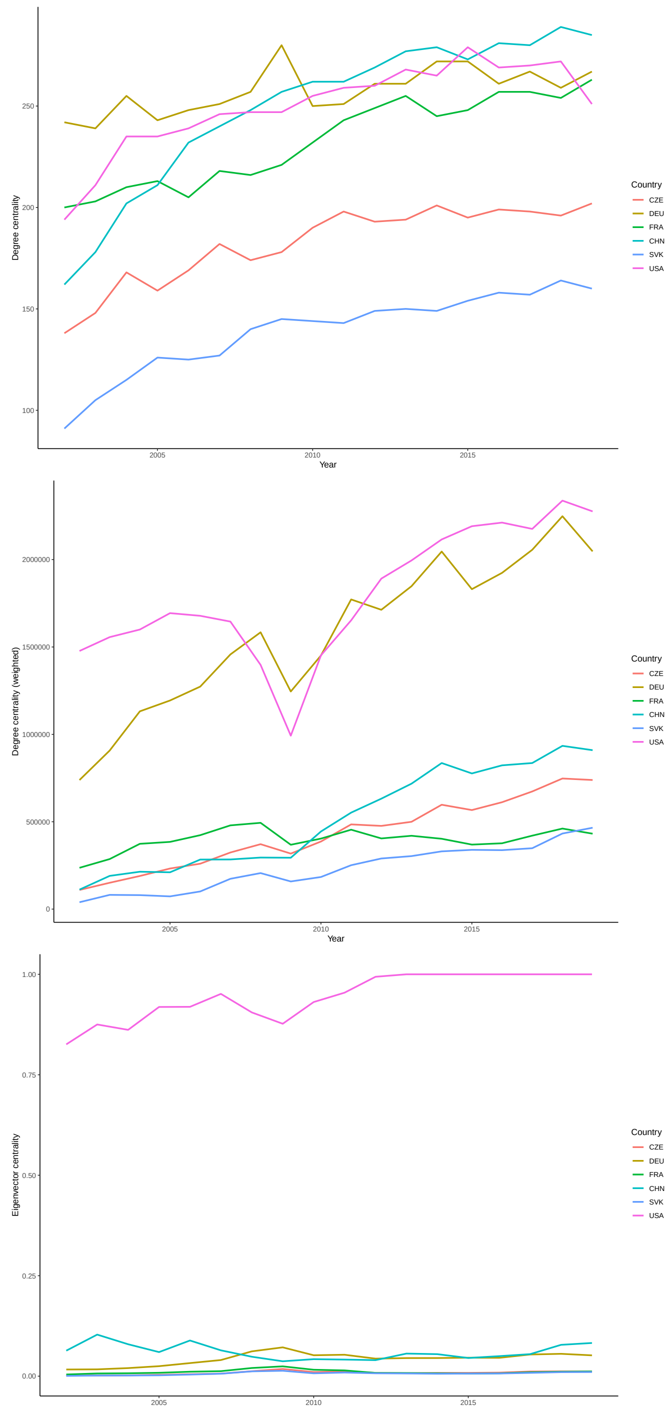

Figure 10. : Vehicles: parts and accessories, of bodies, other than safety seat belts

Table 8—: Measures from year 2019 for Vehicles: parts and accessories, of bodies, other than safety seat belts

	Degree Centrality		Degree Centrality (w)		Eigenvector Centrality		Betweenness Centrality	
1	CHN	285	USA	2,275,816	USA	1.0000	BRA	8,418.5
2	DEU	267	DEU	2,047,116	CAN	0.7555	FRA	7,809.0
3	FRA	263	MEX	1,129,308	MEX	0.5169	BRN	6,908.0
4	ARE	262	CAN	944,130	CHN	0.0826	ZAF	5,897.5
5	USA	251	CHN	909,478	DEU	0.0519	CRI	5,307.5
6	THA	245	CZE	738,853	RUS	0.0292	KHM	5,288.0
7	CAN	238	POL	540,300	THA	0.0244	NZL	5,242.5
8	GBR	235	SVK	465,745	JPN	0.0236	UGA	5,231.5
9	BEL	233	JPN	458,139	GBR	0.0158	BEL	4,817.0
10	JPN	232	FRA	431,665	BRA	0.0140	POL	4,766.0
11	TUR	230	GBR	386,012	ESP	0.0136	ARM	4,733.0
12	ZAF	229	KOR	368,295	ZAF	0.0127	EST	4,407.0
13	KOR	224	ESP	354,666	KOR	0.0119	SYC	4,260.5
14	NLD	219	BEL	312,552	FRA	0.0118	CAN	3,627.0
15	IND	216	AUT	307,320	CZE	0.0116	BGR	3,567.5
16	ITA	213	HUN	284,599	POL	0.0113	PHL	3,470.5
17	POL	208	ITA	239,487	AUS	0.0107	GHA	3,382.0
18	CZE	202	THA	236,277	BEL	0.0105	THA	3,245.5
19	BRA	199	SWE	213,123	SVK	0.0104	CHN	3,191.0
20	AUS	196	NLD	212,738	NLD	0.0096	NIC	3,018.5
21	HUN	191	RUS	169,747	AUT	0.0089	STP	2,977.0
22	ESP	191	TUR	148,382	IND	0.0086	NAM	2,749.5
23	RUS	188	PRT	112,018	ARE	0.0082	MAR	2,749.0
24	SGP	186	BRA	96,244	MYS	0.0058	RUS	2,623.0
25	CHE	185	MYS	88,847	ARG	0.0050	ECU	2,179.0
26	MYS	177	IND	75,093	SWE	0.0049	KOR	2,133.5
27	AUT	172	VNM	72,859	ITA	0.0049	KAZ	2,124.5
28	SWE	170	ROU	66,379	HUN	0.0046	IDN	2,086.5
29	MEX	166	FIN	59,369	FIN	0.0044	GEO	2,073.0
30	PRT	166	CHE	58,316	TUR	0.0041	KEN	2,043.5

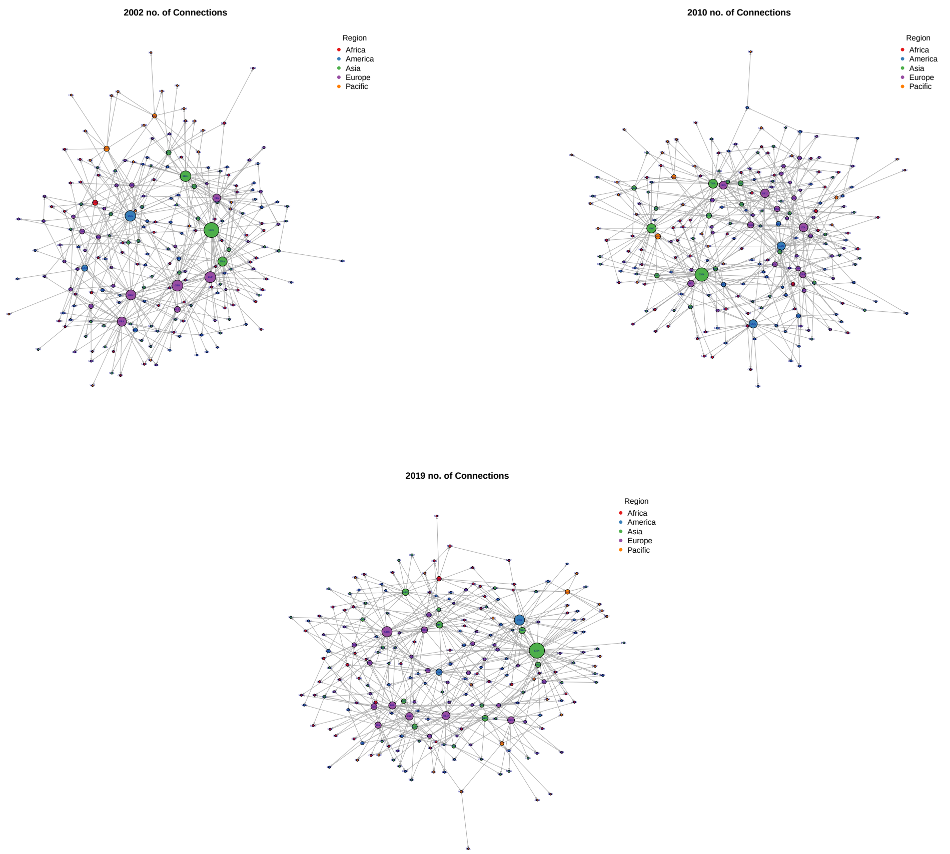

Figure 11. : Toys: n.e.s. in heading no. 9503

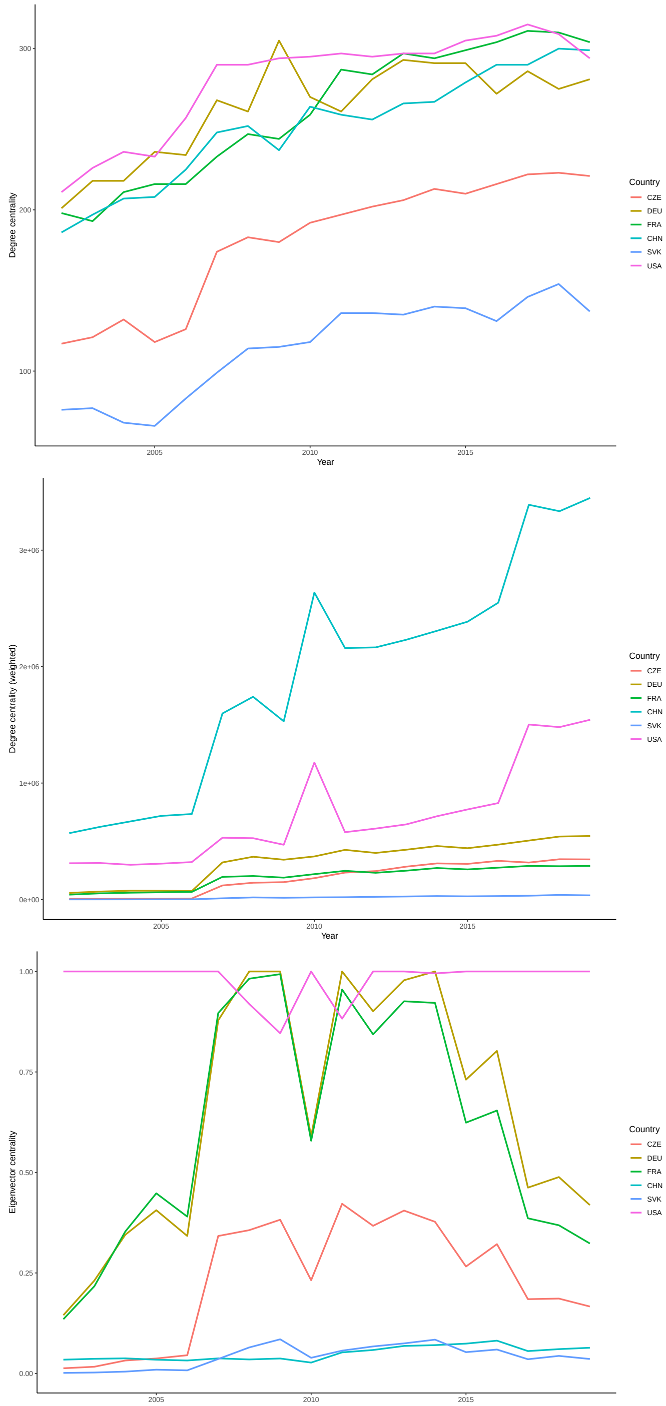

Figure 12. : Toys: n.e.s. in heading no. 9503

Table 9—: Measures from year 2019 for Toys: n.e.s. in heading no. 9503

	Degree Centrality		Degree Centrality (w)		Eigenvector Centrality		Betweenness Centrality	
1	FRA	304	CHN	3,448,404	USA	1.0000	BRN	8,017.3
2	CHN	299	USA	1,543,322	DEU	0.4188	GHA	7,498.0
3	USA	294	DEU	545,179	GBR	0.3288	KOR	5,614.0
4	DEU	281	GBR	345,534	FRA	0.3233	HND	5,248.4
5	NLD	276	CZE	344,212	CAN	0.2519	BOL	4,680.8
6	CAN	274	FRA	288,383	NLD	0.1945	PRT	4,650.3
7	BEL	260	JPN	254,334	POL	0.1945	NAM	4,627.5
8	GBR	259	NLD	200,688	ITA	0.1821	CHE	4,553.2
9	CHE	255	HKG	193,632	CZE	0.1665	CRI	4,474.5
10	AUT	251	POL	192,430	ESP	0.1538	AUS	4,430.3
11	ESP	246	MEX	179,115	MEX	0.1434	MMR	3,844.3
12	KOR	242	VNM	178,340	BEL	0.1402	OMN	3,805.9
13	HKG	235	ITA	167,582	JPN	0.1388	COL	3,663.8
14	POL	233	ESP	166,122	AUT	0.1254	VCT	3,606.3
15	ITA	231	CAN	152,570	RUS	0.1252	ARE	3,171.3
16	ARE	230	RUS	147,051	HKG	0.1226	POL	2,900.5
17	CZE	221	BEL	137,952	AUS	0.0866	NZL	2,826.2
18	SWE	213	AUS	105,779	CHE	0.0715	IRL	2,821.8
19	IND	209	HUN	90,339	DNK	0.0679	KEN	2,756.2
20	THA	208	IDN	86,848	CHN	0.0639	ZAF	2,742.2
21	TUR	207	KOR	84,394	KOR	0.0602	FRA	2,716.5
22	PRT	205	DNK	79,204	HUN	0.0580	AUT	2,524.0
23	AUS	205	AUT	62,879	IRL	0.0489	MAR	2,521.5
24	ZAF	204	IND	58,243	SWE	0.0447	JAM	2,476.0
25	DNK	201	MYS	49,980	PRT	0.0391	BRA	2,466.9
26	HUN	192	THA	44,466	SVK	0.0360	IND	2,412.5
27	IDN	191	CHE	42,943	ROU	0.0354	EGY	2,131.0
28	JPN	190	GRC	40,548	CHL	0.0324	KGZ	2,105.8
29	SGP	178	SAU	38,268	SAU	0.0291	THA	2,089.5
30	FIN	174	ARE	37,498	ARE	0.0282	FIN	1,921.0

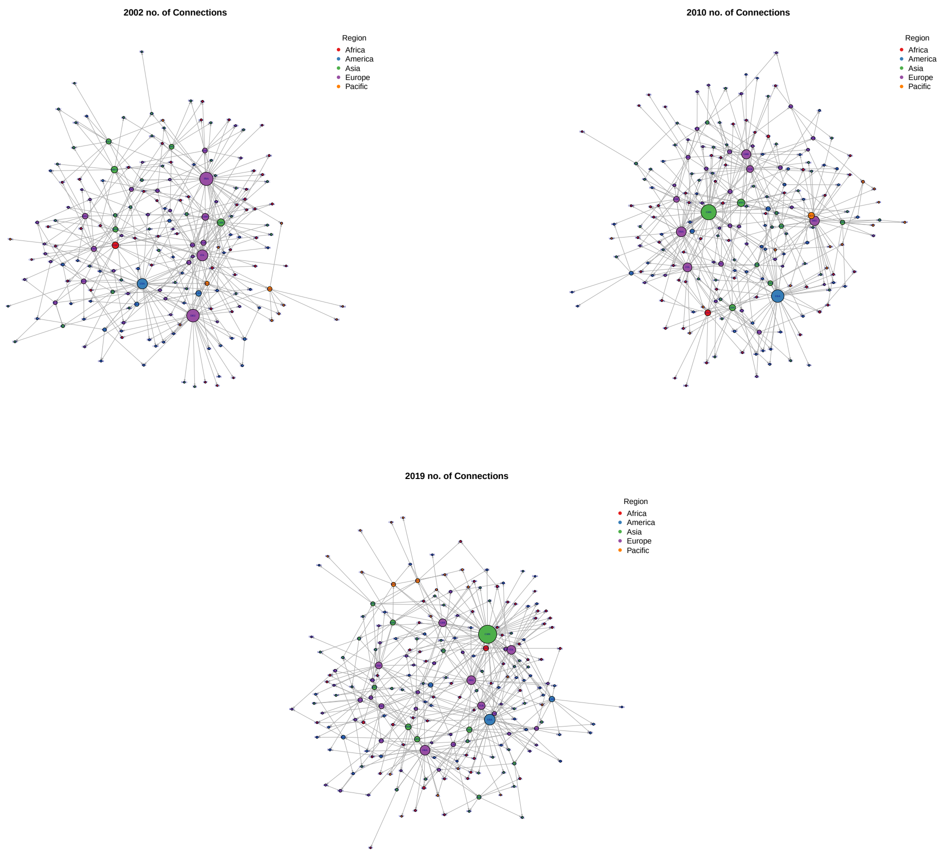

Figure 13. : Seat: parts

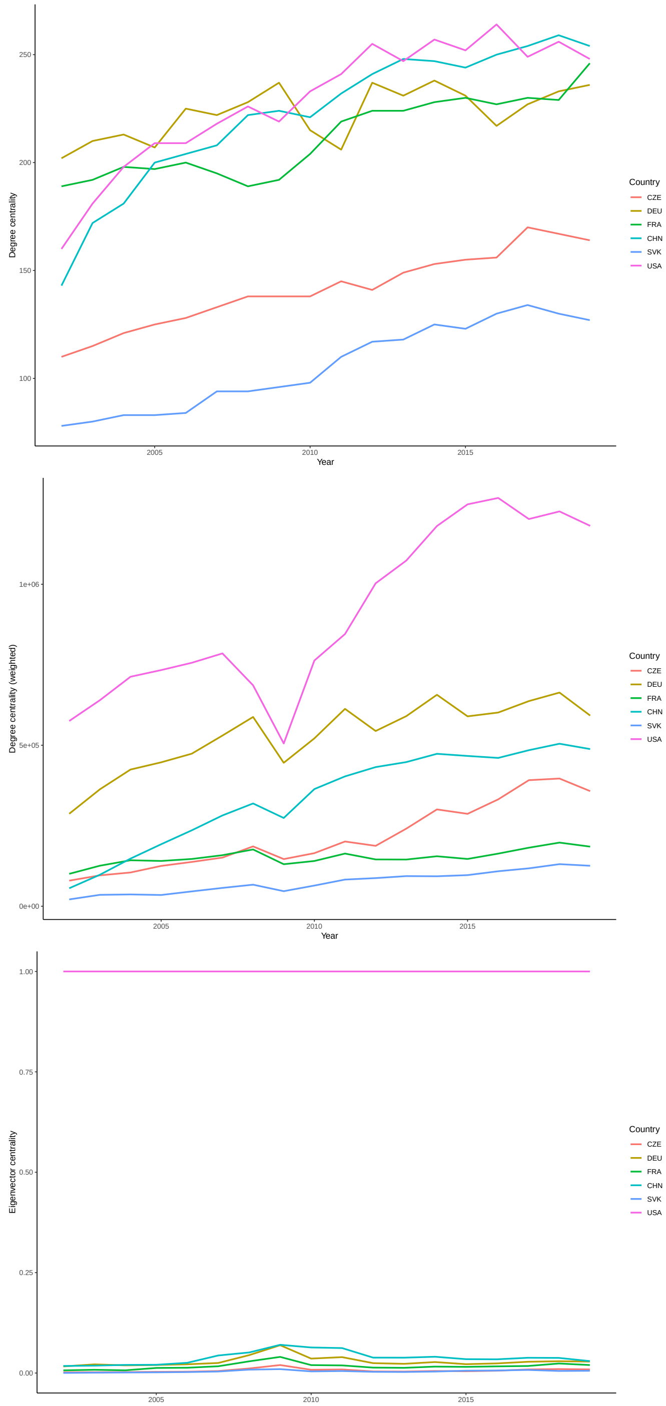

Figure 14. : Seat: parts

Table 10—: Measures from year 2019 for Seat: parts

	Degree Centrality		Degree Centrality (w)		Eigenvector Centrality		Betweenness Centrality	
1	CHN	254	USA	1,181,303	USA	1.0000	CRI	11,768.5
2	USA	248	MEX	803,210	CAN	0.3681	ECU	6,369.0
3	FRA	246	DEU	592,206	MEX	0.3511	AUS	5,927.0
4	DEU	236	CHN	488,080	GBR	0.0873	KOR	5,731.0
5	GBR	210	POL	360,978	JPN	0.0447	BEL	5,283.0
6	NLD	199	CZE	357,544	CHN	0.0298	NAM	5,228.5
7	ITA	197	CAN	250,659	DEU	0.0286	BRA	4,625.5
8	ESP	194	JPN	200,080	FRA	0.0199	CHL	4,399.5
9	TUR	189	GBR	188,006	BRA	0.0193	AUT	4,191.5
10	CAN	189	FRA	185,110	TUR	0.0117	RUS	4,169.5
11	BEL	185	ESP	137,822	RUS	0.0115	PHL	4,149.5
12	KOR	177	SVK	125,742	THA	0.0109	BOL	4,021.5
13	IND	169	PRT	116,758	KOR	0.0106	URY	3,965.0
14	POL	169	KOR	114,208	POL	0.0105	TUR	3,886.5
15	ZAF	168	HUN	105,367	CZE	0.0092	IDN	3,677.0
16	THA	166	VNM	93,973	AUS	0.0078	LUX	3,428.0
17	JPN	165	ITA	92,250	ITA	0.0076	FRA	3,287.5
18	ARE	164	TUR	66,450	ARE	0.0073	GEO	3,149.5
19	ESP	164	THA	60,896	IND	0.0069	HRV	2,790.0
20	HUN	149	MAR	52,152	MYS	0.0064	ARE	2,713.5
21	SWE	147	RUS	38,741	SGP	0.0058	CZE	2,492.5
22	CHE	145	BEL	38,324	SVK	0.0057	AGO	2,427.5
23	AUT	144	SVN	36,682	QAT	0.0056	SGP	2,423.0
24	MYS	139	NLD	36,237	ESP	0.0055	CAN	2,062.5
25	IDN	136	IND	33,338	AUT	0.0046	KGZ	2,011.5
26	PRT	135	BRA	33,080	HKG	0.0043	FIN	1,990.5
27	DNK	134	MKD	28,634	HUN	0.0034	THA	1,850.0
28	MEX	133	MYS	26,968	ZAF	0.0032	BIH	1,791.0
29	BRA	132	AUT	26,391	NLD	0.0030	ZMB	1,749.0
30	RUS	132	SWE	23,386	VNM	0.0029	PER	1,744.0

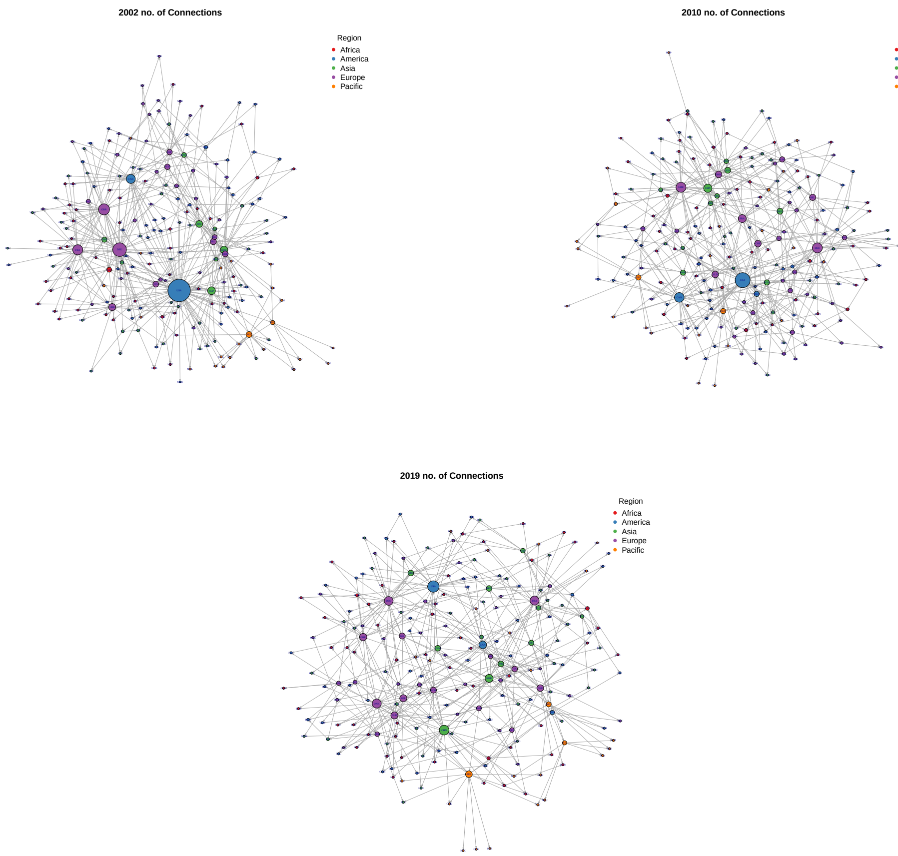

Figure 15. : Data processing machines: portable, digital and automatic, weighing not more than 10kg, consisting of at least a central processing unit, a keyboard and a display

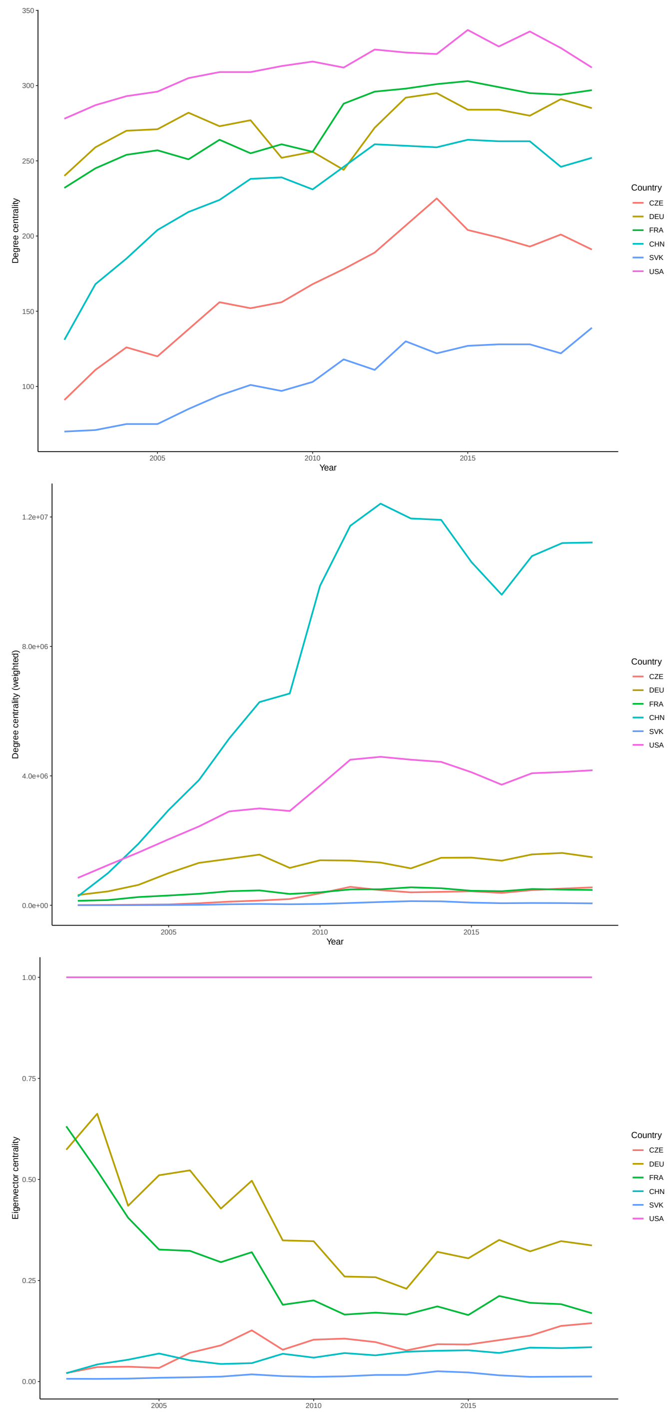

Figure 16. : Data processing machines: portable, digital and automatic, weighing not more than 10kg, consisting of at least a central processing unit, a keyboard and a display

Table 11—: Measures from year 2019 Data processing machines: portable, digital and automatic, weighing not more than 10kg, consisting of at least a central processing unit, a keyboard and a display

	Degree Centrality		Degree Centrality (w)		Eigenvector Centrality		Betweenness Centrality	
1	USA	312	CHN	11,212,272	USA	1.0000	JAM	8,266.0
2	FRA	297	USA	4,173,352	DEU	0.3368	ZAF	8,218.5
3	GBR	294	DEU	1,484,994	GBR	0.2845	KOR	6,842.0
4	DEU	285	NLD	1,394,526	CAN	0.2759	IND	6,274.0
5	NLD	273	JPN	869,569	HKG	0.2210	NGA	4,831.0
6	CHE	258	GBR	808,862	NLD	0.2186	NIC	4,812.0
7	DNK	256	HKG	695,093	JPN	0.2093	IDN	4,627.5
8	CHN	252	CZE	552,950	FRA	0.1690	KEN	4,237.0
9	ARE	245	FRA	472,533	CZE	0.1446	THA	4,192.5
10	ESP	234	CAN	467,673	SWE	0.1203	BRB	4,028.5
11	CAN	233	ARE	431,830	ITA	0.1153	BRA	3,940.0
12	BEL	230	VNM	413,090	IND	0.1038	MMR	3,472.0
13	KOR	229	AUS	357,520	BEL	0.1023	GTM	3,369.0
14	SWE	225	IND	355,666	ARE	0.1008	FRA	3,137.5
15	HKG	220	ITA	315,137	AUS	0.0920	CRI	2,772.0
16	ITA	217	KOR	288,374	CHN	0.0851	VEN	2,661.5
17	SGP	210	SWE	257,794	POL	0.0817	CHE	2,483.0
18	NOR	209	SGP	256,757	MEX	0.0777	SGP	2,461.0
19	POL	204	ESP	214,909	ESP	0.0687	BWA	2,431.0
20	AUS	199	MEX	213,423	KOR	0.0670	CAN	2,307.5
21	AUT	195	BEL	199,228	SGP	0.0545	AUS	2,304.5
22	ZAF	191	POL	199,059	DNK	0.0524	HKG	2,072.0
23	CZE	191	RUS	188,255	RUS	0.0477	EGY	2,055.5
24	IND	186	IRL	152,263	AUT	0.0466	SWE	2,008.0
25	IRL	186	CHE	144,587	CHE	0.0413	FIN	2,004.0
26	PRT	185	THA	122,439	PRY	0.0342	UGA	1,977.0
27	JPN	179	DNK	120,528	THA	0.0299	LBY	1,946.0
28	FIN	174	IDN	110,391	IRL	0.0286	BDI	1,939.0
29	THA	166	MYS	108,426	IDN	0.0279	LKA	1,891.0
30	HUN	164	AUT	103,366	CRI	0.0245	GEO	1,838.5

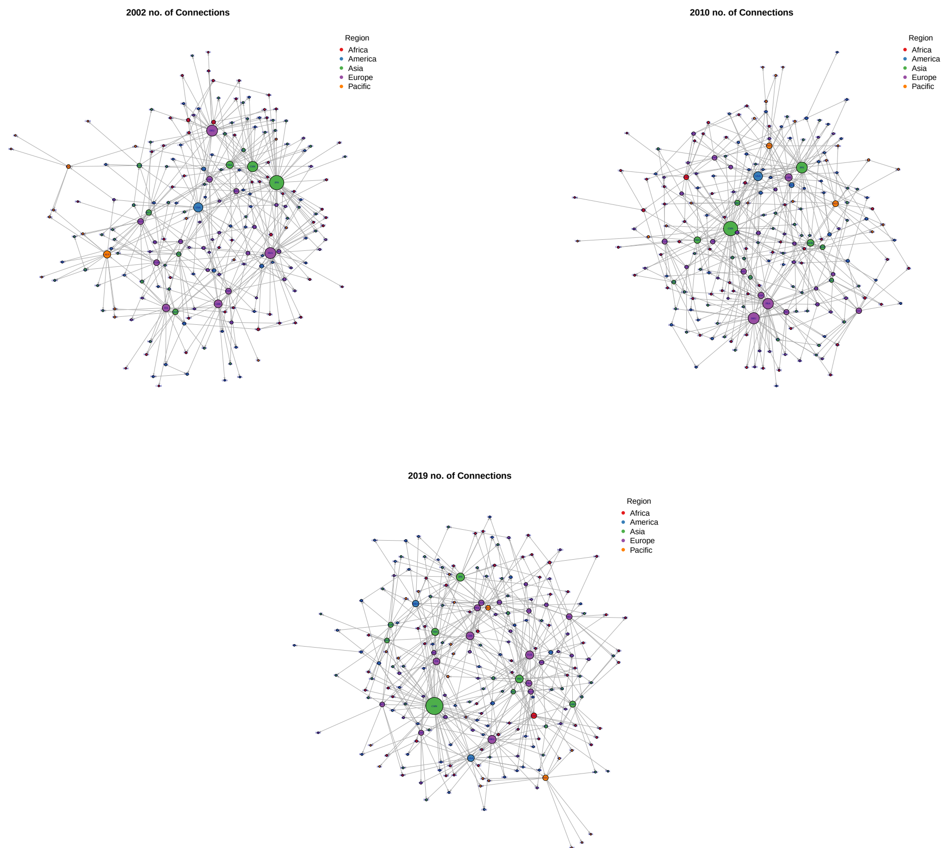

Figure 17. : Lighting or visual signalling equipment: electrical, of a kind used on motor vehicles (excluding articles of heading no. 8539)

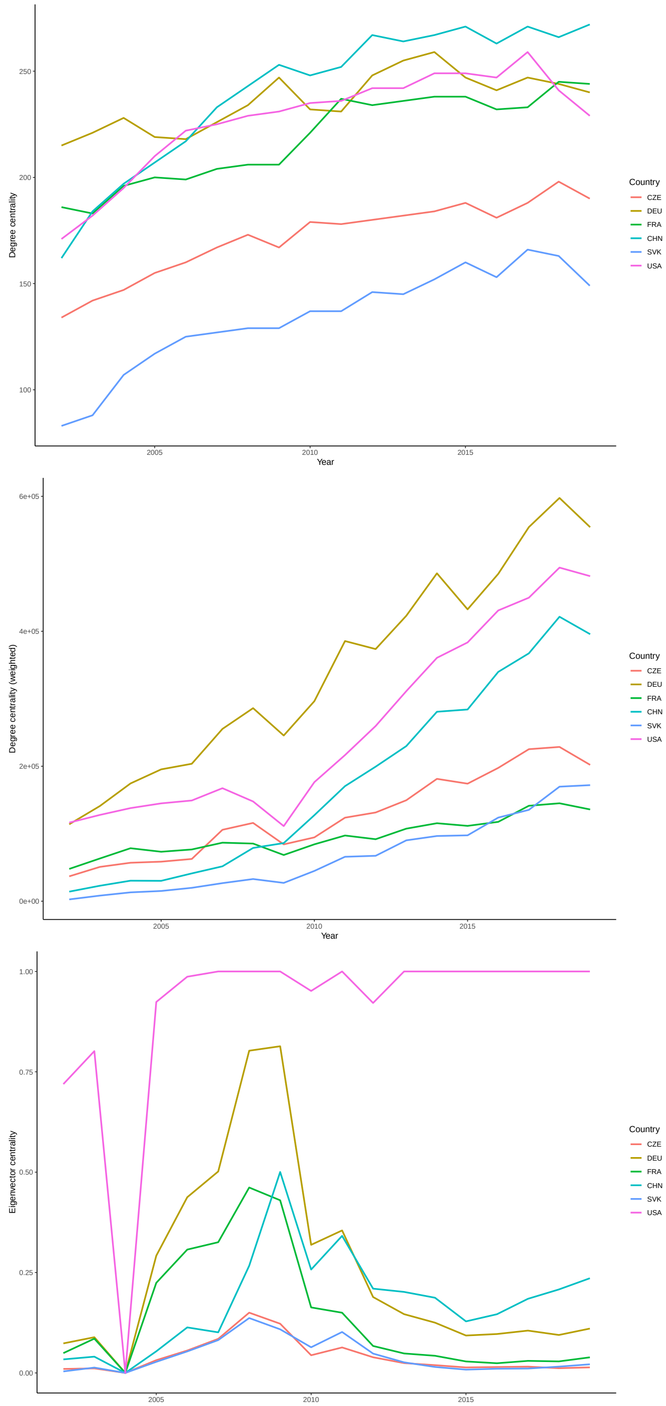

Figure 18. : Lighting or visual signalling equipment: electrical, of a kind used on motor vehicles (excluding articles of heading no. 8539)

Table 12—: Measures from year 2019 for Lighting or visual signalling equipment: electrical, of a kind used on motor vehicles (excluding articles of heading no. 8539)

	Degree Centrality		Degree Centrality (w)		Eigenvector Centrality		Betweenness Centrality	
1	CHN	272	DEU	554,227	USA	1.0000	KGZ	8,578.5
2	FRA	244	USA	481,649	CAN	0.7281	CRI	8,444.0
3	BEL	241	CHN	395,652	MEX	0.4593	ARE	6,727.8
4	DEU	240	MEX	304,686	CHN	0.2358	NZL	6,378.5
5	USA	229	CZE	201,997	DEU	0.1105	PAK	6,267.5
6	THA	229	SVK	171,972	JPN	0.0912	FIN	5,014.3
7	NLD	215	JPN	162,521	GBR	0.0505	CAN	4,654.5
8	TUR	215	CAN	142,015	BRA	0.0461	THA	4,599.5
9	ARE	214	FRA	135,913	RUS	0.0444	URY	4,571.5
10	GBR	213	ESP	134,674	THA	0.0440	CHE	4,189.5
11	CAN	211	KOR	115,228	FRA	0.0388	COL	4,159.0
12	IND	210	AUT	99,223	KOR	0.0356	AUT	4,057.8
13	KOR	207	GBR	93,864	AUS	0.0292	CZE	3,829.5
14	POL	204	POL	73,952	NLD	0.0234	SVK	3,354.0
15	JPN	202	THA	71,923	BEL	0.0226	ARG	3,313.5
16	AUT	197	ITA	70,914	SVK	0.0215	LUX	3,061.0
17	ITA	194	SVN	55,883	ARE	0.0204	MLT	2,986.0
18	CZE	190	BEL	55,075	ESP	0.0200	MEX	2,795.8
19	ESP	188	RUS	49,338	SWE	0.0185	GTM	2,721.8
20	ZAF	186	HUN	41,281	IND	0.0183	EST	2,707.0
21	BRA	177	SWE	38,646	ITA	0.0170	FRA	2,635.5
22	SWE	177	TUR	33,859	POL	0.0157	ZAF	2,533.5
23	HUN	175	NLD	31,514	MYS	0.0149	COM	2,400.5
24	AUS	174	IND	31,010	IDN	0.0139	LAO	2,346.3
25	RUS	173	BRA	29,339	CZE	0.0138	VEN	2,335.0
26	FIN	166	VNM	23,070	SAU	0.0138	BRA	2,286.0
27	HKG	165	MYS	22,432	VNM	0.0133	JAM	2,235.0
28	SGP	156	PRT	19,242	AUT	0.0120	KOR	2,006.0
29	CHE	156	AUS	18,553	HUN	0.0104	IRL	1,980.5
30	PRT	152	IDN	18,309	TUR	0.0098	MDA	1,874.7

Figure 19. : Medicaments: consisting of mixed or unmixed products n.e.s. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale

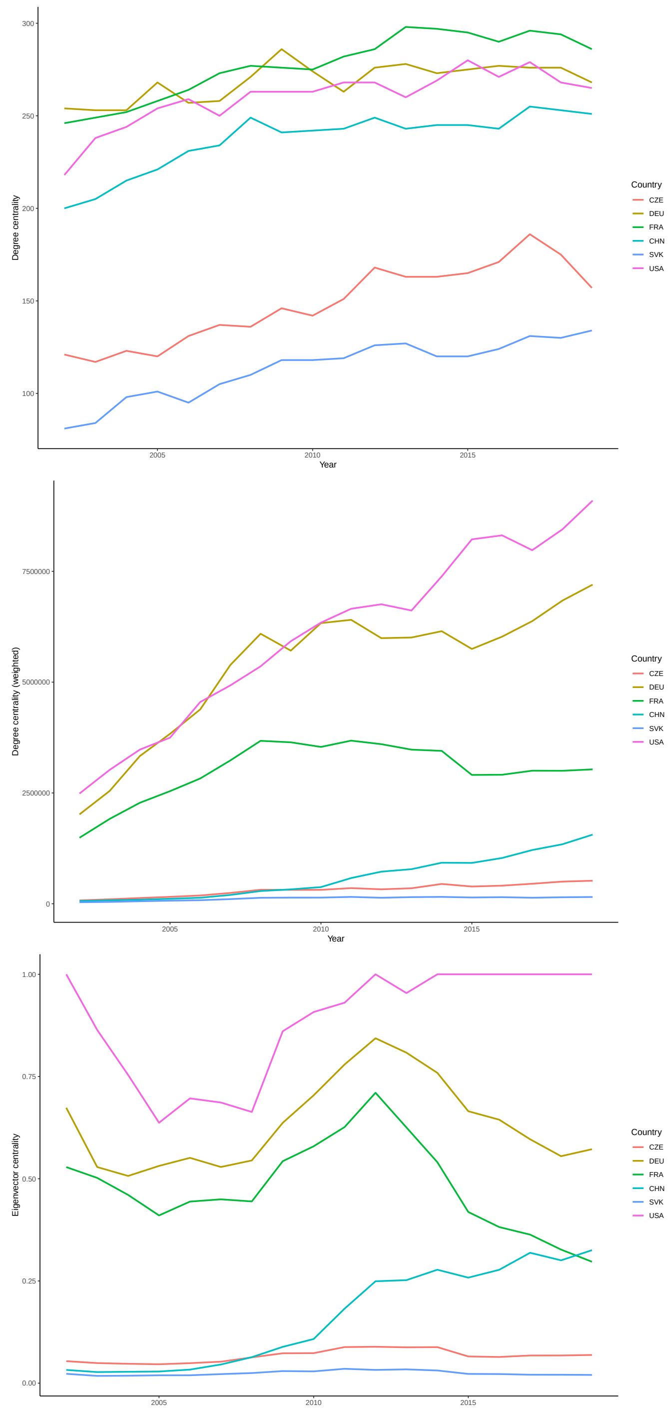

Figure 20. : Medicaments: consisting of mixed or unmixed products n.e.s. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale

Table 13—: Measures from year 2019 for Medicaments: consisting of mixed or unmixed products n.e.s. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale

	Degree Centrality		Degree Centrality (w)		Eigenvector Centrality		Betweenness Centrality	
1	IND	322	USA	9,095,628	USA	1.0000	LUX	15,737.0
2	FRA	286	DEU	7,200,338	DEU	0.5723	SWZ	13,817.5
3	GBR	279	CHE	5,523,609	BEL	0.5431	THA	13,653.5
4	CHE	277	ITA	3,242,498	CHE	0.3816	MDG	11,881.5
5	CAN	271	BEL	3,114,706	JPN	0.3659	CAN	11,421.5
6	DEU	268	FRA	3,032,246	CHN	0.3253	IDN	7,594.0
7	USA	265	IRL	3,019,827	ITA	0.3174	ZAF	6,704.5
8	BEL	263	GBR	2,768,331	GBR	0.3070	GHA	5,303.0
9	NLD	261	NLD	2,400,956	FRA	0.2970	KOR	5,290.0
10	CHN	251	JPN	1,777,969	ESP	0.2623	EGY	4,453.0
11	ESP	240	ESP	1,761,539	NLD	0.2429	HUN	3,637.5
12	TUR	239	CHN	1,559,778	CAN	0.1965	GTM	3,579.5
13	ITA	237	IND	1,529,948	RUS	0.1554	AUS	3,039.0
14	KOR	237	CAN	1,183,375	AUS	0.1144	IRL	2,950.0
15	SGP	237	SWE	851,646	KOR	0.0947	TGO	2,938.0
16	IRL	233	SGP	841,888	IRL	0.0924	SAU	2,923.5
17	ZAF	224	RUS	799,555	POL	0.0816	HRV	2,747.5
18	AUS	223	POL	639,787	AUT	0.0768	LAO	2,643.0
19	AUT	215	SVN	598,656	SVN	0.0765	JPN	2,567.5
20	GRC	207	DNK	594,838	BRA	0.0753	SGP	2,371.5
21	ARE	204	AUT	580,149	CZE	0.0690	RUS	2,354.5
22	PRT	202	HUN	554,445	MEX	0.0601	AUT	2,348.0
23	CYP	197	AUS	542,092	TUR	0.0555	CIV	2,153.5
24	SWE	194	CZE	519,778	ARE	0.0533	PER	2,095.0
25	POL	189	KOR	380,775	SAU	0.0493	NZL	1,844.0
26	THA	182	ISR	356,138	SWE	0.0462	FJI	1,817.0
27	BRA	181	GRC	338,028	GRC	0.0452	PNG	1,749.0
28	SVN	180	BRA	312,002	HUN	0.0447	IND	1,744.0
29	DNK	178	MEX	298,553	ISR	0.0423	PRT	1,566.0
30	NZL	175	TUR	284,566	PRT	0.0408	DOM	1,565.0

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Univerzita Karlova v Praze, Fakulta sociálních věd
Institut ekonomických studií [UK FSV – IES] Praha 1, Opletalova 26
E-mail : ies@fsv.cuni.cz http://ies.fsv.cuni.cz