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BRICS IN TRADE CLUSTERS: THE PROSPECTS OF CONVERGENT TRADE POLICIES OF LARGE EMERGING ECONOMIES

This paper analyzes global trading clusters to understand the effects of the BRICS economic rise for the international trading system and the WTO. The BRICS dominate without doubt their regions in economic and trade figures, as well as compete with — and in the case of China even overtake — the G7-states on the global level. But do the BRICS share a common approach for international trade, which they could promote as an alternative order or challenge to the current international trading system? So far the consequences of the BRICS-rising for international trade structures, multilateral negotiations and the WTO remain uncertain.

This paper argues on the basis of cluster analysis, that — due to their respective trade patterns — the rise of the BRICS will not lead to major changes inside the WTO. By testing emerging economies on different trade variables, the paper shows the challenges for BRICS cooperation in international trade and reveals also false assumptions in the respective literature. The differences between emerging economies are sometimes much bigger than assumed, which makes cooperation rather complicated and complex. The paper concludes that the WTO remains in its current form the most important trade governance institution for emerging economies, because the divergence in their trade patterns hinders emerging economies to challenge the current system with an alternative approach. Refs 28. Tables 2.

Keywords: BRICS, WTO, International Trade, Cluster Analysis, Emerging Economies.

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БРИКС В ТОРГОВЫХ КЛАСТЕРАХ

В статье анализируются глобальные торговые кластеры для того, чтобы иметь представление о последствиях экономического подъема стран БРИКС для международной торговой системы и ВТО. Страны БРИКС, без сомнения, доминируют в своих регионах в экономических и торговых оценках, а также конкурируют с государствами «Большой семерки» (G7) на глобальном уровне, а Китай даже обгоняет их. Но разделяют ли страны БРИКС общий подход к международной торговле, который можно было бы продвигать в качестве альтернативного порядка или вызова текущей международной торговой системе? До сих пор последствия роста БРИКС для международных торговых структур, многосторонних переговоров и ВТО остаются неопределенными.

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В исследовании на основе кластерного анализа утверждается, что рост БРИКС не приведет к серьезным изменениям внутри ВТО из-за индивидуальных структур торговли членов — стран БРИКС. Тестируя страны с развивающейся экономикой на различных торговых переменных, результат показывает наличие проблем для сотрудничества БРИКС в международной торговле, а также ложные предположения на данную тему в соответствующей литературе. Различия между формирующимися рыночными экономиками иногда намного больше, чем предполагалось, что делает сотрудничество довольно сложным в комплексе. В статье делается вывод о том, что ВТО в своей нынешней форме остается наиболее важным институтом управления торговлей для стран с развивающейся экономикой, поскольку расхождение в их структурах торговли мешает странам БРИКС бросить вызов системе, используя альтернативный подход. Библиогр. 28. Ил. 10. Табл. 2.

Ключевые слова: БРИКС, ВТО, международная торговля, кластерный анализ, страны с развивающейся экономикой.

Introduction

Emerging economies play today a significant role in international trade as well as in the academic and political debates about the future developments of the global trading system. Their relatively high growth rates over the last decade, combined with a deepening integration in global production chains and profit promising investment opportunities, have made them a core interests for economic and political elites. Western countries realized, that the rise of emerging economies might imply challenges for Western industries and international economic institutions by a transformation of the global economic order. Yet, emerging economies themselves gained self-confidence and ambitions, caused by their economic growth. One product of these developments is the formation of the BRICS Dialogue Forum, which can be understood as an alliance of Brazil, Russia, India, China and South Africa, in order to promote global redistribution and recognition [Nel, 2010], in line with their mutual cooperation.

Out of all the emerging economies, the BRICS qualifies especially for this analysis, since the BRICS have emerged, out of the purely abstract notion, towards a dialogue forum, which is slowly but constantly promoting various forms of cooperation. Other emerging powers groupings are not considered here, because their level of cooperation is less frequent and less increasing. Founded as a catchy investment phrase from Goldman Sachs' Jim O'Neil in 2001, the BRIC(S) have met for the first time during the global financial crisis in 2008, and are holding annually head-of-state summits since 2009. Furthermore the countries hold regularly meetings of their trade ministers, either as part of the annual summits, or during WTO summits. Intra-BRICS trade, as well as global trade, is discussed in the BRICS' Contact Group on Economic and Trade Issues (CGETI), and under the Trade and Investment Cooperation Frameworks [BRICS, 2013]. Those events do not only justify the academic engagement with the group, but also show the relevance of analyzing the prospects of this cooperation. So far little tangible outcome has been achieved in those meetings and frameworks on international trade cooperation, either because the work is still in process, or because they actually struggle to find a common ground or consensus in international trade issues. According to a study on commitment compliance of the BRICS to their summit declarations, trade has with only 55 % compliance the second lowest score of 16 fields of cooperation. In comparison, overall the BRICS show a compliance of 72 % with their commitments [BRICS Research Group, 2016]. The present paper is giving a detailed analyzes of those prospects and areas of cooperation.

This paper aims to investigate the foundations of potential BRICS trade cooperation and coordination. The main question is, if the BRICS have a combined economic interests in international trade, which they can promote and embed in the international trading system together as a bloc. To uncover this, the paper uses cluster analysis in order to group the WTO member states according to different trade variables. These clusters help us to understand, if the BRICS — in comparison to other WTO member states — share a specific pattern, which could be understood as a BRICS characteristic, and provide a basis for deeper cooperation.

Based on rational-choice theory we can assume that countries have individual preferences, and act according to their restrictions and expected utility maximization. Therefore countries should prefer those trade policies, which are most beneficial for their national economic interest. Simultaneously, it would be highly unlikely that countries support trade policies, which contradict their own preferences. We can assume for the specific case of BRICS cooperation in international trade, that if there are shared preferences, reflected in their trade patterns, the members of the group would try to cooperate in respective areas and try to carry out these policies also in international institutions. However, if this is not the case, cooperation will be more complicated or absent.

In a first section, this paper discusses the relevant theoretical approaches. Simple Rational-Choice Theory is the basis for the logic of argumentation. Next to this, the approach of State-Permeated Market Economies is discussed [Nölke et al., 2015], which offers an economic categorization for large emerging economies — as the BRICS — and gives an overview of patterns, which differentiate the BRICS from other forms of market economies.

The following section provides the necessary background on BRICS internal and global trade developments over the last decade, with a focus on the importance of inter-BRICS trade. Furthermore the section discusses the roles of emerging economies in current developments in the international trading system, as for example mega-regional trade agreements. In doing so, it also provides the basis for the subsequent analysis.

Next up is a cluster analysis, based on self-organizing maps. After introducing the method itself and its methodology, different trade clusters are presented, which show the similarities and differences of the BRICS in their international trade patterns. Those clusters include nearly all of the WTO member states and group those into four defined clusters based on seven trade variables. The main findings and an outlook conclude this paper in the last section.

1. Emerging Economies in International Trade: Theoretical Approach

The developments around the BRICS touch two theoretical debates on the world economy, firstly the question about the behavior of countries, and secondly the debate of economic preferences of emerging economies. This section discusses the first question from a rational choice theory perspective, and the second within the context of different concepts about the economic preferences of emerging economies.

Rational Choice Theory offers a theoretical approach to explain how countries make decisions and how they act under different circumstances — for example different scopes of knowledge or under uncertainty. It has become one major theory of Economics as well as for Social Science in general. Rational choice is defined as the process of determining

what options are available, and choosing the most preferred option according to some consistent criteria [Levin & Milgrom, 2004]. Rational choice theory is therefore an optimization-based approach, or in other words a utility maximization approach. Of cause this approach has also caused much criticism, especially in social science, and maybe most prominently by Amartya Sen for its simplistic explanations, its biased character and its behaviorism [Sen, 1973; 1977]. However, few other theories offer such a precise and convertible set of tools for the empirical research of decision making as rational choice theory. Reflecting the aim of this paper to actually produce empiric output, it should be obvious that an intensive social study of the different underlying social patterns of decision making in the respective countries is not only close to impossible, it is also simply unnecessary for the search of shared preferences of large emerging economies.

The approach is based on the idea that actors have preferences and choose their decisions according to those. There are three main assumptions about the behavior of actors in decision making situation [Bamberg et al., 2008, p.143]. The first is the preference assumption, that actors have the choice between different courses of action, and rank those according to their individual preferences, in order to reach their ultimate action. The second is the restriction assumptions, which determines the decision making of the actor not only by ones preferences, but also by restrictions to act. And the third is the maximization assumption, which assumes that actors will always chose the preference, which under the present restrictions will lead to the best result. One main problem with the rational choice theory is the available information for the actors. In often idealized experiments actors have full information about the different outcomes, restrictions and possibilities of action. However, in real life the situation differs from the idealized experiment — this has become one of the main critiques for rational choice [Schmitt, 1996, p. 106]. Actors do neither have full information about situations, nor does utility maximization apply in all social situations as the main preference. Actors also act according to social patterns, as for example values or group dynamics.

For this paper, rational choice implies that countries make decisions according to their individual preferences and restrictions in order to achieve utility maximization. This applies to developed economies in the same manner as to emerging economies. This means that the individual preferences and economic policies of emerging economies can be determined by the structural economic situations of the respective country. Or very simplified: the current trade patterns of emerging economies determine their decision making in international trade cooperation. Of cause a couple of other factors affect this coherence, and there are differentiations between narrower and wider conceptions of rational choice theory [Bamberg et. al., 2008, p. 144; Opp, 1999]. However, for this analysis it is necessary to simply understand the interacting coherence between domestic economic structures and national preferences, because domestic structures are crucial for explaining a countries foreign policy preferences [Waltz, 1959].

This leads to the question about what are the economic preferences of emerging economies. Andereas Nölke, Tobias ten Brink, Simone Claar and Christian May have developed a market economy categorization [Nölke et al., 2015] for the BIC countries (Brazil, India and China). However, even if the authors suggest that Russia and South Africa are not their first choice for this categorization, we still can assume that the implications of this approach for emerging economies affects also all BRICS, not only because the three example countries are already included, but also because Russia and South Africa show

many pattern which come close to the ideal type categorization of the authors. Their aim of the authors was to determine a common institutional categorization for large emerging economies, which makes them distinguishable from other categorization, and to develop an Political Economy approach for the mainly International Relations debate about the effects of emerging powers on the global order [Ikenberry, 2008; Schweller, 2011; Johnston, 2007].

Here lies the relevance of the present approach of the authors. In order to understand the effects of emerging powers or emerging economies on the global order or international institutions, we first need to understand the internal structures of those countries. Just drawing the differences on governmental statements or assumed cultural differences is not enough. It is of significant necessity to understand the internal socio-economic patterns of countries in order to understand their international politics, of which international trade policies are a part of. Of cause emerging economies are themselves extremely different from each other. However, they also share patterns, which makes them as a group distinguishable from other groups of countries — by showing this, the authors have produced a valuable contribution to the current discourses.

This categorization of state-permeated market economies (SPMEs[1]) is determined by the assumption that the state, driven by strong pro-business support for national development, has a more important role than in OECD economies [Nölke et al., 2015, p. 543]. It takes as a starting point a reciprocal mechanisms of loyalty and trust between the members of this state-business coalitions, based on informal personal relations, family ties and shared social backgrounds. Generally speaking, this state-capitalist categorization should be differentiated from three other categorization: first the liberal market economies (LMEs) where capitalism is coordinated by the market and formal contacts, secondly the coordinated market economies (CMEs) with capitalism coordination through formalized networks and associations, and thirdly dependent market economies (DMEs) where capitalism is organized by hierarchies within multinational enterprises [Nölke et. al., 2015].

This state driven capitalism of SPMEs should not be understood as closed approach, since countries are always different is certain patterns, but has to be understood as a general tendency in contrast to the other forms of capitalism. SPMEs have similarities in five main economic governance patterns: corporate governance, corporate finance, labor relations, innovation, and domestic as well as international integration. In SPME most major companies are dominated by national capital and controlled by well-connected families or the state. They mainly raise investment through internal savings and loans by national banks, or enjoy preferential financial support by the state. SPMEs relay on a low wage regime, arranged and preserved by state institutions through the segmentation of labor forces into well-protected sectors, less-protected sectors and an informal sector. Furthermore, SPMEs hold relatively weak patent right systems, while innovation is mainly exclusively supported in state selected sectors. Finally the growth of SPMEs is also based on large domestic markets, in which sectors grow under the protected of the state.

All those patterns constitute a state-driven capitalism, which diverges in certain factors from the Western forms of capitalism. It explains that the national interest in SPMEs is mainly defined by the interests of the major companies and elites, and not by the general

[1] The Authors themselves use the term SME, but in order to avoid confusion with the acronym SME for 'Small and Medium-sized Enterprises', this paper uses the acronym SPME for State-Permeated Market Economies.

welfare of the population. Even if this might apply also in other forms of capitalism, the authors differentiate between much closer ties between the business elites and the governments in SPMEs in comparison with a lesser degree of state-business interdependencies in other forms of capitalism. In SPMEs the states duty to seek for general welfare of the populations dismantles under the business elites desire to preserve their benefits and positions. Furthermore, the state is — by its close ties to the business elites — in the constant position of preserving national company's interest on the international level through protectionist policies. While in many Western countries multinational companies promote the reduction of protectionism, the for emerging economies so important state-run industries, which are based also on large domestic markets, urge the state to protect them — also in order to keep benefit flows running between the business and state elites. The focus lies here on the involvement of the government of large emerging economies in the domestic economy, in comparison with other countries, and therefore participates in the debate about the Washington and the Beijing Consensus [Chin & Thakur, 2010].

For this paper the conception of SPMEs provides a theoretical possibility to look for common interests in trade policies. It offers an explanation why emerging economies with very different trade patterns and varying national interests might still agree on a shared vision for the regulation of the international trading system. This vision, however, is not the attempt to reform or progressively influence of the current system, but emphasize a slower liberalization and to preserve the status quo of the WTO, for example against progressive (mega-) regional trade agreements. The link between the SPME categorization and rational choice theory is manifested in their common use of rationality for state behavior. In contrast to constructivist approaches in social science, rational choice theory offers the possibility to compare government decision making of countries with different domestic systems, but some common features. Furthermore the approach allows to focus on specific areas of government decision making, without the necessity to explain every course of action of the state. Therefore rational choice offers the ideal foundation to enlarge the SPME categorization, and use it to find common pattern between the BRICS. The next section uses this foundation and looks at the status quo of BRICS Trade.

2. Challenges of Intra-BRICS and Extra-BRICS Trade

As a group, the BRIC heads of state met for the first time officially in 2009 in Yekaterinburg, subsequently after the establishment of the G20 in 2008. In their relatively short joint statement they simply emphasized the importance of international trade, urged for stability of the multilateral trading system, and pushed for comprehensive and balanced results in the WTO's Doha Development Agenda [BRIC, 2009]. In their joint statement in 2010 we can observe a development in BRIC cooperation in trade issues. The BRIC were discussing the modalities of cooperation in trade issues, for example a local currency trade settlement agreement. Furthermore they stronger than before urged all states to resist all forms of trade protectionism and to fight restrictions to trade [BRIC, 2010]. This narratives are continuing in the next joint statements and declarations of the following summits. The BRICS are more and more emphasizing cooperation in trade between each other in line with the international trading system, which is in their view only provided by a stable WTO. Furthermore, all subsequent joint documents called for the reduction of trade barriers of trade protectionism.

However, if we take a look at the development of BRICS trade liberalization since the establishment of their dialogue forum, we can observe increasing protectionism of those emerging economies, and interestingly especially between each other. Simon J. Evenett called therefore for a rethink of the current BRICS trade strategies [Evenett, 2015, p. 11]. He found out that the BRICS have implemented 1196 harmful trade measures against each other since the crisis in 2008. This means that the BRICS themselves are responsible for 32 % or all harmful trade measures against the BRICS, while the G7 and Australia are only responsible for 20 % [Evenett, 2015, p. 4]. In the light of this data, the BRICS statements regarding the abolishment of protectionism and the reduction of trade barriers seem odd. However, the actual situation is still in line with Ian Bremmers and Nouriel Roubinis essay about a G-Zero world, in which trade and economic negotiations of the next 20 years will be driven rather by competition and protectionism, than by cooperation and liberalization [Bremmer & Roubini, 2011, p. 4].

Regarding regional or mega-regional trade integration outside of the WTO the BRICS have also a mixed record. Russia is a members of the Eurasian Economic Union. South Africa is member of the Southern African Customs Union, Brazil member of the Customs Union of Mercosur, and India is part of the South Asian Free Trade Area. China is so far not a member of any institutionalized form of economic integration, the country is until now focusing on Free Trade Agreements (FTAs). Currently Beijing "has 19 FTAs under construction, among which 14 Agreements have been signed and implemented already" [MOFCOM PR China, 2016].

Currently mega-regional trade agreements are on top of the international trade agenda, especially the implementation process and the effects of the Trans-Pacific Partnership (TPP) and the Transatlantic Trade and Investment Partnership (TTIP) are widely discussed. Out of frustration about the slow developments in the WTO have the USA with its pacific partners on the one, and with the EU on the other side started to introduce a 'game-changer' in the international trading system. Even if it is not clear yet, whether those two agreements will actually come into force, the current discussion about who will define the regulations for international trade in the 21st century unfold the clashing interests of those countries that prefer the current WTO rules as basis, and those who are frustrated with the WTO development over the last decades. So far, the BRICS are not part of mega-regional trade agreements, but they are actually discussing the possibilities of a BRICS free trade agreement between themselves. However, if we look at the BRICS joint statements, it is clear, that they are supporting a multilateral trading system, which is regulated by the WTO. Furthermore they are reiterating that all future trade agreements should be in line with WTO rules, and thereby call for the complementarity of FTAs and the WTO [BRICS, 2016].

Outside of the above-mentioned summits and joint statements, the results of actual trade cooperation are very mixed. The BRICS have definitely over the last decade increased intra-BRICS trade (Fig. 1). Intra-BRICS trade reached in 2013 a peak and is declining since then. This is in line with the recent economic problems in those countries However, the BRICS have generally increased their trade not only with other emerging economies, but with many partners over the last decade. Out of the value for all accumulated international trade of the BRICS in 2015, only around 12 % is intra-BRICS trade, with very different weight for the single countries. For Brazil intra-BRICS trade accounts for around 22 % of its overall trade, for South Africa 20 %, for Russia 14.5 %, for India

around 14.5 %, and for China around 10 %. Those findings show that intra-BRICS trade is important for all BRICS countries, with some vaiation [cf. Mathur et. al., 2013]. At the same time is the majority of their trade still with non-BRICS countries. The main trade flows happens in the respective region, or with long lasting trading partners. If we look at the main trading partners of the BRICS, we see — next to the global trading powers USA and EU — countries from the closer region, as for example for China countries as Japan, South Korea or Taiwan, or for Brazil the countries Argentina, Mexico or Chile, under the top ten trading partners.

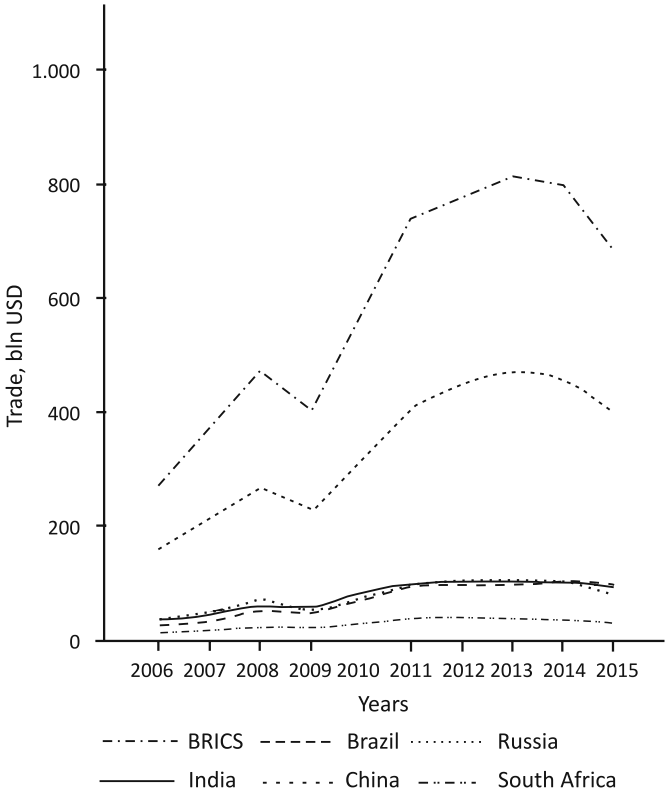

Figure 1. Make an inscription Years (horizontal axis) and Trade, bln USD (vertical axis)

S o u r c e: http://www.trademap.org/Index.aspx (accessed: 15.03.2017).

Figure 2 shows the distribution of trade from the single BRICS economies towards their fellow BRICS partners, and we can observe that trade with China is clearly dominating. China is for Brazil, Russia, India and South Africa by far the most important BRICS trade partner — in general Beijing is the second largest global trading partner for them after the EU. But not one of the other BRICS is in the top 10 list of China's trading partners. China holds on the one side the largest share of intra-BRICS trade, on the other side inter-BRICS trade has a rather small share of China's global trade. Furthermore, for the other BRICS the trade with China is much more important, than trade with the remaining BRICS. So while the increasing number of trade between emerging powers is often

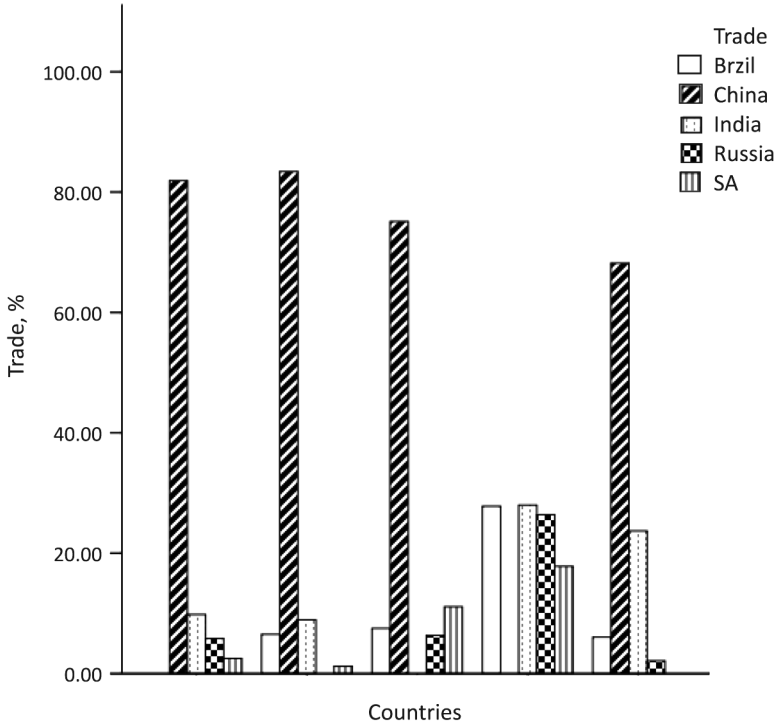

Figure 2. Distribution of Intra-BRICS Trade in percentage, 2015
Source: http://www.trademap.org/Index.aspx (accessed 15.03.2017).

stressed [cf. Mathur et. al., 2013], it is necessary to understand the differences in trade and the outstanding role of China, which is not on the same level as its fellow partners.

To summarize, there are five challenges for intra-BRICS and extra-BRICS trade. Firstly the BRICS need to overcome the ambivalence between their official rhetoric to support intra-BRICS trade and their increasing implementation of protectionist measures against each other. Secondly is for most BRICS the regional trade integration through their various regional frameworks more important than cross-regional BRICS trade. Thirdly are mega-regional trade negotiations a challenge for extra-BRICS trade, if they do not participate in those and therefore missing out to shape those developments. The fourth challenge is the heterogeneity in trade between the BRICS as well as in relation towards other trading partners. A homogenization of trade would require not only a homogenization between the respective customs unions, but also the political will to do so. And finally the overweight of trade with China in intra-BRICS trade might cause a challenge, as discussed above.

3. Methodology: Cluster Analysis of BRICS Trade

In order to find common foreign trading patterns of emerging economies, this paper clusters countries based on trade variables, which show differences and similarities in BRICS trade. In comparison with other quantitative methods that are looking for specific variables to explain outcomes, cluster analysis groups data by variables into units with

similar features — and therefore offers for this paper the possibility to understand if the current political grouping is also a group in international trade, or not. The method helps to organize data in groups with similar variables. These similarity structures are called clusters, and those can be labeled after the attributes and features, which are present, or not present, in the individual clusters. The first part explains the clustering method of self-organizing maps, used in this paper, and the clustering process. In the second part follows a description of the used data set. And subsequently follows the description of the used variables in this analysis.

3.1. Cluster Analysis in the Form of Self-Organizing Maps

Cluster analysis has become an important feature of data mining, the discipline of transforming and discovering huge amounts of data. Contrary to classification, where data is ordered in already existing systems, cluster analysis identifies new groups of data [Abonyi & Feil, 2007].

This analysis uses Kohonen-maps or self-organizing maps, an artificial neural network that helps us to show and understand the clusters easily. It is an unsupervised training set for big data sets, first developed by Teuvo Kohonen in the 1980s [Kohonen, 1995]. The Kohonen net is a computationally convenient abstraction building on work on biologically neural models from the 1970s and morphogenesis models dating back to Alan Turing in the 1950s.

Self-organizing maps can be used to solve economic problems like modeling, forecasting, or pattern-searching in large data sets. The used algorithm represents a specific variant of clustering multidimensional vectors. An important feature of the algorithm used by the computer program Loginom, which has been used for this analysis, is that all parts of the maps (called neurons or nodes) are arranged to one another in a certain structure. The method uses two steps, namely training and mapping. In a specific training the maps are built by the input variables through vector quantization. Here not only the best matching unit is modified, but also its neighbors. A matching unit is the node which correspondents with the input variable more closely than all others. Mapping automatically classifies a new input vector. Through this a multi-dimensional space can be projected on a lower dimensional space, mostly a two-dimensional grid [Loginom, 2008, p. 88]. Therefore these maps can be considered as a method to project complicated data sets into two-dimensional groups. The projection is usually located on 2D grips of rectangular or hexagonal cells. In this analysis we use hexagonal cells, which are easier to understand due to its visualization.The output grids of Kohonen self-organizing maps are useful for finding dependencies in the data between variables — but they don't have specific outputs as for example in the case of regression analysis. Rather, this method simply runs new variables over pervious variables in order to arrange the cases in a logical order. Out of this order we can then label groups or clusters according to the variables values of the nodes in them. Important to notice here is that the presence of two countries in different clusters does not imply the impossibility of trade relations between them, but can deduce highly different preferences for trade regulating policies.

The clustering process in done by the program Loginom. The output of Loginom provides us with clusters based on our variables. The output is shown in a map or set of nodes, in which each node can be associated with a hexagonal area of the picture. The coordinates of this area are determined by the coordinates of the respective node in the grid.

It is important to note that not every hexagon represents a reporting country here, but the whole map together presents the pattern of the variables. The resulting map represents an atlas which shows the location of the countries, their interconnections, and the relative position of the various values of each country.

In a first step all data is normalized by linear normalization of the initial values. Here all variables are transformed in a set from 0–1 or into similar modes dependent of the program. The purpose of normalization is to transform the data into the most suitable type for the clustering. We then define a training set and the weight coefficient of the neurons. The analysis uses eigenvectors in which the weights are initiated using the values of the vectors linearly ordered along the linear subspace passing between the two principal vectors of the data set [Loginom, 2008, p. 89]. The resulting maps can be understood as a layer cake in which each layer represents a color produced by one of the data set components. If we overlap all seven layers of our seven variables we have a final cluster map. The general principle is that each variable creates its own clusters, which then run through other variables to construct common clusters [Loginom, 2008, p. 90].

3.2. The Data set

The idea is to locate the BRICS in a broader scheme of countries, in order to understand their differences as well as their implications for the WTO. Only a broader comparison with a large group of countries can show if the BRICS have actually similarities in certain areas, and by looking of all member states of the WTO we can draw conclusions about effects on the institutions. The used data includes 155 of the 162 WTO members. The EU has not been considered as a separate member of the WTO, since the individual EU member states' data is already a part of the sample. Including the EU would thus not only lead to an extreme outsider case, but also duplicate data. Furthermore, for six single states the data provided by the WTO was not complete, so that they could not be considered in the calculations. However, these six countries — Chad, Djibouti, Dem. Rep. Congo, Liechtenstein, Sierra Leone and Tajikistan — are neither emerging economies, nor does their exclusion influence the outcome of the analysis significantly. The data is generated out of the countries' trade profiles from the WTO Statistical Database and relates in 98 % to the year 2014 and — due to a lack of current data — only in 2 % of the cases to data from the years 2012 or 2013. The used data represents the trade with all trading partners in all goods and all services.

3.3. The Variables

In order to be able to relate the results to the variables, self-organizing maps should not include a large number of variables, but rather a short number of reasonable variables about the same issue. Therefore this paper uses seven variables, which are all related to international trade, as well as to the economic performance of countries. The seven input variables for the cluster analysis are each countries' (1) exports of all goods, (2) visible trade balance[2], (3) exports of all services, (4) percentage of agricultural products of all exports, (5) percentage of fuels and mining products of all exports, (6) percentage of manufactured products of all exports, and (7) Most Favorite Nations (MFN) applied tar-

[2] The invisible trade balance was not considered in this analysis due to the high correlation between imports and exports of services, cf. Annex.

iffs on simple average[3]. Due to the WTO goods' classification in the WTO Statistical Data Base the percentages of variables 4, 5, and 6 do not always end up to 100 %, which makes it necessary to include all three variables. The correlation between those three variables is not high with the Pearson Correlation between variables 4 and 5 being 0.282 and between variables 4 and 6 at 0.367. Only between the variables 5 and 6 we see a higher correlation with 0.603, but the value is not high enough to exclude one of the variables. An overview of the correlations between all variables can be found in the Annex. In the original data set the variables 'imports of all goods', 'nominal GDP[4]', and 'imports of all services' were also present, but have been excluded due to very high correlation of over 0.846, 0.933 and 0.929 with the variable 'export' as well as with the variable 'service exports'.

The logic behind the chosen variables is to distinguish between the trade performances of countries, as well as between their trade compositions. The first three variables exports of goods, visible trade balance and export of services are included to reveal the general economic performances of countries. The discussions about emerging economies points itself already in the direction, that those countries should at least outperform a large number of other countries in their economic performance, or even close the ranks to developed economies. Here it is interesting, if the clusters show a pattern of emerging economies; for example, do they share a pattern in their proportions of exports of goods and exports services? Or are there similarities in the trade balances of the BRICS, in relation to all other included states. Also, trade in services has been recently an important topic at the WTO and might also have an implication for future economic rise.

Trade in agriculture as well as the NAMA negotiations have played a crucial role in the Doha Development Agenda and the WTO in the last 15 years, and therefore a differentiation of the main categories of trade in goods appears reasonable. That is why the variables 4, 5, and 6 are included, in order to differentiate between the domestic backgrounds of countries. Exports are a mirror of domestic economies, though especially agricultural lobbying and domestic politics sometimes leads to an overrepresentation of certain sectors in trade negotiations. Furthermore the main exported good of a country is also related to the countries national interest. Resource exporting countries and countries that export manufacturing products might have very different interests in regulating the related sectors in international trade negotiations. Furthermore those variables are represented in their respective percentages, in order to show their importance for the respective country. Thereby those three variables are related to each other, since a higher percentage in one of them limits automatically the amount of the other two variables. Finally the inclusion of applied tariffs as the seventh variable was then considered to get an estimate about the level of protectionism of the respective countries, also in order to understand which of the clusters apply higher or lower tariffs. Even if tariffs are today just one measure of pro-

[3] This analysis is using simple average applied MFN Tariffs in order to have the maximal amount of available data on all case countries. Data for weighted average applied MFN Tariffs is not available for all countries for the respective years. However, as can be compared in the WTO statistics website, for the BRICS the difference between simple and weighted average tariffs is much smaller than for other countries, therefore weighted tariffs would show an even stronger coherence of the BRICS. Furthermore, theoretically there is no significant difference between simple and weighted data, if this variable is used as an indicator for protection level for a market economy.

[4] Nominal GDP compared better than nominal GDP per capita the weights of different economies. This analysis is looking at the different between whole economies, and not at differences in the development of different countries.

tectionism, and there are numerous other possible protectionist measures, tariff data as a variable for 155 countries are available and transparent, which does not apply for many other trade related regulations. And even if today the importance of tariffs might often be undermined, as we will see in the results, tariffs still differ highly.

4. Main Findings: BRICS in International Trade Clusters

The following analysis shows the combined multidimensional data of the 155 cases in two-dimensional output maps. This general trade cluster map presents the optimal relationship and grouping of all cases according to the seven variables. The result shows, that the 155 cases are best divides in 4 different clusters, which are differentiated from each other by specific similarities or differences in the variables. In the following figures we will see the general clusters in one map, and then seven maps of the different variables — of course the cluster formations and cluster borders in all the variable maps are the same as in the general cluster distribution, which is the formation according to all seven variables combined. The differences of each variable on the respective seven variable maps are signalized by different shades of gray, with darker nodes standing for a lower value of the respective variable and light nodes standing for higher values. The real amounts are not necessary to know for this analysis, only their differences between each other. Furthermore overshadows the normalization of the variables the real values.

Figure 3 shows the four clusters and the positions of the five BRICS inside, indicated by their initials. The first and smallest cluster in the upper right corner includes China and six other states: France, Germany, Hong Kong, Japan, the UK, and the USA. This cluster is labeled '*Economic Leaders*' as will be explained later by the variable distribution. The second cluster is the largest one with 73 states and is labeled '*Manufacture Exporters*'. It also includes India and South Africa, though with a huge distance between them. The third cluster in the lower left corner consists of 38 countries, including Brazil, and is labeled '*Agricultural Exporters*'; the fourth cluster includes Russia and 36 other countries, and is labeled '*Resource Exporters*'. Noteworthy is that Russia has a rather small distance to South Africa. A list of each countries cluster affiliation is provided in the Annex. Regarding the EU countries, we find only Greece in cluster 4 and Germany, France and the UK in cluster 1, while the other 24 EU member states are all in cluster 2 and none of them in cluster 3. Other geographical tendencies show South East Asian countries in cluster 2, Middle Eastern countries in cluster 4, and African as well as Latin American countries in cluster 3.

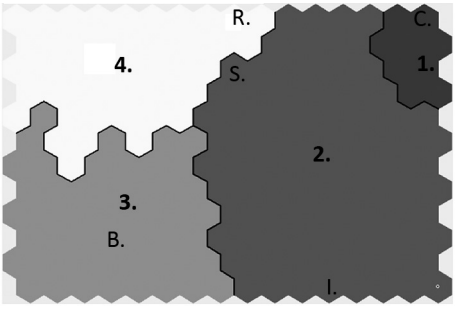

Figure 3. Trade Cluster

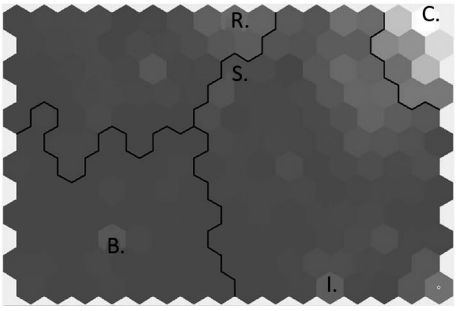

Figure 4. Exports

In order to determine the first cluster we can look at the distributions of the variables export, trade balance, and export of services. For the variable exports' we see in figure 4 a strong concentration of higher values (bright nodes) in cluster 1, with China actually as the biggest exporter of the world, and lower values (dark nodes) in the three other clusters. Furthermore, we can see that Russia, Brazil and India have significant higher export values than their surrounding areas. There is also a concentration of average volumes of exports in cluster 2, close to cluster 1, while cluster 3 shows nearly no other high export nodes, besides the one around Brazil. In cluster 4 we see around Russia a couple of nodes with higher values.

The distribution of nodes in the variable trade balance in figure 5 shows a different, but related picture. Here cluster 1 includes both, the largest as well as the lowest values. China and Germany account for the highest surpluses, while the USA, the UK, Japan and France — together with India in cluster 2 — have the biggest negative balances. Furthermore, we see in nodes around Russia an accumulation of larger values, while South Africa and Brazil show no different values as compared to the rest of the nodes. This distribution shows in comparison with the variable exports, that there might be a relationship between a high amount of exports and an unbalanced trade balance.

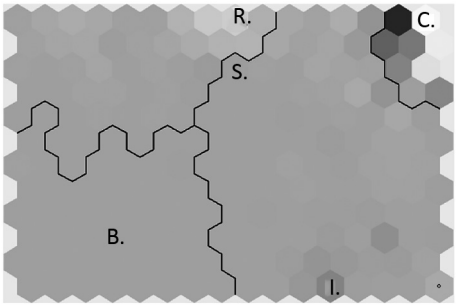

Figure 5. Trade Balance

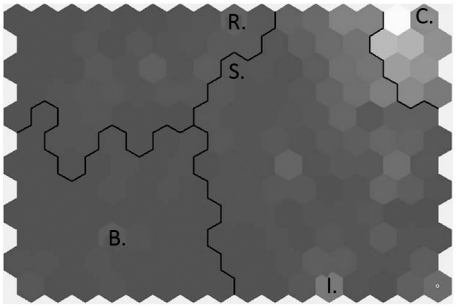

Figure 6. Service Exports

Similar to the distribution of export of goods is the one of exports in services, as can be seen in figure 6. A clearer picture of cluster 1 emerges here. Cluster 1 — together with the node of India and some other nodes of cluster 2 which are located around cluster 1 — shows the highest values of export in services. We understand that high exports of goods and high exports of services combined constitute cluster 1, as can be seen in a Pearson Correlation of 0.797 between both variables[5]. Russia and Brazil show significant higher values in export in services in comparison to their clusters, but at the same time significant smaller values than cluster 1. Inside of cluster 1 the USA lead in exports in services. So far we can observe that cluster 1 countries have significant higher exports and imports[6] in goods as well as in services; those countries have also either an extreme surplus or deficit in their trade balances. The figure also shows that cluster 2 is much closer to cluster 1, while cluster 3 is the farthest away.

The next three export segmentation variables show the composition of the clusters 2, 3, and 4. Figure 7 shows us the percentage of agricultural products in the exports. We can clearly see the composition of cluster 2, including Brazil, which of the BRICS has the largest proportion of agricultural products in its exports. There are even higher values

[5] Cf. Annex.
[6] Cf. Annex.

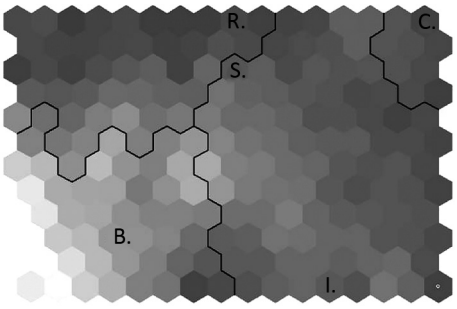

Figure 7. Agriculture

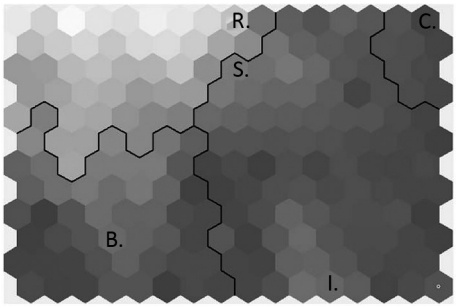

Figure 8. Fuel & Mining

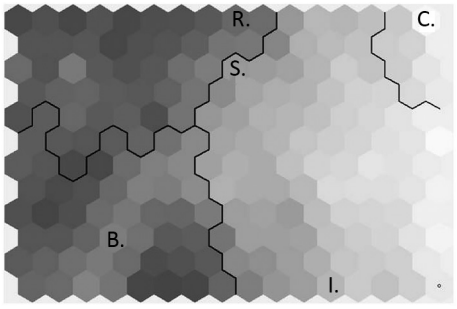

Figure 9. Manufactures

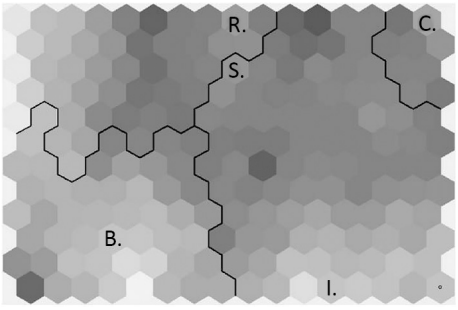

Figure 10. Applied Tariffs

in those nodes, which are farthest away from cluster 1. We can also observe some medium-low values of agricultural trade in cluster 2, and minor values in cluster 4. However, these high values of trade in agriculture explain Brazil's distance to the other BRICS.

In figure 8 we see that cluster 4 includes mainly all countries with over 50 % of their exports in fuels and mining products. Here we can find Russia with a high value of around 70 % its exports in this sector. Also, we see some average values in cluster 2 and cluster 3, especially around Brazil and India, while cluster 1 has the lowest values in this variable. Interesting is the position of South Africa, being located close to Russia, due to its on average higher value as the rest of its cluster. At the same time South Africa is far away from India, which has a similar value in this variable. However, the distribution in the variables of Figures 2, 3 and 4, explains very well the distance between India and South Africa. Furthermore in cluster 3 we see some average value nodes around Brazil.

Figure 9 completes the picture with the percentages of manufactured trade. As might have been expected, we see high values in the nodes of cluster 2, but also of cluster 1 with especially China leading the high values. South Africa and India show average values in this variable, which explains their location in cluster 2. Russia and Brazil have lower values, but we see why Russia is inside of cluster 4 still located close to cluster 2.

Finally, figure 10 shows the distribution of the average applied MFN tariffs of all WTO member states. Here we can see similar tariff values of all BRICS with average to high values. China is an outsider in cluster 1, and we can see significant higher tariffs in cluster 3 and cluster 4. Furthermore, Cluster 2 has a bisected distribution of the nodes. On the one side all 24 EU states of cluster 2 share one value, on the other side we can see in the area around India an aggregation of higher values. Also the BRICS do definitely not belong to

low tariff countries. Fig. 10 is the least structured map and does only slightly follow the division of the previous variables. But, we can also see some correlations between high tariffs and agricultural exports.

The analysis shows that the BRICS are in very different clusters, and those trade clusters are mainly defined by the overall size of trade and by the export segmentation after commodity group. We can see that each of the BRICS has very district key sectors for their national economy, and thereby develop different main interest for trade liberalization or protectionism. This might have also been obvious in a simple comparison of the economic sectors of the BRICS — however this analysis shows that the BRICS do not just differ from each other, but also, that they also do not share many similarities with each other if we compare trade variables of 155 countries. Of cause also the other 150 countries differ from each other, but in relation to the current discussions of groups and categorization of emerging economies, we can see that the BRICS are not a natural convergent group in their international trade structure. The used cluster analysis has shown that the BRICS are located in four different groups of trade patterns, which illustrates their divergence, and helps to assess the future prospects of BRICS trade cooperation. China is here on the same cluster as most G7 states, which means a top trading country by the amount of trade, a nearly exclusively manufacturing products trading economy, and a large amount in trade in services. India and South Africa can be found in the second cluster of rather manufactured products trading countries, where India displays higher values in the trade of services and South Africa a position closer to the cluster of fuel and mining products exporting countries. Russia is located in the cluster of fuel and mining products exporting countries and also displays a higher level in trade surplus. Brazil is finally located in the cluster of agricultural products exporting countries, and even if Brazil shows higher values in the variables exports, manufacturing products as well as fuel and mining products, it is still far positioned from the other emerging powers.

But if we look at the average tariff distribution, the BRICS do share one pattern in comparison with other WTO member states: they belong to the countries with higher tariffs. This similarity is not strong enough to form with the other variables together an own cluster, but we can observe this pattern, which differentiates the 5 BRICS from their surrounding clusters. Of cause there are also other countries with higher tariffs, but it is clear, that we see here a common pattern of emerging economies. According to Olena Sokolovska a relationship between resource exporting counties and higher tariffs exists [Sokolovska, 2016, p. 63]. She further argues that for large economies with a significant part of resource consumption domestically, as Russia, Brazil and China, tariffs are functioning also as a subsidy on domestic consumption in terms of its price and quantity effects.

These highly different patterns will not disappear in the nearer future, even if it might be necessary for India, Russia, Brazil and South Africa to increase their share of exporting manufacturing products, in order to diversify their in some cases very price dependent export patterns. The analysis also shows, that China has much more similarities to the G7 than to the other emerging economies. This result, which shows — based on trade variables — a strongly uneven group of emerging economies, points less to a stronger trade integration between the BRICS, but reveals the necessity of a rule based multilateral trading systems, as the WTO. The mixed structures of the BRICS might thereby even strengthen the WTO, an international institution which has been in some struggles in recent years.

This analysis has only used seven specific variables in order to determine the BRICS location in the presented clusters. And one main finding is the shared amount of comparably high tariffs. Surely further studies with new variables, based on these findings could uncover more detailed the differences and similarities in the used trade policy instruments. However, those studies need a different composition, since there is little comparable data for all WTO member states on specific trade policy instruments. Here a simple comparison of used trade policy instruments — of tariff and non-tariff measures — of the BRICS might be an interesting further study.

Conclusion

This paper asked, if the BRICS share economic interest in global trade, which could be the foundation for increasing cooperation between those emerging economies. Is there latitude for emerging economies to establish lasting cooperation that might have significant effects on international institutions as the WTO, or may different trade patterns hinder the establishment of a comprehensive approach? After creating trade clusters in order to determine trade patterns, the paper gives two main conclusions to this puzzle. Firstly, the analysis shows that the BRICS do not fall in the same clusters if we compare 155 WTO member states on our seven trade variables. The BRICS are highly different in their trade patterns, especially in their export compositions, and have little similar preferences in their direct trade structures. But the BRICS share a higher level of tariffs in comparison with other states, which points to an interest in preserving a higher level of protectionism to secure their current national interests. This rather protectionist position can be explained by the categorization of the BRICS as state-permeated market economies; a categorization which argues that governing elites in large emerging economies prefer — contrary to liberal market economies — the implementation of rather protectionist trade policies. Since the ties between the state and economy are much closer in emerging economies through state-owned companies and personal relations, protection of these constructs against reforms or foreign competition becomes national interest. Those findings therefore also signify that the BRICS do not share a common version of trade liberalization, which stands in contrast to their public statements on the issue.

And secondly this paper concludes that the BRICS have a strong interest in preserving the WTO in its current status. As said above, the BRICS share not much direct trade interests, however they share similar characteristics in the organization of their economies, as well as a higher level of applied tariffs. This does not have to imply a more protectionist global economy [Schweller, 2015, p. 11], however we can expect that the BRICS will not deepen their trade cooperation tremendously in the near future. They might rather rely on the multilateral rule based trading system of the WTO. While the BRICS are not pleased with the current status of the IMF or World Bank, the WTO provides for the BRICS exactly what they require, a rule based system, in which they themselves can influence the speed of liberalization and preserve the status quo, in which emerging economies might further develop. And here lies the actual potential of BRICS cooperation and coordination in the international trading system. By focusing rather on preserving the current system, through supporting each other in resisting fast changes and through knowledge exchange in the WTO, the BRICS are able to improve their trade cooperation on the basis of the current WTO system. Of cause there is also the possibility of establishing bilateral FTSs between

the single BRICS, however also those would be based on the current WTO system. As an open question remains, if their economic form or state-permeated market economies will in the long run prove itself as the more sufficient way for economic development. The current economic problems in the BRICS could also lead to a change in their economic preferences. However, as long as there are such close ties between the business elite, the state, and state-owned enterprises, which hinder national reforms due to their individual benefits of preserving this status quo, the BRICS will rely on a more protectionist trade system as their national preference.

Finally, this paper has introduced cluster analysis to the current studies about the BRICS and the international trading system. Thereby it has opened a new view on the BRICS by not just comparing them with each other, or with Western industrial countries, but by using a framework which includes nearly all members of the WTO. The method itself has thereby shown its potential and limitations. On the one hand the method allows to understand the clear distinctions between those emerging economies, on the other hand the results open a lot of subsequent questions which could not be addressed in this study. In comparison with regression analysis, cluster analysis only allows a limited number of variables, in order to be retraceable. However, this first findings in this paper show the huge potential of further studies with cluster analysis. For example one could compare several clusters based on different groups of variables. Or one could broaden the studies in order to take a more detailed look at the single clusters to find theoretical patterns and explanations for their composition. Unfortunately does this kind of analysis require a huge amount of comparable data, which is not yet available for many specific policies in trade — is has already not been possible to find simple export data for all member states of the WTO itself. But in general offers the engagement with empirical research in new areas as BRICS studies very interesting findings and research possibilities.

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ANNEX

Table 1. **WTO member state's affiliation in the clusters 1–4**

Cluster 1 (N 7) Economic Leaders	Cluster 2 (N 73) Manufacture Exporters		Cluster 3 (N 38) Agri. Exporters	Cluster 4 (N 37) Resource Exporters
China	Albania	Macao SAR	Argentina	Angola
France	Antigua and Bar.	Macedonia	Belize	Armenia
Germany	Austria	Malaysia	Benin	Australia
Hong Kong SAR	Bangladesh	Malta	Brazil	Bahrain
Japan	Barbados	Mauritius	Burkina Faso	Bolivia
United Kingdom	Belgium	Mexico	Burundi	Brunai
USA	Botswana	Moldova	Cabo Verde	Cameroon
	Bulgaria	Morocco	Cen. African Rep.	Chile
	Cambodia	Nepal	Côte d'Ivoire	Colombia
	Canada	Netherlands	Fiji	Congo
	Chinese Taipei	Pakistan	Ghana	Cuba
	Costa Rica	Panama	Grenada	Ecuador
	Croatia	Philippines	Guatemala	Gabon
	Cyprus	Poland	Guinea-Bissau	Greece
	Czech Republic	Portugal	Guyana	Guinea
	Denmark	Romania	Iceland	Jamaica
	Dominica	St. Kitts & Nevis	Kenya	Kazakhstan
	Dominican Rep.	Saint Lucia	Laos	Kuwait
	Egypt	Samoa	Madagascar	Mauritania
	El Salvador	Singapore	Malawi	Mongolia
	Estonia	Slovakia	Maldives	Montenegro
	Finland	Slovenia	Mali	Mozambique
	Georgia	South Africa	Namibia	Myanmar
	Haiti	Spain	New Zealand	Niger
	Hondura	Sri Lanka	Nicaragua	Nigeria
	Hungary	Swaziland	Paraguay	Norway
	India	Sweden	Rwanda	Oman
	Indonesia	Switzerland	St. Vincent	Papua New Guinea
	Ireland	Thailand	Senegal	Peru
	Israel	The Gambia	Seychelles	Qatar
	Italy	Togo	Solomon Islands	Russian Federation
	Jordan	Tunisia	Suriname	Saudi Arabia
	Korea, Rep. Of	Turkey	Tanzania	Trinidad and Tobago
	Kyrgyzstan	Ukraine	Tonda	United Arab Emirates
	Latvia	Viet Nam	Uganda	Venezuela
	Lesotho		Uruguay	Yemen
	Lithuania		Vanuatu	Zambia
	Luxembourg		Zimbabwe	

Table 2. **Correlation index of considered variables**

		Exports	Imports	Trade Balance	GDP	Applied Tariffs	Agricultur.	Fuel and mining	Manufact.	Service Imports	Service Exports
Exports	Pearson Cor.	1	,959**	,027	,846**	–,197*	–,267**	–,098	,339**	,933**	,797**
Imports	Pearson Cor.	,959**	1	–,257**	,938**	–,203*	–,239**	–,138	,352**	,947**	,902**
Trade Balance	Pearson Cor.	,027	–,257**	1	–,424**	,042	–,067	,154	–,087	–,161*	–,466**
GDP	Pearson Cor.	,846**	,938**	–,424**	1	–,128	–,161*	–,078	,232**	,862**	,865**
Applied Tariffs	Pearson Cor.	–,197*	–,203*	,042	–,128	1	,241**	,044	–,334**	–,229**	–,257**
Agricultural	Pearson Cor.	–,267**	–,239**	–,067	–,161*	,241**	1	–,282**	–,367**	–,267**	–,229**
Fuel and mining	Pearson Cor.	–,098	–,138	,154	–,078	,044	–,282**	1	–,603**	–,112	–,157
Manufactures	Pearson Cor.	,339**	,352**	–,087	,232**	–,334**	–,367**	–,603**	1	,356**	,363**
Service Imports	Pearson Cor.	,933**	,947**	–,161*	,862**	–,229**	–,267**	–,112	,356**	1	,929**
Service Exports	Pearson Cor.	,797**	,902**	–,466**	,865**	–,257**	–,229**	–,157	,363**	,929**	1

** The correlations is on a level of 0,01 (bilaterally) significant.
*The correlation is on a level of 0,05 (bilaterally) significant.