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Trade diversification and changing food consumption patterns since the 2000s

The case of homogenizing diets globally and in the BRICS

by

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Abstract: International agricultural trade has seen big developments throughout time, initially driven particularly by the industrial revolution and then influenced by globalization and changes in technology. Coupled with decreasing barriers to trade, the rise of trade agreements, and economic growth of countries, international influences are having big effects on food consumption patterns. In particular, with rising incomes and access to more markets, people tend to diversify their diets towards crops that are not traditionally produced domestically. Increased demand for more varieties requires countries to diversify their export and import relations in order to satisfy changing diets. Through computations of the Herfindahl index, a measure of trade diversification, this thesis studies changing food consumption patterns based on exchanges with diverse markets and with regards to different varieties of products, taking into account more than 150 countries, and 12 product categories. In particular, as the BRICS are generally shown to play a major role in global agricultural trade, they are going to be compared with different groups of countries based on income levels. The results largely confirm the trend towards diet diversification, and in particular for the BRICS, transformations towards more 'westernized' diets, more heavily based on animal products, which will continue to have enormous implications for the future of agriculture and sustainability.

Key words: Food consumption, homogenization, diets, trade diversification, Herfindahl index

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1 Introduction

"Tell me what you eat, and I will tell you what you are. "
- Anthelme Brillat-Savarin (1755-1826)

Agriculture has always been at the backbone of all societies. Lately, increasing and changing food demand by civilizations brings forward big concerns in terms of the limited resources of the planet to keep up (Godfray et al., 2010), and with worldwide population having increased by 1 billion every 12-14 years since the 1960s, food availability has been matched with an intensification of agriculture (D'Odorico et al., 2014). Population projections towards 2050 point towards a world population reaching 9.15 billion people, from the 7 billion in 2011 (UN, 2011). But population size has not been linked linearly with food consumption, as there has been increases in per capita demand for food (D'Odorico et al., 2014). Next to the issues of increased consumption, the problem of homogenizing diets arises, as people worldwide start to demand new, non-traditional, varieties of products, necessitating global agricultural markets to adapt to new demands.

Per capita demand for food also differs in different parts of the world. While there is enough per capita food availability, about one-third of the global population, mainly due to worse economic conditions, live on less than 2500 kcal per day (Alexandratos & Bruinsma, 2012). Although generally, global population growth rates will slow down, the unrelenting fast growth of developing countries will have major impacts on agricultural commodities (UN, 2011), as it has been shown that with economic development, emerging economies start to consume different types of products in their diets (Delgado, 2003). Specifically, due to increases in per capita GDP and GNI, a rise of consumption of meat and other animal products has been identified (Tilman et al., 2011).

Based on assumptions that by 2050 world GDP will be 2.5 times the current value, and average per capita income 1.8 times higher, growing incomes and population and the role of emerging economies will be key in determining future food consumption patterns (Alexandratos & Bruinsma, 2012). As total world consumption is bound to increase, in order to satisfy people's changing needs, global trade in agricultural goods will see a shift as well. Global agricultural trade will see transformations as people start desiring foods that are not native to their country, and subsequently need to be traded on the international market (Cranfield et al., 1998). According to Josling and co-authors (2010), an analysis of trade based on changes in consumer preferences is necessary to evaluate possible future challenges, in particular the future of climate change and world trade. Specifically, this is evermore becoming the case for emerging economies, as through shifts in diets, the demand for more

diversified cereals, and more livestock products will likely have perceptible effects on the environment.

Agricultural trade has always been present and played a key role in changing demands for food products, but especially in the period after WW2, globalization and a general openness to trade, coupled with sustained economic growth worldwide, has stimulated big shifts in the reach and diversity of available agricultural products all over the world (Anderson, 2016). Particularly, in recent times emerging countries are experiencing transformations which are affecting multiple layers of society concomitantly and put in motion big shifts on the global market for agricultural products (FAO, 2015). Synoptically, many scholars point towards the explanation of altered food choices towards factor growth on the supply side, income growth and urbanization on the demand side, and globalization and modifications to trade barriers on a relational level (Gehlhar & Coyle, 2001).

Based on the current trends of growing connectivity and globalization, and changes in trade relations, the connection between changing consumption patterns and a diversification of traded commodities is universal. Grounded on theories relating to changes in diets all over the world, this thesis will utilize trade patterns across countries worldwide to analyze the trends in trade diversification, with a specific focus on the role played by emerging economies and asks the question whether consumption of food has become more differentiated. Two specific hypotheses are advocated, regarding firstly that overall a trend exists that countries worldwide are becoming more diversified in their exporting and importing structures, both with regards to particular partners and varieties of agricultural commodities. Secondly, emerging countries, in particular Brazil, Russia, India, China, and South Africa (BRICS), are endowed with peculiarities that makes them rather different from other high- or middle-income countries with regards to exports and imports of agricultural goods.

In the section that follows, previous literature treating the topic of agricultural trade will be discussed, in order to provide a snapshot of the past and current trends, starting from a supply-side approach to changing consumption patterns. As previously introduced, the different forces of changing consumption patterns are going to be expanded upon, with a specific focus on the role of income and household-level changes in order to explain micro-level consumption changes. The particular case of the BRICS is going to be evaluated, as these are very peculiar emerging economies, and will have major impacts on global agricultural trade in the decades to come. The third section discusses the four-dimensional data used in order to perform the analysis clarified in section four, which bases upon geographical and product diversification indices of different countries. The section thereafter will present the results and perform an analysis of different groupings of countries to disentangle the distinctiveness of the BRICS. Section six provides a discussion and section seven concludes.

2 Literature Review

2.1 Changing patterns of agricultural trade worldwide

On the supply side, relations between countries in terms of trade are an undeniable force behind changing consumption patterns (Gehlhar & Coyle, 2001). An expansion of trade across national borders is an important effect of the world becoming more closely linked together across space, and in particular after the Second World War, coupled with the Golden Age of Capitalism until the 1970s, the changes towards more interconnectedness have instigated big fluctuations in agriculture globally (Serrano & Pinilla, 2011).

Although long-distance trade in agricultural products has always been a significant element in global economic growth, only in recent times did inter-continental trade in farmers' products start playing a major role. Analyzing origins of crops for over 50 years, several authors have concluded that countries are highly interconnected with regards to primary regions that export several crops (Khoury et al., 2014, 2016). According to Khoury and his co-authors (2016), on average, around 70% of national food supplies are derived from foreign crops. What started large-scale trade between continents was the industrial revolution in Britain, which thanks to the steam power, lowered costs of transport by rail and sea of bulky products (Anderson, 2016). In the late nineteenth century, trade in perishable agricultural products was encouraged by the improvements in refrigeration, and afterwards services in air freight allowed fresh products to be transported over very long distances in short periods of time (Anderson, 2016). Already at this point consumers were starting to have an opening up of choice of products over two consuming seasons per year (Anderson, 2016; Kearney, 2010; Thow, 2009). During the first wave of globalization up to 1913, declines in transportation costs and restrictions on food imports were the major players in shaping agricultural trade, but during the inter-war period, trade in agriculture and of general merchandise was hardly growing at all (Anderson, 2016).

According to Anderson (2016), following WW2, and out of the experience of the inter-war period, came the belief that countries should agree on a set of multilateral rules and binding commitments, of which the basis were non-discriminatory attitudes, which resulted in the signing of the General Agreement on Tariffs and Trade (GATT) in 1947. At the time, the 23 participating countries, of which 12 were developed, and 11 were in the developing stage, measured for almost two-thirds of international trade worldwide (Anderson, 2016). As claimed by the author, while the GATT, and its consequent conversion into the WTO (World Trade Organization) in 1995, incentivized overall world exports of all goods, trade in agricultural products was growing both slower than trade in other products, as well as slower

than during the first wave of globalization. In fact, according to Federico (2005) and WTO (2015), during the first wave, between 1850 and 1913, exchanges in agricultural products were growing at 3.44% yearly; this figure declined to 3.22% per year between 1950 and 2000. Gradually, trade in agricultural products was losing importance with regards to trade in merchandise, and the particular agricultural products being exchanged on the international market as well as the trading patterns were changing progressively as well.

Since the 1960s, for most countries, the share of agricultural products in total merchandise exports has been declining, up until recently when international food prices increased drastically (Anderson, 2016; World Bank, 2017). Standard economic trade theory of comparative advantage following Ricardo, posits that under free trade a country will produce more and consume less of a product that has lower relative marginal costs relative to before trade. The thereon based revealed comparative advantage (RCA) index introduced by Balassa and Noland (1989), shows the relative advantage of a country in a certain category of goods as evidenced by trade flows. According to Anderson (2016) there is a negative correlation between an agricultural revealed comparative advantage index (share of agriculture in national exports as a percentage of that sector's share of global exports) and per capita income during the five decades after the 1960s, as low-income countries have the highest revealed comparative advantage, and high-income countries the lowest. Upper middle-income countries saw a persistent RCA decline, whilst for the high-income group, and especially for Western Europe, the revealed comparative advantage index has increased rather than decreased (Anderson, 2016; World Bank, 2017). It is clear, given these tendencies, that the proportion of high-income countries in global trade of agriculture has increased slightly over the past half century (Anderson, 2016).

One of the reasons for not following the trends in national agricultural trade patterns, is the anti-trade bias in many countries' policies that act as a distortionary power to farm product prices relative to those of other goods at home (Anderson, 2016). The anti-trade bias of policies in many regions, but especially in East Asia, provides an explanation of why the share of global agricultural production traded on international markets is so small (Anderson, 2016). Only about one-sixth of grains and less than 1/12th of livestock products are traded internationally, though for sugar and oilseeds this figure is much higher, at one-quarter for the latter, and one-third for soybeans, and four fifths for palm oil (Anderson, 2009). The share however, is especially low for dairy products and rice trade, and there is a trend towards the countries' share in global agricultural trade being lower for developing countries than for developed countries (Anderson, 2009, 2016).

One of the biggest issues with the above-mentioned developments, is that not only is there relatively little international trade in agricultural products, but that for many products it is the case that a small amount of countries dominate large parts of international trade (Anderson, 2016). Anderson (2016) with data from earlier versions of FAO (2017) shows that for 2013, 90% of soybean and palm exports are traded by the top four countries. Similarly, the biggest six exporters for other heavily traded commodities have very high shares of trade (80% for

rice and for sugar, 77% for maize, and about 70% of wheat, beef and milk) (Anderson, 2016; FAO, 2017).

Although the production and exports of some products are focused on just a handful of countries, the variability of global production of these staples is bigger than the actual adaptability of consumption (Anderson, 2016). As will be seen in the next sections there are various major players in the changing patterns of consumption of food. Following a top-down approach to the factors defining changing consumption patterns, the all-encompassing trend of globalization is analyzed as it shapes changes in all countries. Then global interlinkages of markets will be tackled, considering trade agreements and partnerships. Lastly, a more micro-level analysis of changing consumption patterns is going to relate to individual's income level and household choices.

2.2 Globalization and changes in consumption

Globalization encompasses two very different features: the shrinkage of space and time stemming from advances in communication and transport technologies, and the policy choices of economic and political change (von Braun & Díaz-Bonilla, 2008). Global international trade has played such a major role in changing diets, as it has been positively influenced by globalization, which generally has had declining effects on prices of cross-border trade (Anderson, 2016). On a general level, globalization was driven principally by technological changes and the information and communication technology revolution (Senauer & Venturini, 2005). More specifically globalization has had an effect on food products through decreased governmental distortions to production, consumption and trade in the agricultural sector. Firstly, the decrease in costs of transporting products and people in the middle half of the 20th century was spurred by great cost reductions of motor vehicles and transportation by air (Anderson, 2010). Containerization and ocean cargo rates also fell drastically over this period and there was a big shift in transportation of agricultural products, as there was a change in storing bulk products such as grains from bag to bulk (Anderson, 2010). This had significant advantages for transportation on water and land, which in turn reduced transport and storage expenses considerably, also contributing to diminishing post-harvest losses (Anderson, 2010).

This important transformation started in industrial countries several decades ago, slowly progressing to middle-income countries and lately also becoming standard in low-income countries (Anderson, 2010). Improved transport services in terms of increased speed and frequency of containers with a controlled atmosphere makes it possible for meat and dairy products and fresh fruit and vegetables to be shipped over longer distances by both sea and air (Anderson, 2010). The more recent ICT revolution has played a further role in decreasing costs, especially in communications over long distances, making access and processing of knowledge much faster, sharing information worldwide (Anderson, 2010). A further change through globalization has occurred through the rise in foreign direct investment (FDI) and Reardon and Timmer (2007) reason that the liberalization of FDI has eased the changes in

food value chains. All of these changes advanced by globalization; easier and cheaper transport, faster and more efficient communication and investments in value chains of partner countries, have had a particular homogenizing effect of trade in agricultural products and of consumption patterns of populations worldwide.

Probably one of the main effects of globalization is to unite and diminish dissimilarities on a global level, which in turn promotes a process of *homogenization*. Whether homogenization happens at the cultural, political, economic or social level is perhaps an inherent result of globalization. Through globalization and cheaper technology, media outlets manage to have a spread as wide as never before, which brings people together more easily, and contact over large ranges of space is facilitated. The resulting increasing circulation of ideas worldwide, spurs people's desire to know more and act similarly to different cultures and explore differences to their traditional lifestyles, promoting globalization of consumption patterns (Kearney, 2010). Rather than only satisfaction of different behaviors, according to O'Hara and Biesecker (2003) global markets tend to push different desires to the maximum. This all-encompassing connectivity pushes people towards thinking of time in a linear rather than spatial way, and acknowledges the pursuit of interests of individuals as the basis for social welfare (O'Hara & Biesecker, 2003). This resulting loss of socio-diversity, is to large amounts also influenced by the massive expansion of Western capitalism. The resulting changes brought to lifestyles in many different parts of the world are an effect of the political, economic and cultural interrelations of Western imperialism (Tomlinson, 1991).

These changes brought to cultures through the amplification of connections, are of a rather asymmetrical nature between the West and the rest of the world, and changes in food consumption are definitely an important symbol of this overarching connectivity resulting from globalization (Cwiertka & Walraven, 2002). Food consumption represents a daily activity for the large majority of people and in parts of the world, food represents the foundations of diverse cultural relations, and therefore food is a necessity but also acts as a symbol (Inglis & Gimlin, 2009). Food culture being pushed towards being more globalized can happen one of two ways. Firstly, is the effect when a product starts playing a dominant role in cultures worldwide, as exemplified by the universal spread of bread, providing changes to national diets. Secondly, is the effect of different local food systems being adopted all over the world and partaking into change towards multiculturalism. As the West slowly 'conquers' the world and influences many parts of peoples' lives, cultural diversity in terms of goods and identities is being eradicated. Through transnational corporations, and a freer trade environment, under the guise of 'development', the traditional food and food systems, particularly in the developing world, are being destroyed and cultural assimilation has become a truism of the modernizing world. All combined these trends have been termed as 'nutritional transition', which will be described in the next section.

2.3 Determinants of changes in consumption

The trends discussed in the previous section, shifts in consumption patterns and diversification of foodstuffs, is what has been termed the 'nutritional transition'. Gehlhar and Coyle (2001) and Kearney (2010), among other researchers, postulate two separate stages to this transition, which follow along the trend of countries expanding and developing. The first stage is the so-called 'expansion' effect, happening ubiquitously in developing and developed countries. According to Smil (2000), it represents the rapid increase in the intake of additional calories from cheap products, mostly vegetables. The second stage represents the 'substitution' effect, which prolongs over longer period of times and implicates a switch from high-caloric, basic carbohydrates to animal fats, sugar and vegetable oils, all of which involve longer processing times (Kearney, 2010). The latter stage happens more on a country-specific level, depending partly on the development stage, and is influenced by existing institutions such as culture, beliefs and religion, as all have modifying effects on preferences and consumption. This phase is also where changes in demographic factors, such as movements towards more urban settlements, and socio-cultural factors, such as a move to more 'westernized' consumption, play a role.

Changes in lifestyles, lately in particular for developing countries, are therefore the driving force behind this dietary transition, which correspond closely to the one which took place in industrialized and middle-income countries in past decades (Popkin, 1999; Popkin, Adair & Ng, 2012). A big pressure on trade in agricultural goods is therefore the necessity to satisfy the desire for changes in diets towards animal sources, vegetable oils, fruits and vegetables, stimulated through higher incomes, and declining desire for traditional staples such as cereals, roots and tubers (Regmi et al., 2001). Though, per se, this transition has positive effects (i.e. in terms of nutritional values), some negative consequences also appear. In fact, according to Popkin (2002), this change will advance faster in the current emerging countries, when compared to the transitions of developed countries in the past, and the negative effects will be felt more intensely. In countries where fast transitions are present, for example, China, Brazil, and Mexico, what comes with more pleasure through access to more products and diversified diets, also comes with the hardships of consumption patterns based more heavily on fats and sugars, which are clearly demeaning for people's health (Kearney, 2010). As stated above, before being influenced by changes at the micro-level, these conceivably negative effects on diets worldwide are firstly affected by broad changes that happen on the international markets. In particular, the effects of changes in trade agreements on consumption patterns, are going to be clarified in the following section.

2.4 Trade agreements and changes in trade and consumption

As afore-mentioned, in recent times, the increasing globalization of food is not only portrayed in increases in volume of food calories traded globally, but equally in increases in the interconnection of the worldwide network of food products (D'Odorico et al., 2014). As free trade agreements, such as GATT and NAFTA, provide support to global market liberalization, they play a fair share in the trend of homogenizing consumption patterns (O'Hara & Biesecker, 2003). As national polices and institutions are becoming more and more powerless, it promotes a process of homogenization, as they are distorted by the set-up of global rules to be followed by all countries in order to partake in these agreements. Trade liberalization and (preferential) trade agreements can have very varied effects on food consumption. In parts of the world with big incidences of poverty, reductions in the price of foods which are regarded as pleasurable, but that are deemed as unhealthy, combined with an increased asymmetry between consumers and providers of food products, are all likely to have negative effects on diets (Kearney, 2010; Thow, 2009). Through the elimination of certain barriers (e.g. on foreign investments), the availability of particular foods changes. According to Thow and Hawkes (2009), accessibility to and consumption of meat, dairy products, and processed foods have largely been expedited by changes in trade policies.

Such fast changes in agricultural trade has also been the after-effect of previous stringent policies. Since the 1950s, due to distorting government policies, agriculture globally has been characterized by the presence of high protection in developed countries, and by anti-agricultural and anti-trade policies in developing countries (Anderson, 2010). Trade arrangements were used by both sets of countries so to stabilize their domestic food markets. In Europe, North America and Japan, agricultural protection was increasing, and as a result the conditions were worsening around the 1980s (Anderson, 2010). Moreover, international food prices tumbled in 1986, due to an agricultural export subsidy war between the US and the European group (Anderson, 2010). This caused a major disorder in world agriculture, as it meant that developed countries were producing over the domestic needs, and developing countries generally under, and international trade in agricultural products was less than there would have been under free trade (Anderson, 2010). In fact, according to Tyers and Anderson (1992), in the 1980s, the quantity of international trade in grains, livestock products, and sugar, was half of its total potential.

In more recent decades agricultural trade policies in many developing and developed countries have been undergoing modifications, which have had positive effects in the amount of internationally traded agricultural products (Anderson, 2010). This reform originated with trade agreements on a regional level, but changes were also happening due to an overall reaction to pressures at the international level, such as there were conditions put into place by the Uruguay Round of the General Agreement on Tariffs and Trade, and prerequisites for the joining to the World Trade Organization (Anderson, 2010). The current rules governing

international agricultural trade can be described as a combination of multilateral and bilateral/regional trade systems (FAO, 2012). The multilateral process developed after the repercussion of WW2 with the GATT as a trans-Atlantic initiative, and through the inclusion of agriculture in the Uruguay Round in the mid-1980s, the agreement generated more regulations in trade policy and in the use of domestic policies that affect trade in agricultural products (FAO, 2012). Moreover, partly through smaller obligations with regards to policy changes, developing countries were conceded a special treatment, and least developed countries were entirely exempted (FAO, 2012).

At the end of 2001, one more round of multilateral negotiations, known as the Doha Development Agenda, was launched; one of its main aims being an encouragement to decrease the asymmetry of the trade system (FAO, 2012). Indeed, although, since 2008, negotiations under the Doha round are in a standstill, many large emerging economies (many of which are part of the G20) played a prominent role, which relates to their increasing economic and political power and their importance on world trade markets (FAO, 2012). The level of protectionism in agriculture has changed in recent times, as amid OECD countries, tariffs and non-tariff barriers to trade in agricultural products were lessened significantly, and among developing countries, agricultural products are nowadays less taxed than they were in past times (Anderson et al., 2010). Some of the larger nations in Asia, Africa, and Latin America have made efforts towards supporting the sector (Anderson et al., 2010).

Though liberalization of markets and better connections globally on the supply-side provide a clear push towards changing consumption patterns due to more availability and choice, the biggest alterations to diets are prompted by the demand side (Coyle et al., 1998; Gehlhar & Coyle, 2001). Financial stability of countries provides their population with more wealth and the ability to borrow more, which stimulates their preference for diversification. Moreover, incomes are extremely different on a country-by-country level, and because of sustained economic growth big emerging economies have been seeing severe pushes towards more diversification, as will be conceptualized in the next two sections.

2.5 Income and changes in consumption

A person's income is probably the most important factor in individual decision making about consumption, and truly, it has been found to be the main shaping factor in the evolution of international trade in agricultural products, as shown by Coyle et al. (1998), Regmi and Dyck (2001) and Serrano and Pinilla (2010). According to Alexandratos (2006), on a global level, food consumption has risen by almost 400 kcal per person per day from the beginning of the 1970s to the early 2000s, although developing countries differ a lot with respect to developed countries regarding the food commodities providing the daily calories. In developing countries over the period from 1963 to 2003 large increases in calories from meat, sugar and vegetable oils were observed, while on the other hand, in developed countries only consumption of vegetable oils has seen a noticeable increase (105%) (Kearney, 2010). In

those four decades, for both sets of countries declines in consumption were for commodities such as pulses, roots and tubers (Kearney, 2010). Since the available increase in food energy came at the same time as more choices, and as higher incomes, this was accompanied by changes in diet compositions. Clearly, the variation in income growth across countries affects dietary diversification differently over the world (Choudhury & Headey, 2017).

Commonly, income per capita worldwide is bound to continue to increase, with especially developing countries oftentimes experiencing very fast growth rates. Food in general is seen as a 'normal' good and therefore, if income increases, the higher income brings about increases in food expenditures as well (Gehlhar & Coyle, 2001). But the proportion of income spent on food generally diminishes with increased budgetary capabilities, as exemplified by Cranfield and others (1998). This follows Engel's law, which states that with increasing incomes, people will decrease their share of income spent on food. However, not all shares within the food sector fall in a proportionate manner, due to diet upgrading through changes in preferences of households (Gehlhar & Coyle, 2001), which is analogous to common economic theories referring to consumers gaining higher utility from more variety of products. Therefore, it is to be expected to see alternations in food demand, and to observe reduced consumption of unprocessed bulk commodities, but an increased consumption of higher-valued consumer-ready products (livestock and dairy products, and fruits and vegetables). Estimates of disaggregate food product demand with regards to per capita expenditure changes confirm a correspondence to Engel's law (Cranfield et al., 1998). With increasing spending per capita, the position of livestock in relation to grain reversed until, ultimately, expenditures on livestock dominated the other food categories, and grain had the smallest budget share in the consumption basket (Cranfield et al., 1998). The authors concluded that diets in low-income countries will continue to move towards more consumption of livestock products, with a shrinking importance of grains in consumers' budgets (Cranfield et al., 1998).

In particular the above-mentioned effect goes hand in hand with increasing urbanization. As people in cities do not have personal production of products at their disposal, there is a general trend towards stagnation in demand for basic products (Kearney, 2010). The movement of people from rural areas towards more urban cities all over the world also provides a pressure on changes in diets towards being more globalized. According to Popkin (1999), urbanization had major effects on food consumption patterns and will continue to do so. As a consequence, in developing countries in particular, the incidence of less healthy lifestyles is increasing drastically, mainly through an increase in intake of calories, more urban jobs and more sedentary routines (Du et al., 2004). Urbanization also has effects on consumption of food based on shifts in dietary behavior, for instance through the rise of fast-food options. The results of urbanization from a nutrition point of view is the deep change towards more fats and oils, and more animal protein coming from meat and dairy products, leading to higher food energy subsequently (Du et al., 2002; Kearney, 2010). As a consequence, this also leads towards less intake of fiber, vitamins and minerals (Kearney, 2010).

Hence, a fairly ordinary effect of higher incomes are poorer diets, in particular due to higher consumption of fats, and in quite a few cases where being overweight used to be seen as a sign of wealth, now is more seen as an indication of poverty (particularly in countries such as Mexico and Brazil) (Kearney, 2010). Increased incomes combined with lower prices have provided a shift towards a higher consumption of animal-based products and processed foods. But, although for developing countries changes in diets are often negative, according to Marmot (2001) in most developed countries (e.g. the UK and the USA), increases in incomes generally have positive effects, providing an improvement in diets, and therefore lower morbidity and mortality, and lower risks of overweightness and obesity. Lalluka and his co-authors (2007) also find positive effects of socio-economic status on diets in developed countries, pointing towards healthier diets over the past four decades, but the influence that developed countries have on developing countries, which is commonly named as a 'westernization' of diets, usually sees with it negative consequences. The particular case of emerging economies and the effects of external influences coupled with increasing incomes, which endorse changing consumption patterns of diets will be discussed in the next section.

2.6 The case of BRICS

From the previous review of the literature, it is possible to deduce that the trend towards changing diets coupled with higher incomes is especially noticeable in large emerging economies, where through sustained economic growth at the national level, people are able to enter higher paying jobs and consequently afford a more diverse consumption basket of goods. Not only do people have an increased financial possibility through higher incomes to change their consumption patterns, but through movements to cities they also have a higher availability of more diversified commodities. Usually, with income growth come changing diets towards higher-value and more nutritious foods, however as previously described, parallel to a dietary shift that is desirable from a nutrition point of view, coupling income growth with economic development, globalization and urbanization might promote changing lifestyles towards a negative direction, especially in developing countries (Qaim, 2017). According to Regmi et al. (2001), poorer countries exhibit a greater reaction to changes in income levels, with regards to wealthier countries. Through their higher income elasticity, lower-income countries also increase their expenditure on different items to a larger degree than higher-income countries, with the greatest rise in spending on such items such as meat and dairy, which are of high value (Gehlhar & Coyle, 2001; Regmi et al., 2001).

For instance in China, where income grew at staggering rates after the economic reforms in the 1970s, the resulting increasing shares of fatty foods in total consumption meant that incomes level affected diets negatively from a health perspective (Kearney, 2010). There are clear consequences from differences in incomes in the Chinese case, as there the diet tends to move from one relying heavily on carbohydrate-rich foods to one more significantly based on fats and animal products (Du et al., 2004). A significant shift towards more consumption of edible oils is noticeable at all income levels, this being partly due to decreases in prices

making them accessible for the large majority of the population. Research for the specific case of China, shows that the increase in animal product consumption was more significant for people living in urban areas than those living in the rural areas as well as more generally a higher intake for the former with regards to the latter (Zhai et al., 2009).

The Brazilian case also offers a characteristic validation of changing food patterns through higher incomes and a growing urban population. In the 1990s and early 2000s, linked to implementations of various economic reforms, a steady economic growth was restored, and the resulting stability incited a 'wealth effect', which accompanied by slower inflation prompted a domestic demand boom (Valdes, Lopes & De Rezende Lopes, 2009). Real per capita income increased by 14% from 2004 to 2007, owed to the economic reforms employed after 2003. Due to this magnificent growth, Brazil's consumption of food has grown steadily at an annual rate of 0.8% from 1980 to the end of the 2000s, and calories per person per day figures are now above the mean of upper-middle-income countries (Valdes, Lopes & De Rezende Lopes, 2009). Particularly, higher calorie intakes are to be attributed to a quickly expanding consumption of meat and dairy products. With the on-going process of urbanization, Brazil's food consumption will continue to shift towards the typical diets of higher-income countries, and will necessitate to expand its imports, in order to satisfy changes in demand.

Haq and Meilke (2010), use disaggregate consumption data to estimate imports of food products at different levels of development, based on the different income elasticities of food for developing countries. In this study, the BRICS economies stand out in particular, as they show elastic income elasticities (significantly greater than 1) towards food products, thus implying that income is an important cause of trade in agricultural products for these economies. Results also show that income elasticities in China and Russia are higher than those for the other middle-income countries in the analysis for all commodity groups, and in the Brazilian case higher for only some of the products, which points towards, China and Russia, and to some extent Brazil, being the growth markets of the future for agri-food products (Haq & Meilke, 2010).

As established in the previous sections, globalization and income growth are leading to dramatic shifts in consumption patterns all over the world, but especially in developing countries, where the nutrition transition is happening at ever faster rates (Pingali, 2007). The changes towards less traditional consumption patterns, jointly with evidence of convergence to more 'westernized' diets, will likely push changes in trade patterns in order to satisfy demands. In particular, following the 'love-of-variety' concept in trade models specified in 'new trade theory', especially by Krugman (1979, 1980), there is an increase in consumer utility with increases in the number of available product varieties (Parteka, 2013). An inquiry in diversification of agricultural trade is therefore necessary to understand if truly these changes in diets have prompted changes in export and import patterns of emerging economies, in consensus with trade diversification in developed economies.

Following from the different theories stipulating why consumption patterns tend to change over time, the next section describes the data that will be used to analyze different indices of

trade diversification. As hypothesized in previous sections, a general trend towards trade diversification is expected both with regards to exports and imports. In particular, due to globalization stimulating a trend of nutritional transition, combined with an international market with less barriers to agricultural trade, and increasing wealth of many economies, these possibilities push populations towards diversifying their consumption patterns and trade exchanges. As countries have different comparative advantages in a particular set of goods and are located in different climate zones, the need arises to start exporting and importing more goods on the international market, both in terms of total quantity, but also in terms of different varieties.

3 Data

In order to analyze trade patterns across countries, over different product groups and years, and test whether trade patterns and food consumption have become more similar or dissimilar, bilateral trade data is required. For this thesis, the bilateral trade data is retrieved from the Chatham House Resource Trade Database (CHRTD) (Chatham House, 2018). This database has data on more than 200 countries. It includes the monetary values and masses of exports and imports of over 1250 different types of resource products and natural resources, including agricultural, fishery and forestry products, fossil fuels, metals and other minerals. The data in the Chatham House database is originally stemming from the International Merchandise Trade Statistics, which is in turn collected by national customs authorities and compiled into the United Nations Commodity Trade Statistics Database (UN Comtrade) by the United Nations Statistics Division. Of the three different trade classifications systems used by UN Comtrade (the Harmonized Commodity Description and Coding System (HS), the Standard International Trade Classification (SITC), and Broad Economic Categories (BEC)), the CHRTD uses the 1996 revision of the HS classification which assigns codes to all kinds of traded goods based on a hierarchy type of structure (2, 4, and 6 digits codes consistently characterize commodity chapters, headings and subheadings).

The UN Comtrade is the most comprehensive source of merchandise trade statistics available but offers a few complications that the data retrieved from the CHRTD addresses. The CHRTD reduces the difficulties of using the HS system, as it has evolved historically as a pragmatic and comprehensive industrial classification for the very wide range of internationally traded goods. The IMTS data are of inconstant quality. There is missing data, trade mispricing, unreported and illegal trade, and more general mistakes and inconsistencies, which cast doubt over the reliability of the data. Moreover, trade points are supposed to be recorded by both exporters and importers, but if these records do not correspond or are incomplete, uncertainties about the data may arise, and which reported record to actually take into account.

The data obtained from the CHRTD is based on four dimensions, namely it details the reporter country, the respective partner country, the product traded and the year. For the analysis high-income and middle-income countries have been chosen. The database uses groupings according to the World Bank, and reports 73 high-income countries, and 103 middle-income countries. The different commodities are divided into 12 categories at the aggregate level. CHRTD also reports rubber and gums, and other agricultural products (i.e. cotton, fur skins, silk and wool) which have not been taken into account in this analysis, in order to purely focus on consumption patterns of food. In many countries exports of rubber and gums and the other goods play a big role in overall trade, and therefore, if not eliminated

would have tarnished the examination of changing diets based on trade exchanges. The data can be analyzed either in value in US$ or in weight. The data used for this analysis has been chosen to be evaluated in the monetary value, as it is more fitting when the focus is concerning the changes in amount of trade based on changes in preferences over the years. This also avoids interference with better packaging or more efficient transportation options. The twelve categories are divided into cereals; dairy, eggs and honey; fish and aquatic resources; horticulture; live animals; meat; oilseeds; pulses; roots and tubers; stimulants, tobacco, spices; sugar; and water.

Evidently, not every country trades all these commodities with all other countries, so some bilateral trade between pairs are not based on all twelve commodities. For some of the commodities it is very relevant to analyze exports and imports at a more disaggregated level. They are also very significant when analyzing increased similarity or dissimilarity of trade in foodstuffs. Where appropriate in the empirical analysis, a more disaggregate overview on traded products will be given. In categories such as cereals, horticulture, oilseeds looking at data at a more disaggregate level facilitates conclusions in terms of diversifying diets.

4 Methods

Based on the above-mentioned data, which is given by the partners in the exchange, the type and value of the commodity exchanged, and the year, a variety of indices exist to conduct analyses on trade patterns. Some of them, as for example the share of countries' exports to other countries, are not enough in explaining diversification or homogenization of trade over the years. Moreover, indices are required, for which a disaggregation based on different commodities is possible, so to not just analyze total trade values between countries, without taking into account what and how much is actually traded. Therefore, the following two variations of the Herfindahl index will be utilized in this thesis, as they provide the possibility to disentangle not only bilateral trade partners, but also products at the same time.

4.1 The Herfindahl index

The synthetic measure utilized in this analysis of trade diversification is the so-called Herfindahl index. It was initially applied to intra-industry trade but can also be applied to analyze the degree of product and market diversification of trade between countries (Cadot, Carrère & Strauss-Kahn, 2013; UNCTAD, 2015). The indices have been normalized to obtain values from 0 to 1, where unity indicates maximum concentration, and zero maximum diversification.

The *geographical diversification index* is a measure of the dispersion of trade value across different countries in the world. This index acts as an indicator of the exporter's (or importer's) dependency on its trading partners and the possible dangers it could face should its partners increase trade barriers. Measured over time, a fall in the index may be an indication of diversification in the exporter's/importer's trading partnerships. The indicator is calculated as:

$$H_{it} = \frac{\sum_{i=1}^{n_{jt}} \left(\frac{x_{ijt}}{X_{jt}}\right)^2 - \frac{1}{n_{jt}}}{1 - \frac{1}{n_{jt}}} \qquad (eq.1)$$

where x_{ijt} is the value of exports (or imports) from country *i* to or from country *j*, and n_{jt} is the number of partner markets *j*, in year *t*. $X_{jt} = \sum_{i=1}^{n_{jt}} x_{ijt}$, represents the sum of all exports (or imports) by one country *i* with regards to all other countries *j* in this analysis. A higher index indicates that exports are concentrated in fewer markets, whereas a country trading equally with all partners will have an index close to 0. As stated in the data description, not all

countries *i* trade with the totality of around 200 partner countries *j* that are available in the dataset. Therefore, when calculating the index, a modification has been made in order to only count active partners (Jaimovich, 2012). Consequently, n_{jt} represents the number of partner markets, to which exports or from which imports, exhibit values above zero.

Similarly, the *product diversification index* is a measure of the dispersion of trade value across an exporter's/importer's products. A country with a preponderance of trade value concentrated in a very few products will have an index value close to 1. Thus, it is an indicator of the exporter's vulnerability to trade shocks. Measured over time, a fall in the index represents an indication of diversification in the exporter's trade profile. The calculation of this index follows similarly the calculation in equation 1. In this case, x_{ijt} represents the value of the exports (or imports) of product *j* by one country *i* in year *t*, and n_{jt} the number of active products traded. X_{jt} represents the totality of exports (or imports) over all products *j* in the country i. An index value closer to 1 indicates a very concentrated market. Values closer to 0 reflect a more equal distribution of export (or import) shares among different varieties of products.

The Herfindahl index generally provides information on how distant trade flows of singular countries are from the uniform distribution. Therefore, being an absolute measure of diversification, it only indicates whether the imports/exports of a country is diversified or not, in terms of shares (Parteka & Tamberi, 2013). Moreover, technically, a low index value may not necessarily be a true indicator of a large partner set of countries and therefore more diversification, if the number of partners is low, it would simply imply that it trades with each of them equally. In terms of product diversification, a low index value may not be a true portrayal of a diversified trade portfolio if the number of traded commodities is low, it would simply imply that the country trades similar proportions of each product (UNCTAD, 2015). Both these issues are taken into account when discussing the results.

In the case that there is a preferential trade agreement either towards specific products and/or countries it might give rise to two effects. First, there is the effect of trade creation, due to the displacement of domestic production in the donor country by imports from the benefitting country (Finger & Kreinin, 1979). Second, is the effect of trade diversion, as countries displace imports from other countries by imports from the now preferred country sources in the market of the donor countries. The effect of trade diversion would be important if and only if the exports from the benefitting country are the same type of commodities as the other countries' to the market of donor countries (Finger & Kreinin, 1979). There is little room for trade diversion if exports are unalike, i.e. subject to little or no 'commodity overlap' (Finger & Kreinin, 1979).

5 Empirical Analysis

As could be seen from the above-mentioned literature, there are various forces that push towards more diversification of trade in agricultural goods, and in particular, there is abundant evidence that the BRICS countries are quite distinct with respect to other countries. Especially their increasing population size, with masses of people shifting to urban settings has far-reaching consequences on changing consumption patterns and diversification of trade of agricultural products. The results that follow show an overview of the results for the rest of the world. In order to provide a more accurate evaluation and better extract dissimilarities between the BRICS and other countries, the results are being split into different levels of incomes. In the next section an analysis will allow to portray differences between high-income and middle-income countries. Low-income countries have been left out from this analysis as they do not provide any meaningful comparison to the specific case of the BRICS economies, as they are rather different in characteristics. Using the classification by the World Bank there are a total of 73 high-income countries, and 103 middle-income countries in the sample. According to this grouping, Brazil, India, China, and South Africa are part of the middle-income countries, and Russia is classified as a high-income country. The section that follows will focus on the particular setting that prevail in the BRICS. Through the consumption changing effects of globalization, trade agreements, and higher incomes and urbanization, BRICS are evolving at a very fast pace, and the results indeed show quite a few dissimilarities with regards to the other groupings of countries. Moreover, as the analysis is split over 16 years, with four-year intervals, it is also possible to see changes within the particular countries as well. Following the methods described in the previous section the succeeding empirical analysis will firstly focus on geographical diversification of trade related to shares of trades with the different markets worldwide. Secondly, the analysis will focus on the product diversification of trades of the different countries.

5.1 Geographical diversification

5.1.1 Global results – exports

The global results were firstly split into income groups, which allows to portray differences in geographical trade diversification based on how wealthy the countries are. In the tables that follow (Tables 1 and 2), averages for the different groups are depicted. Of course, this being an average of many countries, that have many different characteristics between each other, it smooths out big outliers in the sample. Some countries are very isolated or trade with only very few countries and therefore have very high indices that increase the average index value

by a fair amount. In the interest of transparency, the full results for all countries are given in the tables in the appendix. Moreover, countries that have a total trade value of less than 10000US$ have been left out. This value is fairly small and therefore allows for all major trades to be included in the sample, but it drops several very tiny countries, mostly tiny islands, that would otherwise skew the results. The excluded countries therefore change on a yearly basis, as the exclusion is purely based on trade value, and not on any other characteristic. This exclusion of some countries also results in differences of the actual number of countries in the sample between different years. The average values of the Herfindahl index reported in table 1 for geographical diversification of exports and in table 2 for geographical diversification of imports are based on the set of countries mentioned in the tables in the appendix (Tables A1 and A2).

From table 1 it is deductible that on average over the 16-year time span analyzed here, high-income countries have had a geographical diversification index for exports lower than the middle-income countries. This points towards higher-income countries having a wider reach in terms of export destination. It can be deducted that on average, higher-income countries have better agricultural trade options, as they can usually afford highly efficient production of goods and are possibly better endowed in terms of transportation connections over the world. Moreover, some countries in the sample of high-income countries play major roles in the global agricultural trade, as they are specialized on commodities that are gaining in desirability and seeing big increases in consumption. The United States for instance, in 2016 exported more than a fifth of all global trade in cereals. Coupled with being one of the world's biggest economies, this advantage of exports in cereals, puts the United States at the focus of geographical diversification of agricultural exports, as many countries are demanding more and more cereal imports, as was also postulated in the background section at the beginning. Moreover, high-income countries also have advantages in the other categories of agricultural products. In the dairy, eggs and honey category, the five major economies that had the largest shares of world exports were France, Germany, the Netherlands, New Zealand, and the United States. Combined, these five countries supply 50% of total exports in dairy, eggs and honey globally in 2016. Having such big shares of exports and having ties all over the world thanks to being very prominent economies, puts these countries towards exporting these animal-derived products towards a large number of countries worldwide. In fact, the singular country index values (Table A1) show that all the previously-mentioned countries have values around or lower than 0.10. In 2016 the average for all high-income countries was 0.15. Most high-income countries have low index values for geographical diversification of exports, but some countries that have high income levels by the definition of the World Bank, are also fairly isolated and therefore do not reveal very low values of the Herfindahl index. And since, as mentioned before, a Herfindahl index value that does not tend towards zero but tends towards unity, such values depict fairly undifferentiated trade relationships globally.

Middle-income countries on an aggregate level have seen a fairly large decline in their geographical diversification index of exports, and as a decline in the index points towards more diversification, this is a positive result for the countries in this group, and clearly points towards the abovementioned all-encompassing trend of globalization. Having better access to

more markets all over the world facilitates more diversified export destinations. The average value for the Herfindahl index for exports in 2016 lays at 0.19. This represents rather a big decrease from the 2000 value of 0.26. Though this average is not very far from the average for high-income countries, there are very big changes within the set of countries. In Table A2 in the appendix the values for all countries can be found. Some countries are missing in the results as these were dropped due to the threshold put in place, that dropped countries with a smaller value of total exports than 10 000US$. Countries, such as Algeria, Egypt, Ghana, Indonesia, Malaysia, Sri Lanka, Ukraine, all have very low index values for the Herfindahl measure of geographical diversification. Low values of the measure show that the trade of exports is very diversified on the whole global market. In particular for more developing countries having many trade partners is very important in case of sudden changes to trade relationships. Not being dependent on a little group of importers facilitates a continuation of returns by having other importing countries as trading partners.

Table 1: Geographical diversification of exports

	High-income countries	**Middle-income countries**
2016	0.151	0.191
2012	0.204	0.184
2008	0.182	0.232
2004	0.144	0.228
2000	0.176	0.264

Source: Author's calculations using data from Chatham House (2018)

A case has to be made for the countries with the highest values for the geographical diversification of exports measure. Very high index values can be distinguished for Belarus, Lesotho, Mongolia, Palau, Turkmenistan. Although it is not achievable to find communal traits to these countries, other than their classification as middle-income countries, they all share the same characteristic, as they all export more than 85% of their total exports to one specific country. Belarus not surprisingly in 2016 exported more than 90% of all its agricultural products to Russia, for Lesotho the biggest importer is South Africa (91.5% in 2016). Mongolia's biggest trading partner is China, the small island of Palau exports to Japan, and Afghanistan represents more than 85% of total exports from Turkmenistan. Clearly these countries are all very different from each other, and due to different situations have unusual options on the global agricultural market. The particular discovery that three out of the five BRICS countries play a major role in being the biggest importer of agricultural products from this specific set of countries, is remarkable in terms of the kind of power that the former set of countries have on the international market, as established also by Cousins and co-authors (2018). Moreover, a special mention has to be devoted to Mexico, as this country has a very high index value for geographical diversification of exports even though it is very big. This is of course due to the influence of the neighboring countries and combining the geographical vicinity with the NAFTA agreement with Canada and the United States, this provides a huge export market for Mexico. As will be seen in the next section tackling the particular

geographical diversification of importing markets, the US and Canada will also play a big role as Mexico's main supplier of agricultural products.

5.1.2 Global results – imports

Table 2 provides a snapshot of average index values for imports over the 16-year timespan for high- and middle-income countries separately. The values for the different set of countries based on income values are not very different, but the average for middle-income countries is higher in all five time-points. Precise country-by-country indices can be found in table A3 in the appendix. Observing country-level values, a specificity of small islands can again be noted. These have limited opportunities to import products from more than a very small set of countries, and therefore their values are very high. Herfindahl index values tending towards unity point to a very low diversification of markets for imports. For the most part, European countries show index values that are lower than the average for high-income countries. As the continental market played a role in exports, it also plays a major role in imports. Basing on good relationships between countries in Europe and thanks to the European Union, trading between these countries is fairly easy, as little barriers exist. This is of course also very beneficial in terms of the products traded within the European market of agricultural goods. Europe disposes of very different climates throughout, and particularly through the on-going trend of diversification of diets, more and more people are demanding food products that are not native to their country. As the values in the table do not depict intra-European trade as they are based on global agricultural trade, they show that also on world-wide scenario European countries import from a large group of countries, resulting in importing portfolios that are very diversified.

The middle-income countries that have a very diversified set of importing partner-countries are, Bulgaria, Ghana, Lebanon, Serbia, and Ukraine, among many others. Full results for all middle-income countries can be found in table A4 in the appendix. These low values of the Herfindahl index point towards a very high connectivity on the international market for agricultural goods, as these countries import a large variety of different products from many different countries. Not surprisingly, the countries that have the highest values of the index for imports and therefore have a very biased importing portfolio from only a very small set of countries are, Bhutan, Botswana, Lesotho, and Swaziland. These countries evidently are very particular countries compared to the general experience of countries on the international market and the BRICS economies play a major role in trading with these economies. In 2016, Bhutan imported more than 90% of its total agricultural imports from India. The latter three countries are unmistakably connected to South Africa, as Botswana is a neighboring country, and Lesotho and Swaziland are encircled by the Southernmost African country.

As the two extremes, potentially, do not offer a middle-ground for comparison, several other trends are derivable from the results. Latin American countries in the middle-income group float around the mean of all countries in this group. Countries like Ecuador and Peru had fairly low index values in 2016, 0.10 and 0.14, respectively and throughout all years since the

beginning of the millennium. On the other hand, countries with higher values are Bolivia, Guatemala and with the highest value for Latin American countries, Mexico. During the succeeding analysis with regards to the BRICS, the comparison between Brazil and the aforementioned Latin American countries provides for an interesting discussion. Various Sub-Saharan African countries are significant in the analysis. Algeria, Angola, the Republic of Congo, Cameroon, Cote d'Ivoire, Kenya, Nigeria, and Senegal all have very low values for their indices and show very high diversification of importing partners. On the other hand, next to the Sub-Saharan African countries mentioned in the previous paragraph, Namibia and Zambia also show values higher than the average of middle-income countries, 0.5 and 0.31, respectively in 2016. For these two countries as well, the influence of imports from South Africa with regards to total agricultural imports, renders the index fairly high. In 2016, Namibia imported around 70% of its total agricultural imports from South Africa. These countries are very different between one another, not only in geographical regions and climate zones, which differentiates the possibility of harvesting massively, but also in terms of history and current relationships within the continent and globally. South Africa's current relations with Namibia and Zambia, as well as past events undoubtedly play a considerable role in decisions where to import agricultural products from. As could be concluded from the above-mentioned analysis, BRICS play a major role on international markets for agricultural products. Not only do they play a role with smaller nations in their vicinity, sometimes acting as their main importer or exporter, but their big size and continued economic growth are also very important with regards to exchanges with high income countries all over the world. Therefore, the next section will focus on a breakdown of geographical diversification of exports from and imports to the BRICS, with regards to all countries all over the world.

Table 2: Geographical diversification of imports

	High-income countries	**Middle-income countries**
2016	0.173	0.198
2012	0.178	0.194
2008	0.161	0.211
2004	0.174	0.182
2000	0.154	0.169

Source: Author's calculations using data from Chatham House (2018)

5.1.3 BRICS – exports

Tables 3 and 4 show the results based on the Herfindahl index of geographical diversification for exports from and imports to the BRICS countries, respectively, taking a worldwide perspective. The index for exports has been calculated by summing the shares of exports to all countries worldwide with regards to total exports of the one exporting country. The sum has been squared and normalized by taking into account the number of countries. In order to drop very insignificant small trade exchanges, but still allow for the majority of small countries to

be taken into account, a threshold of total exports of 10 000US$ has been implemented, under which countries get excluded. Over the entire timespan of 16 years, for all five countries, the results show very low values. On a general level this already points towards these countries' ability to export their products in a very wide variety of countries and having an export portfolio that is very diversified. Moreover, three diverse trends can be extracted from the results in table 3. While, roughly, India, Russia and South Africa have not seen major shifts in their index values, therefore per se indicating fairly small shifts in the amount of agricultural goods traded with other countries, Brazil and China have seen stronger changes. The former started with an index value of around 0.04 in 2000, which increased over the years, reaching the double in 2016. On the other hand, the latter exhibited the largest index value over all countries and years in 2000, at a value around 0.12, but then decreased over the years, to reach less than half of the starting value in 2016. These two trends clearly point to very diverse patterns of diversification of trade, and therefore will be treated separately in the next sections, concluding with a discussion of the other three countries afterwards.

Table 3: Geographical diversification of exports – BRICS

	Brazil	**China**	**India**	**Russia**	**South Africa**
2016	0.081	0.053	0.039	0.046	0.035
2012	0.056	0.056	0.021	0.051	0.035
2008	0.040	0.055	0.029	0.039	0.040
2004	0.033	0.102	0.031	0.047	0.035
2000	0.039	0.119	0.045	0.085	0.034

Source: Author's calculations using data from Chatham House (2018)

Over the timespan of 16 years, Brazil has seen a drastic increase in its exports. Total agricultural exports in 2000 were around 12 billion US$. In 2016, this value increased to just under 70 billion US$. This enormous growth in exports though was also coupled with a deeper focus on a smaller amount of countries. In 2000 the biggest importers of Brazilian products, were in order, the Netherlands, the US, Germany, France and Italy, and these countries all had fairly equal shares, between 10 and 5% of total exports, and China at around 4%. In 2004 already, the shift towards exporting more heavily to China began, as the Asian country positioned itself as the highest importer of Brazilian products, although the Dutch and German proportions were not far behind. Gradually over the years, China's position as Brazil's largest importer became more prominent. Though, the European countries and the US remain as next big importers of Brazilian agricultural goods, their shares are becoming less and less pronounced. Especially after the economic crisis, a decline of the previously mentioned countries is noticeable, and an increase of Chinese imports from Brazil are very prevalent. In 2008, China represented around 14% of total worldwide Brazilian exports. This value increased to just under 27% in 2016, with the other countries taking up slightly more than 10% all combined. This intensification of exports to China is a clear indication of geographical re-concentration to a smaller set of countries, and more focused exports. These results also clearly point towards the uniqueness of not only Brazil, but also of China, and the

impact the Asian country has on total agricultural commodities traded globally, as will be discussed in the next section.

China's total world exports of agricultural products in 2000 was slightly above 11 billion US$, whilst in 2016, China exported farm goods worth 40 billion US$ globally. At the turn of the millennium, the biggest importers of Chinese agricultural products were, Japan, Hong Kong, and South Korea, representing 28%, 14%, and 13%, of total Chinese exports, respectively. Clearly, before China's accession to WTO, the exports were heavily based towards East Asian economies. Already in 2008, these values only represented, 13%, 9% and 8% of total Chinese exports, respectively. In 2008, 14% of total Chinese exports were now imported by the US. American imports represented only 4% in 2000. Moreover, over the years, Germany and Russia also started to play bigger roles in importing Chinese agricultural products. Besides, also other Asian countries' shares have slowly become more prominent over the years, as lately Malaysia, Indonesia, Thailand, and Vietnam have seen some of the fastest growth in Chinese export shares. Clearly, from this pattern it emerges why progressively over the years the diversification index for Chinese exports has been declining, and therefore gained in importance on global agricultural markets. Although China plays a very important role in the Asian market, in the case of India, there are more countries that play a more important role, as will examined in the next section.

In 2000, India's total agricultural exports were slightly above 6 billion US$, in 2016 this value was around 26 billion US$. India's agricultural exports have continually been fairly spread over a multitude of countries. In particular in 2000, the US and Japan, were the biggest importers of Indian agricultural commodities, representing, 13% and 11% of total exports, respectively. Saudi Arabia, the United Arab Emirates, and the UK represent other big export destinations for Indian farm products, at around 6% each. Big European importing countries (France, Germany, the Netherlands) and big Asian countries (Bangladesh, China, and Malaysia) take up around 3% shares of total exports in 2000. Comparing these values to 2016, a clear shift in importance can be discovered. Vietnam imported 14% of total Indian exports in 2016, followed by the US (10%) and the UAE (7%). While these countries already stake more than 30% of Indian exports, Indian exports are still fairly far spread to many countries in Europe and Asia. Evident is the increase in the Herfindahl index from 2012 to 2016. In 2012, Indian exports were very equally spread to many countries, including the ones mentioned previously. The big increase in 2016 of exports to Vietnam was due to a spike in exports of meat. The results show that around 2 billion US$ worth of beef were exported to Vietnam from India. The remaining two BRICS countries, show fairly different results as will be tackled in the next section.

Russia's total agricultural exports had a value of around 16 billion US$ in 2016, while for South Africa this value laid at about 6 billion US$. In 2016, the biggest importers of Russian agricultural products, were Egypt, China and Turkey. Together these three countries represent more than 30% of total Russian exports. A big role in the exports towards these countries is the trade in cereals. At the beginning of the analyzed timespan, the biggest importers of Russian produce, were Japan (25%), China (9%) and Belarus (8%). Russia's exporting

destinations have seen big shifts over the years, as well as becoming more geographically diversified, even though within the BRICS, the index value is the second-highest after Brazil. On the other hand, South Africa exhibits the lowest value within this country group. The low index points towards exports that are very geographically diversified. In 2016, the Netherlands accounted for the biggest share in total South African exports (10%). The next countries with the biggest shares were, Zimbabwe, Botswana, Namibia, and the UK, with shares around 6% each. As mentioned in the previous section tackling global results, South Africa discernibly plays as the major exporter for many Sub-Saharan African countries. Especially, partly due to its better climate, it is able to supply these countries with horticultural products and cereals. There has also been a slight change in the countries where South Africa ships its exports. As in the earlier 2000s, European countries such as Germany, France and Spain also had high shares of South African exports, these slowly left more space to exports to other African countries, such as Lesotho and Mozambique.

5.1.4 BRICS – imports

Table 4 shows the results for the Herfindahl index of geographical diversfication for imports from all countries worldwide. The index has been calculated by taking the shares of imports from one country with respect to the totally of imports from the specific BRICS country. The normalized value has been calculated taking into account the number of countries from which the country imports. As throughout the entire empirical analysis, the threshold of 10 000 US$ has been applied. Major differences exist between the five countries examined in detail in the sections that follow. Brazil's index has continuously been decreasing over the 16-year timespan, and the difference between the beginning and end years is rather distinguished. China, India and South Africa have first seen increases between 2004 and 2008 but have tended towards lower indices in the latter two time points. Russia has experienced a fairly stable index over the years, with a slight increase in the last year for which data is available. Similarly to the above exposition of geographical diversification of exports, a country-by-country analysis will follow, going into more depth regarding the values for imports.

Table 4: Geographical diversification of imports – BRICS

	Brazil	**China**	**India**	**Russia**	**South Africa**
2016	0.135	0.102	0.075	0.049	0.039
2012	0.169	0.126	0.134	0.027	0.045
2008	0.208	0.131	0.197	0.037	0.073
2004	0.265	0.099	0.152	0.033	0.076
2000	0.336	0.078	0.123	0.034	0.046

Source: Author's calculations using data from Chatham House (2018)

Brazil's total agricultural imports had a value of about 8 billion US$ in 2016, in 2000 it was slightly less than half. In 2016, more than 30% of total Brazilian imports were sourced from

Argentina, followed by Paraguay, Uruguay and Chile, each sharing about 10% of total Brazilian imports. Clearly, Brazil's imports are heavily based on other Latin American countries, as these four countries already represent more than 60% of total imports. Also with regards to the other BRICS countries, Brazil has the least diversified import portfolio, but it has made major developments over the years towards becoming more diversified on a small amount of countries. For a matter of extreme comparison, in 2000, Argentina's share in Brazilian imports was just shy of 60%. Already as pointed from the Herfindahl index in 2008, major shifts were starting towards more diversification. In 2008, Argentina's share in exporting agricultural products to Brazil had dropped by almost 20%, as gradually Brazil started to import from more Latin American countries, as well as from the US. In later years the US started losing importance again, as Brazil started to import more heavily from China. The specific case of China will be demonstrated in the following paragraph.

China had fairly low values of the index for geographical diversification of imports at the beginning of the period. It peaked in 2008 to then decline again to a value of around 0.1 in 2016. In 2016, total Chinese imports from all countries of farm products had a value of around 86 billion US$. As a counterpart to Brazil's case above, China sourced more than 20% of its total imports from Brazil, as well as more than 20% from the United States. Canada, Argentina, and Thailand also play important role as exporting countries to China, but their share is far from the one afore-mentioned. As touched upon in the literature section, China is growing very rapidly, and is progressively increasing its demand for oilseeds. In fact, around half of the total import value is reflected in imports of soybeans from the US and Brazil. At the turn of the millennium, more countries, especially Argentina, were playing bigger roles in exporting agricultural products to China, but over the years the Asian country has focused more and more on the afore-mentioned countries. This is also depicted in the increase in the index, with only a slight decrease thereafter, as Chinese imports remain focused on a small set of countries.

Regarding, the other Asian economy, India also experienced first an increase, followed by a decrease in the index values for imports. In 2016, India's total imports of agricultural products laid at a value of 20 billion US$. In 2000, the value was less than 3 billion US$. In 2016, the biggest share with regards to total Indian exports, were from Indonesia, at about 20%. Argentina and Malaysia are the nations that follow in terms of biggest shares. The same three countries also played the biggest role in exporting to India at the turn of the millennium. The good trade relations that exist between India and Indonesia are clearly visible here, as Indonesia took the upper-hand over the other oilseeds-exporting countries around 2008, diversifying Indian imports on less countries. Whilst very good relations still prevail, India has made more efforts to diversify the sources of its imports, as for instance, Ukraine, Canada, and Brazil, have seen increases in their shares in Indian imports.

Brazil also has a big role in Russian agricultural imports, as well as for South Africa. In 2016, for Russia, the biggest share of agricultural imports, preceding Brazil (11%), is Belarus (16%). China and Ecuador also have fairly high shares, at about 7% and 6% each, respectively. Over the years, increasing importance has been given to trade with Belarus, as it

has continuously been increasing in total Russian imports. Other countries, as the US, Germany and Ukraine, which played an important role at the turn of the millennium, on the other hand, have been seeing decreasing import shares by Russia. For South Africa, the biggest exporter is represented by Argentina, followed by Zimbabwe and Brazil. Similarly to the other countries, South Africa has first seen an increase followed by a decrease, now demonstrating the lowest index value in this sample of countries, and therefore the highest diversification. The high level of geographical diversification rises from South Africa not focusing on big import shares from a few countries, but rather smaller shares from more countries. India, Indonesia, Thailand, the Netherlands and Spain, all have shares around 3-4% of total products imported by South Africa.

5.2 Product diversification

Similarly to the previous section on geographical diversification of imports and exports, this section tackling product diversification divides the countries into two groups based on their income level, as defined by the World Bank. As developed in the methodology part, to calculate the product diversification, the shares of each commodity group in total exports or imports of agricultural products have been summed and squared, on a country-level basis. The indices have again been normalized, taking into account how many commodities each country trades. The diversities are not as big as with regards to partner countries, as most countries export and import all twelve types of commodities. For the countries that did not trade all twelve commodities, the number has been adjusted accordingly, in order to take into account only active links. The next section will follow with an examination of global results, regarding exports and imports separately, succeeded by an in-depth analysis of the BRICS countries.

5.2.1 Global results – exports

Table 5 indicates the aggregate values for the Herfindahl product diversification index for exports divided into high- and middle-income countries. The results have continuously decreased for high-income countries, averaging at 0.3 over the 16 years. On the other hand, middle-income countries have seen slight up and downs to the average value of the index, but averages much higher, at about 0.42. This result hints to the ability of more developed countries to be present in more exchanges, based on a greater multitude of products. While, on the other hand, according to this result, middle-income countries, which are usually seen as still developing, tend to be more concentrated in exporting commodities for which they have a comparative advantage. Evidently, similarly to the discussion regarding big fluctuations with regards to trading partners, there are also big fluctuations within the income groups regarding product diversification. Distinctly, if a country does not have the possibility to harvest some particular type of good, this will affect the index negatively, as it is evaluated as being less

diversified. For instance, a very high-income country such as Norway has a very high index value for product diversification of exports, as it effectively only exports fish. Table B1 and B2 in the appendix include country-level values of the index for all years. Similarly, as in the previous section, countries that are small and are located in climate zones unadapt to agriculture, will increase the overall average, and point towards less diversification.

Table 5: Product diversification of exports

	High-income countries	**Middle-income countries**
2016	0.295	0.433
2012	0.300	0.421
2008	0.301	0.423
2004	0.313	0.419
2000	0.312	0.432

Source: Author's calculations using data from Chatham House (2018)

5.2.2 Global results – imports

Global results for the Herfindahl product diversification index for imports are presented in table 6. Striking are the differences that are present with regards to the values of exports. Firstly, for both the income groups the average values are much lower, and therefore point towards high degrees of diversification in terms of agricultural products imported. Secondly, the values have also shown a slight decrease in the average over time. For both sets of countries this is a clear indication of changes in diets towards a more diverse group of commodities. Tables B3 and B4 show the results country-by-country and allow to extricate changes more finely. Countries that show the most diversified imports of products in 2016 are Greece, Italy, Singapore, as well as countries like Croatia, Hungary and New Zealand. These countries import fairly equal shares of all agricultural commodities globally. Similarly as in previous discussions of results, the high-income countries that have the highest values, and are therefore concentrating on less varieties of products, are small isolated countries, which have higher difficulties of reaching the worldwide agricultural trading system, and therefore rely on a imports on fewer commodities. The middle-income countries with the lowest values for import product diversification in 2016 are, Albania, Lebanon, Sri Lanka, and Malaysia. These middle-income countries therefore display consumption patterns that are fairly diversified on a varied basket of goods.

Table 6: Product diversification of imports

	High-income countries	Middle-income countries
2016	0.116	0.145
2012	0.120	0.158
2008	0.120	0.198
2004	0.136	0.165
2000	0.123	0.161

Source: Author's calculations using data from Chatham House (2018)

5.2.3 BRICS – exports

The results for the BRICS with regards to product diversification of exports are depicted in table 7. As mentioned previously, according to these results, even more than previously for geographical diversification, it matters how well a country is endowed and what the possibilities are to trade on a global level. There are again three different trends when comparing the results. Brazil and India have gone up and down, without ever stabilizing into more or less diversification. Secondly, China and South Africa has seen fairly large increases in their indices. These results show that these countries have been specializing more and more on a particular type of product, and therefore exporting a less diversified basked of goods. But through a combined analysis with the geographical diversification, it easy to see that both China and South Africa are focusing on less products, so to have an advantage when exporting. The third trend represent declines in the index values. In this particular case Russia averages around 0.3, which points towards low diversification.

In 2016, Brazil's biggest export commodity was represented by the oilseeds group, representing almost 40% of total exports, followed by the meat category, taking up more than 19% of all exports. These values are fairly bigger than values for 2012, where exports were more diversified, and the sugar category and the stimulants, tobacco, and spices, including heavily demanded goods such as cocoa, coffee and spices, had bigger shares in overall Brazilian exports. In 2016, China was the biggest importer of this commodity, followed in smaller values by the Netherlands. The biggest shares of meat products also go to China, as well as Hong Kong and Saudi Arabia.

The former country has exports in agricultural products that are heavily based on two particular commodities. In 2016, exports of horticulture from China represented more than 40% of total exports, with a trade value of 17 billion US$. The second largest exported commodity is represented by the fish and aquatic resources, at practically 30% of total exports. In 2016, the biggest importers of this commodity were the US and Japan. Over the timespan, a clear concentration on these two categories is visible. Combined, in 2000, they only represented 50% of total exports, a decline of 20% from the value in 2016. Gradually, the export shares of previously highly traded goods, such as cereals and stimulants, have decreased over the years, leaving a larger focus on the most efficient commodities.

In India, in 2016, the export commodities are spread more equally over a larger set of different commodities, than was the case for Brazil and China. Cereals and aquatic resources represent 22% and 20% of total Indian exports, respectively. Meat and the stimulants group closely follow at 14% each, horticulture represented 11%, while exports of oilseeds are also represented at around 10% of the total. As mentioned previously, in recent years, Vietnam and the US are the biggest importers of Indian agricultural produce. Vietnam's biggest import of Indian products is in the meat category, while the US imports a large majority of the fish produce. Rice represents the biggest category in the exports of cereals, and in 2016 the top four countries importing rice from India were countries in the Middle East (Saudi Arabia, the UAE, Iran and Iraq). As can be seen from the fairly low values of the Herfindahl index, India has had a fairly diversified portfolio of commodities exported, though in the earlier years, bigger shares of total exports were in the cereals and oilseeds groups, which have gradually declined, as the meat and stimulants category began playing a bigger role, promoting a more diversified trade in agricultural products.

Similarly, Russia has also seen significant declines in the index values over the years. While in 2000, more than 65% of total exports were in the fish and aquatic resources category, and about 14% in oilseeds, this figure completely switched over the years. Increasingly exports of cereals became more and more important, and already in 2008, they represented more than 50% of total exports, with the other two major categories taking up slightly below than 40% of total exported value. Cereals, fish, and oilseeds essentially represent most of Russia's agricultural exports, with respective shares at 46%, 24% and 21%.

Table 7: Product diversification of exports – BRICS

	Brazil	**China**	**India**	**Russia**	**South Africa**
2016	0.171	0.208	0.077	0.253	0.360
2012	0.150	0.169	0.107	0.262	0.266
2008	0.167	0.144	0.093	0.305	0.290
2004	0.175	0.137	0.109	0.265	0.246
2000	0.161	0.097	0.097	0.406	0.179

Source: Author's calculations using data from Chatham House (2018)

Somewhat a different examination is in order for South Africa, as similarly to China, this country has experienced a concentration of exported products over the years. In 2000, South Africa exported high amounts of horticulture, representing 44% of total exports. These were followed by the fish and sugar categories, representing around 14% each of total exports. Cereals denoted about 10% of total South African exports. In 2016, the horticulture category took up more than 60% of total exports, and the other categories, were significantly reduced, with cereals and fish only partaking in total exports with shares of 10% and 8% each, respectively. A clear shift away regarding sugar exports is noticeable, as in 2016 they represented less than 3% of total exports. The Western European countries that acted as the major importers of South African horticulture, more specifically, fruit and berries, were, the Netherlands, the UK and Germany. The biggest exports in the cereals category is maize, with

the biggest shares going to Zimbabwe and Botswana, as was also noticeable in the discussion regarding geographical diversification.

5.2.4 BRICS – imports

Contrasting exports of different commodity groups to imports over all agricultural products, gives fairly different results, as is portrayed in table 8. Brazil and India have seen big declines in their index values over the years. Whilst China's, Russia's and South Africa's have initially increased, before assuming values in 2016 that are similar to or higher than the ones in 2000.

Starting the analysis with Brazil, in 2000, the Latin American country was importing cereals worth almost 50% of total imports. The dairy, eggs and honey category was the second largest group of commodities imported, followed by horticulture, at 12% and 11%, respectively. The biggest exporter to Brazil was Argentina, and the neighboring country also represented the major exporter of cereals to Brazil. In 2016, imports of cereals represented less than 40%, with the imports of horticulture and fish products having taken more important roles, with the dairy, eggs and honey category experiencing a decline in imports. The biggest category of cereals that Brazil imports, is wheat, and fruit and berries in the horticulture category. Over the years these results clearly indicate a diversification of consumption towards less grains, and less dairy and eggs, with an increasing of healthy calories coming progressively from more vegetables and fish supplies.

In the case of China, the peak in the index value for product diversification of imports is due to the increasing role played by imports of oilseeds. Already in 2000, oilseeds represented 42% of total imports, but by 2008 this value had increased to 71%, though it is gradually declining again, and it reached below 50% of total imports in 2016. In China, diets changed towards being more diversified in the last years in the sample, though differently than to Brazil, the increasing shares are pointing towards less healthy consumption of goods, confirming earlier results by Du and co-authors (2004). Whilst in 2000 the fish products represented almost 20% of total imports, this share declined significantly, and there were big increases in imports of cereals, and of livestock products, such as milk and pork meat.

The import Herfindahl index for products by India is the highest within the BRICS countries. Over the entire timespan in this analysis, the three largest commodity groups imported by India were, oilseeds, horticulture and pulses. Oilseeds imports have gradually been declining, and in 2016 represented 50% of total Indian imports, there was a decrease in imports of horticulture, and a significant increase in pulses. While in 2000, pulses represented only 6% of Indian agricultural imports, this value increased to 20% in 2016. Significant towards the future of Indian consumption of foods, is the very low imports of livestock products. These represent less than 1% of total imports in all the years.

The positive results from the Indian case towards less consumption of animal products, can neither be observed in Russia, nor in South Africa, both countries having had fairly diversified imports of products over the years. Although in Russia, there has been a decrease

of imports of meat, and an increase of horticulture, the dairy, eggs, and honey category has seen increasing import shares, as well as fish products, and oilseeds. According to these figures, Russia is slowly switching to consumption patterns less based on meat, but higher in other fruits and vegetables, and other animal products, as well as consuming more soybeans.

South African imports have not shifted majorly during the first sixteen years of the 21st century. Cereals and oilseeds represent the biggest shares of imports, above 20% each in all years. Meat imports ranged around 10% in all years, while the other categories based on animal products represented around 5% each throughout the analysis. As the index values show for South Africa, together with the broken-down analysis of the different agricultural categories, it can be deducted that based on imports of food products, South African consumption patterns have not changed considerably.

Table 8: Product diversification of imports – BRICS

	Brazil	**China**	**India**	**Russia**	**South Africa**
2016	0.130	0.223	0.271	0.112	0.094
2012	0.137	0.326	0.397	0.128	0.097
2008	0.235	0.478	0.338	0.114	0.121
2004	0.232	0.279	0.357	0.085	0.108
2000	0.199	0.181	0.419	0.071	0.086

Source: Author's calculations using data from Chatham House (2018)

6 Discussion

The previous sections indicate several different trends. As shown by the aggregate values of the indices, on a general level it can be deducted that higher-income countries have better geographical diversification of their trading partners. Both for exports and for imports, the averages for high-income countries show lower values than for middle-income countries. Coupled with the general decreasing averages over the timespan since the turn of the millennium, these findings provide evidence for the theories stipulated in the previous section. As, particularly in later years, globalization is advancing rapidly and encompassing more and more countries, combined with increasing numbers of preferential trade agreements and the participation of many countries in the WTO, trade in agricultures has been facilitated. Increasingly, larger numbers of countries are able to export and import more products, with a more diversified set of countries. The latter effect is clearly also due to higher incomes, as can be seen from the higher diversification of the higher-income countries, which accordingly follows the theories that countries tend to diversify as they grow (Cadot, Carrère & Strauss-Kahn, 2011, 2013).

The peculiarity of the BRICS countries analyzed in depth here, lays in their fairly unconventional characteristics. All countries had geographical diversification index values much lower than the averages based on their income-level. Moreover, China shows a clear indication of more geographically diversified partners, which clearly points towards the significance that this emerging economy is having on world markets in agriculture. While values for diversification of countries to which the BRICS export to are tangibly low, which also point to a general power and desirability of exchanges with these countries, values for import diversification are fairly higher. As described earlier, different trends exist in the separate countries, but generally higher values of the index point towards higher trading values with neighboring countries, especially in the case of Brazil and India. As it happens, Cousins and co-authors (2018) point towards the BRICS expanding their presence in their particular regions. European countries not only play a role in sourcing their imports from these countries, but they also act as major partners from which BRICS countries import their agricultural products. Summing up, a general confirmation has been discovered in terms of global trends in geographical diversification of trade patterns, which point towards the significance of agreements, and higher incomes. Moreover, the analysis on BRICS points towards the general difference between these emerging countries and the average set of countries, as well as directing towards the peculiarities in each of the countries singularly. The economic and political rise of the BRICS countries, parallel to powerful middle-income countries, such as Argentina, Indonesia, Malaysia, Nigeria will have continued across-the-board implications for global agricultural changes (Cousins et al., 2018).

In terms of product diversification, aggregate results over the two income groups show fairly different results. Middle-income countries on average show much less diversification of products with respects to high-income countries in terms of both exports and imports over the different product categories, though it is far more pronounced for exports. High-income countries show that they are able to export a higher variety of products, while middle-income countries generally focus on categories where they have an advantage and, therefore, tend to export more of the same category. In terms of imports a similar trend is present. High-income countries, likely due to their advantageous economic status and international linkages, have very diversified imports of different agricultural commodities. Middle-income countries also have seen a higher diversification of their imported commodities, particularly after 2008.

As indicated in the previous analysis of the results, BRICS show fairly different patterns of product diversification of exports. China and South Africa have even seen increases in their indices over the years, which indicates that they are specializing on exporting a smaller number of categories, concurring with their specific advantages (Cousins et al., 2018). Different trends exist in terms of product diversification of imports, but it can lightly be deducted that the BRICS are importing more diversified categories. Even though in the entire time span increases in index values exist, generally between 2012 and 2016, decreases in the index are universal, pointing towards more diversification. The individual country analyses also show different results in terms of the focus of the imported commodities. In particular, India and Brazil indicate shifts towards consumption patterns less heavily based on meat and animal products, and more consumption based on plant-based sources such as vegetables, fruits and pulses. The other three countries on the other hand, are seeing more changes towards imports in the meat category, as well as the other categories of animal products, confirming the theories of diet diversification, and concurring with previous results (e.g. by Gehlhar et al. (2001), and Regmi et al. (2001)). Summing up, the high averages for product diversification of exported products in both income groups, as well as for BRICS point towards a specialization of countries in exporting a small number of commodities, usually following their comparative advantages, and provides a confirmation for general economic theories. A corroboration of the theory has also been found in terms of imports of diversified products. The very low and generally declining values for product diversification indices of imported goods point towards countries importing a high variety of all products, which confirm the hypothesis of a presence of a trend towards more globalized diets. Moreover, the theory of higher diversification along the development path of countries, is also corroborated by the results, as the less diversification found for middle-income countries and to some extent for the BRICS, show that income does indeed play a role in terms of possibilities of diversification of trade in agricultural products.

7 Conclusion

International agricultural trade has seen very big changes over the centuries. Thanks to big progresses such as the industrial revolution and globalization, gradually trading over borders and long distances has been rendered far easier. The same effects that have been having altering effects on the amounts and varieties of products traded worldwide, are also affecting people's desires for more diversified consumption of food products. In particular globalization, coupled with the two stages of the nutritional transition has provided big changes on cultures and is continuing to influence diets worldwide. The connectivity between people and the desire for experiments with different products is changing trade exchanges. Global transitions in trade agreements, and global institutions such as the WTO have had their fair share in bringing populations closer together. With decreased barriers to trade, it is easier for countries showing desire for more diversified diets, to trade with countries worldwide, and import and export agricultural products that are not available domestically. Therefore, due to an all-encompassing trend of globalization and looser trade deals, a diversification of consumption patterns was to be expected. Moreover, globally, countries are becoming wealthier and people dispose of higher incomes. Based on Engel's law, it is theorized that with increasing incomes, people will increase their consumption of higher-valued food products, and will seek higher utility from more product varieties, and trade exchanges will become more diversified according to the 'love-of-variety' concept. Especially emerging economies, that are experiencing very fast growth rates, will provide big repercussions for globally traded agricultural goods, as they start demanding more commodities such as meat and dairy products, and more nontraditional crops to their native soil. Starting at the turn of the millennium, bilateral trade data has been analyzed in order to establish if imports and exports have become more diversified, in terms of destinations, as well as in terms of varieties.

The results have shown that on a general level in terms of geographical diversification, which bases its calculations on the share of one partner country with regards to total traded exports or imports, high-income countries have seen more diversification for both exports and imports with respect to middle-income countries. The geographical diversification of the BRICS also shows that these countries are very important on the international market for agricultural products, as they do not only export to a large variety of countries, but they also import from very diversified groups of countries, confirming recent trends portrayed by Cousins, Borras, Sauer and Ye (2018). Summed up, this shows that globalization and trade agreements have definitely played a big role in trading of agricultural commodities starting at the beginning of the century. In terms of the different varieties of products that are exported worldwide, generally both high- and middle-income countries tend to show less diversification, as both sets of countries would usually focus on the exports for which they have an advantage,

concurring with general economic trade theories. The analysis for product diversification of imports, provides further support to the theory that with economic growth, countries start to diversify their consumption patterns, as posited by Serrano and Pinilla (2010). Based on the results, it is also possible to see differentiated trends in the various BRICS economies. While some, such as Brazil and India, show to be switching towards more healthy diets, less based on meat, and more based on plant products, some countries, like Russia, and China, are seeing larger trends to more consumption of animal products.

Concluding, while on a general level the notion of globalized diets has been confirmed, based on theories of globalization, lower trade barriers and higher incomes as incentives, the method employed here only offers the changes in consumption patterns based on diversification of trade exchanges. The argument of this thesis was factually that changes in consumption patterns can be measured through diversification of exports and imports, both, based on particular partner markets and the particular varieties. For this reason, domestic production of agricultural products consumed in the home country are being neglected here, but they naturally play an important role in people's diets. Arguably though, as many countries are not able to produce what their population desires, due to several circumstances, such as climate zones, or effective size of arable land, they are forced to import products from other countries in order to satisfy changing consumption patterns driven by effects such as globalization, the nutritional transition, looser trade barriers and increasing incomes.

Ultimately, connecting to the predictions of continued population and income growth specified at the beginning of this thesis, these results will have major impacts on the world in the very near future. Through the disregard of time and space in food production and distribution, variety and choice in food have exploded and food has truly become a multicultural affair (Spaargaren, Oosterveer & Loeber, 2012). The gain of power from consumers eating food, has been resulting in significant loss of power for farmers producing the food. Although generally more sensitivity towards eating local and diminished consumption of animal products is arising in various parts of the world, the public still has to take major actions with regards to the huge impacts that food production and consumption have on nature, the climate and the environment, which will largely affect food patterns in the future (Spaargaren, Oosterveer & Loeber, 2012). Therefore, a major, systemic shift is needed to create a sustainable and nutritious food revolution that meets tomorrow's demand.

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Appendix A

Geographical diversification

Table A 1: Geographical diversification for exports – high-income countries

	2016	2012	2008	2004	2000
Andorra		0.91	0.84	0.73	
Antigua and Barbuda	0.24	0.31	0.28	0.19	
Argentina	0.04	0.03	0.05	0.03	0.04
Aruba		0.85	0.57	0.33	0.82
Australia	0.06	0.05	0.07	0.08	0.09
Austria	0.16	0.15	0.15	0.17	0.19
Bahamas	0.32	0.36	0.36	0.10	0.41
Bahrain	0.17	0.18	0.14	0.18	0.30
Barbados	0.14	0.67	0.34	-0.01	0.50
Belgium	0.13	0.13	0.12	0.12	0.13
Bermuda		0.67			
Canada	0.20	0.18	0.19	0.02	0.25
Chile	0.12	0.10	0.11	0.03	0.18
China, Hong Kong SAR	0.27	0.28	0.39	0.48	0.48
China, Macao SAR		0.52	0.36		0.23
Croatia	0.11	0.09	0.10	0.18	0.08
Curacao	0.72	0.63			
Cyprus	0.07	0.06	0.05	0.03	0.08
Czech Rep.	0.14	0.15	0.17	0.09	0.11
Denmark	0.07	0.08	0.08	0.06	0.08
Estonia	0.06	0.09	0.09	0.10	0.09
Faeroe Isds	0.13	0.10	0.10	0.06	0.14
Finland	0.05	0.11	0.09	0.07	0.06
France	0.07	0.07	0.07	0.08	0.07
French Polynesia	0.31	0.28	0.20	0.06	0.19
Germany	0.06	0.06	0.06	0.08	0.07
Greece	0.09	0.07	0.07	0.07	0.10
Greenland	0.22	0.27	0.32	0.39	0.35
Guam			0.75	0.59	0.86
Hungary	0.07	0.07	0.07	0.06	0.06
Iceland	0.06	0.05	0.10	0.02	0.09
Ireland	0.18	0.20	0.22	0.02	0.13
Israel	0.10	0.09	0.07	0.06	0.09

	2016	2012	2008	2004	2000
Italy	0.07	0.07	0.07	0.08	0.09
Japan	0.10	0.09	0.08	0.08	0.10
Korea, Rep.	0.15	0.19	0.20	0.36	0.48
Kuwait	0.27	0.58	0.27	0.43	0.30
Latvia	0.05	0.08	0.08	0.08	0.07
Lithuania	0.05	0.10	0.11	0.06	0.06
Luxembourg	0.17	0.34	0.44	0.26	0.19
Malta	0.44	0.26	0.58	0.58	0.10
Netherlands	0.11	0.11	0.10	0.09	0.11
New Caledonia	0.18	0.35	0.21	0.25	0.29
New Zealand	0.07	0.05	0.03	0.02	0.06
Norway	0.06	0.06	0.06	0.05	0.06
Oman	0.11	0.16	0.16	0.04	0.11
Poland	0.08	0.08	0.10	0.09	0.09
Portugal	0.18	0.19	0.27	0.27	0.26
Qatar	0.33	0.45	0.39	0.30	
Saint Kitts and Nevis				0.26	
Saudi Arabia	0.14	0.05	0.10	0.06	0.14
Seychelles	0.14	0.10	0.08	0.18	0.16
Singapore	0.05	0.29	0.04	0.03	0.04
Slovakia	0.11	0.04	0.12	0.13	0.14
Slovenia	0.24	0.17	0.24	0.12	0.13
Spain	0.07	0.34	0.10	0.10	0.10
Sweden	0.06	0.08	0.07	0.06	0.06
Switzerland	0.13	0.06	0.09	0.10	0.07
Trinidad and Tobago	0.26	0.10	0.09	0.01	0.16
Turks and Caicos Isds	0.51			0.04	
United Arab Emirates	0.08	0.11	0.09	0.13	0.11
United Kingdom	0.07	0.07	0.08	0.07	0.06
United States	0.08	0.08	0.06	0.07	0.08
Uruguay	0.10	0.08	0.05	0.03	0.09
Venezuela	0.14	0.08	0.18	0.02	0.27

Source: Author's calculations using data from Chatham House (2018)

Table A 2: Geographical diversification for exports – middle-income countries

	2016	2012	2008	2004	2000
Albania	0.08	0.08	0.27	0.10	0.11
Algeria	0.05	0.11	0.10	0.17	0.32
Angola	0.14	0.57	0.84	0.16	0.66
Armenia	0.61	0.41	0.22	0.23	
Azerbaijan	0.42	0.34	0.62	0.59	0.26

	2016	2012	2008	2004	2000
Bangladesh	0.07	0.06	0.08	0.15	0.15
Belarus	0.85	0.66	0.66	0.85	0.61
Belize	0.18	0.12	0.32	0.23	0.15
Bhutan		0.45	0.91		
Bolivia	0.16	0.13	0.13	0.17	0.26
Bosnia Herzegovina	0.01	0.14	0.18	0.15	0.19
Botswana	0.19	0.59	0.19	0.23	0.23
Bulgaria	0.05	0.07	0.06	0.05	0.03
Cabo Verde	0.58	0.27	0.45		
Cameroon	0.16	0.15	0.15	0.13	0.14
Colombia	0.15	0.13	0.12	0.14	0.17
Congo, Rep.	0.09	0.07	0.16	0.13	0.12
Costa Rica	0.15	0.14	0.14	0.15	0.22
Cote d'Ivoire	0.08	0.06	0.08	0.08	0.09
Cuba	0.16	0.22	0.18	0.12	0.19
Djibouti	0.13	0.26	0.51		
Dominican Rep.	0.12	0.16	0.25	0.25	0.68
Dominican Rep.			0.16	0.21	0.45
Ecuador	0.08	0.09	0.09	0.11	0.11
Egypt	0.04	0.04	0.04	0.09	0.06
El Salvador	0.14	0.19	0.20	0.14	0.21
Fiji	0.15	0.17	0.23	0.25	0.23
Gabon				0.38	0.39
Georgia	0.06	0.10	0.08	0.13	0.10
Ghana	0.06	0.06	0.08	0.09	0.07
Grenada	0.20	0.09	0.17	0.09	0.14
Guatemala	0.18	0.19	0.21	0.22	0.20
Guyana	0.08	0.26	0.14	0.12	0.20
Honduras	0.15	0.13	0.16	0.22	0.28
Indonesia	0.06	0.07	0.06	0.06	0.07
Iran	0.06	0.08	0.05	0.07	0.05
Iraq	0.39	0.34	0.27	0.79	0.94
Jamaica	0.17	0.10	0.32	0.31	0.31
Jordan	0.15	0.09	0.14	0.12	0.10
Kazakhstan	0.12	0.05	0.05	0.24	0.36
Kenya	0.08	0.08	0.10	0.10	0.09
Kiribati	0.52		0.19		0.56
Kyrgyzstan	0.11	0.34	0.48	0.30	0.44
Lao PDR	0.26	0.06	0.12	0.18	0.08
Lebanon	0.06	0.07	0.06	0.14	0.08
Lesotho	0.83	0.95	0.96		
Libya	0.22	0.19	0.42	0.33	0.38

	2016	2012	2008	2004	2000
Macedonia, FYR	0.06	0.06	0.07	0.06	0.08
Malaysia	0.04	0.06	0.06	0.05	0.06
Maldives	0.13	0.05	0.24	0.20	0.19
Marshall Isds	0.16		0.25	0.30	0.81
Mauritania	0.12	0.13	0.16	0.22	0.14
Mauritius	0.06	0.10	0.35	0.48	0.30
Mexico	0.60	0.55	0.53	0.67	0.62
Micronesia	0.33	0.07	0.26	0.39	0.44
Moldova	0.05	0.09	0.06	0.10	0.20
Mongolia	0.85	0.37	0.56	0.42	0.67
Montenegro	0.43	0.12	0.24		
Morocco	0.11	0.10	0.13	0.15	0.14
Myanmar	0.28	0.16	0.16	0.13	0.09
Namibia	0.11	0.13	0.14	0.23	0.26
Nicaragua	0.17	0.15	0.14	0.19	0.20
Nigeria	0.09	0.13	0.05	0.09	0.08
Pakistan	0.05	0.05	0.05	0.05	0.04
Palau	0.84	0.94	0.95	0.98	0.92
Panama	0.09	0.08	0.11	0.10	0.15
Papua New Guinea	0.08	0.09	0.08	0.08	0.10
Paraguay	0.05	0.08	0.09	0.08	0.15
Peru	0.12	0.08	0.09	0.12	0.12
Philippines	0.11	0.12	0.12	0.14	0.18
Romania	0.04	0.04	0.04	0.06	0.06
Saint Lucia	0.26	0.71	0.88	0.95	0.94
Saint Vincent and the Grenadines	0.13	0.16	0.13	0.31	0.27
Samoa	0.21	0.15		0.29	0.22
Sao Tome and Principe	0.21				0.38
Senegal	0.05	0.05	0.08	0.12	0.14
Serbia	0.06	0.05	0.06		
Solomon Isds	0.11	0.08	0.18	0.17	0.19
Sri Lanka	0.03	0.03	0.04	0.04	0.04
State of Palestine	0.25	0.27	0.55	0.17	0.37
Sudan	0.11	0.17			
Suriname	0.12	0.15	0.13	0.13	0.14
Swaziland	0.37	0.23	0.11	0.13	0.19
Syria	0.09	0.17	0.13	0.11	0.31
Tajikistan	0.32	0.47	0.63	0.78	0.91
Thailand	0.07	0.06	0.03	0.05	0.08
Timor-Leste	0.11	0.27	0.13		
Tonga	0.18	0.13		0.46	0.45
Tunisia	0.09	0.12	0.16	0.30	0.25

	2016	2012	2008	2004	2000
Turkey	0.05	0.07	0.04	0.05	0.05
Turkmenistan	0.73	0.22			
Ukraine	0.04	0.05	0.04	0.07	0.18
Uzbekistan	0.27	0.34	0.63	0.51	0.77
Vanuatu	0.30	0.03	0.51	0.49	0.20
Vietnam	0.07	0.05	0.04	0.06	0.06
Yemen	0.11	0.27	0.18	0.27	0.27
Zambia	0.11		0.07	0.13	0.11

Source: Author's calculations using data from Chatham House (2018)

Table A 3: Geographical diversification for imports – high-income countries

	2016	2012	2008	2004	2000
Andorra	0.73	0.59	0.50	0.51	0.38
Antigua and Barbuda	0.20	0.21	0.11	0.10	0.25
Argentina	0.14	0.20	0.38	0.18	0.15
Aruba	0.31	0.22	0.16	0.20	0.13
Australia	0.05	0.06	0.06	0.06	0.06
Austria	0.17	0.13	0.14	0.14	0.14
Bahamas	0.59	0.56	0.71	0.56	0.73
Bahrain	0.08	0.08	0.08	0.08	0.10
Barbados	0.19	0.76	0.19	0.18	0.19
Belgium	0.10	0.10	0.10	0.10	0.10
Bermuda	0.73	0.74	0.62	0.59	0.53
Brunei Darussalam	0.12	0.18	0.17	0.15	0.17
Canada	0.34	0.39	0.42	0.40	0.42
Cayman Isds	0.71	0.41	0.39	0.80	0.42
Chile	0.12	0.15	0.18	0.17	0.17
China, Hong Kong SAR	0.13	0.10	0.09	0.10	0.10
China, Macao SAR	0.32	0.23	0.19	0.22	0.27
Croatia	0.06	0.05	0.05	0.05	0.05
Curacao	0.16	0.12			
Cyprus	0.06	0.05	0.05	0.05	0.04
Czech Rep.	0.10	0.10	0.09	0.08	0.06
Denmark	0.09	0.08	0.08	0.07	0.07
Equatorial Guinea	0.06	0.06	0.08	0.10	0.22
Estonia	0.04	0.06	0.05	0.04	0.06
Faeroe Isds	0.20	0.34	0.15	0.19	0.17
Finland	0.06	0.06	0.06	0.06	0.05
France	0.06	0.07	0.07	0.07	0.07
French Polynesia	0.19	0.19	0.18	0.22	0.19
Germany	0.08	0.08	0.08	0.08	0.08

	2016	2012	2008	2004	2000
Greece	0.05	0.06	0.06	0.07	0.09
Greenland	0.61	0.70	0.78	0.85	0.56
Guam	0.11	0.19	0.21	0.39	0.51
Hungary	0.07	0.10	0.09	0.06	0.06
Iceland	0.05	0.06	0.06	0.06	0.07
Ireland	0.19	0.19	0.21	0.26	0.21
Israel	0.04	0.05	0.05	0.08	0.10
Italy	0.05	0.06	0.06	0.08	0.08
Japan	0.09	0.09	0.12	0.09	0.10
Korea, Rep.	0.09	0.09	0.14	0.11	0.15
Kuwait	0.06	0.08	0.06	0.07	0.07
Latvia	0.09	0.09	0.09	0.07	0.06
Lithuania	0.06	0.06	0.07	0.04	0.04
Luxembourg	0.16	0.18	0.16	0.26	0.27
Malta	0.11	0.08	0.08	0.07	0.06
Netherlands	0.05	0.06	0.06	0.07	0.06
New Caledonia	0.19	0.18	0.18	0.19	0.22
New Zealand	0.07	0.10	0.12	0.14	0.13
Norway	0.05	0.05	0.05	0.05	0.06
Oman	0.13	0.07	0.04	0.11	0.09
Poland	0.06	0.06	0.06	0.05	0.04
Portugal	0.18	0.17	0.18	0.17	0.15
Qatar	0.06	0.11	0.06	0.08	0.06
Saint Kitts and Nevis	0.27	0.18	0.26	0.36	0.31
Saudi Arabia	0.06	0.05	0.05	0.05	0.04
Seychelles	0.19	0.32	0.23	0.26	0.13
Singapore	0.07	0.08	0.09	0.08	0.08
Sint Maarten (Dutch part)	0.52	0.91			
Slovakia	0.10	0.13	0.10	0.08	0.08
Slovenia	0.12	0.08	0.08	0.07	0.08
Spain	0.04	0.04	0.05	0.05	0.06
Sweden	0.12	0.10	0.10	0.09	0.09
Switzerland	0.07	0.07	0.07	0.07	0.06
Trinidad and Tobago	0.17	0.14	0.18	0.15	0.15
Turks and Caicos Isds	0.88	0.46	0.66	0.69	
United Arab Emirates	0.05	0.05	0.06	0.05	0.04
United Kingdom	0.05	0.06	0.06	0.06	0.05
United States	0.08	0.08	0.08	0.07	0.07
Uruguay	0.19	0.22	0.24	0.48	0.18
Venezuela	0.17	0.10	0.11	0.09	0.11

Source: Author's calculations using data from Chatham House (2018)

Table A 4: Geographical diversification of imports – Middle-Income countries

	2016	2012	2008	2004	2000
Albania	0.06	0.06	0.06	0.07	0.12
Algeria	0.08	0.09	0.09	0.07	0.09
American Samoa	0.17	0.18	0.26	0.50	0.26
Angola	0.10	0.07	0.07	0.06	0.08
Armenia	0.11	0.14	0.12	0.08	0.07
Azerbaijan	0.16	0.10	0.13	0.11	0.14
Bangladesh	0.08	0.11	0.13	0.11	0.11
Belarus	0.06	0.07	0.07	0.12	0.09
Belize	0.26	0.24	0.25	0.21	0.22
Bhutan	0.84	0.95	0.55	0.60	
Bolivia	0.38	0.49	0.46	0.21	0.20
Bosnia Herzegovina	0.11	0.11	0.11	0.08	0.09
Botswana	0.77	0.77	0.73	0.88	0.68
Bulgaria	0.05	0.06	0.05	0.07	0.04
Cabo Verde	0.13	0.15	0.12	0.10	0.12
Cameroon	0.11	0.07	0.07	0.07	0.11
Colombia	0.25	0.17	0.27	0.18	0.16
Congo, Rep.	0.05	0.06	0.06	0.07	0.10
Costa Rica	0.25	0.26	0.39	0.34	0.27
Cote d'Ivoire	0.08	0.07	0.07	0.08	0.10
Cuba	0.10	0.17	0.17	0.18	0.12
Djibouti	0.12	0.11	0.12	0.08	0.14
Dominica	0.15	0.16	0.08	0.10	0.13
Dominican Rep.	0.24	0.22	0.38	0.31	0.41
Ecuador	0.10	0.10	0.12	0.11	0.11
Egypt	0.07	0.09	0.09	0.10	0.14
El Salvador	0.21	0.21	0.26	0.18	0.21
Fiji	0.18	0.14	0.17	0.22	0.26
Gabon	0.07	0.08	0.09	0.11	0.13
Georgia	0.10	0.08	0.07	0.09	0.14
Ghana	0.04	0.04	0.05	0.07	0.06
Grenada	0.16	0.15	0.20	0.14	0.18
Guatemala	0.34	0.27	0.38	0.29	0.18
Guyana	0.12	0.13	0.13	0.16	0.20
Honduras	0.41	0.37	0.39	0.23	0.28
Indonesia	0.08	0.08	0.09	0.09	0.08
Iran	0.14	0.09	0.07	0.12	0.12
Iraq	0.22	0.14	0.09	0.07	0.16
Jamaica	0.23	0.28	0.29	0.23	0.23
Jordan	0.06	0.05	0.05	0.06	0.06
Kazakhstan	0.09	0.08	0.12	0.08	0.33

	2016	2012	2008	2004	2000
Kenya	0.07	0.05	0.06	0.06	0.05
Kiribati	0.16	0.28	0.23	0.51	
Kyrgyzstan	0.19	0.17	0.23	0.23	0.19
Lao PDR	0.66	0.57	0.74	0.53	0.36
Lebanon	0.04	0.04	0.05	0.05	0.04
Lesotho	0.96	0.98	0.97		
Libya	0.05	0.05	0.04	0.06	0.08
Macedonia, FYR	0.06	0.06	0.07	0.05	0.06
Malaysia	0.06	0.08	0.09	0.08	0.08
Maldives	0.10	0.11	0.09	0.10	0.10
Marshall Isds		0.24			
Mauritania	0.05	0.06	0.11	0.10	0.18
Mauritius	0.06	0.06	0.06	0.08	0.09
Mexico	0.54	0.55	0.57	0.46	0.55
Micronesia	0.49	0.27	0.36	0.35	
Moldova	0.06	0.05	0.08	0.06	0.05
Mongolia	0.19	0.20	0.44	0.16	0.19
Montenegro	0.15	0.19	0.22		
Morocco	0.07	0.08	0.10	0.08	0.10
Myanmar	0.12	0.14	0.19	0.17	0.14
Namibia	0.51	0.45	0.52	0.57	0.51
Nicaragua	0.16	0.17	0.31	0.23	0.22
Nigeria	0.07	0.07	0.09	0.11	0.07
Pakistan	0.10	0.14	0.08	0.11	0.11
Palau	0.37	0.40	0.49		
Panama	0.29	0.20	0.35	0.21	0.30
Papua New Guinea	0.24	0.43	0.12	0.24	0.34
Paraguay	0.29	0.36	0.36	0.23	0.40
Peru	0.14	0.15	0.20	0.16	0.15
Philippines	0.10	0.10	0.11	0.08	0.14
Romania	0.06	0.07	0.07	0.06	0.05
Saint Lucia	0.22	0.15	0.19	0.19	0.16
Saint Vincent and the Grenadines	0.34	0.38	0.37	0.29	0.29
Samoa	0.15	0.22	0.18	0.26	0.14
Sao Tome and Principe	0.48	0.28	0.27	0.19	
Senegal	0.05	0.08	0.09	0.11	0.12
Serbia	0.03	0.03	0.03		
Solomon Isds	0.20	0.22	0.28		
Sri Lanka	0.07	0.11	0.11	0.08	0.06
State of Palestine	0.53	0.59	0.57		
Sudan	0.08	0.07			
Suriname	0.13	0.13	0.13	0.15	0.25

	2016	2012	2008	2004	2000
Swaziland	0.93	0.71	0.15	0.84	0.74
Syria	0.15	0.05	0.05	0.06	0.06
Tajikistan	0.42	0.46	0.37	0.26	0.13
Thailand	0.07	0.06	0.06	0.04	0.05
Timor-Leste	0.17	0.18	0.60	0.25	
Tonga	0.15	0.24	0.24	0.44	
Tunisia	0.06	0.06	0.06	0.07	0.07
Turkey	0.06	0.07	0.05	0.05	0.09
Turkmenistan	0.10	0.11	0.46	0.21	0.08
Ukraine	0.05	0.03	0.04	0.04	0.05
Uzbekistan	0.34	0.28	0.33	0.10	0.09
Vanuatu	0.21	0.18	0.24		
Vietnam	0.08	0.06	0.07	0.07	0.07
Yemen	0.07	0.06	0.06	0.05	0.07
Zambia	0.31	0.14	0.37	0.32	0.26

Source: Author's calculations using data from Chatham House (2018)

Appendix B

Table B 1: Product diversification of exports – High-income countries

	2016	2012	2008	2004	2000
Andorra		0.54	0.67	0.67	
Antigua and Barbuda	0.40	0.37	0.24	0.23	
Argentina	0.32	0.30	0.35	0.32	0.23
Aruba		0.48	0.63	0.49	0.57
Australia	0.13	0.16	0.18	0.21	0.16
Austria	0.11	0.10	0.11	0.12	0.11
Bahamas	0.92	0.86	0.82	0.89	0.87
Bahrain	0.21	0.41	0.39	0.26	0.22
Barbados	0.11	0.27	0.15	0.38	0.47
Belgium	0.09	0.09	0.10	0.11	0.09
Bermuda		0.68			
Canada	0.10	0.13	0.12	0.09	0.09
Chile	0.36	0.33	0.34	0.34	0.37
China, Hong Kong SAR	0.26	0.28	0.31	0.14	0.16
China, Macao SAR		0.15	0.30		0.48
Croatia	0.06	0.07	0.08	0.12	0.14
Curacao	0.86	0.67			
Cyprus	0.18	0.10	0.10	0.17	0.18
Czech Rep.	0.08	0.08	0.09	0.07	0.11
Denmark	0.14	0.14	0.16	0.21	0.20
Equatorial Guinea					0.68
Estonia	0.08	0.08	0.07	0.15	0.20
Faeroe Isds	1.00	1.00	1.00	1.00	1.00
Finland	0.14	0.18	0.16	0.19	0.19
France	0.07	0.08	0.09	0.07	0.08
French Polynesia	0.18	0.32	0.26	0.15	0.24
Germany	0.07	0.07	0.08	0.09	0.09
Greece	0.12	0.13	0.11	0.14	0.14
Greenland	1.00	1.00	1.00	1.00	1.00
Guam			0.84	0.81	0.97
Hungary	0.11	0.12	0.14	0.11	0.12
Iceland	0.92	0.93	0.94	0.96	0.96
Ireland	0.25	0.24	0.24	0.22	0.20

	2016	2012	2008	2004	2000
Israel	0.41	0.43	0.38	0.54	0.67
Italy	0.14	0.14	0.14	0.15	0.17
Japan	0.38	0.39	0.42	0.46	0.39
Korea, Rep.	0.30	0.33	0.38	0.40	0.39
Kuwait	0.26	0.20	0.14	0.23	0.18
Latvia	0.14	0.13	0.14	0.10	0.19
Lithuania	0.08	0.10	0.11	0.14	0.13
Luxembourg	0.22	0.29	0.26	0.30	0.16
Malta	0.59	0.45	0.75	0.76	0.27
Netherlands	0.13	0.12	0.12	0.15	0.14
New Caledonia	0.44	0.70	0.74	0.82	0.79
New Zealand	0.27	0.33	0.28	0.23	0.22
Norway	0.94	0.92	0.91	0.90	0.91
Oman	0.09	0.13	0.17	0.18	0.13
Poland	0.11	0.11	0.13	0.14	0.15
Portugal	0.09	0.08	0.08	0.10	0.11
Qatar	0.39	0.25	0.40	0.23	
Russian Federation			0.31	0.27	0.41
Saint Kitts and Nevis				0.84	
Saudi Arabia	0.21	0.14	0.14	0.18	0.21
Seychelles	0.99	0.95	0.78	0.85	0.96
Singapore	0.10	0.08	0.11	0.11	0.13
Slovakia	0.07	0.10	0.09	0.07	0.09
Slovenia	0.12	0.18	0.12	0.17	0.14
Spain	0.23	0.23	0.23	0.27	0.28
Sweden	0.38	0.23	0.15	0.14	0.12
Switzerland	0.34	0.29	0.17	0.14	0.29
Trinidad and Tobago	0.39	0.19	0.10	0.12	0.16
Turks and Caicos Isds	0.50			0.29	
United Arab Emirates	0.06	0.06	0.10	0.07	0.04
United Kingdom	0.05	0.05	0.05	0.05	0.06
United States	0.12	0.12	0.16	0.14	0.11
Uruguay	0.17	0.17	0.15	0.15	0.18
Venezuela	0.46	0.34	0.35	0.36	0.28

Source: Author's calculations using data from Chatham House (2018)

Table B 2: Product diversification of exports – Middle-income countries

	2016	2012	2008	2004	2000
Albania	0.39	0.25	0.21	0.27	0.30
Algeria	0.51	0.32	0.13	0.13	0.45
Angola	0.94	0.85	0.88	0.78	0.83
Armenia	0.35	0.18	0.18	0.20	

	2016	2012	2008	2004	2000
Azerbaijan	0.57	0.23	0.26	0.25	0.39
Bangladesh	0.54	0.32	0.55	0.67	0.89
Belarus	0.30	0.29	0.35	0.24	0.16
Belize	0.25	0.23	0.23	0.26	0.30
Bhutan		0.22	0.82		
Bolivia	0.49	0.52	0.53	0.58	0.64
Bosnia Herzegovina	0.10	0.10	0.11	0.09	0.24
Botswana	0.78	0.51	0.74	0.70	0.77
Bulgaria	0.17	0.17	0.15	0.08	0.09
Cabo Verde	0.98	0.79	0.96		
Cameroon	0.49	0.52	0.43	0.44	0.42
Colombia	0.31	0.26	0.22	0.26	0.29
Congo, Rep.	0.37	0.22	0.23	0.25	0.31
Costa Rica	0.57	0.48	0.56	0.56	0.47
Cote d'Ivoire	0.69	0.62	0.63	0.64	0.61
Cuba	0.60	0.62	0.48	0.40	0.42
Djibouti	0.43	0.57	0.83		
Dominica			0.64	0.41	0.81
Dominican Rep.	0.28	0.21	0.22	0.21	0.23
Ecuador	0.35	0.39	0.45	0.53	0.53
Egypt	0.33	0.29	0.19	0.22	0.24
El Salvador	0.15	0.21	0.27	0.21	0.41
Fiji	0.18	0.19	0.29	0.28	0.41
Gabon			0.23	0.70	0.74
Georgia	0.41	0.29	0.36	0.17	0.23
Ghana	0.49	0.71	0.66	0.65	0.67
Grenada	0.22	0.40	0.25	0.42	0.38
Guatemala	0.23	0.20	0.20	0.22	0.27
Guyana	0.26	0.39	0.29	0.29	0.31
Honduras	0.19	0.27	0.21	0.22	0.24
Indonesia	0.44	0.53	0.45	0.32	0.21
Iran	0.63	0.65	0.48	0.51	0.47
Iraq	0.94	0.93	0.70	0.64	0.58
Jamaica	0.11	0.17	0.21	0.21	0.20
Jordan	0.38	0.41	0.39	0.42	0.44
Kazakhstan	0.51	0.64	0.74	0.50	0.68
Kenya	0.39	0.38	0.35	0.34	0.44
Kiribati	0.94	0.79	0.57		
Kyrgyzstan	0.23	0.22	0.54	0.13	0.32
Lao PDR	0.14	0.15	0.28	0.26	0.43
Lebanon	0.18	0.22	0.17	0.14	0.25
Lesotho	0.69	0.42	0.42		

	2016	2012	2008	2004	2000
Libya	0.69	0.52	0.28	0.91	0.37
Macedonia, FYR	0.33	0.29	0.31	0.31	0.30
Malaysia	0.55	0.68	0.68	0.59	0.49
Maldives	0.99	1.00	1.00	0.99	0.99
Marshall Isds	0.94	0.99	0.87	0.91	0.95
Mauritania	0.98	0.98	0.99	0.99	1.00
Mauritius	0.29	0.41	0.53	0.64	0.45
Mexico	0.46	0.35	0.36	0.42	0.28
Micronesia	1.00	0.91	0.92	0.96	1.00
Moldova	0.21	0.26	0.27	0.22	0.12
Mongolia	0.36	0.25	0.58	0.39	0.80
Montenegro	0.39	0.16	0.33		
Morocco	0.36	0.37	0.37	0.33	0.41
Myanmar	0.17	0.23	0.28	0.22	0.28
Namibia	0.49	0.45	0.39	0.42	0.60
Nicaragua	0.09	0.09	0.09	0.07	0.12
Nigeria	0.33	0.33	0.43	0.37	0.29
Pakistan	0.26	0.32	0.50	0.30	0.22
Palau	0.97	0.95		1.00	1.00
Panama	0.19	0.27	0.32	0.36	0.33
Papua New Guinea	0.31	0.34	0.40	0.30	0.32
Paraguay	0.39	0.31	0.50	0.66	0.59
Peru	0.31	0.22	0.22	0.23	0.23
Philippines	0.31	0.28	0.27	0.27	0.28
Romania	0.30	0.23	0.26	0.17	0.15
Saint Lucia	0.54	0.84	0.94	0.96	0.98
Saint Vincent and the Grenadines	0.30	0.41	0.27	0.35	0.25
Samoa	0.46	0.45		0.35	0.44
Sao Tome and Principe	0.97				0.45
Senegal	0.30	0.34	0.37	0.49	0.46
Serbia	0.19	0.20	0.14		
Solomon Isds	0.28	0.34	0.27	0.46	0.36
Sri Lanka	0.45	0.50	0.49	0.54	0.50
State of Palestine	0.31	0.15	0.13	0.61	0.91
Sudan	0.39	0.24			
Suriname	0.29	0.26	0.31	0.49	0.34
Swaziland	0.86	0.76	0.54	0.57	0.51
Syria	0.26	0.27	0.10	0.14	0.24
Tajikistan	0.37	0.78	0.57	0.64	0.54
Thailand	0.11	0.11	0.20	0.16	0.16
Timor-Leste	0.93	0.80	0.84		
Tonga	0.22	0.31		0.52	0.31

	2016	2012	2008	2004	2000
Tunisia	0.22	0.18	0.26	0.41	0.23
Turkey	0.21	0.27	0.33	0.31	0.26
Turkmenistan	0.49	0.61			
Tuvalu		1.00			
Ukraine	0.36	0.35	0.34	0.20	0.17
Uzbekistan	0.63	0.73	0.75	0.51	0.52
Vanuatu	0.51	0.85	0.67	0.64	0.19
Vietnam	0.18	0.17	0.19	0.21	0.18
Yemen	0.44	0.29	0.35	0.45	0.36
Zambia	0.21	0.23	0.23	0.15	0.17

Source: Author's calculations using data from Chatham House (2018)

Table B 3: Product diversification of imports – High-income countries

	2016	2012	2008	2004	2000
Andorra	0.12	0.12	0.11	0.11	0.10
Antigua and Barbuda	0.11	0.06	0.07	0.08	0.09
Argentina	0.15	0.17	0.41	0.14	0.12
Aruba	0.11	0.10	0.14	0.11	0.09
Australia	0.07	0.07	0.07	0.09	0.08
Austria	0.10	0.10	0.10	0.13	0.15
Bahamas	0.20	0.12	0.12	0.15	0.11
Bahrain	0.10	0.09	0.09	0.10	0.15
Barbados	0.05	0.74	0.07	0.06	0.06
Belgium	0.08	0.07	0.08	0.08	0.07
Bermuda	0.13	0.12	0.21	0.18	0.18
Brunei Darussalam	0.07	0.10	0.12	0.07	0.07
Canada	0.17	0.16	0.16	0.16	0.15
Cayman Isds	0.18	0.21	0.16	0.68	0.30
Chile	0.11	0.10	0.13	0.10	0.10
China, Hong Kong SAR	0.15	0.14	0.14	0.10	0.10
China, Macao SAR	0.12	0.09	0.09	0.07	0.09
Croatia	0.06	0.05	0.05	0.05	0.06
Curacao	0.14	0.13			
Cyprus	0.07	0.07	0.07	0.08	0.11
Czech Rep.	0.10	0.09	0.12	0.15	0.15
Denmark	0.11	0.09	0.08	0.09	0.11
Equatorial Guinea	0.16	0.20	0.22	0.18	0.16
Estonia	0.11	0.10	0.08	0.09	0.09
Faeroe Isds	0.19	0.25	0.14	0.15	0.24
Finland	0.12	0.10	0.10	0.15	0.14
France	0.10	0.09	0.09	0.11	0.10

	2016	2012	2008	2004	2000
French Polynesia	0.19	0.18	0.17	0.19	0.14
Germany	0.11	0.10	0.10	0.14	0.14
Greece	0.06	0.07	0.06	0.07	0.08
Greenland	0.14	0.12	0.12	0.12	0.12
Guam	0.29	0.32	0.46	0.56	0.65
Hungary	0.06	0.06	0.08	0.07	0.12
Iceland	0.18	0.17	0.17	0.25	0.28
Ireland	0.06	0.06	0.07	0.07	0.06
Israel	0.07	0.12	0.13	0.14	0.11
Italy	0.05	0.04	0.05	0.05	0.05
Japan	0.09	0.09	0.10	0.12	0.14
Korea, Rep.	0.08	0.08	0.10	0.11	0.10
Kuwait	0.09	0.08	0.09	0.08	0.08
Latvia	0.07	0.07	0.07	0.09	0.09
Lithuania	0.11	0.09	0.10	0.09	0.10
Luxembourg	0.12	0.13	0.13	0.13	0.10
Malta	0.10	0.07	0.08	0.06	0.08
Netherlands	0.09	0.09	0.10	0.08	0.08
New Caledonia	0.12	0.10	0.10	0.09	0.12
New Zealand	0.06	0.07	0.09	0.06	0.05
Norway	0.13	0.13	0.14	0.16	0.16
Oman	0.08	0.08	0.13	0.11	0.09
Poland	0.07	0.06	0.08	0.10	0.10
Portugal	0.09	0.07	0.06	0.07	0.07
Qatar	0.09	0.09	0.10	0.09	0.09
Saint Kitts and Nevis	0.16	0.14	0.09	0.32	0.10
Saudi Arabia	0.09	0.10	0.16	0.09	0.11
Seychelles	0.39	0.52	0.43	0.47	0.25
Singapore	0.05	0.05	0.05	0.05	0.05
Sint Maarten (Dutch part)	0.13	0.16			
Slovakia	0.09	0.06	0.08	0.11	0.09
Slovenia	0.10	0.08	0.10	0.09	0.09
Spain	0.08	0.07	0.07	0.08	0.09
Sweden	0.12	0.10	0.11	0.14	0.13
Switzerland	0.14	0.13	0.12	0.13	0.14
Trinidad and Tobago	0.06	0.05	0.07	0.07	0.07
Turks and Caicos Isds	0.23	0.15	0.16	0.16	
United Arab Emirates	0.07	0.05	0.07	0.05	0.04
United Kingdom	0.13	0.11	0.11	0.12	0.10
United States	0.12	0.10	0.10	0.12	0.11
Uruguay	0.06	0.07	0.13	0.47	0.24
Venezuela	0.18	0.08	0.10	0.11	0.13

Source: Author's calculations using data from Chatham House (2018)

Table B 4: Product diversification of imports – Middle-income countries

	2016	2012	2008	2004	2000
Albania	0.05	0.08	0.07	0.11	0.11
Algeria	0.13	0.13	0.24	0.14	0.20
American Samoa	0.67	0.76	0.68	0.66	0.21
Angola	0.12	0.12	0.13	0.13	0.13
Armenia	0.08	0.14	0.13	0.16	0.25
Azerbaijan	0.12	0.12	0.23	0.23	0.25
Bangladesh	0.16	0.26	0.21	0.19	0.15
Belarus	0.30	0.09	0.08	0.07	0.16
Belize	0.11	0.13	0.13	0.17	0.16
Bhutan	0.27	0.10	0.18	0.21	
Bolivia	0.16	0.32	0.47	0.24	0.25
Bosnia Herzegovina	0.06	0.05	0.07	0.06	0.07
Botswana	0.11	0.10	0.08	0.13	0.11
Bulgaria	0.06	0.07	0.06	0.05	0.06
Cabo Verde	0.07	0.08	0.09	0.10	0.09
Cameroon	0.37	0.28	0.30	0.22	0.26
Colombia	0.19	0.19	0.30	0.25	0.19
Congo, Rep.	0.16	0.14	0.13	0.12	0.15
Costa Rica	0.11	0.17	0.21	0.19	0.16
Cote d'Ivoire	0.17	0.26	0.23	0.16	0.23
Cuba	0.15	0.18	0.25	0.21	0.25
Djibouti	0.20	0.18	0.19	0.10	0.20
Dominica	0.15	0.09	0.08	0.08	0.08
Dominican Rep.	0.06	0.11	0.12	0.14	0.11
Ecuador	0.18	0.16	0.18	0.18	0.19
Egypt	0.15	0.19	0.22	0.17	0.13
El Salvador	0.11	0.13	0.17	0.12	0.12
Fiji	0.08	0.19	0.07	0.07	0.08
Gabon	0.17	0.16	0.17	0.15	0.16
Georgia	0.06	0.11	0.11	0.14	0.17
Ghana	0.12	0.11	0.13	0.15	0.18
Grenada	0.11	0.13	0.11	0.08	0.10
Guatemala	0.12	0.14	0.23	0.16	0.12
Guyana	0.12	0.15	0.20	0.23	0.17
Honduras	0.17	0.19	0.19	0.12	0.11
Indonesia	0.08	0.10	0.11	0.11	0.13
Iran	0.18	0.24	0.27	0.28	0.41

	2016	2012	2008	2004	2000
Iraq	0.08	0.13	0.20	0.20	0.24
Jamaica	0.08	0.15	0.18	0.12	0.06
Jordan	0.11	0.10	0.15	0.13	0.10
Kazakhstan	0.14	0.10	0.08	0.09	0.07
Kenya	0.16	0.17	0.19	0.16	0.21
Kiribati	0.13	0.16	0.27	0.31	
Kyrgyzstan	0.09	0.12	0.17	0.12	0.33
Lao PDR	0.10	0.13	0.08	0.11	0.10
Lebanon	0.05	0.05	0.05	0.07	0.06
Lesotho	0.18	0.16	0.12		
Libya	0.11	0.14	0.24	0.40	0.48
Macedonia, FYR	0.07	0.07	0.08	0.08	0.07
Malaysia	0.06	0.08	0.09	0.07	0.07
Maldives	0.11	0.10	0.10	0.09	0.10
Marshall Isds		0.15			
Mauritania	0.10	0.16	0.15	0.13	0.18
Mauritius	0.16	0.15	0.12	0.09	0.07
Mexico	0.10	0.11	0.13	0.13	0.12
Micronesia	0.20	0.14	0.22	0.15	
Moldova	0.06	0.07	0.11	0.09	0.05
Mongolia	0.12	0.12	0.44	0.34	0.37
Montenegro	0.08	0.07	0.10		
Morocco	0.17	0.19	0.25	0.19	0.26
Myanmar	0.28	0.13	0.41	0.27	0.18
Namibia	0.07	0.09	0.06	0.07	0.06
Nicaragua	0.14	0.20	0.26	0.20	0.12
Nigeria	0.21	0.24	0.23	0.21	0.16
Pakistan	0.27	0.37	0.28	0.34	0.25
Palau	0.14	0.27	0.41		
Panama	0.10	0.15	0.20	0.11	0.10
Papua New Guinea	0.26	0.24	0.33	0.29	0.23
Paraguay	0.18	0.18	0.18	0.22	0.13
Peru	0.19	0.21	0.28	0.24	0.24
Philippines	0.07	0.09	0.22	0.12	0.10
Romania	0.07	0.06	0.07	0.08	0.06
Saint Lucia	0.09	0.08	0.09	0.11	0.11
Saint Vincent and the Grenadines	0.17	0.17	0.17	0.13	0.16
Samoa	0.12	0.18	0.11	0.12	0.17
Sao Tome and Principe	0.14	0.14	0.20	0.15	
Senegal	0.16	0.25	0.29	0.25	0.24
Serbia	0.12	0.09	0.11		
Solomon Isds	0.25	0.08	0.13		

	2016	2012	2008	2004	2000
Sri Lanka	0.04	0.07	0.08	0.09	0.09
State of Palestine	0.09	0.10	0.17		
Sudan	0.20	0.20			
Suriname	0.07	0.07	0.09	0.08	0.07
Swaziland	0.13	0.09	0.36	0.08	0.07
Syria	0.08	0.10	0.15	0.15	0.13
Tajikistan	0.34	0.49	0.48	0.28	0.28
Thailand	0.13	0.14	0.18	0.18	0.17
Timor-Leste	0.10	0.22	0.65	0.30	
Tonga	0.24	0.27	0.24	0.25	
Tunisia	0.23	0.17	0.30	0.16	0.25
Turkey	0.14	0.17	0.20	0.18	0.17
Turkmenistan	0.06	0.10	0.50	0.20	0.13
Ukraine	0.09	0.10	0.09	0.08	0.10
Uzbekistan	0.28	0.23	0.39	0.10	0.27
Vanuatu	0.11	0.10	0.10		
Vietnam	0.10	0.12	0.12	0.13	0.14
Yemen	0.24	0.30	0.32	0.20	0.15
Zambia	0.18	0.16	0.19	0.18	0.15

Source: Author's calculations using data from Chatham House (2018)