Effects of Trade Barriers on Trade Potential between the EU and BRICS Countries

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"There is no road to freedom, freedom is the road."

Mohandas K. Gandhi
I hereby declare that I have developed the entire doctoral thesis including annexes myself. All sources of information have been indicated in the bibliography and were quoted appropriately throughout the doctoral thesis.

Ostrava  
14th September 2018

Signature ---------------------------
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Anotace

Obchodní vztahy mezi rozvinutými a rozvojovými zeměmi byly výrazně ovlivněny procesem globalizace, který dává možnost vytvářet nové ekonomické vztahy a rozšiřovat vzájemnou hospodářskou propojenost mezi jednotlivými zeměmi. Hospodářská transformace Brazílie, Ruska, Indie, Číny a Jihoafrické republiky (BRICS), nových rozvíjejících se ekonomických gigantů v posledních dekádách, nabízí pro výrobce a spotřebitele ze zemí Evropské unie obrovské obchodní možnosti. Z toho důvodu klade Evropská unie důraz na zlepšení obchodních vztahů s těmito zeměmi ve své nové obchodní a investiční strategii.

V předložené doktorské dizertační práci je poskytnut kompletní pohled na bilaterální obchod se zbožím mezi zeměmi Evropské unie (EU) a zeměmi BRICS prostřednictvím analyzy jejich vzájemné obchodní výměny, hodnocením směřování jejich obchodních politik a odhadem nevyužitého obchodního potenciálu, který existuje díky přirozenými a administrativními bariérami obchodu. V předložené doktorské dizertační práci je pro analýzu použit strukturální gravitační model mezinárodního obchodu. Je použito nejnovějších postupů gravitačního modelování, stejně tak jako nejnovějších poznatků a metod k získání co nejpřesnějších koeficientů odhadu.

Výsledky výzkum prokazují platnost gravitační rovnice ve své základní i rozšířené verzi za použití různých časově variabilních a invariantních proměnných, představujících různé efekty ovlivňující bilaterální obchodní toky se zbožím mezi zeměmi EU a BRICS. Výsledky potvrdily obecně úsilí o liberalizaci mezinárodního obchodu za správnou cestu jak zvýšit hospodářský růst a rozvoj, nicméně bylo zjištěno, že výše celních sazeb stále představuje významnou překážku obchodu. Díky využití gravitačního modelu a panelových dat bylo potvrzeno několik specifických efektů známých v mezinárodním obchodu, jako je Rotterdamský efekt, odklon obchodu nebo existence meziodvětvového obchodu. Závěrem bylo zjištěno, že Brazílie, Indie a Rusko skýtají nevyužitý obchodní potenciál pro výrobce ze zemí EU, zatímco potenciál Číny a Jižní Afriky je plně využit. Na druhou stranu, čínským a indickým producentům se za poslední dvě desetiletí podařilo dostatečně proniknout na evropský trh, což nelze usuzovat o producentech z Brazílie a Jihoafrické republiky.

Klíčová slova:

BRICS, Evropská unie, společná obchodní politika EU, volný obchod, mezinárodní obchod, panelová data, protekcionismus, strukturální gravitační model

JEL: C33, F11, F12, F13, F14, F41
Abstract

Trade relations among the developed and developing countries have been significantly affected by globalization process, giving the possibility to create new economic relations and broaden mutual interdependence among countries. The economic transformation of Brazil, Russia, India, China and South Africa (BRICS), new emerging economic giants, during last two decades offers amazing possibility for producers and consumers from the EU countries to trade. For this reason, the European Union emphasizes the improvement of trade relations with those countries in its new EU trade and investment strategy.

The doctoral thesis offers a comprehensive view of bilateral trade in goods between the European Union (EU) and BRICS countries by the analysis of their mutual trade flows, assessment of their mutual trade policies and estimation of untapped trade potential caused by natural and administrative barriers. For this purpose, the structural gravity model on panel data is used in the empirical part of the doctoral thesis. There are present the most common practices in gravity modelling as well as the most recent findings and technical upgrades to gain unbiased results.

As a result, the validity of gravity equation in its core as well as the augmented version by many time-variant and time-invariant variables version representing various kind of attributes that may affect bilateral trade flows among the EU and BRICS countries, were confirmed. The results also confirmed the general effort for international trade liberalization as a right way to boost production performance and support economic development, although the bilateral trade tariffs still represent a significant barrier to trade. Using the panel gravity approach, several specific effects that may appear in international trade relations such as the Rotterdam effect, a trade diversion or an existence of inter-industry trade, were observed. Finally, a high untapped trade potential was found for the EU producers on the Brazilian, Indian and Russian market, while the potential of China and South Africa is rather fully employed. On the other hand, Chinese and Indian producers have been relatively successful in penetrating the European market, but especially Brazilian and South African producers still keep a high untapped trade potential.

Key words:

BRICS, European Union, EU Common Commercial Policy, free trade, international trade, panel data, protectionism, structural gravity model

JEL: C33, F11, F12, F13, F14, F41
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1 Introduction

Trade relations among developed and developing countries were significantly affected by globalization process during the last decades. Many developing countries went through an economic transformation that enabled them to create new trade relations with the European Union (EU) members and other developed countries. Brazil, Russia, India, China and South Africa (BRICS) were among them. During the last two decades, these countries have become regional giants with a great economic and political power. Russia and China have even considerably influenced the global and political relations that were dominated by the United States of America and the European Union until that time.

Since the new millennium, the above-mentioned five emerging countries have developed closer economic and trade relations with each other to increase their economic power in the global economic system. Although the BRICS group was officially established only in 2010, the story of BRIC (without South Africa membership) began already in 2001 when Jim O’Neill, chief economist at Goldman Sachs, published the article called Building Better Global Economic BRIC. He expressed his opinion, as it turned out correctly, that their political, economic and military power will increase in the following ten years and that especially China will have a significant impact on global economic changes.

Political and structural changes in BRICS during late 1980’s and 1990’s and their following tremendous economic growth had a significant effect on the size and structure of the global trade. For this reason, the European Union had to revise its position towards BRICS members to support its new trade relations with them, to fulfil its aim of progressive abolition of trade restrictions and lowering customs and other trade barriers in the long term.

International trade relations are predominantly in the competence of the European Union since the beginning of its history. The Treaty of Rome, signed in 1957, dedicated the entire chapter to the liberalization of the international exchange of goods. Over the following decades, trade in services and commercial aspects of intellectual property rights also came to the attention of the EU Common Commercial Policy.\(^1\) In order to remedy the situation caused by the World Trade Organization (WTO) established in 1995, and preparation for the EU biggest

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\(^1\) Trade policy states for general rules applied by the government on trade relations between domestic and foreign entities. Within the European Union, these rules are mostly in the power of the European Commission covered by the EU Common Commercial Policy.
enlargement, the EU Common Commercial Policy had to be revised twice, by the Maastricht Treaty (1993) and the Treaty of Nice (2003).

However, a significant change of the EU Common Commercial Policy came in December 2009 when the Lisbon Treaty was implemented. It was included under the EU external services framework together with foreign and security policy, environmental policy, development aid and economic, financial and technical cooperation with non-EU member countries. It means that it was newly conducted to the principles and objectives of the Union's external action. The competences of the European Commission (EC) within the EU Common Commercial Policy, such as changes of tariff and non-tariff measures or a reach of preferential trade agreements, a trade in services and commercial aspects of intellectual property rights, were extended by foreign direct investments. Hence, the European Commission got external exclusive competence to negotiate international agreements and internal exclusive competence regarding their implementation (European Commission, 2009).

The EU trade relations with the non-EU member countries are still largely implemented through regional and preferential trade agreements. Since the fall of the colonial relationship, the EU has granted trade preferences to developing countries under the scheme of the Generalized System of Preferences (GSP), which complies with WTO requirements (Fojtíková et al., 2014). The main purpose of this system is the support of their economic growth through preferential or free access on the EU market. Although all BRICS countries are still considered to be developing countries, the EU applies very different preferential trade approach towards them. In 2014, the EU reformed the GSP scheme of preferential trade relations and excluded Brazil and Russia from this system (European Commission, 2016). Therefore, the only countries still benefiting from this unilateral GSP scheme are India and China. The only reciprocal preferential trade agreement between the EU and any of the BRICS countries was achieved between the EU and South Africa already in the year 2000.

Further global development, the EU enlargement and the Lisbon Treaty adoption led the European Union to create a new EU Trade and Investment Strategy with a time horizon of 2020, following the EU’s overall economic strategy for smart, sustainable and inclusive growth Europe 2020 Strategy. In terms of trade policy, completion of ongoing negotiations on

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2 According to the WTO regulations, any country can be excluded from the GSP scheme if have been listed by the World Bank as high or upper middle income economy for the past three years, based on Gross National Income per capita.

3 Nevertheless, the trade agreements between the EU and Russia that came into force in 1997, and the EU and China since 1985 are still valid.
multilateral and bilateral trade agreements and the creation of new ways for cooperation with other countries has become the main priority within the EU Common Commercial Policy. The European Commission estimates that the mere implementation of existing trade agreements with strategic partners can increase the size of the gross domestic product (GDP) of the EU by 150 billion EUR (DG Trade, 2011). Moreover, the new EU Trade and Investment Strategy\(^4\) emphasizes the needs to orientate its trade policy especially to the markets of the United States, China, Russia, Japan, India, and Brazil. The emphasis on relations with BRICS countries is obvious.

Despite their tremendous political and economic transformation, BRICS countries still suffer from lack of sufficient attention from the side of economic research and economic policy analysis. The content of the doctoral thesis will contribute to the current state of knowledge about their economic development by detailed analysis of mutual trade relations with the EU countries, trade policy between the EU and BRICS, and the detection of determinants influencing their mutual trade.

The doctoral thesis abstracts from trade in commercial services and deals only with trade in goods. The reason is the lack of information about trade in services and missing opportunity to analyse effect of tariffs on trade flows of commercial services. Despite trade in services have increased its share in global trading, the share in trade between the EU and BRICS countries remains still negligible compared to trade in goods.

1.1 The Aim and Hypothesis of the Doctoral Thesis

In the doctoral thesis, there is offered a comprehensive view on bilateral trade in goods between the EU Members and BRICS countries by identifying the effect of their trade policies on bilateral trade flows and estimating untapped trade potential caused by natural and administrative barriers to trade. The research is based on the current knowledge of the theory of international trade, trade policy and econometric modelling of international trade flows using structural gravity model, a work-horse of international trade analysis.

The aim of the doctoral thesis is finding of determinants of bilateral trade flows between the EU Members and BRICS countries, estimation of the effect of natural and administrative barriers to trade using the structural gravity model of international trade and panel estimation techniques, and uncover their mutual untapped trade potential resulting from their underdeveloped trade relations. The research hypothesis of the doctoral thesis is based on the

\(^4\) The most actual version of the EU trade strategy called *Trade for all* was published in 2015.
assumption that the protectionist barriers, represented by bilateral tariffs, have still significant effect on bilateral trade flows between the EU Members and BRICS countries, hence they are one of the reasons behind the untapped trade potential among them, while trade agreements benefit their mutual trade.

There are several partial aims of the doctoral thesis to reach the main purpose of the research. The aims are:

1) To address whether the trade policy measures protecting domestic market are justified or not;
2) To capture the structural changes of bilateral trade between the EU and BRICS countries during the last two decades;
3) To identify the determinants of bilateral trade between the EU Members and BRICS countries, test the effect of natural and administrative barriers to trade and examine the pattern of their bilateral trade flows;
4) To quantify the trade potential that lies behind the existence of trade barriers;
5) To set options to boost the efficiency of bilateral trade by preferential trade agreements between selected countries.

To achieve the aim of the research, it is necessary to explain the existence of the international exchange, emphasize the importance of free trade and contradict the claims of the protectionists that are currently reborn. An understanding of possible benefits of free trade with other countries, a comprehensive theoretical and practical knowledge of the EU Common Commercial Policy with a special focus on foreign trade relations with selected emerging markets is provided in the doctoral thesis. Finally, the methodology of structural gravity model is introduced in detail and possibilities of its use in international trade research to support empirical results.

1.2 Structure of the Doctoral Thesis

The doctoral thesis is structured into three main chapters, supplemented by introduction and conclusion. The second chapter deals with the theoretical background of international trade. The aim of this chapter is twofold. At first, the benefits of free trade are critically explained using the mainstream economic theories supporting the idea of free trade and disproving the frequent claims that are used by protectionism protagonists. At second, several economic theories of international trade are elaborated and used in theoretical derivations of gravity model. In this chapter, the reasons for the international exchange of goods are clarified,
emphasized thoughts in favour of free trade on specific examples and proved basic mistakes about the positive effects of protectionism using events and statements that really happened. A common reader may feel that international trade takes place at the macroeconomic level, however, there is a disproved conviction bearing those theoretical thoughts, where appropriate, to microeconomic level, to better explain effects and functioning of international exchange, the benefits of free trade and the drawbacks of protectionism. This chapter also contains introduction to the history of gravity model and theoretical derivation of the gravity equation according to Anderson and van Wincoop (2003) that is used in the empirical part.

In the third chapter, the economic relationships between the European Union (EU) and the group of BRICS countries (Brazil, Russia, India, China, and South Africa) are elaborated. Firstly, the position of the EU Common Commercial Policy within the European Union, its function and principles are elaborated. Then the measures of the Policy that are used to restrict or improve bilateral trade flows with the third countries are described. An overview of the development and the current state of the EU Common Commercial Policy towards BRICS countries are provided and the explanation why the European Commission emphasizes the improvement of trade and economic relations with these countries and what benefits may offer close cooperation with them is given. Furthermore, the group of BRICS is defined and described and its evolution during the last fifteen years, highlighted their dominance within the developing world as well as increasing position on the global economic and political scene. Finally, the chapter is concluded by the empirical analysis of bilateral trade on goods between the EU and BRICS countries with the special focus on geographical distribution within the European Union and structural changes on the side of BRICS.

Combining the knowledge gained in the above-mentioned chapters, the empirical application of the gravity model on bilateral trade between twenty-eight EU member countries and BRICS is provided in the fourth chapter. Firstly, there are three important steps in the timeline of gravity model development that significantly influenced its empirical testing. It contains the solution of the distance puzzle offered by Anderson and van Wincoop (2003), the solution of estimation bias created by Head and Mayer (2014), and best practices of panel data estimation proposed by Piermartiny and Yotov (2016). All above-mentioned authors solve the practical problems of gravity model estimation that have been rising up through empirical testing. Therefore, the most common procedures of the modern gravity model estimation are presented in the following sub-chapter. Using the fixed effect estimations significantly improved the validity of the gravity equation and increased the robustness of the results.
Therefore, the methodology of panel data estimation and three estimators that are used in the empirical part are also explained there. Finally, the input data and used gravity model equations are elaborated to estimate the effect of barriers to trade and untapped trade potential between the EU and BRICS countries. The chapter is concluded by results discussion and estimation of untapped trade potential between the EU Members and BRICS countries.

1.3 Methods of the Doctoral Thesis

General theoretical as well as empirical methods are used in the thesis to reach the aim of the research. General theoretical methods represent a framework for the observation and understanding of the world around us. It allows creating the links between the abstract and concrete through statements and observations. A theory is a generalized explanatory principle that sets the connection between two or more types of phenomena with the power to explain and predict this relationship. It should be emphasized that theory is empirically relevant and always tentative as it is highly declared on the evolution of the gravity model. The doctoral thesis uses the general theoretical methods of research on two levels. At the micro-economic level, relationships and behaviour are explained at the level of individuals which interactions are then transferred to the macro-economic level to explain a general phenomenon that may be observed among countries. The general theoretical methods of research are dominated by methods of analysis and synthesis, deductive and inductive approach, generalization and abstraction, observation and analogy.

The empirical methods of research are based on the previous observations and research that form the research procedures. It is a way of gaining knowledge about some phenomenon through direct or indirect observation and measuring, while its evidence may be analysed quantitatively or qualitatively. Quantitative research uses measurable data to formulate facts and uncover patterns in research. It is based on the quantification of the problem using numerical data or data that may be transformed into the usable statistics. It is used to quantify observed relations and generalize results from a larger sample of the population. Qualitative research is rather used to understand the underlying reasons, the opinions or motivations of the subject of research to behave in certain way. It provides insights into the problem and develops ideas for potential quantitative research. Qualitative research is usually based on observations of focus groups, individual interviews and participation. Both types of empirical research use mathematical and statistical methods that allow a specific explanation of the phenomena and relationships between them. Mathematics helps to solve research problems through
mathematical operations and formulas, statistics allows data collection, distribution, and quantification of phenomenon based on probability.

It follows that the research presented in the doctoral thesis is based on several general theoretical methods and fully on the empirical-quantitative methods of research. Each phase of the research uses several research methods while one or more of them may prevail above others.

In the second chapter, there are mostly used general theoretical methods of research. The analysis divides the whole observed phenomenon into partial components that becomes the subject of research. The aim of the analysis is the explanation of observed phenomenon, the conditions of its origins, its evolution, state or relationships. The analysis separates important and unnecessary information, it proceeds from the general to individual and from multiplicity to unity. The doctoral thesis uses several methods of analysis across the chapters to understand the phenomenon of international trade, the relations and determinants of trade between the EU and BRICS. In the theoretical part, the determinants of international exchange among entities and reasons for free trade or protectionism are explained. In the empirical part, the methods of observation are used and also analysis of the relations among the objects of the research with the aim to find whether they are dependent or independent on each other, assuming the causality of their relations.

In the doctoral thesis, the synthesis methods that allows compiling the individual parts of knowledge and ideas to the one piece are used. The relationships between the individual components of a phenomenon help to reveal its internal patterns of functioning and create final conclusions. Therefore, the synthesis is mainly used in the first part of the doctoral thesis to gain a broader picture about the reasons and effects of international exchange.

The deductive approach, which helps using economic theory to guide a design of the research and interpretation of results, is used in the thesis as well. Deductive methods create new propositions based on the general conclusions and statements. The deduction approach accompanies the history of the gravity model. As the researchers have continued to conduct the empirical research of the theory of gravity equation, they developed confidence that some of its part is true, however, it has often happened that the theory had to be modified or even rejected as the researchers gained negative findings. Therefore, they have abandoned or changed a theory as the evidence against it mounted during the years of gravity development.

Inductive approaches are used to derive general statements from empirical material on the basis of any knowledge about the individual phenomenon. Inductive theorizing begins with a
few assumptions and broad orienting concepts, developing the theory from the ground up slowly over time, constructing the ideas and empirical generalizations that lead to the creation of more abstract theory. The analogy methods are used to find identical relationships between the observed phenomenon to understand and judge the properties of another similar phenomenon. It is natural that all general theoretical methods merge throughout the doctoral thesis.

The third and fourth chapter are based rather on the empirical methods of research. The methods of observation and comparison that provide the comparability of objects and allow to determine the consistency and differences among them are used there. The process of comparison is strongly connected to the findings of an identical or different side of the observed objects of research, as it may be used in terms of substance, space or time. Finally, the research is largely based on mathematical and statistical methods that are used to derive relations among the objects of research as well as their determinants. The last chapter strongly relies on quantitative methods of research.
2 Theoretical Backgrounds of International Trade

International trade has been developing during the centuries on the background of the international division of labour. The mutual economic relations between states date back to the beginning of Mediterranean civilizations. In spite of the passing centuries, the reasons for trade are valid even today. Shortage of goods, price differentiation, and consumer preferences are the only fraction of reasons of the contemporary international economic system. International trade, as a part of this system, has been historically developing under the two main forms of trade policy: liberalism and protectionism. While the former term represents a system of elimination of tariff and non-tariff measures to achieve free trade, the latter means any restriction of free trade. There is no empirical evidence about the free trade in the current world in the sense of free trade as a theoretical concept; national governments seek trade liberalization in the sense of eliminating trade barriers at the bilateral, regional as well as multilateral level. Nevertheless, there are still too many forms of protectionism among countries reflecting their political relations and economic goals.

The benefits of free trade were already well known in times of classical political economy, however, the current state of the international trade relations still includes many protectionist measures creating barriers to trade. Each country has its own policy or delegates its power on supranational institutions, as it is in the case of the European Union, in the matter of trade with other countries. Foreign trade policy as a system of measures to affect economic relations with other countries acts in several dimensions. It affects relations between domestic and foreign economic subjects; it may work in favour or against the free trade. It depends on how the origins of trade relations are considered. Nonetheless, exchange of goods was not distorting until the first state institutions were created. At the beginning of the modern international trade, it was just the state institutions, which tried to limit international trade through their policy. Nowadays, trade policy is rather understood as a tool to remove trade barriers and simplify international economic relations.

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5 Scientific evidence documents first economic relations between civilizations of Egypt, Syria, Mesopotamia or Turkey. Later on, the economic contacts were established also with more distant civilizations in areas of India and China.

6 For the purpose of the doctoral thesis, the beginning of modern international trade is considered with the first overseas discoveries.
The doctoral thesis will address whether the trade policy measures to protect domestic market are justified or not, and quantify the trade potential that lies behind the existence of trade barriers. In the terms of free trade, trade potential may be fully used, if some of the trade barriers are eliminated and are benefiting economic growth. Moreover, there are several factors that may increase trade potential between two countries. International trade is, together with innovations, the essential source of economic growth, productivity and development. The international trade must keep going because the growth potential would stay mediocre without increasing productivity (IMF, 2017a). Therefore, it is important to deal with the sources that make international trade more difficult.

The aim of this chapter is to critically evaluate main economic theories of international trade, which are used to derive gravity model, use them to defend the idea of free trade and disprove the frequent claims of protectionism protagonists. The chapter will explain trade theories at the macroeconomic level, however, where appropriate, it will transfer theoretical thoughts to microeconomic level, in order to better explain effects and functioning of exchange, benefits and drawbacks of free trade and protectionism. This chapter is very important for better understanding of the function of international trade liberalization that is currently at risk due to increasing protectionist pressures and the beginning of trade wars.

2.1 Definition of Essential Concepts in the Theory of International Trade

The theories of international trade have a long history. They were created under certain events and circumstances of those times. As some of the trade theories may seem to be very simple or not valid under the current economic conditions, it should be kept in mind when and under what conditions they were created. Most of them were established to address given economic events or international relations. Nevertheless, all theories of international trade circle around one essential question: Does international trade benefits economic growth and development or should the country protect its market from foreign competition? To answer this question, which can be found at the end of this chapter, it is necessary to understand basic

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7 In general, it can be differentiated between trade barriers in the natural and administrative form. The trade barriers of natural form are hard to overcome (geography, language, culture); administrative form of barriers exists only because of the will of states represented by the government.

8 For example, John Locke criticized the Mercantilists for the precious metals inflows claiming that the price level increase will be the only effect. In the reality, his theory, known as neutrality of money, was developed by others. Another example is the case when David Ricardo was defending reduction of corn trade tariffs creating the roots of the theory of rent or comparative advantage. Many similar cases can be found in the history of economy.
terminology and process hidden behind the words inherently belonging to international economics: exchange, free trade and protectionism.

2.1.1 Exchange in the International Environment

Probably no one can imagine the world without exchange. In such a world, everyone would be able to consume the only products and services that is able to produce, there would be no space for the division of labour, as exchange cannot exist without division of labour and vice versa. As people are not able to produce and consume all the goods and services, they specialize in a field where they gain some particular advantage. A confectioner bakes a cake, a seamstress sews a dress, a teacher teaches and the king rules a country. Then they exchange their products among each other because everyone is producer and consumer at the same time. Once the exchange crosses the state border, it is spoken about foreign trade.

As the doctoral thesis deal with international trade, it is important to define what the term international trade means. Books of economics usually define international trade as foreign trade activities among multiple countries on an aggregated level. This definition is, however, quite misleading as it sets an idea that the nations are trading among each other and that trade is, somehow, directed on the national level. Media, politicians and sometimes even economists speak about international trade in the sense of this aggregated level, creating a false impression in people's minds that nations are able to trade among each other. However, it should never be forgotten that there are always real people and companies behind the trade, e.g. trade is driven by needs of individuals to consume and sell (Šťastný, 1999).

If we think of exchange on the level of individuals, assuming any model of economic competition, individuals compete among themselves to gain the largest share of profit. International trade is described by very similar features as domestic trade, just on the international level. Thinking about the trade as an economic interaction between supply represented by producers and demand represented by consumers within one nation, the same must be applied among countries as well. It means that it is not possible to think about trade as

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9 Not only that it is misleading that any nation sold anything to other nation, but the idea that whole country is selling or buying anything from other nation is set ad absurdum.
an aimed economic policy of state, but as a natural sign of division of labour.\(^{10}\) A state is not the same as a company, therefore it does not have mechanisms to trade *per se.*\(^{11}\)

In the following subchapters, theories of international trade addressing following questions will be presented (Varadzin, 2012):\(^{12}\)

1) *Why countries join international trade network and what are the benefits on the supply and demand side in various kind of countries?* This question was at the origin of international economics, explaining benefits of trade through the international division of labour. Set to microeconomic level, the question may be reformulated to *why people exchange their products and what are the benefits of this exchange?*

2) *What is driving the structure of international trade, why is the structure of export and import similar or different across countries?* This question continued to develop economic theories by searching for sources of specialization. At the microeconomic level, the question would be *what forms the particular structure of exchange between individuals, how they decide what to produce and what to consume?*

3) *What are the terms of trade causing international trade? Simply said what must the relative prices of the exchanged product look like to be the subject of trade?* This is the most important and the oldest question, which explains the origin of any trade. At the microeconomic level, the question can be set as *how much must someone pay to get the unity of different product?*

It is clear that it is possible to apply similar methods to analyse the relation between supply and demand at any level. At the macroeconomic level, as there is spoken about trade between countries, it is necessary to use a lot of abstraction and keep in mind that even there is a discussion about production, consumption, and trade among countries, it is always driven by individuals and companies, not by states.

Following subchapters will address above-mentioned questions using trade economic theories, which are related to the derivation of gravity equation and presence of protectionism.

\(^{10}\) Misunderstanding of this simple economic concept leads high representatives of United States of America (USA) to statements that Germany is unfair with its trade arrangements leading to the high trade surplus. As there are false accusations of German’s wage deflation or even manipulating with Euro, they did not simply understand an interaction between supply and demand.

\(^{11}\) It follows that no state can be managed as a company, despite the fact that some politicians claim that and some people believe it.

\(^{12}\) To prove that international trade is managed by the same rules as domestic trade, questions will be set in the traditional way at macroeconomic level, but then transferred to microeconomic level.
in the global economy. Practical answers to these questions will be provided in chapter 3 on examples of trade between the EU and BRICS countries.

2.1.2 Liberalism Leading to Free Trade

Liberalism, in the sense of international economic relations, may be understood as a process of tariff and non-tariff barriers elimination, opening domestic market to international competition and cutting all direct or indirect funding to private sector by state. Trade liberalization leads to the final stage called free trade. The term free trade is used mostly in connection to international trade, as there are usually no impediments to trade on the national level. Therefore, the term free trade is understood as no interference of states, respectively state institutions, into the free exchange among entities at international level.¹³

The scope of administrative barriers to trade is mostly decided at the national level by the government within the trade policy.¹⁴,¹⁵ Nowadays, most of the states declare their will to support international trade liberalization by their memberships in the international organizations and regional economic integrations. People make usually a very basic mistake, particularly many politicians and also economists, when they claim that the liberalization process carried out within any international economic integration or membership in the World Trade Organization has anything common with the free trade (Šťastný, 1999). The definition of free trade clearly states no impediments from the side of the state. Therefore, watching the recent negotiations of the Doha round clearly shows the lack of the will at the international level to get closer to the term of free trade as it takes place already since 2000 with no significant results.¹⁶ Actually, the current state of multilateral trade liberalization reminds the situation that could be described as "ordeñar una vaca muerta" (milking a dead cow).¹⁷

Free trade does not need any international negotiations, any agreements nor coordination at any level defining when, what and under what circumstances may or may not individuals and

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¹³ It does not mean that all free trade may be legal. However, the topic of legitimacy of international trade is out of the scope of the thesis as it belongs under the studies of international law.
¹⁴ Notice that national trade policy does not deal with trade within the given state, but with external trade. It just confirms no administrative barriers to trade within one nation.
¹⁵ Within the EU, the European Commission has all competences to submit proposals of administrative measures within the EU Common Commercial Policy as the EU member states delegated all their power in commercial policy onto the EU level.
¹⁶ As a result of fail negotiations is increasing number of bilateral and multilateral treaties among countries to liberalize their markets. Notice that there was used the word liberalize as it cannot be spoken about free trade even in this case (more about conflict of multilateralism and regionalism in Chelková, 2010).
¹⁷ So as not to be extremely critical, it should be noted that at least the Trade Facilitation Agreement came into force in 2017. It contains provisions for simplification of the movement, release, and clearance of goods, including goods in transit, effective cooperation between customs and technical assistance.
companies trade. Even if the process of international trade liberalization works well, the state of free trade will be never reached. There would be no room for trade policy, no space for the bureaucracy and weaker power for the government. If there is more political will, it would be possible to continue in trade liberalization process much faster and less complicated, eliminate enormous red tape and keep only really important measures to preserve for example health and environment in a sensible way.

2.1.3 Protectionism Leading to Autarky

Protection of domestic market, mainly producers, against any external competition through any government policy is called protectionism. Each government is using a huge scope of measures that aim to protect or support domestic producers against the foreign companies that represent direct or indirect competition. Application of protectionist measures ab absurdum leads to autarky, i.e. a situation when the economy is absolutely separated from any external relations, trying to reach production self-sufficiency. Despite the global liberalization effort, the rise of protectionism period comes once in a while, and is usually connected to economic recession or political change. In the current global economy, the process of multilateral trade liberalization stagnates, while the protectionism is on the rise.

In case of international trade, the term of protectionism can be defined as the government actions and policies that restrict or restrain external economic relations with other countries with the intent to protect local businesses and jobs from foreign competition. Staying on a general level, there can be included any kind of tariffs or quotas, increasing group of non-tariff measures such as technological measures, certifications, licenses, import and financial restrictions, measures to control prices of import, etc. There are also several foreign trade policy measures that serve to force a given state to act properly.18

Although to many people it seems incomprehensible, protectionism does not include only measures that prevent foreign exchange, but also those, which ‘support’ foreign exchange, mainly in the case of export. It is the case when the government purposefully supports domestic production.19 From the theoretical point of view, the state support is also an intervention into the free market; hence such measures must be included in the category of protectionism as well.

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18 For example, the European Union and other democratic states have imposed trade sanctions on Russia because of the annexation of the Crimea and the support of the separatists in eastern Ukraine in 2014. North Korea is under pressure from trade sanctions almost constantly. The current situation in Syria has also required restrictions on trade from the side of democratic countries. Trade sanctions have been imposed again on Iran because of its nuclear program. The most recent sanctions have been taken against Qatar for its support of terrorist groups.

19 It is not the case of central bank which devalues national currency in order to achieve the inflation target. Export increase is just secondary effect, despite some politicians and economists claims otherwise.
It means that all state institutions helping to domestic companies to reach new markets abroad interfere with the free trade.\textsuperscript{20}

As noted, protectionism is in direct contradiction with the idea of free trade. Although, the long-term positive impact of liberalization was declared many times, the effect of protectionism is contradictory. Generally said, the protectionist measures may have a positive effect on the domestic economy in the short term, however, the negative effect will usually arrive in the long run. Despite all the proclamations of politicians, any significant step towards real liberalization of the world trade since the economic crisis was not made. Governments increased their activity in trade policy through the higher support of domestic producers but also higher protection of domestic market.\textsuperscript{21} The evidence of the rise of protectionism is the number of trade violations that increased from a little over 2% to 6.5% of noncompliance with the trade commitments by the G20 countries between 2015 and 2016. Moreover, there have been about 3,000 new restrictive rules adopted on trade since 2008 (IMF, 2017\textit{b}). Additionally, trade agreements negotiations at the regional and bilateral level stagnate as well.\textsuperscript{22} Despite the fact that these steps do not violate the WTO agreements,\textsuperscript{23} it cannot be spoken about moves forward, but only about returns back which are, in this case, absolutely inappropriate.

With regard to increasing sophistication of protectionist measures, mainly in the case of non-tariffs, one can doubt the trade liberalization effort. The reality is more simple. As states eliminate the visible administrative barriers to trade, they replace them with those less visible.

\textsuperscript{20} It includes subsidised export insurance or preferential export credits offered by specialized insurance companies and banks, free or cheap information about export markets, various kinds of tax exemptions or export subsidies, etc. It is also a common practice that state delegations visiting other countries are accompanied by business groups to mediate negotiations between companies.

\textsuperscript{21} The United States of America seems to be a new leader of trade protectionism. Everyone heard about the Buy American Act which was adopted during the Great Depression in the 1930s, and which was revived by president Barack Obama after financial crisis in 2009. Recently, president Donald Trump sign a new "Buy American, Hire American" executive order forcing US government agencies to buy more domestically produced products and cracking down on skilled worker visa abuse. The most recently, president Trump’s rhetoric took a strong protectionism attitude when he increased tariffs on imports from major trading partners during 2018 and continues to sharpen his actions especially towards China.

\textsuperscript{22} Some examples: there came into force the lowest number of trade agreements in 2016 during this century; president Trump abandoned the Trans-Pacific Partnership during first week of his presidency; the Transatlantic Trade and Investment Partnership is also dead as he wants to scrap it or significantly renegotiate.

\textsuperscript{23} For example, the WTO rules set the maximum admissible rate (ceiling) applied on goods. However, the applied rates of duty are usually lower enabling the government to manoeuvre with them when necessary. The difference between the admissible rate and applied rate is called "tariff water". Country can raise barriers against products that are considered to be traded unfairly from specific countries. In the case of services, countries are allowed, in limited circumstances, to discriminate.
2.2 Economic Theories in Favour of Free Trade

The division of labour and exchange were always in the centre of economic science, dealing with the possibilities of people meeting their needs in the presence of limited resources. As this is a very basic question, the first ideas were created several centuries ago. In general, the exchange is always connected to comparative advantage, specialization, and division of labour, regardless the space of where it takes place.

The division of labour is a result of specialization that creates a space for higher efficiency and productivity. As the producers consume only a fraction of their own production, they may exchange their production on the domestic or foreign market. However, at the international level, producers may enter foreign market only when they are able to pay additional costs connected to overcoming trade barriers. The market openness is, therefore, very important condition for effective foreign trade as additional trade barriers create higher costs for producers compared to the domestic market. Nonetheless, it is obvious that there is no difference between domestic and foreign exchange as they are based on the same principles: division of labour and trade costs.

2.2.1 Adam Smith’s Theory of Absolute Advantage

The idea of division of labour based on specialization was pronounced by David Hume already in the Mercantilist period. He claimed that any exchange leads to the optimization of the production structure. This idea, among others, influenced Adam Smith24 so much that it led him to the theory of absolute advantage. He emphasized the importance of specialization and division of labour in the exchange, claiming that the same principles apply at national, as well as international level. As an example, he compares production of household and nation: "It is the maxim of every prudent master of a family, never to attempt to make at home what it will cost him more to make than to buy.", and he continues: "What is prudence in the conduct of every private family, can scarcely be a folly in that of a kingdom. If a foreign country can supply us with a commodity cheaper than we ourselves can make it, better buy it of them with some part of the produce of our own industry, employed in a way in which we have some advantage." (Smith and Sutherland, 2008, pp. 292-293).

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24 Adam Smith established the foundations of liberal economics (also known as classical economics). He elaborated foreign trade in his most influential work: An Inquiry into the Nature and Causes of the Wealth of Nations (1776).
The idea of the absolute advantages results from the exchange that takes place based on the free decision-making of the trading parties. He defended free trade among countries through the theory of international division of labour and absolute advantages.\textsuperscript{25} The theory of absolute advantage is very simple. For example, if Scottish producers are able to produce wool cheaper than producers in Flanders, but those are able to produce bone lace cheaper than Scottish, it is not effective for both to produce both textiles. If Scottish producers specialize in wool and Flanders producers in bone lace, the division of labour will be crowned by mutual trade – exchange of wool for bonelace – and both countries will benefit as their wealth increases.

Smith believed that as the division of labour is limited within the manufactory, it is limited by the extent of market as well. He claims that big market offers more possibilities for the division of labour. Therefore, small markets should strive for trade barriers elimination to create one big international market with one international division of labour. The result would be the rise of the wealth of nations, which got involved. He clearly criticized Mercantilist doctrine of market protection leading to the elimination of division of labour, autarky, and decline in wealth.\textsuperscript{26} Smith considered international trade as a positive sum game when everybody wins due to the division of labour. He realized that specialization is boosting human productivity and production, resulting in benefits across the whole population. How far and how fast the benefits spread depends on how wide and efficient is the market. He stressed that the best interests of ordinary people are served, if policymakers avoid any interventions and promote open competition even at the international level.

\textbf{2.2.2 David Ricardo’s Theory of Comparative Advantage}

Smith’s theory of absolute advantage describes just a small fraction of current international trade. Mutual trade does not require each producer to have an absolute advantage over his competitors, but rather a weaker condition of a comparative advantage. It lies in the difference of comparative costs of competitors, resulting in the possibility to engage and benefit from foreign trade even with no absolute advantage. David Ricardo elaborates this idea in the \textit{On the Principles of Political Economy and Taxation} at the beginning of the 19\textsuperscript{th} century.\textsuperscript{27} As he follows Smith’s work, he based his theory also on the labour theory of value.

\textsuperscript{25} It is important to note that each economic theory works under particular assumptions. In the case of absolute advantages, it is a perfect competition, liberalized markets, trade balance, labour theory of value and international immobility of factor endowments.

\textsuperscript{26} The Mercantilism will be discussed in the chapter 2.3.1.

\textsuperscript{27} However, there is still the question who was the first defining the theory of comparative advantage. The theory is usually attributed to David Ricardo, but many historians claim that it was created by Robert Torrens or Ricardo's
Despite the fact that the theory of comparative advantage exists already two hundred years, and it represents one of the pillars on which contemporary economics is built on, it is very rarely used to explain benefits of free trade. Nevertheless, its principles are general. It explains why people specialize on production of the given goods or service and why all can be part of division of labour despite they have no absolute advantage within one or among more countries. Why an actress does not sell theatre tickets even though she would be at least as productive as a cashier, why nurses take care of patients in the hospitals more than doctors or why a prehistoric man went to hit the mammoth by his club while his wife kept the fire in the cave\textsuperscript{28}. As you can see, the theory of comparative advantage is strongly connected to microeconomic level, to the division of labour, although it is usually taught in macroeconomic courses.

Generally speaking, the theory of comparative advantage claims that the country has a comparative advantage in case of goods with the highest absolute advantage or the lowest comparative disadvantage. It proves that international division of labour can allocate the production of goods and services to the countries with lower productivity. Moreover, comparative and absolute advantages have the same properties as it causes higher total production in both countries. Specialization increases production and consumption in both trading countries. The reason is that a better use of resources in one country makes it possible to free up resources for additional production in another country. The result is a higher total production with the same level of employment, all just because of specialization.

Another contribution strongly supporting the validity of comparative advantages is the assumption of international capital immobility.\textsuperscript{29} In Ricardo’s times, producers hesitated to send their capital to another country due to the different culture, language, law, political situation, etc. Moreover, Ricardo also considered certain form of labour immobility as he says: "the fancied or real insecurity of capital, when not under the immediate control of its owner, together with the natural disinclination which every man has to quit the country of his birth and connexions, and intrust himself with all his habits fixed, to a strange government and new laws, check the emigration of capital. These feelings, which I should be sorry to see weakened, induce most men of property to be satisfied with a low rate of profits in their own country, rather than seek a more advantageous employment for their wealth in foreign nations." (Ricardo, 1817, p.

teacher James Mill. Whether it is one way or the other, this theory laid down the foundations of the most current liberal trade theories.

\textsuperscript{28} It is just an example; there is not emphasised any kind of such gender division of labour these days.

\textsuperscript{29} At the beginning of the 19\textsuperscript{th} century, the capital mobility was very difficult. Simplification came with the development of information and communication technologies, the internet and electronic money in the second half of the 20\textsuperscript{th} century.
10). He realized that if the assumption of free capital is met, the international capital flows would head to the country with cheaper labour, hence higher profit for capital owners in any industry.

However, the last assumption is not so strong anymore as the capital flows between countries are much faster than flows of goods or services. It is also one of the reasons why the theory of comparative advantages, although it is still valid, is beneficial for economic development only in the short term. Ricardo tried to prove that free trade benefits everyone and he was right to some extent. However, nowadays, free international trade based on comparative advantages may preserve economic backward in the case that countries are too clinging to those advantages and does not develop their industrial production and sector of services. In the long term, such free trade may be in direct contradiction with economic development.\footnote{This is valid mainly for many developing countries as they rely on production and export of natural resources.}

2.2.3 Terms of Trade and John Stuart Mill

The theory of comparative advantage also explains the room for mutual exchange of goods benefiting both entities while having different exchange ratio. This idea was seized and developed by another famous author of liberal economy, John Stuart Mill.\footnote{John Stuart Mill was David Ricardo's successor and his theory of comparative advantages was first presented in his most famous piece the \textit{Principles of Political Economy} (1848).} He asked the question: "What must be the proportion of the goods exchanged between entities from different countries and who will benefit more from this exchange". Despite the fact that he did not use any mathematical techniques and the theory of elasticity did not exist at that time yet, he correctly assumed that the terms of trade depend on the demands for imported products by the two countries.\footnote{This assumption was fundamentally different from the rest of the authors of political economy who assumed that the terms of trade are driven by production costs. John Stuart Mill thus observes demand side of the economy.}

Mill simply suggested that the terms of trade would be roughly halfway between the two domestic prices. Another way around, international trade takes place only when the terms of trade stand between national exchange ratios. However, there is a question in which country the consumers will gain more from international trade. J. S. Mill claims that the final value in terms of trade is determined by import demand of the country and will settle when international demand and supply is in balance. It means that if the consumers demand for production from one country is relatively bigger the demand from another, the terms of trade will stand relatively
closer to national exchange ratio of the letter country. The reason is the relation of demand for imports directly proportional to the size and the stage of country’s development.

The total benefits from the terms of trade may be described as follows: (i) economy gains a greater share of international trade, the more the ratio of the terms of trade is getting closer to the exchange ratio of its trading partner, (ii) international trade benefits more usually smaller countries if they trade with big countries. Keep in mind that a simple 2x2x2 model and perfect competition is assumed.

Finally, the scope of Mill’s contributions to the theory of trade is wider. For example, he was probably the first one, who considered the effect of transportation costs into the trade analysis. He claims that there may be the situations in which trade will not occur even with differences in national comparative costs. As he was thinking about the transportation costs as about the fixed costs, the producer cannot trade as costs to transport are too high. He also analysed the effect of tariffs on the terms of trade. He found that both price and income changes bring trade equilibrium between countries (Economic Theories, 2017).

Liberal theories of international economics belong to the most important contributions of those times. It was nearly one hundred years after Mill, when some major changes in the classical theory of international trade were established by Ohlin and Keynes.

2.2.4 Neoclassical Theory of International Trade

Another important step in the theory of trade was the contribution of two Swedish economists Eli Hecksher and Bertil Ohlin who explained the determinants of comparative advantage. They followed the Ricardian theory, which is based on differences in productivity of labour, however, which does not ask where the origin of comparative advantage is. Hecksher-Ohlin’s theory offers explanation due to differences in resources. The neoclassical economists knew that labour costs are not able to explain advantages coming from international trade by themselves as the final price is formed by many other variables. Therefore, they replaced the labour theory of value by the theory of factor endowments.

Heckscher-Ohlin model, based on neoclassical assumptions, uses the idea that each country has different production needs and different production-factor abundance. Heckscher and Ohlin derived comparative advantages from the market of factor endowments, i.e. on the labour
market and capital market, in contrast with Smith or Ricardo.\textsuperscript{33} Keep in mind that this theory is not limited to international trade only. It can be applied generally on any other exchange regardless it is between countries or within one country. Borders do not play any key role here.

To sum up, Heckscher-Ohlin theory explains that comparative advantage of each country is set by the production of goods and services, which are relatively more intensive on the certain factor of production which country is relatively more abundant. Despite the fact that Heckscher-Ohlin theory is static, the factor-endowment abundance may change over time, hence the comparative advantage as well.\textsuperscript{34} Moreover, while the production of any goods may be capital-intensive in one country, it may be a labour-intensive in another. The reason is that there is still yet one factor affecting the production: technology. Fortunately, this effect can be applied to a very narrow scope of production; therefore, it does not deny the validity of the Heckscher-Ohlin theory.

Despite the Heckscher-Ohlin model has been the subject of criticism, because of its assumption of perfect competition and its failure to prove its empirical validity\textsuperscript{35} in particular, it is generally recognized as a significant shift in the theory of trade.

\subsection*{2.2.5 New Theory of International Trade}

Before the functioning and validity of the \textit{new theory of international trade} is introduced, it is important to note why this model was developed, and what meaning it has for the contemporary economics and the gravity model. The last globalization wave is represented by collapse of the colonial system, geopolitical and technological changes and economic growth of newly industrialized countries. The global trade gained new features such as economies of scale, global value chains, and intra-industry trade and become more complex, connected by a huge network of contractual relations among producers and consumers around the world. Trade does not follow only the Ricardian and neoclassical features anymore.

As the reaction to global changes, a more general foreign trade model was needed. During the 1960s, Paul Krugman developed a model that eliminated the shortcomings of previous theories of trade, namely their unrealistic assumptions. The Krugman’s standard model of

\begin{itemize}
  \item[33] Despite the fact that Hecksher and Ohlin did not do so, there can be add also the last factor endowment: land. In this case, land-abundant countries such as Russia, Brazil or South Africa specialize on production of oil, soya beans or gold. Those facts will be proven in the chapter 3.
  \item[34] China gives a great example of change in comparative advantage as you can find in the chapter 3.4.
  \item[35] For example, the model does not consider substitution of factor endowments, their mobility and relative demand, differences in the economic growth of developing countries, transportation costs, etc. Perhaps the most famous empirical study denying the validity of Heckscher-Ohlin model is known as Leontief's paradox. For more information, read Feenstra (2004), Carbaugh (2005) or Krugman (2012).
\end{itemize}
Trade links together the Ricardian model, the model with specific factors, and the Heckscher-Ohlin model.

The new theory of trade, which is associated with the name of Paul Krugman, deals with the assumption of monopolistic and oligopolistic competition. Krugman’s model is able to incorporate increasing returns to scale depending on the product differentiation (in the case of monopolistic competition) or the expectations of the producers (in the case of oligopoly). Increasing returns to scale, i.e. decreasing average costs of production, become important feature providing additional profit to companies or whole industries. If the industry is significantly involved in the overall production of the country, or there are more of such industries, the economies of scale will affect the production function of the country, hence its production possibility frontier (PPF). Economists noticed this effect due to multinational companies’ operations around the world. Due to their size, they benefit the economies of scale decreasing average fixed costs and increasing productivity due to specialization. As the name suggests, the crucial assumption for economies of scale is the market size.

Trade based on increasing economies of scale benefits the economy because of lower production costs. The reason for economies of scale may have many sources, such as comparative advantages, historical ties, localization, etc. Nevertheless, the lower production costs are the reason why so many multinational corporations move their production overseas to developing countries. Such companies use local economies of scale created by low production costs and then export final products or intermediates to consumers back to developed countries.

In the monopolistic competition, the number of companies and the prices of goods are significantly determined by the size of the market. Large market enables more firms producing a large variety of goods for lower prices, gaining higher sales. Moreover, in case of international trade, the market can expand fast due to removing administrative trade barriers. Additionally, as producers in both countries produce the same but differentiated products, consumers have a wider range of choices. Specialization in combination with bigger market pushes the costs of production benefiting both sides of the exchange.

36 It is based on four basic relations: (i) the production possibility frontier and the relative supply curve, (ii) relative prices and relative demand, (iii) the determination of world equilibrium by world relative supply and demand, and (iv) the effect of the terms of trade on nation’s welfare.

37 The Krugman’s assumption represented a huge change in the understanding of the world trade system compared to the previous classic and neoclassic models.

38 It is necessary to distinguish between two kinds of economies of scale. While external economies of scale depend on the output of the entire industry resulting in a large number of small firms (monopolistic competition), internal economies of scale are based on the size of each company (rather oligopolistic competition).
The Krugman’s model concludes that product differentiation stemming from the nature of monopolistic competition and increasing economies of scale creates new conditions for trade among countries, where consumers have similar preferences, despite the fact that they do not have differences in comparative advantages. Such conditions instigated to create of intra-industry trade (Krugman, Obstfeld and Melitz, 2012). Additionally, consumers benefit from a higher variety of products at lower prices. It is what Krugman calls "love for variety".

First thoughts of intra-industry trade appeared already in the 1920s, but its theoretical background came up four decades later. That time, Staffan Linder explained this trade phenomenon by the similarity of consumer preferences across countries, which are on the comparable level of development. He stressed that a crucial assumption for economies of scale is the similarity in demand, represented by income level on both markets. In other words, Linder claims that the more the volume of trade between two countries, the more similar is their demand structure. However, this statement is valid only for the final production. It implies that international trade of commodities and intermediates is relatively well explained by classical and neoclassical theories. Using gravity model of international trade in following chapters, there will be tested the validity of both hypotheses on case of trade flows between the EU and BRICS countries.

In this sub-chapter, the questions which were set at the beginning of section 2.1.1 were answered. Due to the Ricardian theory of comparative advantage, the question number one was addressed: Why countries join international trade network and what are the benefits on the supply and demand side in various kinds of countries? It was proved that trade always benefits both sides when they have different terms of trade on the domestic market. Through the Heckscher-Ohlin theory of differences of factor endowments and Krugman’s theory of increasing economies of scale, there were provided answers to the question: What is driving the structure of international trade, why is the structure of export and import similar or different across countries? There was showed that structure of trade is based on relative abundance of factor endowments of each economy, as well as on similarities in consumer preferences and relative level of development between trading countries. Finally, last question: What are the terms of trade causing international trade, simply said what must the relative prices of the exchanged product look like to be the subject of trade? It was answered due to the theory of J.

39 It is the exact opposite conclusion to neoclassical theories valid until that time.
S. Mill in terms of trade. It was demonstrated that international terms of trade will be always formed between exchange ratios on the domestic market.

To sum up this subchapter, free trade does not take place unless both parties expect to benefit from it, as it can still be advantageous even if one country has worse productivity in comparison to its trading partners. Trade still can be advantageous even if one country is inferior in productivity to its trading partners. According to David Ricardo, country will always find a range of goods in which it has comparative advantage.

2.3 Economic Opinions Defending Protectionism

As it was emphasized in the sub-chapter 2.1.3, protectionism is a set of government actions and policies that restrict or restrain external economic relations with other countries. There are various kinds of reasons to use protectionist measures. Although some of them have a kind of rational justification, most of them are false. Despite the function and positive effect of protectionist measures have already been denied by many economists, some politicians, and many people still claim; maybe even believe, in their usefulness. People sometimes do not perceive that international trade is not about competition, but about a mutually beneficial exchange, as it was proved in the previous sub-chapter. Imports, hence the need for consumption, are the purpose of trade, not exports. As export is not the objective of trade by itself, a country must bear a burden of its inhabitants need to consume goods and services they are not producing themselves. Setting to very abstract macroeconomic level, what a country gains from international trade is the ability to import things it wants.

To paraphrase Krugman (1997a), people who call for protectionist measures believe themselves to be smart, sophisticated and forward-looking; nonetheless, they do not know that they are just repeating set of misleading clichés as many before them. Therefore, following subchapter will provide an insight into several mostly used claims to defend protectionist measures and elaborate their truthfulness. As in the previous subchapter, the chronological development from Mercantilism to the newest protectionist theories will be introduced.

2.3.1 Mercantilism and Defence of External Balance

Mercantilism significantly shifted thoughts about economic relations from moral statements, represented by Antic and Christian philosophers, to practical issues of trade and national economy. Sirůček et al. (2007) points out that the highly pragmatic way of thinking was the
product of emerging economic, social and political conditions (similar to recent situation in China). From the historical point of view, it is necessary to realize that Mercantilism was created under the certain circumstances of economic development characterized by overseas discoveries and exploitation of their wealth in the period of 16th-18th century. Despite the fact that the current external economic relations are more complicated, they were represented mainly by trade relations during the Mercantilism era.

The main aim of Mercantilism was to increase the wealth of the nation, meaning the value of precious metals and money in the given territory through mining the precious metals or active trade balance. Mercantilists perceived international trade as a zero-sum game because the international division of labour and specialization was not taken into account. Hence, they thought that the country with active trade balance wins and also gains money inflow and the other country loses. However, the gains of this strategy benefited only narrow groups of populations, mainly Royal Court, aristocracy or merchant companies. The desire for wealth led the state to be highly involved in international trade (monopoles to trade with colonies, tariffs for domestic market protection, etc.). Unfortunately, the impact of this policy was highly negative to regular inhabitants.

Consequently, the word accompanying the whole interpretation of mercantilism is the trade balance. Precisely, this argument is used by many politicians even today, despite they should know what negative consequences this policy had in the times of Mercantilism. Therefore, it is necessary to elaborate if the negative trade balance represents a real problem and if the protectionism may ensure its balance.

41 It is the period of full-value money determining purchasing power.
42 For example, the Corn Laws enforced by the United Kingdom on imported grain, mainly against French producers, in the period 1815-1846, caused high prices of basic food on the domestic market having a severe impact on poor people. Such people as Thomas Malthus and David Ricardo came to the fore due to the Corn Laws. Many serious problems were caused in France in the 17th century (the era called Colbertism, according to state secretary Jean-Baptiste Colbert). He restricted grain exports causing oversupply on the domestic market, hence low income of agriculturists and their families, increasing rural poverty. Such restriction allowed keeping low prices of industrial production and export which was necessary to compete with more developed Dutch production in third markets.
43 In this sense, the current US president Donald Trump overcomes all other politicians. Among all, he criticised Germany for “too high” trade balance with the USA claiming that Germany has to decrease it. Not only that it is absolutely false to accuse only Germany, when the US trade deficit with Japan, China or Mexico is more negative, but also Germany is not holding power above its trade policy (it has the European Commission) neither exchange rate policy (it has the European Central Bank). Moreover, he also points out higher tariffs American producers have to face on the European market. Nevertheless, all these distortions happen in the name of protectionism, not in the name of the free trade. Finally, such statement strongly reminds thoughts of early mercantilists to have a positive trade balance with each trading partner.
First of all, the term of external balance needs to be defined. The broader definition says it is the equilibrium between money outflows and inflows of the country. If there is considered only the international trade, the external balance would represent the situation when money the country brings in from exports is roughly equal to the money it spends on imports. This could be considered as the definition in times of Mercantilism. Nowadays, it is not possible to consider trade balance as independent part of external relations.

Even though the criticism of the current US administration is not the aim of the thesis, its proclamations give a great view to think of trade protectionism. President Trump said: We import nearly USD 800 billion more in goods than we export. We can't continue to do that …, it's a political and politician-made disaster. It is very simple. And it can be corrected and we can correct it fast (Bloomberg, 2017). Unfortunately, it is not that simple. The problem of external trade deficit can be easily transferred to the level of individuals. Each person buys food in the grocery store, it means that consumer buys goods and pays money to the producer or merchant, hence, he achieves bilateral trade deficit. Is it such a disaster as president Trump says? It is absolutely not as long as there is enough income from other sources to make up the debt. There are various ways to gain the money that is spent. One can earn money by his own production and services, one can own capital or land receiving rent, one can get money from the inheritance, or one can borrow money from someone having savings. The problem in Trump’s interpretation is his limitation of external balance to the trade balance without considering other parts of the balance of payments, or other parts of current account at all. It is the same as the only way to shop in the grocery store is to offer a different product. Such policy would send us back to the barter society.

Moreover, it is absolutely false to take into account only trade deficit of goods, without considering other parts of the current account or the balance of payments, including fluctuations of the exchange rate. It is an absolutely legitimate source of financing the deficit of one account by the surplus on another. In a theoretical way, as all residents decide to borrow money abroad and buy imports, the trade deficit will be financed ceteris paribus by financial account surplus. It means that residents create debt abroad to consume goods from abroad. Their ability to pay the debt depends on possibilities to purchase foreign currency by any of above-mentioned ways in the future. The most traditional way in the current globalized economy is to repay old debts

44 It is clear that it is not possible to finance the current account deficit by foreign exchange reserves, financial aid or international loans in the long-term. However, it is important to note that all those mechanisms are highly used in many developing countries.
by the new ones. If there is someone able to borrow money with the positive expectation of his or her repayment in the future, this mechanism may work even in the long-term. However, if the credibility of the debtor is distrusted, the debtor may get fast into insolvency. It is important to note that, in case of international trade, it is still about the relationship between creditor and debtor, not between two states. \footnote{The same principle may be applied also for states as they borrow money on international markets to finance their public debt.}

In case of Trump’s statement about the trade deficit, the problem lies in other parts of the US balance of payments, namely financial account. The reason for high US trade deficit is really simple: the US citizens spend more than they produce or, in other terms, borrow more than save. \footnote{If you look at the statistics of the US net national savings, you can find that they were even negative during the period 2008-2011, currently about 3% of gross national income. On the other hand, the saving rate in countries as China or India was 25%, 21% respectively, in 2015 (World Bank, 2017a).} Hence, trade deficit is not a symptom of bad trade policy, but of the Americans’ tendency to generate enormous debts. Simply said, the USA must import savings from countries like China, Germany or Japan, which have high surpluses. Threats in the form of tariffs on imports are nothing more than a political bluster. Imposing trade barriers on imports from a few trading partners will simply just transfer to trade deficits with others (Financial Times, 2017). Hence, the only meaningful solution to US trade deficit is to boost domestic savings. You may find a similar problem in many developed countries.

However, it is not a usual case of developing countries, which use other ways to finance trade deficit. For example, many people from the Commonwealth of Independent States work in Russia sending home remittances that are used to purchase goods from Russia. One part of the current account is balanced by the other part. Additionally, in case of many African countries, imports are purchased directly in foreign currency as many countries are highly dollarized. It means that imports are financed by foreign reserves loss. Hence, the value of trade deficit is not important if there is a possibility to finance it from other sources.

Is it possible to reduce trade deficit by import restrictions? According to some politicians, economists and people, external imbalances may be restored by protectionist measures. The government may introduce or increase already existing tariffs on imports, impose quotas or even prohibit imports. Theoretically, all these measures could reduce imports and improve the trade balance. However, not in the current globalized and highly interdependent economy, which is linked by global value chains, free capital movements and business relations. Such steps would most probably cause bigger harm. Imposing tariffs to restore trade balance is
probably the worst remedy the politicians can make. Unfortunately, this argument often wins in the eyes of society as it is easier to understand statements as "save American jobs," "buy American" or simply blame foreigners for our trade problems. Politicians are aware of these statements’ power, hence explaining the trade deficit equalizing mechanisms or functioning of balance of payments would be unnecessary strain.48

One of the reasons why protectionism is not successful to balance trade deficit is that it leads to retaliation. If state imposes trade tariffs to reduce imports, they will most probably fall.49 Nevertheless, if foreign country will react and revenge by the same or similar measures,50 the exports of home country will fall and trade deficit will appear again. This scenario may or may not happen, however, world trade will suffer for sure.51 Even when foreign countries do not react, protectionist measures may not improve trade deficit. Declining imports reduce supply of domestic currency on international market, pushing the value of such currency up. It will encourage imports, as the goods abroad will be cheaper and hurt exports. As a result, trade deficit will appear again (Baumol and Blinder, 2012). In general, using tariffs to protect domestic market leads to loss of competitiveness, slow technological development and lack of innovation, preservation of level and structure of production, suppression of competition on domestic market resulting in higher prices, wages, inflation, unemployment, economic autarky and finally isolation from external economic relations in the long-term. The long-term trade deficit may be a problem for most countries because it slows economic growth, especially when the deficit is financed by capital flows. The foreign creditors may be suspicious about an adequate return on their investment and they will stop buying the debt. Hence, interest rates will need to climb up reducing domestic economic activity and rising debt service. If the demand falls off, the value of domestic currency will depreciate.52 Then it is only a vicious circle.53

Although the Mercantilism was replaced by the classical political economy in the 18th century, its ideas were reflected in much younger Keynesian economic theories, and mainly in

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47 In the following sub-chapter, there will be proved that neither this claim is correct.
48 Politicians mostly do not understand these mechanisms by themselves.
49 If it is not a commodity which the country is dependent on, as raw materials or food, however, tariffs would not be most probably imposed on goods in such case.
50 This is currently the ongoing situation as economies, headed by such countries as China, European Union, Russia, Turkey, Canada or Mexico, imposed higher tariffs on US products as the reaction to Trump’s actions.
51 Effect of trade policy measures will be presented in the following chapter.
52 Current situation in Turkey may serve as a great example.
53 Keep in mind that the whole balance of payments is created by free decisions of individuals about their production and consumption, i.e. about their money flows. It means that final form of balance of payments is a result of free exchanges, which were done because they were benefiting their originators.
practical economic policy emphasizing the need to protect and support domestic market in the same time. As you will see within this chapter, the ideas of protectionism are still alive in the form of restrictive trade policy and market protection. Moreover, since the economic crisis and new administration in the United States of America, the international protectionism is rising up transforming to the position of trade wars among the biggest economies. It was proved on several examples and real cases that protectionism cannot restore negative trade balance; or the trade deficit problem per se.

2.3.2 Infant-industries and Protection of Employment

The argument of infant-industry seems to have very strong support of protectionists. Even liberal economists take this reasoning seriously because it does not totally deny the validity of free trade (Carbaugh, 2005). Protectionists claim that new industries (infant-industries), mainly in developing countries, need protection against more efficient foreign competition, as they have to face high costs connected to capital investment and business development until they are competitive. In other words, the infant-industries cannot develop based on free trade because they are not competitive enough as its production would be driven out of the market by cheaper products from abroad.

The infant-industry theory was compiled by German economist Friedrich List in the 19th century. List emphasizes that industry grows due to economies of scale as small industry produces with high costs and when it becomes large, it is able to reduce costs to the level it is competitive with foreign companies. This argument is in line with classical political economics. Hence, Adam Smith or J. S. Mill understood the arguments of infant-industry protectionism in the same way. They also assumed that production in the protected infant-industry should create new skills and experience necessary to lower costs of domestic production. Mill argues that protection should be confined to those cases in which it is reasonable to expect that the industry, after a learning period, will be able to survive without government intervention. Similarly, List

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54 Friedrich List was a predecessor of the German Historical School emphasising that economic events are determined by historical evolution of the nation. Hence, they were in opposition to classical economics that look for universal rules of economics valid for all countries.

55 Notice that arguments of infant-industry protection are older than Friedrich List formulated his theory. Alexander Hamilton, the second president of the USA, initiated debate on protectionism-required-infant-industry already in 1791.

56 J. S. Mill writes in his Principles of Political Economy (Mill, 2017, p. 701): "The only case in which, on mere principles of political economy, protecting duties can be defensible is when they are imposed temporarily (especially in a young and rising nation) in hopes of naturalizing a foreign industry ... A protecting duty continued for a reasonable time, might sometimes be the least inconvenient mode in which the country can tax itself for the support of such an experiment. But it is essential that the protection should be confined to cases in which there is ground for assurance that the industry which it fosters will after a time be able to dispense with it."
claims that infant-industry needs protectionist policy to develop, however, since the industry is strong enough; it should face free trade policy. Although this approach seems to be reasonable, its transformation into the real economic policy is very questionable as no one ever defined the difference between infant-industry and "adult" industry.

The theory speaks about the whole industry protection, however, each industry is composed of several or many companies. In such case, does it mean that the government should protect every new entrepreneur as all of them face certain difficulties at the beginning of business because of sunk capital? If it is assumed that foreign industries are more productive, their sunk capital creates certain comparative advantage compared to the domestic infant-industries. Despite certain time sunk capital does not represent the cheapest production possibility, it may still serve to decrease production costs. In other words, replacement of production capital depends on time preferences and return of capital to entrepreneur. The higher costs of sunk capital, the easier way to succeed for new producers on the market because new capital is more productive than the old one. This is the reason why new businesses are formed without any help of the government. Producers establish new businesses to reach profit, however, it is their own decision where and how to invest their capital. This is the only way in which all factor endowments may be used effectively. If there is an industry, which is not worth to enter by new producers according to their free decision, the state should not force its development by trade restrictions.

Another argument against protectionism is that it is highly probable that once the government begins to protect infant-industry, it will not stop when the industry is "adult" because they do not know when it is "adult" enough. It is also possible that even after decades, the infant-industry is still underdeveloped because it did not have sufficient impulses from competitors abroad, which would encourage it to be more productive or develop faster. This is the major argument of classical economists. Some more liberal economists say that better solution to support "young" industries is the provision of subsidies rather than trade barriers. However, subsidies have their own negative consequences connected to public expenditures, corruption, deformation of the internal market, etc. It is obvious that the problem of infant-industries belongs to the state industrial policy, which decides which industry will or won’t
support. To sum up, in the case of free trade, the effective industry will not need state support in any form, hence industrial policy protects mostly only inefficient industries.\(^{57}\)

Similarly, all issues mentioned in this sub-chapter may be transferred to the regional level. Why the government does not support infant-industries in the region, when it has competitors in other regions?\(^{58}\) Simply, because it would be against the protection of competition law. For example, imagine that the new English producer of shortbreads has to compete with traditional Scottish production. What an absurd situation would happen if the government in London would support such English company by introducing tariffs on Scottish imports of shortbreads to England. Hence, if such a situation is absurd on the national level, why it should exist on the international level?

Additionally, while the protectionism may benefit some countries under certain circumstances, such policy represents costs for international trade because of economies of scale. As it was showed in the sub-chapter 2.2.5, trade barriers raised among countries do not allow companies to apply economies of scale, as they cannot reach foreign markets. Since any country decides to protect its market, the global market will break down into fractions. It means that each country will represent only small fraction of the world market with small localized and inefficient productions, resulting in lower economic growth and welfare.

Another strong reason for trade protectionism is employment or job protection. Historically, loss of jobs due to foreign competition is still the most used reason for protectionism. It usually appears in the periods of economic recession, including recent economic crisis.\(^{59}\) As the unemployment increases, the need for domestic employment protection through trade protectionism always magically appears. Sometimes, the arguments in favour of protectionism appear even in the years of economic prosperity. The main argument is cheap foreign labour that threatens domestic jobs. It is clear that wages are very different across countries. As it can be seen in Annex 1, developed countries have much higher average earnings than developing countries. Most of people in developed countries believe that products from low-wage countries

\(^{57}\) For example, Pakistan and India have protected their manufacturing sectors, for example heavy industry, for decades without any successful result. On the other hand, light manufactures in those countries, namely textiles, are nowadays highly competitive on the world markets without any previous form of protection.

\(^{58}\) State has many tools to support producers at any level, in any industry or in any region, however, it is never called in the name of infant-industry protection.

\(^{59}\) President Trump is an unabashed protectionist. In his inaugural speech, he exclaimed: "Protection will lead to great prosperity and strength." That returns to the late 1920s and early 1930s when a similar mind-set led to the passage of the Smoot-Hawley tariffs, a global trade war and the Great Depression.
are harmful and unfair to their employment. This argument is simple to understand and seems reasonable. Trade protection may in this case wipe out wage differential between countries.

However, such policy may hurt domestic economy anyway. Comparing, for example, average earnings in Germany and China in 2015, while average monthly earnings per worker in Germany reached USD 4,413, it was only USD 830 in China. It seems that producers in China have a huge comparative advantage, as their labour costs are more than five times lower. It is not necessary to go so far to China.\(^6^0\) Average earnings in PPP in the Czech Republic reached only 42% of Germans earnings, in Bulgaria even only 24% in the same year. Despite that, all countries are members of the European Union, the biggest free trade area in the world.

However, as you may have already recognized, there are several bottlenecks to this theory. It cannot be valid because it absolutely misses the relationship between productivity, wages, and costs. Wages are not related only to the costs but also to the productivity. Hence, if productivity is high in the domestic country, labour may still reach high wages and be competitive compared to the foreign producers. If the productivity of domestic labour is higher than their wages compared to abroad, the domestic costs actually fall.\(^6^1\) Annex 1 shows that the productivity in developed countries is higher than in developing countries, hence earnings are higher as well.

It confirms that low wages by themselves do not guarantee low production costs if it is not counted with other costs and productivity. Following Hecksher-Ohlin theory, notice that countries with cheap labour tend to have comparative advantage in the production of labour-intensive goods, as the country is a labour abundant, wages are low and production cheap. In such case, countries with high wages may have relative disadvantage compared to the cheap-labour country, however, only in the production of labour-intensive goods. It is the reason, why countries with high wages import cheap labour-intensive goods from abroad. A great example of the Hecksher-Ohlin theory in practise.

The idea that it is possible to protect employment by trade policy measures is very misleading. Before the negative consequences of lifting trade barriers in the name of job protection are elaborated, it is necessary to think how this would work on national or individual

\(^6^0\) It is more correct to point out earnings in purchasing power parity (PPP). In this case, average monthly earnings in China are only 3.5 times lower.

\(^6^1\) Comparing productivity and wages in China and Germany, there can be found very similar differences, however, while the productivity in South Africa is half compared to Germany, average earnings are nine times lower. In the Czech Republic, this difference reached value of 2.4 in 2015, it means that the labour is very cheap compared to German’s with the same productivity.
level. As well as nations, even regions within one country are abandoned by factor endowments very differently. Can someone imagine that the mayor of Paris would increase tariffs on imports from Pas-de-Calais or Provence to safe local jobs, and that Parisians would start to grow their own crops or maize in front of the Eiffel Tower or build ships in Montmartre?

The defence of job protection fails on several levels. It is claimed that the trade restrictions increase employment in the industries, which are protected by reducing the foreign supply, hence increasing the price for domestic consumers. Domestic related industries also gain jobs. However, industries that buy products abroad have to face higher costs. These additional costs will be later passed on to the consumers through higher prices, decreasing purchasing amount of goods. Hence, the employment will fall anyway.

For many countries, especially for small open economies, imports are a very crucial source of production and exports. Hence, international trade has important dual function for the economy. Countries export because they want to import. Respectively, people or companies sell abroad because they desire to buy abroad. When people in the Czech Republic import goods from China, producers, and workers in China gain purchasing power what, eventually, may be spent on goods from the Czech Republic. As Carbaugh (2005) claims, rather than promoting overall employment, imports change the structure of employment across industries. Unfortunately, the job gains due to open trade policy tend to be less visible to the public than the readily observable job losses stemming from foreign competition.

Finally, each country that has to face new tariffs may retaliate and lift up tariffs on import from the targeted country. This may lead to the set of protectionist measures resulting in trade war, which no one will benefit of.

2.3.3 Arguments Defending Protectionism in Developing Countries

All countries, even those, which nowadays call for a rapid trade liberalization, have used protectionist measures. As it was mentioned in chapters above, current world trade liberalization efforts are mostly feigned as all countries use more sophisticated and hard-to-prove tools to protect their markets. Especially developing countries have doubt about positive effects of free trade on their economies. Many politicians and also economists defend the use

62 Despite the fact that Czech export to China is marginal, Chinese will probably consume more goods from Germany, hence it has significant impact on Czech economy anyway.

63 Media and politicians have a great merit on that. For example, only big foreign investments creating many jobs are promoted in the Czech media. However, when one mine is closed because it became non-profitable, such news fills several weeks in the main broadcasting time. Moreover, politicians are saving such industries from the state budget, hence from taxes, proud of their success of saving jobs which will be lost sooner or later anyway.
of protectionism in the case of developing countries, claiming that it may accelerate their economic development.

The fact that companies and individuals from various countries trade with each other signals that the trade benefits all of them. Otherwise, why would they do it? Therefore, it is important to ask one question. Why the governments of developing countries prevent people to trade using administrative trade barriers? They use many arguments that were disproved in previous sub-chapters. However, there are several arguments that you would not find in the claims of developed countries’ policymakers.

Position of developing countries in the world economy has become the hot topic as a consequence of geopolitical changes after the Second World War. The protagonist of protectionism claimed that the liberalization process caused many economic troubles to developing countries. There are many reasons why so many developing countries still stay out of the international trade network and why trade liberalization may harm their economic development. For example, the most common reason is a strong focus on export of natural resources or low-tech production, weak domestic market, bad infrastructure, unfavourable terms of trade, inefficient factor endowments allocation etc., completed by many social, political, ethnic or religious issues, which strongly drive economic development down. All these factors may have different effect on the economy than it would be expected from trade models applied for developed countries. However, the claim that the free trade is inappropriate for developing countries is based on several arguments, which is possible to elaborate.

Alternative theories usually appeared as the economists realized that the terms of trade do not go in the direction it would be expected according to the economic theory. One of the alternative theories explaining the worsening of terms of trade was put forth by Jagdish Bhagwati (1987). He found several cases when increasing productivity decreases economic wellbeing. This theory is called "immiserating growth". He noticed that in some developing countries, producers react completely the opposite to price changes. Let us assume that international price of any goods declines. According to the mainstream economics, firms will restrict their supply. In developing countries, however, firms produce more and more goods to prevent their income to fall.\textsuperscript{64} Paradoxically, they create a surplus of supply over demand, which continues to push the world price down. This process gets domestic producers to the vicious circle. The result is that the terms of trade of the country still worsen as the companies produce

\textsuperscript{64} Despite the fact that Bhagwati defined his theory in general, the protectionists in developing countries broadly accepted this idea as a reason to use protectionist measures (Pryor, 2007).
more and more goods selling it for lower and lower prices. According to Bhagwati, this effect may appear only in the situation when the economic growth relies heavily on export industries and the country is able to affect, significantly, international prices of exported goods, as the world demand elasticity is very low.

Although the protectionists usually use the argument of immiserating growth in favour of trade measures, their application will not prevent worsening the terms of trade. For example, Indian production of textiles is so huge that it is able to affect international prices. The mainstream economics claims that if the Indian producers know that international price is declining, they would reduce their production of textiles until the prices start to rise up again because they have no motivation to produce more or increase their productivity. They would rather spend more free time or move to production of different products, i.e. products, which prices are rising up. As firms behave rationally with the aim to gain profit, they do not need someone else, for example, the government, who would tell them how much or what to produce. It is the reason why the existence of immiserating growth was proved in only very few empirical studies regarding minimum of countries and only in the certain periods. However, none of them did prove that protectionism would reverse such situation. According to Charles P. Kindleberger (2003), companies in developing countries are not able to follow decreasing prices by adjusting their production and substitute it by the production of other goods because they are limited by their primitive social environment, traditions, and habits.

Paul Prebish (1950) and Hans W. Singer (1950) offered an explanation by dividing the world economy on the centre (developed countries) and the periphery (developing countries) which differ by income elasticity of demand. They found that all profit goes to the producers in the centre as they import a primary production from the periphery; create value added by manufacturing and export back to the periphery. They claim that the growth of primary products’ prices, typical for developing countries, is slower than a growth of prices of final goods they import, as the income elasticity of demand of the final goods is higher, i.e. the terms of trade of developing countries worsen. Moreover, new technologies allow increasing wages and profits in the centres resulting in the accumulation of savings. Therefore, producers in developing countries may became relatively poorer despite the fact the volume of their

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65 See for example Pryor, 2007.
66 Their theory is based on empirical observations of the Organization for Economic Cooperation and Development (OECD) and developing countries.
67 It means that increase of the world income affects increase of demand for final goods faster than demand for natural resources and food products.
production may increase, as it is not sufficient for purchasing goods on the world market. In other words, they purchase less imports for the same amount of exports.

Prebisch and Singer offer the solution of worsening the terms of trade by industrial substitution of imports. The substance of this theory, usually introduced in developing countries, aims to replace reliance on imports from developed countries by own industrial production. The government protects newly-formed domestic industries by high tariffs usually completed by the state subsidies for such sectors, to develop the ability to compete with imports. Actually, it is the principle of infant-industries protection introduced in the previous sub-chapter. Although the example of Latin American countries may serve as a model for other economies, the Prebisch-Singer hypothesis has several bumps. The problems of developing countries do not rely on the world prices only. As it was already said, there are many other factors negatively affecting their economic development starting at the political level (political instability, national interests, corruption), through social matters (unemployment, poverty, income inequalities), infrastructure (energy, transport), environmental issues, etc.

2.3.4 Other Arguments in Favour of Protectionism

There are many other preposterous reasons to ban international trade using administrative measures; however, most of them do not rely on any economic arguments. In this sub-chapter, it will just briefly follow the arguments that can be heard in today’s media or political proclamations.

On the side of developing countries, tariff revenues serve as a very important source of national budget income as they usually have a problem with tax revenues on their own territory. As the national borders are usually heavily protected, the inflow and outflow of goods are strictly under the control of state administration as they may be transported just through clearly defined locations such as ports, roads, railways, and airports. Tariffs are also easier for administration than other types of taxes. However, the budget income resulting from tariffs is very limited as it increases costs of households and companies and decreases consumption on the domestic market. Tariff revenues are just an additional tool for the government redistribution carrying all the negative effects of state functioning as a lack of

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68 For example, policy of industrial substitution of imports was successfully introduced in many Latin American countries during the 1950s-60s. However, the economic turbulences of the 1970s and depletion of industrial substitution of imports caused many problems for following decades.
69 For example, tariffs shared more than 20% of total budget revenues for twenty-six developing countries in the period 2010-2015 (World Bank, 2017a).
70 Compared to the European Union law which bans tariffs on export, developing countries use them on certain commodities very often.
efficiency, corruption, mismanagement of redistribution and time inconsistency. Moreover, increasing tariffs may decrease imports at the level that will result in the decline of total budget revenues. Tariffs are not the right way to increase budget revenues as they reduce exchange interactions among producers and consumers, limit economic activity, and inefficiently allocate production factors. Rather than imposing tariff barriers, governments should eliminate them and create efficient system of domestic taxes (mainly indirect taxes).

Argument often used in favour of protectionism, especially since the economic crisis in 2008, is national security that claims that every country should be self-sufficient in the production of strategic commodities. This argument is usually used by populists who claim to protect domestic employment or producers who are not able or do not want to compete with other international producers by calling domestic production a strategic one. However, in such case, any production and any commodity may be called as a strategic in such case, from oil, coal or wheat to electronics, high-technologies, guns, etc. It means that the national security may be questioned so long until the country becomes self-sufficient, hence autarky without any external economic relations. No one can imagine how the reduction of natural resources imports could cause their production on the domestic market. In such case, people would lose electricity, transportation, defence, industrial production and highly probably the agriculture production as well. Following the logic of this argument, one can say that security of any region within one state, neither security of any individual, is not adequate until he is self-sufficient. In such case, everyone who is not producing wheat or milk and relies on economic interactions is at the risk of starving and dying. Such consideration is extremely pointless, as economic relations always need two sides for exchange, supply and demand (Šťastný, 1999). Any country seeking to ban exports of goods to consumers abroad would lose sources of income, which all have negative effects on the domestic economy. Hence, the national security is very relative and such trade measures are used only in the state of war. However, neither in such case, the country can become self-sufficient. Usually just changes the supplier.

71 Tariff is just an equivalent of a tax, hence the Laffer’s curve is valid in this case as well, however, carrying more negative effect.

72 None of the countries may be self-sufficient as they miss any reserves of natural resources (the European Union members have to import about 90% of their oil consumption), favourable environment for agriculture (coffee or tea production in Russia would be very expensive) and many others.

73 Current political situation between the European Union and Russia is a great example. Despite that both countries threaten with economic sanctions, none of them were introduced in the way to hit economic life of the other side significantly as the negative reaction would return back. No-one can imagine that the European Union would ban imports of gas and oil from Russia and vice versa.
One special type of international trade restrictions is called embargo. It is usually used with political motives to force some other nation or its administration to behave in certain way. However, the effect of trade embargo is highly questionable as its results may or may not be effective. In a country that has to face international embargo usually declines economic activity and standard of living very fast. Moreover, such situation leads to the easy way to find external enemy in the countries ruled by dictatorship, even more, it helps them to foster their position (North Korea or Iran may serve as a great examples). It is not necessary to emphasise that this clearly political measure has negative effect on trade relations as well.

The government should state and guarantee the medical or security harmlessness of products, and leave the decision making process about purchasing goods abroad on domestic demand. Moreover, contemporary production of goods is so highly dependent on the global value chains that it does not allow marking most of goods as purely domestic. Such policy may also have a negative effect on nationalistic tendencies, which were noted not only against the non-EU products but also within the common market. The USA shifted this campaign the farthest when they introduced the ‘Buy American’ provision. Despite the fact that such provision may be understood in case of economic recession to stimulate economic growth, recently, when the US economic growth was about 2% p. a., president Trump reinforced this idea by introducing ‘Buy American, Hire American’ Act. Some people consider the self-sufficiency in production as a positive symbol that they are able to produce their own cars, computers, of phones, regardless of costs.

Last but not least, there should be mentioned thoughts of anti-globalization movements voiced recently again in connection to the meeting of the G20 in Hamburg in 2017. The aim of anti-globalization movements is a rejection of the ideology of neo-liberalism and the global expansion of corporate capital. They believe that international agreements and global financial institutions undermine local decision-making. Despite all those proclamations of social equality, environment protection or anti-war policy, their actions are usually associated with committing criminal offenses, fight against democratic authorities, expressing their disagreement with international politics, etc. The fact that they do not suggest any alternative

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74 One of the longest-standing and most well-known embargos are against Cuba, Iran or North Korea for their nuclear programs or activities against democratic countries.
75 Embargo is imposed by group of countries, usually approved by the United Nations General Assembly.
76 He said that he has raised the alarm over unfair foreign trade practices that have robbed communities of their wealth and robbed inhabitants of the USA of their ability to provide for their families. He accused other countries for stealing American jobs and robbing their companies (Jacobinmag.com, 2017).
77 It is the same principle as an obsession of many countries to host the Olympics, despite the fact that they were almost always unprofitable.
ways to the current globalization process is the best evidence. The representatives of such movements, mostly anarchists or rising extreme left-wing activists, claim that globalization process leads to the universal decline of the standard of living, widening inequalities among countries (poor are poorer and rich are richer) and depleting of developing countries. It is true that globalization does not have a positive effect on economic development only; however, the negative effects are usually connected to mismanagement of domestic policy rather than aimed effort of the capitalistic world. The whole globalization process is nothing more than just realization of international demand and supply; hence, you always need two sides that support globalization process (Šťastný, 1999). No one will supply domestic market with goods produced on the other side of the globe if there is no demand. Similarly, no one will open McDonald’s if no one would like to eat there. Hence, the anti-globalization movements blame a global process, while they should blame people who want to consume foreign goods. If this simple principle is understood, the anti-globalization effort aims to prohibit, restrict or reduce the freedom of choice, the freedom of people.

2.4 Trade Policy and its Measures

Trade policy of each country uses a variety of measures to promote their economic strategy and affect their trade flows. During the second half of the 20th century, the process of international trade liberalization had taken place because of post-war development. In 1947, the General Agreement on Tariffs and Trade (GATT) was signed, having a major impact on the world liberalization process. Its aim was to remove customs barriers and apply the principle of non-discrimination in international trade, which is executed on the Most Favourite Nation (MFN) principle. However, according to the article XXIV of the GATT and the article V of the GATS, free trade agreements, customs unions and other forms of economic integrations enabling preferential treatment of trade are allowed above the MFN principle.

According to the WTO rules, there are two special types of trade agreements outside the MFN principle. The Regional Trade Agreements (RTAs) are defined as reciprocal trade agreements between two or more countries including free trade agreements and customs unions. Preferential Trade Arrangements are based on unilateral trade preferences under which

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78 Therefore, they usually attack symbols of capitalism – Internet, fast-food companies like McDonald’s or Starbucks, supermarkets like Walmart – hence usually the companies that operate on the global level.

79 According to this principle, each member treats all the other members equally as “most-favoured” trading partners. If a country improves the benefits that it gives to one trading partner, it has to give the same “best” treatment to all the other WTO members so that they all remain “most-favoured” (WTO, 2016).

80 The General Agreement on Trade in Services established in 1995.
developed countries grant preferential tariffs to import from developing countries, as well as other non-reciprocal preferential schemes.

Since the early 1990s, the number of new regional and preferential trade agreements has significantly increased, while the multilateral negotiations stagnate since the beginning of the Doha round. Until the end of 2017, 659 notifications of the RTAs had been received by the WTO, while 445 were in force. Approximately 90% of the RTAs are covered by the Free Trade Areas (FTA), while custom unions accounted for the rest. According to the WTO (2011, p. 44), almost 90% of the global trade is related to preferential tariffs under reciprocal agreements.

In this subchapter, the most used foreign trade policy measures – tariffs – will be examined and offered some thoughts about the effect on international demand and supply. Finally, it will be useful as their effect on trade flows between the EU and BRICS using the structural gravity model will be tested in chapter 4.

2.4.1 Theoretical View on Tariffs

The measures of foreign trade policy can be divided, for example, into external measures designed to protect domestic market against foreign competition, and internal measures, which support export. External measures include various tariff and non-tariff trade barriers, anti-dumping and anti-subsidy measures, countervailing and safeguard measures or various forms of taxes. Internal measures include export subsidies, export credits, and insurance, information, exhibition, fairs as well as active foreign policy. The government is the main body realizing trade policy using both groups of measures.

In the doctoral thesis, the focus is only on the narrow scope of external measures of trade policy – tariffs – and their function in the global trade. Tariffs are the oldest and best known protectionist measures that include almost all types of duties. The advantages of tariffs include: easy administration, simple traceability, applicability and verifiability, as their rates are announced in advance for a certain period in the form of a legal transcript.

Tariffs are the oldest form of the trade policy measures and have been traditionally used, in addition to its protective function, as a source of the state budget income (Krugman, Obstfeld and Melitz, 2012). Tariff is a monetary amount gained in the connection with the import or export of goods when crossing the geographic or administrative customs border. The advantage of contractual tariff, which result from the bilateral and multilateral agreements between countries, stands in relative stability for the business creating relatively favourable conditions for the mutual trade.
Import tariff represents the most common type of duty, as their primary task is to protect domestic market from foreign competition and create state budget income. However, import duty increases the value of imported goods and artificially creates a space for the demand of domestic products. Moreover, in countries which are heavily depended on imports, as in the case of the small open economy, the import duty increases production costs and the price of the final product. Finally, in the developed countries, import duties do not represent a high contribution to the fiscal income. However, this statement cannot be applied in the case of developing countries. Conversely, for some developing economies duties serve as the main source of state revenues.

The economic theory offers some explanations of tariffs effect on foreign trade. As it was already mentioned, the main task of the tariff is the protection of domestic market from foreign competition, and source of income to the state budget. Therefore, the final price for a consumer on the domestic market consists of the price of imported goods increased by the value of the duty. It results in a growth of domestic production of similar goods and a decrease of domestic demand for imports. It means that the revenues are redistributed from home consumers towards home producers.

There are more differences between the effect of tariff on small and large economy. For example, small open economy introducing tariffs on imports increases only the price of goods in the proportion of tariff charge. However, big economy causes surplus of goods on the world market and fall of its world price. The total effect for consumers remains whether the drop of the world price is higher than the price of import plus tariff. Since the tariffs are supposed to protect domestic economy, the goods prices are higher than the world prices.81

Trade theories advocating free trade consider tariffs as a negative tool that makes the difference between domestic and foreign prices and interferes to maximize the standard of living through a decline of production and suboptimal allocation of goods among countries. As long as the marginal rate of transformation differs across countries, there is a space to increase production without making a production of any other goods worse off. Conversely, if the world economy produces on the production possibility frontier, each country makes full use of its comparative advantages. Therefore, there cannot be a change to a different allocation that makes at least one of the goods better off without making any other goods worse off. Such

81 However, Metzler (1949) discovered a paradoxical situation where tariffs reduced prices on the global market as well as on the domestic market. This phenomenon, arises if the domestic demand is inelastic and marginal propensity to import in the large economy is low. In this situation, tariffs thus lose their protective function.
economy would be Pareto efficient. According to the neoclassical economics, free trade balances prices across countries by aligning their marginal rate of transformation and maximizes global output. In terms of the demand side of the economy, free trade helps to the optimal allocation of goods through the balance of the marginal rate of substitution across economies. If the marginal rate of substitution is balanced across all countries, there is no space to improve the standard of living. However, tariffs interfere with parity at home and foreign prices causing suboptimal reallocation of resources as well as output.

Finally, tariffs may have positive effect on the domestic market in the short term, however, their negative impact will appear in the longer horizon and no country will be better off. Tariffs serve rather as a big redistribution mechanism in the direction from consumer to domestic producers. Nevertheless, the negative effect will touch everyone, consumers, producers as well as state finances in the long term.

2.5 Gravity Model of International Trade

The gravity model has been used for decades in international trade modelling and it has become one of the most popular tools for economic analysis. Its main purpose is to explain the extent of bilateral trade flows among trading partners. Due to the high explanatory power and its ability to fit any trade theory, the gravity model has become a commonly used method of modelling trade flows. An additional valuable feature is its universal adaptation to a multitude analysed relations of international economics, such as migration (Grogger and Hanson, 2011), foreign direct investments (Head and Reis, 2008) or capital flows (Portes and Rey, 2005), but also in other social sciences.

The theory behind the gravity model stands on Newton’s general theory of gravitation, which was transformed and applied to the economic science based on the assumption that the volume of trade between two countries depends on their size and distance. It was assumed that economic size has a positive effect on their mutual trade, while distance representing a certain barrier to trade affects trade negatively. As Ševela (2002) claims, the model implies that larger objects that are closer to each other should show stronger trade relationships.

Gravity model, representing the relationship between different locations has a long history.\footnote{The first idea of gravity function was mentioned in Ravenstein (1885) explaining international migration flows.} In the mid-1950s, Isard and Peck (1954) or Isard (1954) published first elements of gravity model in their empirical research of distance effect on different modes of international transport. The gravity model of international trade was firstly introduced in the 1960s. It was developed
by Tinbergen (1962), followed later on by Pöyhönen (1963), Pullianen (1963) and Linnemann (1966).

A large number of the literature dealing with the gravity model came up over the following decades. The existence of gravity equation led to extensive discussions about the appropriateness of this approach, used variables and estimation methods, resulting in its improvements in terms of economics and econometrics. Although the gravity model has been performing very well in empirical applications, some economists objected over the lack of its theoretical foundations. For example, Leamer and Stern (1970; p. 169) note: "The significance of such research must be understood in the context of seeking a broader understanding of the empirical basis of the pure theory of international trade. Despite the long-term criticism, the gravity equation was becoming very popular in empirical international economic research. Deardorff (1984, p. 503) says that despite their: "somewhat dubious theoretical heritage, gravity models have been extremely successful empirically". Anderson (1979) claims that the gravity equation is probably the most successful empirical trade device of the last twenty-five years. Bergstrand (1985) adds that the gravity equation was long recognized tool for consistent empirical success in explaining many different types of flows in economics. Eichengreen and Irwin (1998), called the gravity model of trade the "workhorse" of empirical studies of regional integration. Finally, Krugman (1997b) writes about the gravity equation as about "an example of social physics"; a relatively few law-like empirical regularities that characterize social interactions (Head and Mayer, 2014).

The lack of a theoretical foundation gave the gravity model high attention on the research agenda. Anderson (1979) was the first economist providing a sound microeconomic foundation of the gravity model. Bergstrand (1985) introduced its gravity equation based on the model of monopolistic competition and Bergstrand (1989) combined factor endowment theory and Linder’s theory to extend microeconomic foundation of the gravity equation. Although, classic and neoclassic models explain international trade by differences in production technology (Ricardo’s comparative advantages) or factor endowments (Heckscher-Ohlin model), the first approach based on any economic school came from Helpman and Krugman (1985, 1989). Deardorff (1998) discovered the relations in gravity model using the factor-endowment approach based on the Heckscher-Ohlin theory. Eaton and Kortum (2002) developed Ricardian trade model based on origin assumption of differences in production technology and labour immobility employing absolute and comparative advantages, geographic barriers and heterogeneity in consumption. Last significant theoretical upgrade of gravity model was
developed by Helpman et al. (2008) and Chaney (2008) using the assumption of heterogeneous firms and market selection.

Even when economic research proved that the gravity equation could be derived from any international trade theory, it has also met with widespread criticism. Deardorff (1998), for example, was critical about the micro-foundations of the gravity model, simply because there are too many. But paradoxically the fact that the gravity equation can be derived from the Ricardian model or Heckscher-Ohlin model, as well as from monopolistic competition models, have offered great confidence to trade policy researchers and trade policymakers (Bergeijk and Bakman, 2010).

2.5.1 Origins of the Gravity Model

The origin of gravity model goes back to the year 1687 when Issak Newton published Philosophiae Naturalis Principia Mathematica (Mathematical Principles of Natural Philosophy) in which, inter alia, described the law of universal gravitation. In modern language of physics, the law states: "Every point mass attracts every single other point mass by a force pointing along the line intersecting both points. The force is proportional to the product of the two masses and inversely proportional to the square of the distance between them" (Newton, Cohen and Whitman, 1999, p. 956). In physics, this relation is expressed as:

\[ F_{ij} = \frac{G m_1 m_2}{r^2} \]  \hspace{1cm} (2.1)

The gravitational force \( F_{ij} \) relates proportionally to the product of the two masses \( m_1 \) and \( m_2 \) and is inversely proportional to the square of the distance \( r^2 \) that keeps the two masses apart from each other. The gravitational constant \( G \) represents an empirically determined value. This relation can be applied in any context that includes flow or movement modelling. Therefore, the gravity model of international trade transfers Newton’s law of universal gravity into the international economic context, which can be written, in a strongly simplified version, as:

\[ X_{ij} = G \frac{Y_i Y_j}{D_{ij}} \]  \hspace{1cm} (2.2)

where \( X_{ij} \), represented by the export volume from the country \( i \) to \( j \), is characterized by the economic sizes embodied by each country’s GDP and by geographical distance \( D_{ij} \) between the countries.

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83 The original Newton's law of universal gravitation states that a particle attracts every other particle in the universe using a force that is directly proportional to the product of their masses but also inversely proportional to the square of the distance between them.
them. The symbol $G$ is a gravitational constant depending on the units of measurement for mass and force (Head, 2003).

Albeit the gravity equation has many predecessors (see Bergeijk and Brakman, 2010), the first mathematical formulation and empirical application of the gravity model was made by a group of Dutch economists headed by Jan Tinbergen in the publication called *Shaping the World Economy: Suggestions for an International Economic Policy* in 1962.\(^8\) They assume that the size of the trade flow between any pair of countries is determined by the main factors such as their economic size and the distance between them. Their relevance is as follows: the value of exports a country is able to supply depends on its economic size ($Y_i$), the amount that can be sold to a particular country vary with the size of its market ($Y_j$) and the volume of trade depends on transportation costs ($D_{ij}$). The Tinbergen’s naive gravity equation can be written as:

$$X_{ij} = G \frac{Y_i^\alpha Y_j^\beta}{D_{ij}^\gamma}. \quad (2.3)$$

The coefficients $\alpha$, $\beta$ and $\gamma$ represent the elasticity of the exporting country’s GDP ($\alpha$), the elasticity of the importing country’s GDP ($\beta$) and the elasticity of distance ($\gamma$). However, as Tinbergen notes, there is not necessarily direct proportionality between the regressors and dependent variable. Therefore, the coefficients $\alpha$, $\beta$ and $\gamma$ can be different from 1.

Although Tinbergen used the variable of gross national income to express the economic size, most of the gravity equations use the indicator of gross national product or other variables that may represent the size of the economy (see chapter 4.3). The gravity model is thus a model of general economic equilibrium since on the one hand, involves the supply side of the economy as a production capacity of each country, while on the other hand, it includes the potential market for sales of goods to each country of the world. It means that economic size variables represent the supply and the demand side of the economy which significantly affect trade flows between countries.

The distance variable represents the magnitude of transaction costs in the gravity equation as a geographic distance between the main economic hubs of the country $i$ and $j$ or the distance between the capitals approximated by physical units of distance. The distance represents the basic natural barrier of trade associated with the shipping costs, which represents a kind of natural form of tax on trade with other countries. However, the distance can represent many other factors influencing bilateral trade. For example, Tinbergen points out that distance may

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\(^8\) Gravity model can be found in Appendix VI of their publication.
represent a proxy variable for an index of information about export markets (Tinbergen, 1962). The issue of distance has been employed by many economists dealing with the gravity model for decades. Head (2003) summarizes that the distance variable began to be used as a proxy for many other factors that affect international trade, such as shipping or transportation costs, time elapsed during shipment, synchronization costs, communication costs, transaction costs or cultural distance.

The most common method for the purpose of gravity model estimation is the method of ordinary least squares (OLS) usually estimated in the log-linear reformulation of the model. By taking the natural logarithm of (2.3) and adding the disturbance term $\varepsilon_{ij}$, the gravity equation can be rewritten in the form-meaning a linear relationship between the dependent variable and the set of regressors allowing to interpret coefficients as elasticities:

$$\ln(X_{ij}) = \ln G + a \ln(Y_i) + b \ln(Y_j) - \gamma \ln(D_{ij}) + \varepsilon_{ij}. \quad (2.4)$$

The gravity equation explains bilateral trade using given variables of economic size and distance: the larger the two trading partners, the larger the bilateral trade between them; but the larger the distance between two trading countries, the smaller is the bilateral trade. The coefficient $G$ in the (2.4) represents an intercept, and $\varepsilon_{ij}$ is a disturbance term for which is assumed independent and log-normal distribution.

Head and Mayer (2014) define three distinct steps in the history of gravity modelling. The first period is dated up to 1995 when the paper of McCallum was published. Until that time, many economists were not able to accept the idea of gravity as the possibility to measure and explain a large amount of missing trade. McCallum (1995) empirically proved the importance of geographic distance and national border effect in gravity model and refute the notion about the borderless world, or as it was proclaimed as "death of distance" or "flat world". Since the publications of Eaton and Kortum (2002) and Anderson and van Wincoop (2003), there were no critics about the lack of micro-economic foundations of the gravity equation. Moreover, empirical results in Feenstra (2004), and Redding and Venables (2004) proved the existence of multilateral resistances and universality of gravity model. To the end, Chaney (2008) and Helpman et al. (2008) published gravity equations in case of heterogeneous firms including new distinctions between intensive and extensive margins. Their model is able to explain zero trade flows between countries and decompose trade according to trade volumes and a number of trading agents. In the following subchapter, there will be elaborated a microeconomic

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85 The term log stands for natural logarithm in the whole doctoral thesis.
derivation of the gravity equation according to Anderson (1979) and Anderson and van Wincoop (2003), that represent the first and basic derivation of the structural gravity equation every research should know.

2.5.2 Anderson's Contribution to the Gravity Model

The origin of the gravity model was empirically defined based on international trade flows analysis and therefore it missed any theoretical foundations during the first years of its existence. James E. Anderson was one of the first economists dealing with the theoretical foundation of the gravity equation applied to commodities. Anderson himself admits that "its use (gravity equation) for policy is severely hampered by its unidentified properties" (Anderson, 1979, p. 106).

Following chapter elaborates Anderson’s contribution based on Anderson (1979), Anderson and van Wincoop (2003), Anderson and van Wincoop (2004) and Anderson (2011). His explanation is based on the assumption of identical homothetic preferences across regions represented by Cobb-Douglas utility function and product differentiation by their place of origin according to Armington assumption. Anderson (1979) introduces gravity model based on the expenditure system specifying that the share of national expenditure accounted for by spending on imports is a reduced-form function of income and population. Anderson derives the gravity equation gradually:

1) Gravity model is based on exporting country $i$ and importing country $j$, each specializing in the production of its own goods. There are no tariffs or transport costs and prices are constant.

2) Extension of gravity equation by distinguishing between tradable and non-tradable goods.

3) Inclusion of distance function.

4) Expansion of gravity model by multiple tradable goods.

Anderson’s model is based on identical Cobb-Douglas preferences where a share of income spent on tradable goods, denoted by $b_i$, is the same for both countries. Therefore, import of

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86 Cobb-Douglas utility function takes the shape of $U(T, NT) = k x_1^\alpha x_2^\beta$, where $k$ is a constant and $x_1, x_2$ represent tradable goods and non-tradable goods. Cobb-Douglas utility function includes homogenous preferences when $\alpha + \beta = 1$. Countries with growing income consume more tradable goods in the same proportion in relation to their total income, thanks to a constant marginal rate of substitution.

87 Differentiated goods assumptions of Armington (1969) distribute goods not only by type but also by its place of production because the place of origin has a major influence on the shape of goods. Armington follows the assumption that two goods of the same kind produced in various countries are imperfect substitutes.
goods $M_{ij}$ purchased by country $j$ from the country $i$ is given by income of importing country $Y_j$ multiplied by the share of income spent on tradable goods from exporting country $b_i$, as:

$$M_{ij} = b_i Y_j. \quad (2.5)$$

The budget constraint implies the assumption that income from sales of goods in country $i$ equals expenditure on goods in country $j$:

$$Y_i = b_i \sum_j Y_j. \quad (2.6)$$

Solving (2.6) for $b_i$ and substituting into (2.5) obtains the simplest form of the gravity model, often called the traditional gravity equation:

$$M_{ij} = \frac{Y_i Y_j}{\sum_j Y_j}. \quad (2.7)$$

Tinbergen (1962) assumes that in cross-section analysis using OLS method, the income elasticities should not differ significantly from unity. However, this form of gravity equation is considerably restrictive because it considers countries producing only one differentiated product.

However, the gravity equation makes more sense when it comes to the distribution into tradable and non-tradable goods, which should ensure more accurate estimates and get rid of the previous restrictions from the gravity model, because tradable-goods shares of total expenditure vary across countries according to income and population. The country demand is determined by utility function and budget constraints for given level of expenditures on tradables. Therefore, the tradable-goods share on total expenditures is a function of tradable goods prices only because of homothetic preferences across countries. Thus, $\theta_i$ is the share of imports from country $i$ on total expenditure for tradable goods by country $j$, and $\phi_j$ is the share of expenditure on all tradable goods in total expenditure of country $j$ determined by income and population $\phi_j = f(Y_j, N_j).$ \(^{88}\) Therewith, imports of country $j$ from $i$ are defined as a share of $j$’s expenditures spent on tradable goods $\phi_j$ multiplied by share spent on tradable goods originating from country $i(\theta_i)$ as:

$$M_{ij} = \phi_j \theta_i Y_j. \quad (2.8)$$

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^{88} The total income of the country can be expressed as the function of income per capita, which represents an exogenous demand-side factor, and population (country size) as a supply-side factor.
Considering only the trade between two countries, the income of country $i$ gained from tradable goods sold to country $j$ equals expenditure on imports of country $j$ originating in country $i$, denoted for country $i$:

$$Y_i \phi_i = (\sum_j Y_j \phi_j) \theta_i.$$  \hspace{1em} (2.9)

In other words, the country $i$ can spend only what gains from its exports to country $j$. Solving (2.9) for $\theta_i$ and substituting into (2.8), yields:

$$M_{ij} = \frac{\phi_i Y_i \phi_j Y_j}{\sum_j \phi_j Y_j} = \frac{\phi_i Y_i \phi_j Y_j}{\sum_i \sum_j M_{ij}}.$$  \hspace{1em} (2.10)

Holding previous assumptions of identical preferences across countries and differentiated goods by place of origin, the assumption of a borderless world can be omitted. Anderson (1979) considers gravity equation as a more realistic implementation of the various scopes of differentiated goods classified by the product $k$ and transport costs proxy by distance $\tau_{ij}$. The final value of import in country $j$ from country $i$ consist of $M_{ij}$ representing the foreign port value and transportation cost factor.\(^\text{89}\) The share of tradable goods from country $i$ on total expenditure for tradable goods in country $j$ ($\theta_i$) depends on all transport costs $\tau_{ij}$ from country $i$, which results in:

$$M_{ijk} = \frac{1}{\tau_{ij}} \phi_j \theta_i (\tau_j) Y_j.$$  \hspace{1em} (2.11)

Thus aggregated trade flows between $i$ and $j$ are:

$$M_{ij} = (\sum_k \theta_{ik}) \phi_j Y_j \frac{1}{f(d_{ij})}.$$  \hspace{1em} (2.12)

The budget constraint in the world with trade barriers is similar to (2.9), but includes transport costs:

$$Y_i \phi_i = (\sum_k \theta_{ik}) \sum_j \phi_j Y_j \frac{1}{f(d_{ij})}.$$  \hspace{1em} (2.13)

Equation (2.12) states that the aggregated value of $j$’s imports from country $i$ equals total expenditure on tradable goods multiplied by the common aggregate tradable goods expenditure share for goods from country $i$ deflated by the transport costs. Equation (2.13) states that the income of country $i$ gained from tradable goods sold to country $j$ equals the value of country $i$’s exports to all countries. Solving (2.13) for $\sum \theta_i$ and substituting into (2.12), one can get:

\(^\text{89}\) Anderson did not distinguish between the different value of export and import separating transport costs (including border adjustments) from the value of import.
\[ M_{ij} = \frac{Y_i \phi_i \phi_j Y_j}{\sum_j \phi_j Y_j \frac{1}{f(d_{ij})}} \left[ \frac{\sum_j \phi_j Y_j}{\sum_j \phi_j Y_j \frac{1}{f(d_{ij})}} \right]^{-1}. \] (2.14)

The first part of gravity equation represents aggregated gravity model explaining the economic distance between county \( i \) and \( j \) in relation to world expenditure. The square bracket term can be interpreted as the flow from country \( i \) to country \( j \) relative to a trade-weighted average of economic distance from \( i \) to all points in the system. Gravity equation in (2.14), thus, describes the economic distance between country \( i \) and \( j \), in relation to the trade-adjusted economic distance of country \( i \) to all other possible trading partners. The result of Anderson’s gravity equation based on his theoretical derivation of the countries’ expenditure systems compares bilateral trade in relation to the world trade average. In other words, after controlling the size of trading economies, their mutual trade is decreasing according to the relation of their bilateral trade barrier relative to the average trade barrier ratio.

In 2003, James Anderson in cooperation with Eric van Wincoop published the most famous work of gravity model *Gravity with Gravitas: A Solution to the Border Puzzle*, responding to McCallum’s (1995) article about the effect of the border on trade. The theoretical foundation based in Anderson (1979) stimulated the idea that the more resistant is a country to trade with all others, the more it is pushed to trade with a given bilateral partner.\(^{90}\) This effect analysed in Anderson and van Wincoop (2003) begun to be called as "multilateral trade resistance" (MTR).\(^{91}\) Authors kept their assumptions such as differentiation of goods by place of origin, identical and homothetic preferences of trading countries and division of goods to tradable and non-tradable (Theie, 2015). Subsequently, they decomposed trade resistance as a function of (a) the bilateral trade barrier between country \( i \) and country \( j \), (b) trade resistance of country \( i \) with all countries and (c) trade resistance of country \( j \) with all countries. The effect (a) was discussed already in Anderson (1979), but newly added effects (b) and (c) called "multilateral trade resistances" have become a standard concept of gravity modelling known as structural

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\(^{90}\) For example, Head (2003) explains this effect on the example of trade between Australia and New Zealand with trade between Austria and Portugal where the distance between each pairs is approximately the same as well as the product of their GDP. Omitting multilateral resistance term, approximated by remoteness, the gravity equation would predict approximately the same results for both country pairs. In fact, however, Australia-New Zealand trade was nine times higher than Austria-Portugal trade.

\(^{91}\) The concept of MRT, however, is much older. Krugman (1995) introduced the concept of "remoteness", or Polak (1996) who emphasizes the necessity to control for this effect.
The starting point of gravity equation derivation is based on the constant elasticity of substitution utility function $U$, which is maximized by consumers of country $j$:

$$U_j = \left[ \sum_{i=1}^{N} \beta_i \left(1+\sigma / \sigma (\sigma-1) \right) \frac{c_{ij}}{\sigma (\sigma-1)}, \right]$$

(2.15)

where $c_{ij}$ is the consumption of country $j$ of goods imported from country $i$, $\sigma$ is the elasticity of substitution, $\beta_i$ represents an arbitrary parameter of preferences towards goods from country $i$, and $N$ is the number of countries. The budget constraint representing a total expenditure of country $j$ on goods from country $i$ is:

$$Y_j = \sum_{i=1}^{N} t_{ij} p_i c_{ij},$$

(2.16)

where $Y_j$ represents the nominal income of consumers in country $j$, $p_i$ stands for the supply price from country $i$, and $t_{ij}$ for the trade cost factor between trading partners $i$ and $j$. The sum of all goods and countries by country $j$ equals importer $j$’s total expenditure. Due to the trade costs, the price of imports to country $j$ differs depending on the exporting country $i$. Moreover, trade costs are proportional to the value of tradable goods, thus, can be understood as the "iceberg" costs. In the following equation, the $p_{ij}$ is the price on goods from the country of export $i$ faced by consumers in the country $j$, substituting factor $t_{ij}p_i$, thus $p_{ij} = t_{ij}p_i$, because the trade costs are passed on to the importer. Under these assumptions, the nominal value of trade from country $i$ to country $j$, and therefore expenditure/income of country $j/i$ is:

$$x_{ij} = p_{ij} c_{ij}.$$  

(2.17)

Since the $t_{ij}$ represents transportation costs, the nominal value of exports $X_{ij}$ from country $i$ to all countries $j$ equals total income of country $i$, called the market clearing condition, such as:

$$Y_i = \sum_{j=1}^{N} X_{ij}.$$  

(2.18)

In regards to the gravity model derivation, the nominal demand for goods from country $i$ by country $j$ must be calculated using utility function (2.15) and the budget constraint (2.16), which yields in (for full derivation see Annex 2):

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92 Piermartini and Yotov (2016) describe multilateral trade resistances as: "vehicles that translate the initial, partial equilibrium effects of trade policy at the bilateral level to country-specific effects on consumer and producer prices".

93 The $\beta_i$ is an inverse measure of quality. The higher $\beta_i$, the lower demand for country $i$’s goods (Theie, 2015).

94 Samuelson’s (1954) iceberg costs mean the costs of transporting a good that uses up some fraction of the good itself, rather than other resources. Therefore, a fraction of the good is lost (melted) during transportation, which can be equivalent to an ad valorem tax.

56
\[ X_{ij} = \frac{(t_{ij}p_i\beta_i)^{1-\sigma}}{p_j^{1-\sigma}} Y_j, \quad (2.19) \]

Inserting (2.19) into (2.18) and solving the equilibrium market price \((\beta_ip_i)^{1-\sigma}\) yields:

\[ Y_i = \sum_{j=1}^{N} \left( \frac{t_{ij}p_ip_i}{p_j} \right)^{1-\sigma} Y_j, \quad (2.20) \]

\[
(\beta_ip_i)^{1-\sigma} = \frac{Y_i}{\sum_{j=1}^{N} t_{ij}p_ip_i} Y_j.
\]

According to Anderson and van Wincoop (2003), \(Y^w = \sum_{i=1}^{N} Y_j\) defines world nominal income, expanding the right hand side in (2.20) by \((1/Y^w)(1/Y^w)^{-1}\):

\[
(\beta_ip_i)^{1-\sigma} = \frac{Y_i}{Y^w} \left[ \sum_{j=1}^{N} \left( \frac{t_{ij}p_ip_i}{p_j} \right)^{1-\sigma} \frac{Y_j}{Y^w} \right]^{-1}, \quad (2.21)
\]

and substituting the price index into the import demand (2.19), one can get:

\[ X_{ij} = \left( \frac{t_{ij}p_ip_i}{p_j} \right)^{1-\sigma} \frac{Y_i}{Y^w} \left[ \sum_{j=1}^{N} \left( \frac{t_{ij}p_ip_i}{p_j} \right)^{1-\sigma} \frac{Y_j}{Y^w} \right]^{-1}. \quad (2.22) \]

Substituting the term in the brackets on the right-hand side of the (2.22) for \((\Pi_i)^{1-\sigma}\) yields final structural gravity equation:

\[ X_{ij} = \frac{Y_i}{Y^w} \left( \frac{t_{ij}p_ip_i}{p_j\Pi_i} \right)^{1-\sigma}, \quad (2.23) \]

where:

\[ (\Pi_i)^{1-\sigma} = \sum_{j=1}^{N} \left( \frac{t_{ij}p_ip_i}{p_j} \right)^{1-\sigma} \frac{Y_j}{Y^w}, \quad (2.24) \]

\[ (P_j)^{1-\sigma} = \sum_{i=1}^{N} \left( \frac{t_{ij}p_ip_i}{p_j\Pi_i} \right)^{1-\sigma} \frac{Y_i}{Y^w}, \quad (2.25) \]

are multilateral trade resistance terms showing the exporter’s and importer’s joint average trade barriers which both of them face with all of their possible trading partners. This structural gravity model captures all three resistances between two trading countries:

1) the bilateral trade resistance between country \(i\) and \(j\) defined as \(t_{ij}\),
2) outward multilateral resistance \(\Pi_i\) of exporting country \(i\) which faces to all other demands,
3) inward multilateral resistance \(P_j\) of importing country \(j\) which faces to all other supplies.

Therefore, the structural gravity equation in (2.23) describes that trade between two countries is determined by the bilateral barrier between them relative to the average trade
barriers that both countries face with all their trading partners. The higher resistance between $i$ and its other trading partners will lower the demand for $i$’s goods and therefore reduces its relative supply price $p_i$. This effect will raise the level of trade between country $i$ and $j$. Higher resistance between $j$ and its other trading partners will reduce the relative price of goods importing from country $i$ and thus, increase country $j$’s imports from $i$.

2.6 Summary

This chapter have emphasized the benefits of free trade and disprove arguments defending protectionism. The essence of liberal economic theories was explained. Economies that are based on freedom of exchange among entities concluding that the only free demand and supply may take full advantage of the international division of labour and benefit everybody in the long-term. It was proved that any kind of trade impediments cannot lead to the higher well-being of producers and consumers and all arguments defending protectionist measures are based on lack of judgment and understanding what the term of free trade really means.

The most primitive myths about the negative effect of international trade on national well-being were elaborated as they are frequently used by politicians and media in favour to introduce new trade restrictions. The current disappointing development of international trade liberalization was discussed, an increase of protectionism and mismanagement of politicians and economists to explain benefits of free trade to people. On real examples and statements, it was proved that real picture of protectionism does not follow any theory of economics and that realization of protectionist measures does not benefit the economy as it is claimed by their communicators. Finally, it was demonstrated that the trade policy could be used as a tool for trade liberalization as well as a tool that can make free trade impossible.

It was explained that free trade can operate effectively among countries, using benefits of international division of labour. There were found no negative arguments that would disprove the benefits of free trade, emphasizing that any government intervention into the free trade cannot be defended by arguments of protectionism. The reason is very simple. Exchange cannot occur if there is no will to trade. By other words, if the subjects of trade do not consider that their mutual exchange will benefit their needs, they have no reason to trade.

In the last sub-chapter, the derivation of gravity model was described. Applying the Newton’s Law of Gravity in international trade, gravity model implies that countries trade in proportion to their economic size and proximity. Missing any theoretical foundations, the empirical power of gravity model induced the interest of economists. Anderson (1979) offered
first theoretical economic foundations of gravity model based on assumptions of Armington’s product differentiation and constant elasticity of substitution.

3 EU Trade Relations with BRICS Countries

The European Union belongs to the most important players in the global market. Its economy accounts for half billion consumers and trade ties reach every state in the world. The EU is the largest exporter of manufactured goods and services covering 15% of global trade, excluding the intra-EU trade,\(^{95}\) it is the biggest source and destination of foreign direct investment as well. The EU is the most important trading partner for more than 80 countries and the second most important for another 40 states (DG Trade, 2017b).\(^{96}\) The EU is also the biggest single market with transparent rules, secure legal investment environment, and consistent business framework. The external economic relations are unified among members and presented through the single common policy. The European Commission, as the highest representative of the EU Common Commercial Policy, prefers and highly advocates international trade liberalization. To demonstrate its determination for global market liberalization, the EU belongs to countries with the lowest administrative trade barriers. More than 70% of imports enter the EU market at zero or reduced tariff according to preferential trade arrangements. Therefore, the average applied tariff for goods imported on the EU market was only about 3% in 2016 (WTO, 2017a). However, the EU still keeps relatively high trade measures of protection in several sectors too, namely agriculture, steel or garment.

All BRICS countries belong to the group of developing markets progressing toward becoming advanced markets (therefore called as emerging economies). They differ from each other by political systems, level of democracy, type and structure of the market, the degree of the financial system or quality of business environment. Nevertheless, in the last part of this chapter, it will be proved that they share several signs in the case of foreign trade. Higher openness to trade, higher importance of the EU market, export dependent on labour and natural resources or inter-industry structure of trade, are just some of them. The position of BRICS in the global economy significantly strengthened on the back of higher participation in global economic relations during last two decades. Especially, they have become regional economic hegemony highly affecting political and economic development in their regions, China

\(^{95}\) Including the trade on the EU Common Market, its share is more than 30% of global trade in goods. However, this share declined significantly during last two decades, mainly in favour of China.

\(^{96}\) By comparison, the USA is the top trading partner for a little over 20 countries.
globally. Structure of their markets and production has gone through tremendous change, however, it is still highly dependent on low-tech products, mostly based on natural resources, agriculture, and light manufacturing.\(^97\) Their economic development has been also reflected in the structure, direction, and volume of trade flows and total external position.

The difference between developed EU market and developing BRICS mirrors in the form of their trade policy. In case of the EU, trade policy is designed to represent common interest of its members by one common policy, which is carried out by the European Commission. On the other hand, all BRICS countries have their own trade policy. The EU keeps significant trade dominance with BRICS markets, however, strengthening position of China and big economic power of the United States of America still create high competitive pressure, which has been recently supported by other emerging countries. The European Union is the main business partner of BRICS, but the progress of mutual trade liberalization remains slow (with the exception of South Africa) and in some cases, such as Russia or China, it will be probably never achieved.

In relation to above-mentioned facts, international trade liberalization has become the subject of intensive debate since a new wave of protectionism has occurred recently as a reaction to the global economic slowdown, political changes, embargos, and sanctions imposed against some countries. While the EU has not reacted to the financial and economic crisis in 2008-2009 by increasing market protection, some of its main trading partners did. The BRICS were no exceptions. Every report on barriers to trade, annually published by the European Commission, emphasizes that the majority of new trade barriers are introduced by developing countries, with the BRICS at the top of the rank. The last report stated that 36 new trade and investment barriers were put in place just during the last reported year (increase by 10% compared to previous year).\(^98\) The European Commission estimates that the increase of trade barriers in the period 2013-2015 may cost the European businesses about EUR 27 billion (1.6% of total EU export). As it was noted in the second chapter, despite the world leaders still pledge to reject protectionism, all ten countries with the highest number of trade barriers are members of the G20\(^99\). In 2016, the highest number of trade barriers was observed in Russia, followed by Brazil, China, and India. Most of the new trade protection measures were registered behind

\(^{97}\) Those structural changes will be more elaborated in the last sub-chapter.

\(^{98}\) The European Commission reports 372 kinds of trade and investment barriers in 2016.

\(^{99}\) The group of G20 covers twenty biggest economies in the world including countries of the EU and BRICS.
the border,\textsuperscript{100} including unjustified regulations, internal taxes; intellectual property rights measures, most of them in the sectors of agriculture and food industry (European Commission, 2016).

\subsection*{3.1 EU Common Commercial Policy}

The EU Common Commercial Policy (CCP) represents the highest level of integration effort among member countries as they delegated most of their power in foreign trade policy with the third countries to the European Commission that has exclusive jurisdiction to create common legislation valid for all EU member countries.

In case of the EU, trade takes two dimensions. Internal trade (intra-EU) takes place on the EU single market, i.e. among entities of the EU member countries characterized by zero trade barriers and single rules.\textsuperscript{101} Given the fact that most of the EU countries are the GATT or the WTO founding members, the process of trade liberalization represents a significant boost to the economic growth. Therefore, movement of goods on the single market must be in accordance with the rules and principles of the EU Common Commercial Policy as well. The second dimension of the EU trade, the external trade (extra-EU), takes place among the entities from the EU countries and the rest of the world. Such economic relations are governed by the EU Common Commercial Policy, which must be in line with the rules and principles of the World Trade Organization.

\subsubsection*{3.1.1 Function and Principles of the EU Common Commercial Policy}

The current form of the EU Common Commercial Policy is based on the Treaty of Lisbon, which was signed in 2007 and entered into force in December 2009. The principles of the EU CCP are edited in part five; title two of the Treaty Establishing the European Community, specifically in articles 206 and 207. As the EU CCP became a part of the External Action of the Union, including foreign and security policy, development aid, economic, financial and technical cooperation with third countries or international environmental policy, it is subordinated to the objectives of the Union’s External Action. In particular, principles of democracy, rule of law, universality and indivisibility of human rights and freedoms, respect

\begin{itemize}
\item \textsuperscript{100} According to the trade policy terminology, measures on the border equal to tariff barriers, while measures behind the border equal to non-tariff barriers.
\item \textsuperscript{101} In the sense of the first chapter, the EU common market represents multinational integration process aiming to remove all barriers to intra-EU trade and create one single market with four fundamental freedoms: freedom of movement of goods due to the elimination of all trade barriers; freedom of movement of labour due to the elimination of all restrictions to enter and residence in other Member States; freedom of establishment of trades and companies on the territory of any Member State and of the provision of services by them in the host country; and freedom of capital movements for business or personal purposes.
\end{itemize}
for human dignity, equality and solidarity, compliance with the United Nation’s agreements and international law are set above the business interests.\[102\]

The Lisbon Treaty emphasizes the goal of "free and fair" trade and encourages effort of international market integration of all countries to the world economy. Hence, it is clear that the EU external action’s principles do not limit trade liberalization. Despite the significant criticism before the Treaty of Lisbon came into force in 2009, that it will lead to the "politicisation" of trade policy, such statements were unfounded and based on the misunderstanding of trade policy. Trade liberalization or international trade is not the goal by itself, but as all multilateral trade agreements stipulate, it is a tool to increase the standard of living, enhance sustainable development, protect environment, etc. Trade policy has been always political, even before the Treaty of Lisbon came into force. It was always used to support political decisions and reach political goals. Moreover, the Treaty specifies which objectives may or may not guide trade policy. There is a great example in the current situation of political and business relations between the EU and Russia. Trade sanctions were used to create a pressure to Russian administration because of the annexation of Crimea in 2014. Since trade liberalization and political objectives are set to be equal, the European Union uses these measures only to foster human rights and minimize negative economic effects.

Main purpose of the EU Common Commercial Policy is "the harmonious development of world trade, the progressive abolition of restrictions on international trade and on foreign direct investment, and the lowering of customs and other barriers" (European Commission, 2009, p. 139). The policy, thus, affects the business environment within, as well as out, of the Union. Implementation of the Lisbon Treaty provides the Union with exclusive competences in this policy, hence only the EU, and not individual member states, can legislate on trade matters and conclude international trade agreements. Decisions on the EU CCP are implemented through the ordinary legislative procedure, which is the case for the EU Council on Foreign Affairs (FAC), which follows the strategic decisions taken by the European Council. Since the issue of trade is very broad, the FAC includes not only the ministers of trade but also other offices according to the relevancy of issues.

Treaty of Lisbon significantly changed functions of the EU Common Commercial Policy (Baldwin and Wyplosz, 2012):

\[102\] It is questionable if above-mentioned principles are good or bad for international trade. However, the UN principles should be set above commercial interests if it is necessary and effective to improve human relations among nations.
1) In particular, it extended the powers of the European Parliament in the area of the EU CCP to the Council level. All EU trade legislation must be adopted under the ordinary legislative procedure, the European Parliament must approve all trade agreements with the third countries, but it has no right to propose changes.

2) The European Commission has gained new powers to negotiate trade agreements in the foreign direct investment, trade in services and commercial aspects of intellectual property, or public procurement. It needs to be noted that the EU law is a subject to a special voting procedure in some, particularly sensitive areas.

3) Most of the EU CCP issues are voted by a qualified majority, including new areas of investment and services. In some cases, however, the governments have a veto right. Unanimity is required if the law or trade agreement concerns unanimous decisions\textsuperscript{103}.

The European Commission is the executive part of the EU in the sense of the EU Common Commercial Policy. It defends the interests of the Union as a whole and is entrusted with the executive power in the extra-EU trade relations. It has the mandate to negotiate international treaties, after receiving an approval from the Council, it may submit proposals to the Council and the European Parliament, represent the EU in the World Trade Organization, conduct a dialogue with the public on common commercial policy issues, inform the EU institutions about the procedures of the EU CCP implementation, etc. Trade negotiations with third countries or within the WTO are led by the EU Trade Commissioner, but genuine negotiations are being carried out by qualified teams of officials of the European Commission’s Directorate-General for trade. The EU CCP implementation is consistently coordinated with the EU Members, which are informed about the processes and results of negotiations with third countries through the Council and the European Parliament (Kalinská, 2010).

Since the beginning, the common commercial policy has been based on the principle of unity, i.e. unified progress of all Member States in economic relations with the third countries. The need for a unified procedure was triggered by the elimination of trade barriers within the EU and the subsequent creation of a single market that must be protected in a uniform manner. The common procedures are reflected in the instruments such as a common customs tariff, a common export and import regime, a common internal legislation for the EU CCP implementation (for example, all export barriers from the EU Member States were banned since 1993) or the negotiation of trade agreements with third countries only at the EU level. The EU

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\textsuperscript{103} These include, for example, issues of common foreign and security policy, citizenship, EU membership, harmonization of indirect taxes, the EU budget, certain provisions in the area of justice and home affairs, harmonization in the field of social security and social protection, etc.
Common Commercial Policy also opens the European market for all third countries under the conditions of compliance with internal market rules (Štěrbová, 2013).

3.1.2 EU Common Commercial Policy Measures

The European Commission, having exclusive competences to form the EU Common Commercial Policy, uses a standard set of trade policy measures in accordance with multilateral trade rules. The European Union thus applies tariff and non-tariff measures on imports, while the export tariffs are not used anymore. In the following chapters, there are only tariff measures elaborated as they are in the spotlight of the doctoral thesis. The EU trade tariff measures meet the requirement of systematic application; i.e. tariff rates are known in advance for a specific period of time (usually one year) through a legal regulation. Tariffs are the most transparent measures of trade policy, their level is easy to trace and administrate enabling exporters and importers to manage their business across borders with low costs.

The European Union uses unique common commercial policy tools, the Common Customs Tariff that applies to import of goods crossing the EU external border. Rates of duty differ according to the kind of imported goods depending on what they are and what country they come from. As the EU is a member of the WTO, it does not use any autonomous tariffs. It relies only on the system of multilateral, regional and bilateral treaties and agreements. The EU willingness to liberalize trade flows can be illustrated by the level of tariffs that are applied to imports from the third countries. In 2015, the average trade-weighted tariff was only 3%, with dispersion to agricultural products accounting for 7.8% and for non-agricultural products with 2.6% (WTO, 2017a). Imports to the EU Single Market are guided by the Customs Code, which is based on the EC Regulation 2913/92, followed by the Common Customs Tariff (CCT). While the Customs Code contains the EU-wide customs legislation, the CCT contains combined nomenclature of goods based on the Harmonized System of the World Customs Organization. The CCT covers all EU customs, agricultural and trade measures applied to EU-imported goods. It contains information about tens of thousands of products from all countries in the world. The variation of tariff rates is considerable. According to WTO (2017a), the spread of the EU tariffs ranges from zero to 366%. The EU uses ad valorem, specific or combined customs rates, according to the type of goods they are applied to (Štěrbová, 2013).

104 Compared to the second and the third biggest market, the trade average weighted tariff was 4.4% (for agricultural products 9.4% and for non-agricultural products 4%) in China, and 2.4% (for agricultural products 3.8% and for non-agricultural products 2.3%) in USA.
The European Union applies also a system of trade agreements with the aim to liberalize mutual trade relations and improve access of domestic producers to the third markets. Despite the EU being a legitimate member of the WTO, current stagnation of multilateral trade negotiations within the Doha round pushes the European Commission to broaden and deepen the system of regional and bilateral agreements with other countries. Fortunately, the WTO membership gives an option to use preferential trade regimes under the Article XXIV of the General Agreement on Tariffs and Trade and Article V of General Agreement on Trade in Services. Modern EU trade agreements do not include the only liberalization of trade in goods, but also arrangements in services, investment, rights of intellectual property, public procurement, etc. Opening the EU market to foreign imports is often conditioned by requirements in the areas of human rights, democracy, security, environmental protection and others. Preferential trade agreements benefit both sides, not equally, by opening new markets for domestic production, reduction of costs, faster exchange, lower tariffs and elimination of other bureaucratic barriers, the predictability of business environment, improvement of infrastructure, international law enforcement, etc.

3.2 Definition of BRICS Countries

The BRICS is a formal group of emerging markets formed in December 2010 including the Brazilian Republic, the Russian Federation, the Republic of India, the People’s Republic of China and the Republic of South Africa. It was preceded by the existence of non-formal group of BRIC, hence without South Africa. The history of the term BRIC is dated to the year 2001 when this "brand" was used by the chief economist of Goldman Sachs Jim O’Neill in his article "Building Better Global Economic BRICs" for the first time. He claimed that these economies will significantly increase their share on the global production within next ten years, China in particular. Additionally, he suggested that the G7 should incorporate the BRIC into the world political meetings and forums that set out strategies for the future of global policy (Goldman Sachs, 2001).

Since the early 1990s, all BRICS countries have experienced tremendous economic growth and became to play an important role in the global production of goods and services, demand, investment and financial markets. Over the last twenty years, they have gone through significant political and economic changes that have fundamentally influenced their internal functioning and external position in the world economy. Due to high economic performance and relative

105 It is used mostly in case of developing countries, however, the rules are not very strict, usually just confirming the membership and commitments to any international agreement.
stability in the period of economic crisis in the years 2008-2009, they have converted to the engines of the global economy.\(^{106}\) It is being expected that BRICS will become new hegemons and maybe superpowers that will catch and overtake advanced economies and fundamentally affect the geopolitical and economic situation in the world.

At first glance, it seems that the BRICS have a lot in common. All of them belong to the largest countries in the world. Russia has the largest area in the world, followed by China (3\(^{rd}\) place), Brazil (5\(^{th}\) place), India (7\(^{th}\) place), and South Africa (9\(^{th}\) place in Africa). Together, they share about one-fourth of the world area. Although the power of the country can be viewed from many perspectives, the following Tab. 3.1 shows some selected indicators pertaining to the development and strength of BRICS economies.

The share of BRICS on the global GDP reached 22.5% in 2016 compared to only 6.8% twenty years ago. Calculating GDP in purchasing power parity, the BRICS countries create even 32% of the world GDP. A closer look shows, however, that despite India is in the fourth place, Russia on the sixth, Brazil on the eighth, and South Africa on the thirtieth place, China is far from all other BRICS, covering 18% of the world’s GDP (World Bank, 2017a).

Tab. 3.1 Overview of Selected Indicators of the BRICS in the Period 1995-2016

<table>
<thead>
<tr>
<th></th>
<th>Share of world’s GDP (%)</th>
<th>Average real GDP growth (%)</th>
<th>GDP per capita in Purchasing Power Parity</th>
<th>Share of world’s population (%)</th>
<th>Share of world’ area (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>2.5</td>
<td>2.5</td>
<td>8 073.0</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>Russia</td>
<td>1.3</td>
<td>1.7</td>
<td>5 611.7</td>
<td>2.6</td>
<td>1.9</td>
</tr>
<tr>
<td>India</td>
<td>1.2</td>
<td>3.0</td>
<td>1 485.0</td>
<td>16.8</td>
<td>17.8</td>
</tr>
<tr>
<td>China</td>
<td>1.3</td>
<td>14.8</td>
<td>1 870.0</td>
<td>21.1</td>
<td>18.5</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.5</td>
<td>0.4</td>
<td>6 691.0</td>
<td>0.7</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Source: World Bank (2017a), International Monetary Fund (2017a); own elaboration, 2017

The BRICS are also the most populated countries in the world (41.8%). In this regard, China shares currently 1.39 billion and India 1.32 billion of people.\(^{107}\) Both countries, thus, cover about 87% of the BRICS total population. On the other hand, Russia has been struggling with the population decline for a long time (World Bank, 2017a).

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\(^{106}\) To be more precise, China has become to have a significant effect on global economic performance, however, the rest of BRICS countries plays major role mostly in their regions.

\(^{107}\) However, the population predictions suggest that high population growth will push India to the most populated country in the world by 2030 (estimation of 1.53 billion of people).
All BRICS, with the exception of Russia, are defined as newly industrialized countries, reaching high economic growth during the last two decades.\textsuperscript{108} It has been reflected at the improving level of the standard of living (measured as GDP per capita in purchasing power parity). The highest ranking is occupied by Russia on the 48\textsuperscript{th} place, reaching 73\% of the EU level. Other BRICS rank around the 80\textsuperscript{th}-90\textsuperscript{th} place, India even 123\textsuperscript{rd} place. Nevertheless, despite these common attributes, closer elaboration of BRICS uncovers their huge differences, with the significant dominance of China.\textsuperscript{109}

3.2.1 Formation of BRICS Group

In spite of BRICS countries not creating any kind of economic integration, it is already considered a formal group. Their first, yet informal, diplomatic meeting took place in 2006 as a part of the UN General Assembly, which turned out to be a new occasion for regular annual meetings. The first formal meeting, this time at the level of the highest constitutional representatives, came about three years later in Yekaterinburg. South Africa joined, formally, the group of BRIC in 2011. After the decade of their mutual cooperation, BRICS managed to establish common New Development Bank (NDB), a sovereign fund and cooperate in many fields of economic, social and politic life. Currently, this strong geopolitical group of emerging markets is present on four continents, defending their interests on regional and global level, but also representing developing world in front of developed countries.

The BRICS are sovereign states with their own independent economic and foreign policy. Despite having gone through the economic and social transition in different periods, they are significantly involved in international trade relations for centuries. After the Second World War, they joined several integrations mostly based on political and ideological development. It caused a relative diversion from liberal and open trade relations, at that time common in the Western world. However, all BRICS members have recently begun to open their markets, carry out liberalization reforms and partially democratize their society. All BRICS countries have become members of the United Nations, moreover, Russia and China are the UN Security Council permanent members. They are also active members\textsuperscript{110} of the International Monetary Fund (IMF) and the World Bank (WB). Brazil, India and South Africa are also founding

\textsuperscript{108} According to the methodology of the International Monetary Fund, newly industrialized countries reached significant economic development, usually connected to fast export-oriented industrialization.

\textsuperscript{109} Trade analysis provided in this chapter will at least partially reveal differences in state and dynamics of BRICS economic development.

\textsuperscript{110} Countries that have used any kind of the IMF or WB development program.
members of the GATT/WTO, while China joined it in 2001 and Russia in 2012, as it is demonstrated in the Tab. 3.2.

In 2006, the governments of BRICS countries decided to improve their mutual economic and trade relations by closer cooperation, technical support and coordinated actions on the global level. At the first formal meeting in 2008, they concluded first common goals: (i) the support of Russia and China to India and Brazil to build a better position in the UN as well as to promote the reform of this multilateral organization in favour of developing countries, (ii) an initiative to complete a comprehensive UN Convention on International Terrorism (Ministry for External Relations, 2008).

Tab. 3.2 BRICS Membership in Selected International Organizations

<table>
<thead>
<tr>
<th>United Nations</th>
<th>UN Security Council permanent members</th>
<th>IMF</th>
<th>WB</th>
<th>GATT/WTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>1945</td>
<td>1946</td>
<td>1946</td>
<td>1948/1995</td>
</tr>
<tr>
<td>India</td>
<td>1945</td>
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<td>1945</td>
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<tr>
<td>China</td>
<td>1945</td>
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</tr>
<tr>
<td>South Africa</td>
<td>1945</td>
<td>1945</td>
<td>1945</td>
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</tr>
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</table>

Source: own elaboration, 2017

Increasing economic position of the group of BRICS in the global economy was an impulse to establish regular summits on the highest level of representation. The first summit was held in Yekaterinburg in June 2009, where the existence of BRICS as a political and diplomatic group was confirmed, aiming to build strong functional relations among members in economic and social development. BRICS leaders agreed that the annual summits will be held just before the G20 meetings to formulate their position, as the reform of the Bretton-Woods institutions is their key task. They also emphasized to complete the Doha Development Round to stabilize international trade and investment relations that would help to global economic recovery after the recession in 2008-2009.

The second summit was held in Brazil in 2010. The BRICS representatives confirmed the intention to change their position in the multilateral system; they increased their capital share in the International Bank for Reconstruction and Development and expressed support to Russia in the WTO accession program. They also committed to improve regulation of their financial

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111 All BRICS are represented by presidents. Only India is represented by the Prime minister.

112 Since the IMF reform came into force in 2010, the BRIC became the top 10 biggest IMF shareholders, China has the third largest IMF quota and voting share after the United States and Japan (rt.com, 2016).
markets, create a common agricultural information system, and approved humanitarian aid to Haiti (BRICS: India 2016, 2016). The third summit was held in Sanya, China, in 2011. Economic situation and the wave of revolutions and civil wars in North Africa and the Middle East was the main topic of this summit. Despite BRICS agreeing that such situation should be solved in a peaceful way through multilateral diplomacy, the position of some members, in the ongoing conflicts, is still highly questionable. Representatives confirmed their continuity to support reforming process of the international financial system and tight supervision of risky global financial capital flows, especially in developing countries. The energy sector, food security, and the WTO negotiations were also in the spotlight. The common objectives were transformed into the first Action Plan, which still serves as the main framework for their cooperation. As it was agreed to expand BRIC at the Foreign Ministers’ meeting in 2010, the summit in China was already fully attended by all five countries (BRICS: India 2016, 2016).

The first suggestion to establish a new Development Bank was put on the table at the fourth summit in India in 2012. It should mobilize additional funding for infrastructure and environmental development projects in developing countries, partially replacing grants provided by the World Bank and other Western institutions. The BRICS intent to favour developing countries on their side as they are important suppliers of natural resources and labour, and, thus, create certain balance in global foreign relations. The Master Agreement on Extending Credit Facility in Local Currency enabling easier intra-BRICS trade was also signed there. Among others, they emphasised the need for global cooperation to foster economic growth after crisis, unanimously condemned the pressure of the EU and USA on Iran, confirmed the dialogue as the only way to calm the situation in Syria and resolutely refused the possibility of any intervention.

One year later, the first five-year period of BRICS cooperation was completed on the summit in Durban, South Africa. The BRICS concluded the first stage of their sought to coordinate their common position in international institutions based on two pillars: (i) economic and political governance, and (ii) mutual cooperation. The aim of the first pillar was to create pressure to the Bretton-Woods institutions’ reform to better reflect the current state of the global economy and bring more effective internal processes and decision-making. This goal was successfully achieved. The second pillar involved cooperation among the BRICS themselves in the fields of finances, agriculture, economy and trade, combating international crime, support of science and technology, fostering health and education systems, etc. However, any judgement about the success of cooperation is hard as the goals were very general. Finally, the BRICS
representatives also agreed on cooperation among export credit agencies to better facilitate mutual trade and signed the Innovation Cooperation Agreement.

The sixth summit was held in Brazil in 2014. The new five-year cycle was launched to strengthen existing cooperation among BRICS members and pursued a course of the counter-development of developing countries in the world economy. The issue of social inclusion and sustainable development was included on the list of cooperation with the aim to reduce poverty as the level of long-term poverty and income inequality still remains a significant issue for their economic development.

On the Ufa Summit in 2015, the NDB and the Contingent Reserve Agreement became formally operational legal entities. The general aim of the summit confirmed the current direction of cooperation and launched new objectives in the areas of trade and investment. The BRICS leaders discussed common steps towards economic growth, financial markets stability, and acceleration of economic reforms. The BRICS Economic Partnership Strategy was the key step of the summit. It formed the main line for the future cooperation covering trade, investment, industry and mining, agriculture, and many other areas. Finally, as the cooperation among all Member’s Export agencies begun in the previous year, the first annual meeting was held in Ufa as well, discussing common export cooperation opportunities.

In 2016, the BRICS summit took place in Goa, India. Among all topics discussed at this meeting, the international relations and global terrorism were in the centre of all issues. Russian interventions in Syria, increasing terrorist activities on the Indian-Pakistan border and position of China in the South East Asia put the BRICS more in the spotlight of the international relations. Increasing power of the BRICS members created new responsibilities they cannot avoid. However, no legal binding was issued there despite all their political statements. None of the BRICS did formally agree that terrorism must be wiped out or on the proliferation of chemical and biological weapons. Another important issue discussed at the Goa Summit was international trade, co-operation in matters of intellectual property rights and the digital economy. The Goa Declaration suggests several measures to reduce non-tariff barriers among BRICS (customs cooperation and procedures of customs control).

The last summit took place in Xiamen, China, in September 2017. The BRICS confirmed their cooperation mainly in the area of security, macroeconomic policy coordination and structural reforms. They adopted common declaration naming several terrorist groups, which the BRICS will fight against together. This was positive mainly for India, as China has blocked
such initiative in the past. In spite of the prevalent power asymmetry in favour of China\textsuperscript{113}, India proved that it is the equal member of the BRICS family showing resolute political stamina in important matters. They also emphasized the lack of progress in the Doha Round negotiations, urged the IMF to complete its reform from 2010 and foster the voice of developing countries in the World Bank. The agenda dealt also with the implementation of the Strategy for Economic Partnership, which was adopted at the previous summit (BRICS: 2017 China, 2017).

Since the first BRICS summit, two areas of cooperation have been created: (i) coordination of engagement in international organizations, and (ii) development of cooperation in many sectors among members. At present, nine years after the first summit, the BRICS countries cooperate in more than 30 areas. The most promising is the cooperation in economic and financial matters, followed by coordination of foreign policy, especially in the area of global security. Moreover, the BRICS leaders declare that their cooperation is open to all countries and international institutions seeking to find common solutions to contemporary global challenges.

Following all summits, the intra-BRICS activities continue to speed up and cover a broader area of economic and social life. A study published by the University of Toronto highlights that the BRICS achieved 78% compliance with the Ufa Summit Commitments made in 2015 within one year (Post-Western World, 2016). Over its existence, the BRICS group fulfilled their pledge on tax transparency, competition policy, improved information and communications technology, cooperation on agriculture and food security, mutual trade etc. However, the truth is that many commitments and proclamations touching the highest sovereignty of each member remain unspoken or without common agreement (position within the UN, foreign relations, and the fight against terrorism).

3.3 EU Common Commercial Policy in Relation to BRICS Countries

The European Union belongs to the biggest economies and players in the field of international trade and investment. According to the European Commission (2016), more than 30 million jobs are directly supported by exports outside the EU, twice as much as at the beginning of this century. While its share of the world trade is still high, a sharp economic growth of some emerging countries has significantly reduced the importance of the EU on the

\textsuperscript{113} China clearly wins in the China-India competition within the group of BRICS resulting in ambitious One Belt One Road project, China-Pakistan Economic Corridor or India’s longstanding bid for membership of the Nuclear Suppliers’ Group.
global market. It is estimated that about 90% of the world’s growth will be created outside the EU within next two decades.

Therefore, the EU members must be active to develop economic relations with other trading partners, the emerging markets in particular. Active trade policy in the sense of trade liberalization, especially in case of agriculture products, is a key tool to deepen economic relations with the developing countries. The European Commission, therefore, promotes new kind of trade agreements that include the elimination of trade barriers in goods and services, and reciprocity of trade liberalization, investment, public procurement, intellectual property rights, international standards, and supply of natural resources. Despite the EU declaring the Doha Round as a high priority, it does not wait for its completion and continues to negotiate bilateral and regional trade agreements.

The group of BRICS has become important trade partner of the EU countries. While they accounted for only 4% of the EU exports (and 5% of the EU imports) in 1995, their share increased significantly until 2016, to almost 20% on the side of exports, and 33% of imports respectively (DG Trade, 2017a). It means that larger share of the EU trade deficit belongs to the BRICS countries, but their economic importance is mutual, as the EU still remains the main trade partner for all BRICS countries, as it can be seen in Annex 3.

Changes from bipolar to the multipolar economic system during the last three decades have shifted economic power towards BRICS that became new world and regional powers. Their power was confirmed by the recent economic crisis in 2008. In 2011, the European Commission issued a new trade and investment strategy reflecting the aims of the Europe 2020 Strategy for smart, sustainable and inclusive growth. In terms of the EU Common Commercial Policy, main objectives are set to complete negotiations in ongoing multilateral and bilateral trade agreements and seek new ways of cooperation with trading partners. The European Commission estimates that the mere implementation of the existing trade agreements with main strategic partners may increase the EU GDP by EUR 150 billion (DG Trade, 2011). The new EU trade strategy promotes the orientation of the trade policy to the United States of America, China, Russia, Japan, India, and Brazil. It is clear from this enumeration that the group of emerging countries is particularly concerned with BRICS. There are many reasons for that. China is already the largest economy in the world and India has a potential to become the second by 2050 (PwC, 2015).
As the doctoral thesis deals with trade in goods among the EU and BRICS countries, evolution and the current state of the EU Common Commercial Policy towards those countries will be elaborated in this subchapter.

3.3.1 EU Common Commercial Policy Relations with Brazil

Brazil, as the largest economic power of Latin America, is the EU's biggest trading partner in this region. However, negotiations between the European Commission and the Brazilian administration are complicated and long as a new trade agreement is negotiated as part of the EU's Association Agreement with the Mercosur countries. The EU is Brazil's main trading partner, accounting for almost 20% of its total trade, and Brazil is the EU’s biggest trading partner in Latin America, accounting about 2% of total EU trade (DG Trade, 2017c).

Europe has a very long tradition in trade relations with Brazil as it was colonized by the Portuguese and Spanish for many centuries. Formal trade relations between both economies began shortly after the foundation of the European Economic Community in the 1960s. In the early period of cooperation, Brazil did not incline fast towards the emerging European integration as the EU strongly protected its agriculture market and preferred imports from former colonies in Africa and Asia. This EU approach had damaged Brazilian production; trade in sugar and cocoa in particular (Balabán and Rašek, 2010). In 1975, the first Trade and Economic Cooperation Agreement were concluded, followed by various cooperation agreements. With the consolidation of democracy in Brazil, bilateral relations have become more formal resulting through the Framework Cooperation Agreement signed in 1992. Additionally, the latter agreement conditioned broader economic cooperation by complying democratic principles and human rights. The fulfilment of the Agreement was supervised by the Joint Committee (Cihelková, 2003).

A long period of successful economic co-operation between Brazil and the EU were confirmed by the Strategic Partnership in 2007, covering a range of issues, both economies face such as climate change, sustainable energy, fight against poverty, the Mercosur integration process and stability and prosperity in Latin America. In the case of trade, the EU encourages Brazil to reduce tariff and non-tariff barriers and maintain stable rules for trade and investment as Brazil is a G20 country that has the highest number of new, potentially restrictive trade

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114 Mercosur also includes Argentina, Uruguay and Paraguay.
measures (European Commission, 2017a). Strategic Partnership also includes sectoral dialogues that are part of the implementation of the Joint Action Plan. Latest summit that was held in 2017 reaffirmed their shared commitment to implement the Paris Agreement on Climate Change, promote trade liberalization and facilitation of trade, and investment on the multilateral level.

Finally, the EU has been negotiating an Association Agreement with the Mercosur already since 2010, including a free trade area between both integrations. A study made by University of Manchester in 2008 reports that full liberalization of trade between the EU and Mercosur would increase the EU’s production by 0.1% and production of Brazil by 1.5%, excluding other dynamic effects. Positive effects of agreement should be mainly reflected in sectors of manufacturing and services in the EU countries and in agriculture and food processing sectors in Mercosur (DG Trade, 2008). The real success in negotiations was made in May 2016, when the mutual offers on market access for goods, services, and public procurement were set (European Parliament, 2017). Despite big steps in an agreement’s negotiations, it will take a long time when it will come into force, mainly due to the lack of unity within Mercosur. Moreover, Brazil has experienced an economic recession, sharp currency devaluation and political crisis since 2014, which slows all efforts of free trade negotiations.

3.3.2 EU Common Commercial Policy Relations with Russia

Russia is the second most important trade partner of the EU from the BRICS group. Russia exports almost half of its production on the EU market (DG Trade, 2017d). Europe is heavily dependent on Russian oil and gas imports and the EU is reliable business partner meeting its commitments on time. Income from exports is used for modernization Russian economy, building energy and transport infrastructure and explore new oil and gas resources. In the long term, both economies cooperate in the diversification of oil and gas pipelines, especially to avoid "troublemakers" such as Ukraine and Poland. However, as the economic dependence is highly mutual, trade and economic cooperation are still negatively affected by the Cold War reverberations, which are projected to diplomatic disputes, which elevated in 2014. Currently, many European and Russian businesses struggle with high tariff and non-tariff barriers to both

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115 Sectoral dialogues concern cooperation in the fields of human rights and democracy, economic, social and environmental development, regional cooperation, technology and innovation, culture and education (European Commission, 2011).

116 The EU-Mercosur Association Agreement is in fact negotiated since 1999. However, the negotiations were suspended in 2004 and resumed in 2010, focusing on the political and cooperation chapters and the ‘normative’ part of the trade chapter (rules of origin, etc.).
markets, completed by export restriction and economic sanctions on both sides due to recent events in the East Ukraine.

It took several years to restore the political situation in Russia after the fall of communism and it was essential to establish good relations with the European Union. Therefore, the Partnership and Cooperation Agreement (PCA) came into force in 1997, creating a framework for future economic, political and cultural relations, with the duration of ten years. Mutual cooperation was institutionalized in the joint summits of the highest representatives, the annual meetings of the European Council, members of parliaments and many working groups. During that period, many sectoral agreements were signed, for example on textiles, steel, cooperation in science and technology, nuclear safety, fisheries, etc. (Cihelková, 2003).

Later on, political and economic relations between the EU and Russia were developed through the Common Space Initiative covering the four areas of cooperation (economy and the environment; freedom, security and justice; external security; research and education) or the Partnership for Modernization, which was set up at the EU-Russia Summit in 2010, covering all aspects of modernization, i.e. economic, technical, legal issues and functioning of justice (European Commission, 2017b).

The EU wanted to establish a deeper economic integration with Russia already in 2003 when the concept of the Common Economic Space was introduced. It supposed to remove most of the trade barriers, create new common regulation, building a backbone infrastructure and exchange of information. This strategy should also support the forthcoming entrance of Russia to the WTO. Russia joined the WTO, after a difficult eighteen years long process as the 156th member in 2012. Unfortunately, before the WTO membership could bring first clear benefits, new political and military conflict on Russian-Ukraine border and annexation of Crimea stopped all efforts of business development. Despite not affecting most of trade relations, the European Union and many other democratic countries have adopted economic sanctions against Russia, including the freezing of deposits in the European Banks, removal of visas for representatives of the Russian government and mainly a ban on the export of certain goods and technologies from the EU. As a reaction, Russia adopted several sanctions on the EU members as well. Currently, political and economic relations remain subdued despite new negotiations

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117 However, the unclear position of Russia, troubles to meet conditions of accession and Georgia’s veto caused huge delay of the WTO negotiations.
118 More information about the EU-Russia crisis can be found in Fojtíková and Vahalík, 2015.
between the EU and Russia’s administration. Regular summits between the EU and Russia were left and bilateral talks on a new agreement postponed (Fojtíková and Vahalík, 2015).

Aside from current political tensions, Russia continues to lift trade barriers to protect domestic industries. In 2016, Russia recorded the highest number of new trade barriers, mostly in the form of non-tariff measures across various sectors. The government in Moscow applied thirty-three new trade protecting measures, sixteen applied directly on the border, fourteen behind the border and three new subsidies. They use mostly non-tariff measures, namely certifications and trade-distorting subsidies. The European Commission estimates that these measures cost European businesses only in the period 2013-2015 more than EUR 12 billion (European Commission, 2016).

### 3.3.3 EU Common Commercial Policy Relations with India

India has a tremendous potential for trade and investment because of its fast economic growth and the biggest and still fast growing and well-educated population. The potential for trade between the EU and India remains huge, representing a market of 1.7 billion consumers. Therefore, the EU and India increase their effort to finish negotiations of free trade agreement launched in 2007. Current Indian market contains many pitfalls and issues for European exporters, particularly in the form of high tariff and non-tariff barriers, lack of transport and energy infrastructure, bureaucracy and traditions, etc., that do not allow deeper economic cooperation. Negotiations on the trade agreement, including for example services, investment or public procurement are currently underway, however, the negotiation process is mostly hampered by disputes over the trade of agricultural products.

India was one of the first countries establishing trade and diplomatic relations with the European Economic Community (EEC). During the 1960s, India was formed to the geopolitical entity with relatively solid rules of law and administration. Since then, it has signed several bilateral agreements, i.e. on economic cooperation (1973) and on trade and economic cooperation (1981) with the EEC. Since 1994, the EU-India relations are managed by the Cooperation Agreement which opened the door to wide-range political dialogue through annual summits (European Commission, 2017c). In the commercial area, both parties committed to enable market access through trade and investment liberalization (Cihelková, 2003).

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119 New PCA supposed to be re-negotiated in 2008, providing a comprehensive framework for bilateral relations in line with the WTO rules. Unfortunately, the negotiations were disrupted in 2010 because of disagreements in the trade and investment part. Moreover, on the background of the crisis in Ukraine, the negotiations were formally suspended in 2014.
During the 1990s, India launched liberalization process to integrate into the global economic system. However, even today, the Indian trade policy as well as legal environment are still very restrictive. In the case of trade policy, India still keeps high tariff and non-tariff barriers on trade with the EU members. For example, average tariff on non-agricultural products is about 10%, on agricultural products even 33% (WTO, 2017b). Moreover, India also applies a huge range of quantitative restrictions and import licenses, specific mandatory testing and certifications, etc. Just in 2016, India resorted five new trade barriers in sectors of steel, medical devices, textiles and food, with estimated costs of EUR 2.2 billion. The length of customs procedures is also a big obstacle for European companies. On the other hand, India benefits of the EU trade preferential treatment of GSP system applied to roughly one-third of total India’s exports to the EU (European Commission, 2016).

In 2004, India became the strategic partner of the EU. In the following year, the EU-India Joint Action Plan was signed creating a framework for future partnership and cooperation in the key areas of political, economic and social cooperation. The regular summits at the ministerial, expert and sectoral level were established as well as parliamentary exchanges to extend cooperation on a broad range of issues. India does not consider the EU as one partner, but its trade policy focuses on the main markets such as Germany, France, United Kingdom or Italy. The EU thus partially balances the dominance of the USA in the region, but currently faces increasing power of China (Balabán and Rašek, 2010). It is another reason for deeper cooperation between both economies.

Since 2007, both economies negotiate a comprehensive FTA covering mainly free access to each other’s markets in goods, services, public procurement and investment\(^{120}\) as well as measures of sustainable development. After substantial progress, the negotiations got stuck for the period of three years. Discussions were resumed in 2016, currently focusing on key outstanding issues that include improved market access for some goods and services, government procurement, geographical indications, investment protection rules, and sustainable development (DG Trade, 2017e). The coverage of GSP preferences has been decreasing over the years as India is less and less in the need of such help. When the FTA will be established, the current GSP system will be phased out over a period of two years. It is

\(^{120}\) India has so far introduced some changes in investment rules and has opened the possibility of 100% foreign ownership in the telecommunication sector. Similarly, the government increased investment limits in the armaments and insurance sectors from 26% to 49% (DG Trade, 2017e).
estimated that the FTA would have a positive impact on the EU, as well as India’s exports in total turnover of USD 23-26 billion (European Commission, 2017b).

3.3.4 EU Common Commercial Policy Relations with China

China is the most important business partner of the EU from the developing world. It is a very attractive country for the EU producers and investors, due to its high economic potential, a source of cheap consumer goods and a key supplier of intermediates for the European industry. However, China still remains among the most trade-restrictive partners, as it blocks the EU producers’ access to the domestic market through a big amount of non-tariff barriers, limitations in capital flows, control of information, etc. The EC estimates the total costs of those measures of EUR 3.7 billion (European Commission, 2016). China, together with India, also uses the most of trade defence instruments against the EU. The Chinese government is also very unwilling to respect the intellectual property rights, international certification, technology duplication; not to mention the violation of human rights.

Trade relations were quite subdued in the first decades of the People’s Republic of China because the Communist doctrine did not allow developing any relations with the Imperialistic world at the beginning of the Cold War. A new era of economic relations between the ECC and China began during the 1970s, after the reform wind coming from the change in the Communist Party leadership.\textsuperscript{121} In 1975, official economic relation started with signing the Agreement on Trade, however, this step was clearly just political. According to Cihelková (2003), economic opening took place gradually after the market transformation several years later. As a result of improving economic relations, China was included in the EU GSP preferential system. Subsequently, an extended version of the Agreement on Trade and Economic Cooperation was concluded in 1985, the legal document, which determines bilateral trade and economic relations even today, coupled by several commodity agreements.

Since 1994, there have been regular meetings between the EU and Chinese representatives at various levels within the framework of the annual political dialog, currently covering over fifty topics.\textsuperscript{122} One year later, the first long-term strategy for the development of relations was adopted.\textsuperscript{123} In 2003, the EU and China signed the Strategic Partnership. Unfortunately, these

\textsuperscript{121} Since 1974, Chinese economic policy deviated from its previous path towards pragmatism by opening market for foreign capital and modernization create new kind of market economy but still driven by socialism thoughts.
\textsuperscript{122} Aside the economic issues, it includes also strengthening cooperation addressing global challenges, such as air pollution and climate changes solution, fight against organized crime, international terrorism or drug smuggling.
\textsuperscript{123} In 2000, an agreement on science and technology entered into force, followed by agreement on maritime transport in the following year. Cooperation has been developing also within the framework of the European Research Centre Program or the Energy and Environment Program.
negotiations are proceeding very slowly. Although China is the WTO member since 2001 and has made huge progress in market liberalization, there was made just a little progress in areas of industrial policy and non-tariff barriers, reduction of government interventions to the state-owned companies and lack of transparency (DG Trade, 2017f). The EC expands trade relations with China on the fair-on-fair terms, especially in the field of intellectual property rights and fulfilling the WTO rules (Baláž et al., 2012). However, the recent economic and consequent debt crisis of the Euro Area just complicated the whole situation.

The EU and China launched negotiations on Comprehensive Investment Agreement in 2013, which should ensure gradual opening of markets to investors from both economies. This agreement will provide a simple and safe legal framework by ensuring the predictability of the investment environment (DG Trade, 2014). The European Commission identified 21 administrative practices that the China administration uses to curb the EU investment. Investment agreement could have significant effect on European companies’ profit as most of them want to provide capital investment and produce goods and services for the Chinese market. In addition, China is an important source of natural resources and intermediates important for European industry (Fojtíková and Vahalík, 2017). On the other hand, the EU needs to increase investment activity on the European market as well in order to boost economic growth and employment. Europe continues to be a favourite destination for Chinese investors, which resulted in total FDI inflows of EUR 35 billion in 2016 (about 19% of total FDI). Nevertheless, China’s investment is highly concentrated in several EU markets, especially Germany, which accounts for one-third of total Chinese investment (Merics, 2017).

Despite high investment activity of European companies on China’s market, huge red tape and increasing barriers to foreign investment in the banking, construction and telecommunication sectors, complicates access to the market. The rapid economic development offers tremendous potential for Chinese procurements, however, the current situation in this market makes it, in fact, highly inaccessible to foreign companies due to lack of transparency and appeal procedures. Finally, compared to current FTA negotiations with India and Brazil, there is no free trade agreement negotiated with China, and the European Commission proceeds on the case-by-case basis.

The rising living standard in China boosts domestic demand for foreign goods, representing a significant export potential for the EU exporters. But the broad scale of tariff and non-tariff

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124 It includes areas of investment rules, administrative procedures, standards, lawsuits and law enforcement that is currently the subject of bargaining.
barriers, on Chinese side, in particular, does not allow full exploiting this potential. Elimination of trade barriers would lead to an unprecedented growth of economic activity between both economies (DG Trade, 2015). The European Commission claims that a major problem for the EU-China trade remains unfair business practices. In 2017, the EU applied a total of fifty-one anti-dumping measures and one anti-subsidy measure only against Chinese imports. Moreover, European companies have to face a large number of non-tariff barriers as Chinese government often changes standards, rules and administrative procedures that are not in power of foreign producers to fulfil. China also limits export of strategic commodities, especially raw materials, from its territory. Several serious trade disputes got even to the floor of the WTO. Perhaps, the most well-known disputes in the recent past were of Huawei solar panels or telecommunication devices. An important issue is represented by the significant amount of counterfeit goods imported to the European market. According to the EU customs authorities, about 70% of all counterfeit goods originate in China. The main reason is the violation of intellectual property rights by Chinese companies and the enforceability of international law (European Commission, 2017d).

3.3.5 EU Common Commercial Policy Relations with South Africa

South Africa is the only representative of BRICS and main trading partner of the EU on the African continent. It is also the only country in the group that has already signed any kind of Free Trade Agreement with the EU. Although, the EU-South Africa trade of goods and services is not so high, their bilateral relations are probably the most developed.

The history of South Africa is strongly tied to the culture of the EU countries that had many dependent territories in the region during the colonialism era (started by Dutch, followed by British). During the apartheid era, economic and trade relations between the ECC and South Africa were partially managed by Lomé Conventions I-IV laying down development cooperation and trade provisions, which allowed 99.5% of products from African, Caribbean and Pacific countries free access to the European market. The EU has fully re-established its diplomatic relations with South Africa and has launched a new policy aimed at developing common trade and investment after the fall of apartheid in the mid-1990s. The first cooperation agreement was signed in 1994, covering areas of human rights, democracy, institution as well as trade. Five years later, when South Africa was fully included to the Lomé Conventions IV,

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125 The ECC representatives condemned and ostracised political apartheid in South Africa, and applied economic restrictions on some sectors, mutual trade in goods expended in others (Adebajo and Whiteman, 2012).
126 African, Caribbean and Pacific group of states benefit from the EU preferential trade treatment.
the negotiations on the Trade, Development and Cooperation Agreement (TDCA) were launched including preferential trade. While its business section came into force in 2000, the TDCA as a whole did not enter into force until 2004.

The most important part of the Agreement covers trade relations with the EU. Its aim is to establish the very first North-South reciprocal free trade area. Despite the negotiation process being long, it still did not fully cover all areas in the trade with goods. The FTA was phased in over the twelve-year period from the side of South Africa and the majority of tariffs on import to the EU were phased out over the ten-year period. The liberalization process was completed by 2012. Since the Agreement came into force, the mutual trade between the EU and South Africa more than doubled, and the volume of foreign investment has even increased fivefold (DG Trade, 2017g). It clearly shows the importance of economic relations of both economies and increasing dynamics of mutual trade once the trade agreement was established.

During the FTA implementation process, the Strategic Partnership Agreement (SPA) entered into force in 2007, creating a new framework for political and economic cooperation. The aim of this cooperation is primarily to promote peace, security, and stability in the African continent as South Africa is considered to be the largest security guarantee in the region (European Commission, 2017e). Recently in June 2016, the EU and South Africa, together with other members of the Southern African Development Community, signed the Economic Partnership Agreement (EPA) that will regulate trade in goods between both regions once it is ratified. The EU will fully or partially remove customs duties on 98.7% of imports from South Africa while guaranteeing full free access to the rest of the signing countries. The EU will obtain new market access on Southern African Customs Union market and the bilateral agreement on trade with Mozambique. This new agreement will be asymmetric, hence the African signatories are not required to respond with the same level of market openness as the EU can provide (DG Trade, 2017h).

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127 The EU-South Africa FTA does not include all aspects of agriculture goods, there are exception in the automotive industry on the side of South Africa and textile on the side of the EU.
128 According to the Agreement, South Africa’s market should open to 86% of the EU goods, and the EU market to 95% of goods. The EU pledged to drop average duties from 2.7% to 1.5% and South Africa agreed to cut average duties from 10% to 4.3% (European Commission, 1999).
129 If the EPA will be ratified, it will replace the TDCA.
130 The new access includes better trading terms mainly in agriculture and fisheries, including wine, sugar, fisheries products, flowers and canned fruits.
3.4 Trade in Goods between the EU and BRICS Countries

International trade has grown rapidly during last decades. Since 1995, global trade grew about 10% p.a. on average until the financial crisis in 2008-2009. However, this growth declined to only 2% in the post-crisis period. Recent global trade activity slowed down due to subdued international prices, lower economic growth in China and rising protectionism. International commodity prices dropped significantly in 2014 and remained at historic low levels. Economic growth in China has declined to 7% compared to its average of 10% growth since the mid-1990s and the economic production of other BRICS members have also held up since 2011. Since the economic crisis, protectionism sentiment has been on the rise in many countries. According to the last WTO Global Monitoring Report, the group of G20 countries issued 42 new trade-restrictive measures including new or increased tariffs, customs regulations or rules of origin (WTO, 2017c).

The global trade dynamics and economic growth of observed economies are pictured in the following Fig. 3.1. The growth of global trade was higher and more volatile during the observed period than economic growth of the EU and BRICS. While the volume of global trade grew by 6.3% on average in the pre-crisis period, it recorded only 2.8% in the post-crisis period. Economic growth and global trade dynamics, thus, go hand in hand. Moreover, economic growth of emerging countries was much higher than in the EU. Recently, while the European market recovers from the crisis, economies of BRICS have slowed down.

Fig. 3.1 Real GDP Growth and Global Trade Growth (%)

For the following analysis, the post-crisis period is considered as years 2011-2016.
3.4.1 The Position of Trade in the Economy of the EU and BRICS Countries

Foreign trade is a vital part of economic relations. Due to globalization, which is represented mainly by increasing division of labour and international exchange, all countries have become more dependent on each other. From the macroeconomic point of view, foreign trade can be described as the consumption of goods and services produced in domestic economy by consumers in different country. As it was discussed in chapter 2, each country is more or less dependent on external trade.\(^{132}\) According to the degree of integration in the global trade relations, the countries may be divided into the category of open and closed economies.\(^{133}\) It is very usual that the country with a large internal market is less open than the country with a small market. Nevertheless, there is no rule in such matter, as trade barriers may significantly affect the level of trade openness as well.

The trade dependence index is used to measure the importance of international trade in the overall economy measured as the size of export and import of goods compared to the gross domestic product.\(^{134}\) Fig. 3.2 shows the level of trade openness (trade dependence) of the EU and BRICS in the observed period. The EU market is more open to international trade than BRICS. Since 1995, the share of trade to the EU GDP increased from 44% to 65% in 2016 but stagnates in the post-crisis period.\(^{135}\)

The BRICS markets are less dependent on the trade. South Africa is the most open economy of about 50% share of trade to GDP and it is the only country, which trade openness has grown. On the other hand, trade dependence of Brazil varies only about 20%. The share of trade on total product of Russia has been constantly decreasing already since 1999. It is mainly caused by increasing share of domestic production for the local market. In the case of China, trade

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\(^{132}\) See section 2.1 about trade liberalization and protectionism.

\(^{133}\) Remember that open economy enters trade relations with other countries. Such country then exports part of its production to foreign markets for which collects funds to buy products from abroad. On contrary, closed economy is characterized by not entering into international trade relations and also that the size of its consumption equals its production. However, there is no country that would be so self-sufficient and possess such scale of production, which the people want consume, to be closed economy. Hence, fully open or closed economies are just a theoretical possibility.

\(^{134}\) Trade dependence is determined by large number of factors such as population, level of economic development, as well as by trade restrictions like tariff and non-tariff barriers, exchange rate regimes, etc.

\(^{135}\) During the research, the trade dependence of each EU country was elaborated as well. There was found that countries such as Czechia, Estonia, Hungary, Lithuania, Slovakia or Slovenia are highly dependent on foreign trade, while Cyprus, Finland, France, Greece, Italy or United Kingdom relies more on domestic market. Complete results may be found in Annex 5.
openness dropped by half since 2006, which is also connected to the strengthening of domestic consumption. Finally, a similar pattern can be found in the case of India as well.

**Fig. 3.2 Trade Openness of the EU and BRICS Countries (% of GDP)**

![Trade Openness Graph](image)

Source: UNCTAD (2017); own elaboration, 2017

The amount of export also depends on the size of the foreign market. The import penetration rate shows to what degree domestic demand is satisfied by imports.\(^{136}\) Comparing the EU and BRICS, there was found that the consumption in the EU is more covered by imports than consumption in the BRICS countries. Specifically, imports satisfied 29% of the EU demand on average, with the remaining 71% covered by domestic production in the observed period.\(^{137}\) Finally, the demand in the BRICS countries is dependent more on own production. It varies between 9% in Brazil to 23% in South Africa on average.\(^{138}\) The rest of demand is covered by domestic production. Domestic consumption satisfied by imports declines in BRICS since 2013, which is strongly connected to the drop of their economic production.

### 3.4.2 Size of Mutual Trade between the EU and BRICS Countries

As the mutual trade relationships between the EU and BRICS are in the spotlight of the doctoral thesis, it should be observed how important all the economies are for each other. Export

\(^{136}\) The import penetration index is biased upward by re-exports. It can be seen for example in the case of countries that highly rely on international trade transport such as Belgium or Netherlands.

\(^{137}\) Comparing the EU countries, there were found huge differences on the import penetration between big and small economies. For example, total imports to Czechia, Hungary, Slovakia or Slovenia satisfies more than 70% of domestic demand, while aggregate demand of Finland, France, Greece, Italy, Spain or United Kingdom relies on import just by less than 25%. Moreover, import penetration index have increased in the most of the EU countries during the period 1995-2016.

\(^{138}\) Import penetration may be highly affected by the level of tariff and non-tariff barriers.
of the EU to BRICS doubled during last two decades, currently covering about 7% of total EU export (about 20% of extra-EU export). On the other hand, the BRICS exported more than 20% of their total exports on the European market in 2016. The EU is recovering from the long-term recession but its economic growth remains fragile. Therefore, the BRICS exporters look for new consumers, mainly in developing world, resulting in decline of the EU market share on the total BRICS exports.\textsuperscript{139} Finally, the intra-EU trade accounts for about 65% of the total EU export and this share remains quite stable.\textsuperscript{140} The BRICS leaders show big effort in economic cooperation, however, their mutual trade remains still very low (just about 8% of total BRICS exports), hence developed markets are still more important for them.

As the Annex 4 shows, the EU is currently the most important market for all BRICS members and it has been so during last two decades. But it cannot be applied vice versa.\textsuperscript{141} The share of Brazilian market on the total EU exports was only 1.7% in 2016 (has remained stable at about 20% of the EU exports to BRICS). The share of Russia was only 1.5%, India and South Africa lower than 1%.\textsuperscript{142} The absolute dominance was gained by China, which increased its share on the total EU exports four times during last two decades (from 20% to 45% of total EU exports to BRICS). It suggests tremendous economic development and importance of China for the EU producers. To make it more interesting, the BRICS countries are not equally important for the EU members. For example, Baltic states or Bulgaria exported directly much less to the BRICS markets, than they did in the 1990s (see Fig. 3.3).\textsuperscript{143} However, BRICS has become more important for big EU economies, such as Germany, United Kingdom or France, as their export share more than doubled.

In absolute terms of mutual trade in goods between the EU and BRICS, the main EU exporters and importers still remain the same (see the Annex 4). Germany was the biggest exporter and importer during the entire period. Normalizing both trade flows to the base year of 1995, there was found that trade between Germany and BRICS increased six times. Germany is followed by other big EU countries and countries, which serve as important trade centres.

\textsuperscript{139} The share of the EU reached almost 30% in 2008.
\textsuperscript{140} The EU internal trade is more important for the EU members. Especially for those which joined after the year 2004 (more than 70% of their export remains on the EU market). On the other hand, island and coastwise countries rely relatively more on exports out of the EU market (for example, United Kingdom exported more than 55% of total exports outside the EU).
\textsuperscript{141} Remember that the share of BRICS on total EU export is only 7%.
\textsuperscript{142} Share of India on total exports to BRICS declined from 15% to 10%, Russia from 32% to 20% and share of South Africa dropped by half to only 6% compared to 1995.
\textsuperscript{143} Naturally, Russia was their main trading partner.
On the export side in 2016, Germany was followed by France, United Kingdom, Italy, Belgium, and Netherlands, with the similar amount of exports. Export of other countries is, then, significantly smaller compared to Germany, especially in the case of new EU members, which are strongly connected to the intra-EU trade. If export to BRICS is normalized in the same way as it was done with Germany, high growth of small countries’ export can be found. Finally, despite the EU export dropped significantly in 2009, it recovered fast in the post-crisis period and has been significantly falling since 2014. The current value of export to BRICS is almost five times higher than it was in 1995 but lower by 25% compared to the value in 2011.

Fig. 3.3 Share of Export to BRICS on Total Export of the EU Members (%)

On the side of imports, Germany remains the main trade partner of BRICS. It is followed by Netherlands, which imports reached about 60% of the German’s level in 2016, followed by United Kingdom, France, Italy, and Poland. As the Annex 4 shows, the ten biggest importers from BRICS remain the same, they just change the ranking. The smallest imports are, understandably, to the small EU countries such as Cyprus, Croatia, Luxembourg or Malta. Despite France is the second biggest exporter to BRICS countries, the value of export was already four times lower than German’s in 2016. In 2013, for example, export of Malta to BRICS increased twenty times, Slovakia and Lithuania thirteen times, Estonia and Cyprus ten times compared to 1995. Notice that in the top ten biggest importers is also ranked the Czech Republic.
followed, surprisingly, by Poland (eighteen times higher imports), Netherlands, Romania and Slovakia.

Such development of the EU trade with BRICS must be reflected also in the trade balance which was fairly negative during the whole period. The EU trade deficit with BRICS countries increased from USD 4 bill. in 1995 to USD 193 bill. in 2016. Despite the trend of deepening the trade balance may look terrifying, it was caused by opening the EU market and tremendous economic evolution of emerging markets until the crisis in 2009. Since then, trade deficit of the EU with BRICS countries stabilized about USD 200 bill. However, it represents only 1.3% of the EU GDP as it can be seen in Fig. 3.4. The highest deficit was reached by Netherlands covering of 22%. However, it is caused by the nature of Dutch economy, which is based on trade and international ports. The high trade deficit with BRICS had also United Kingdom, France or Spain. There is no EU country, which would have a positive trade balance with the BRICS since 2011.

Fig. 3.4 Trade Balance of the EU with BRICS countries

On the other hand, export of BRICS to the EU increased seven times since 1995 and eighteen times in the case of China. The BRICS imports increased just five times and yet again China’s imports have increased the most. The total trade balance of the group is positive already since 1996, however, India and South Africa mostly kept trade deficit with the EU. Trade balance of Brazil is still about the zero, Russia keeps high surplus due to the export of natural resources. It is the reason why its balance significantly varies over time. Finally, in China’s case, trade deficit changed to surplus already in 1996 and increased eleven times ever since.
To understand better the development and recent state of trade flows between the EU and BRICS, a normalized trade balance was calculated. In the long-term, this indicator should be zero as imports are financed by exports, but it may vary considerably in the short periods. Its range between -1 and +1 allows unbiased comparisons through the time as well as among countries. The results can be found in Annex 6. Most of the EU countries have significantly negative trade balance compared to its total trade with BRICS. Several years before the crisis, imports from BRICS significantly strengthened in the balance sheets of some EU countries. For example, Bulgaria, Croatia, Greece, Romania or Slovakia high import growth resulted in the highly deep trade deficit. On the other hand, countries such as Austria, Finland, Germany or Sweden have kept their balance fairly stable. Finally, it can be seen that the BRICS kept positive or quite balanced trade flows with the EU. Trade balance of China and Russia are especially high compared to its total trade. Brazil’s and India’s trade balance was relatively stable during the entire period.

3.4.3 Structural Changes in the EU-BRICS Trade in Goods

In the second chapter, the reasons for international trade were elaborated according to the economic theory. This section will refer to the structure and changes in the composition of trade in goods between the EU and BRICS countries during the last two decades. In this part, comparative advantages based on the theory of David Ricardo will be practically evaluated, followed by the theory of factor endowments of production and export based on the Hecksher-Ohlin theory and increasing returns to scale represented by Linder’s theory of intra-industrial trade. Last part will conclude this sub-chapter by observing the sectoral concentration of export, which is strongly connected to all above-mentioned indicators and check how much the EU and BRICS exports fits each other’s demand composition.

The first of assessed indicators is the revealed comparative advantage (RCA), which provides an economic explanation of the inter-sectoral trade. Comparative advantages are explained in the theoretical models by relative prices of one product from two countries. However, as it is very difficult to observe those prices and aggregate goods in one price, the RCA indicator is used in international economics. It uses trade flows to identify sectors in which the economy has a comparative advantage in relation to the world’s average. The calculations are based on the three-digit level of the Standard International Trade Classification (SITC), revision 4, which includes 255 product groups, which are aggregated in ten classes (SITC0-
Because of the scope of the doctoral thesis, just the results for the EU as a group and for each country of BRICS will be presented. Results are aggregated in the Tab. 3.3.

The EU keeps revealed comparative advantage in production of many goods across sectors, except crude materials, mineral fuels, and gold. Moreover, the EU has increased the share of sectors with revealed comparative advantage during the observed period except for chemicals and manufactured goods. On the other hand, Brazil keeps revealed comparative advantage only in the group of animal and vegetable oils. It also has a high advantage in the production of food and live animals, crude materials and manufactured goods, however the advantage is not better than the EU. Its advantage in the gold production disappeared since 1995. Russia has a significant RCA’s in the production of crude materials, and especially in the group of mineral fuels. However, there are minor advantages in other sectors. In the case of India, it keeps comparative advantages mainly in production of animal and vegetable oils, manufactured goods and miscellaneous manufactured articles.

Tab. 3.3 Revealed Comparative Advantage of the EU and BRICS (% of total products in the group)

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Source: UNCTAD (2017); own elaboration, 2017

The biggest progress of revealed comparative advantages was reached in the case of China. As it had advantage mainly in the group of miscellaneous manufactured articles in 1995, it has gained huge advantages in machinery and transport equipment during the last two decades.

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Food and live animals (SITC0); Beverages and tobacco (SITC1); Crude materials, inedible, except fuels (SITC2); Mineral fuels, lubricants and related materials (SITC3); Animal and vegetable oils, fats and waxes (SITC4); Chemicals and related products (SITC5); Manufactured goods classified chiefly by material (SITC6); Machinery and transport equipment (SITC7); Miscellaneous manufactured articles (SITC8); Commodity and transactions not classified elsewhere in the SITC (SITC9) which covers only gold.

For the purpose of the doctoral thesis, there was used a three-colour scaling method to better understand the results of countries in the given indicators for each year. The green colour is expressing countries with the highest values of the given indicator, yellow is showing the average countries and the red colour is capturing countries with values of selected indicators with the lowest results. Results are presented only for the EU as a whole economy for better clarification, however, more detailed results may be offered upon request.
Small improvement of RCA was recorded in manufactured goods and preserved in miscellaneous manufactured articles. Tremendous structural changes in China’s economy are also reflected in the loss of comparative advantages in all other sectors. Lastly, the advantage of South Africa is mainly kept in the group of beverages and tobacco, crude materials, and mainly gold production, which has been kept during the entire period.

As the composition of comparative advantages in the EU and BRICS countries was found very different, it is necessary to know what their driving forces are. According to the neoclassical economics, comparative advantage is based on the factor endowment abundance in different types of resources. In the international economy, there can be distinguished among goods export, according to the intensity of factor endowments used for their production as it is shown in Tab. 3.4. There was found that the EU rather exports research intensive (inimitable) and capital intensive goods, while exports from BRICS are still based on cheap labour and natural resources. It is especially visible in case of Russia and Brazil, where the share of resource-based exports increased during the last two decades.

**Tab. 3.4 Share of Exports by Factor Intensity of its Production (% of total exports)**

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Source: UNCTAD (2017); own elaboration, 2017

On the other hand, India decreased the share of labour-intensive exports as well as China. Compared to India, China significantly increased export of research-intensive goods. Its share was even higher than in the case of the EU. South Africa has kept its production intensity stable, based mainly on resource and capital-intensive goods. Notice the quite strong connection between comparative advantages and factor intensity of production. Russia, Brazil or South Africa keeps a high share of comparative advantage in the production of food, crude materials or minerals, which are highly dependent on the land factor endowment, while India keeps comparative advantages in manufactured goods based on labour factor endowment. Change in the use of factors of production significantly changed the composition of comparative advantages.

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149 More detailed results were calculated for each EU country, however, due to the scope of the theses, the results can be shared upon request.
advantages in China. Despite being still highly dependent on labour, high investment to capital, education, and research substantially increased share of research-intensive production, machinery and transport exports. Finally, high intensity of production based on research and capital is reflected in the composition of the EU, and in its revealed comparative advantages as well.\textsuperscript{150}

Comparative advantages and factor endowments may be reflected in the level of technological specialization. International databases of foreign trade do not provide enough information about exports based on the technological level of processing. Therefore, there was used the methodology of Lall (2000) coming from disaggregated data of the SITC at the 3-digit level. There was found that the EU export to BRICS is covered by 25\% by medium-technology engineering manufactures, followed by high-tech manufactures (21\%) and medium-technology automotive manufactures (13\%). In the case of the BRICS, Brazil and Russia exports to the EU mainly primary products, India and South Africa exports mainly resource-based manufactures. Finally, China’s export transformed from low-tech production based on textile, garment and footwear goods to the medium-tech engineering production and high-tech electronic and electrical goods.\textsuperscript{151}

So far, observed countries have various comparative advantages based on a number of factor endowments and which have changed only marginally over time. Exports are then, to the large extent, affected by the structure of the economy and production.\textsuperscript{152} As a reaction to the changes in international trade patterns, economists noticed that similar structure of goods is traded among countries. As the neoclassical economics always considered trade based on factor endowments reflected in trade between industries (inter-industry), they did not have any explanation for trade within the same industry (intra-industry) among countries. Intra-industry trade appeared since companies started to exploit economies of scale and consumers reached higher possibility to choose from various kinds of the same products. In this case, there is a space for the theory of Staffan Linder who explains this modern phenomenon through the demand side of the economy. He assumes that the demand for goods is created if it also has its domestic market (overlapping demand). It means that the more similar is the demand structure

\textsuperscript{150} It is important to note that research intensive production is highly dependent on both, capital and labour, but especially on human capital.

\textsuperscript{151} If exports are disaggregated based on the level of technology processing across the EU countries, the majority of the countries produces medium-technology manufactures. However, there are also exceptions. For example, Ireland exports mainly high-technology manufactures, while Finland, Latvia, and Portugal exports to the BRICS mainly agro-based manufactures. The author may offer more results on request.

\textsuperscript{152} The term “to the large extent” is used because a big share of production is created in the tertiary sector which output is usually non-tradable across the border.
of both countries, the more they trade with each other. Gains from intra-industry trade then reflect wider consumer choices and benefits coming from economies of scale for producers.

Therefore, the extent of intra-industry trade between the EU and BRICS countries was measured to find out if they trade rather between industries or within industries. A higher ratio of the intra-industry trade index suggests that economies of scale are being exploited. To better clarify the results, there was chosen just trade between the EU and BRICS and among BRICS for comparison. Results are shown in Tab. 3.5. Trade within the same industries covers about 30% of total EU trade with the BRICS, except Russia, which is highly based on trade among sectors. The share of intra-industry trade between the EU and BRICS is relatively small, however significantly higher than among BRICS. Trade among the BRICS members is highly inter-industrial. The only exception is trading between Russia and South Africa.

**Tab. 3.5 Intra-industry Trade on Total Trade among the EU and BRICS Countries**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EU-Brazil</td>
<td>0.21</td>
<td>0.26</td>
<td>0.28</td>
<td>0.26</td>
<td>0.23</td>
<td>0.26</td>
</tr>
<tr>
<td>EU-Russia</td>
<td>0.11</td>
<td>0.09</td>
<td>0.07</td>
<td>0.06</td>
<td>0.08</td>
<td>0.09</td>
</tr>
<tr>
<td>EU-India</td>
<td>0.25</td>
<td>0.31</td>
<td>0.33</td>
<td>0.35</td>
<td>0.40</td>
<td>0.41</td>
</tr>
<tr>
<td>EU-China</td>
<td>0.19</td>
<td>0.27</td>
<td>0.23</td>
<td>0.24</td>
<td>0.28</td>
<td>0.30</td>
</tr>
<tr>
<td>EU-South Africa</td>
<td>0.30</td>
<td>0.25</td>
<td>0.28</td>
<td>0.30</td>
<td>0.27</td>
<td>0.24</td>
</tr>
<tr>
<td>Brazil-Russia</td>
<td>0.04</td>
<td>0.04</td>
<td>0.02</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Brazil-India</td>
<td>0.07</td>
<td>0.11</td>
<td>0.09</td>
<td>0.11</td>
<td>0.10</td>
<td>0.13</td>
</tr>
<tr>
<td>Brazil-China</td>
<td>0.06</td>
<td>0.06</td>
<td>0.07</td>
<td>0.03</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Brazil-South Africa</td>
<td>0.02</td>
<td>0.15</td>
<td>0.11</td>
<td>0.16</td>
<td>0.13</td>
<td>0.13</td>
</tr>
<tr>
<td>Russia-India</td>
<td>0.06</td>
<td>0.04</td>
<td>0.07</td>
<td>0.10</td>
<td>0.12</td>
<td>0.15</td>
</tr>
<tr>
<td>Russia-China</td>
<td>0.06</td>
<td>0.06</td>
<td>0.08</td>
<td>0.07</td>
<td>0.06</td>
<td>0.07</td>
</tr>
<tr>
<td>Russia-South Africa</td>
<td>0.49</td>
<td>0.23</td>
<td>0.13</td>
<td>0.43</td>
<td>0.37</td>
<td></td>
</tr>
<tr>
<td>India-China</td>
<td>0.15</td>
<td>0.20</td>
<td>0.14</td>
<td>0.11</td>
<td>0.12</td>
<td>0.12</td>
</tr>
<tr>
<td>India-South Africa</td>
<td>0.07</td>
<td>0.06</td>
<td>0.09</td>
<td>0.05</td>
<td>0.06</td>
<td>0.07</td>
</tr>
<tr>
<td>China-South Africa</td>
<td>0.08</td>
<td>0.06</td>
<td>0.07</td>
<td>0.04</td>
<td>0.02</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Source: UNCTAD (2017); own elaboration, 2017

The EU companies trade very large volume of production within the same industry benefiting from economies of scale. As the distribution of production across sectors is high, the European economy is less vulnerable to the external changes than BRICS, which have a high concentration of exports in a few industries. The sectoral concentration of exports can be measured using Hirschman-Herfindahl index. Results are published in Annex 7. Results suggest that the EU countries exports are highly diversified across sectors. The only exceptions are Cyprus, Greece, Ireland, and Malta. Export of BRICS is also highly diversified except Russia, which export

---

153 For example, intra-industry trade between the EU and USA shares more than 60% of total trade.

154 High concentration of exports may have negative effect on the economy when it is hit by external shock. Recent economic crisis in Russia caused by low oil prices is a great example of high concentration (and high vulnerability) of exports.
base is highly concentrated on mineral and gas production. Moreover, its export concentration has been increasing over time.

Finally, trade complementarity between the EU and BRICS countries is observed. The complementarity index measures the degree to which the export pattern on one country matches the import pattern of another. The high value of the index suggests great match between the export-import pattern of trading partners. It means that the given country produces what the other consumes. This may indicate more favourable prospects for successful trade arrangements. The results suggest that the complementarity of trade between the EU and BRICS did not change during last two decades. The exports of the EU fits better the import structure of BRICS rather than vice versa. However, there were some changes over time with individual countries. For example, the position of the EU and China complementarity switched in favour of Chinese export during last two decades. The same statement is valid for exports from India. The exports of the EU are quite complementary with the imports of Russia, but the convers is not true, moreover it diverges over time. Trade complementarity with the rest of the BRICS did not significantly changed, as it remained about 70% in the case of the EU export and about 50% in the case of Brazil and South Africa.

3.5 Summary

In this chapter, the principles and functioning of the EU Common Commercial Policy and trade relations with BRICS countries were presented. The EU CCP belongs to the oldest policies of the EU. It promotes international trade liberalization process on the multilateral basis; however, the European Commission is very active to negotiate also regional and bilateral trade agreements to improve trade relations with the third countries. Due to the recent development of the global economy, new trade strategy was launched emphasizing trade policy orientation towards developing countries, the BRICS in particular, despite their recent protectionist trends.

The BRICS is a formal group of emerging markets, which have gone through significant political and economic changes that fundamentally influenced their position in the world economy. Their cooperation is still young, however, covers broad scope of areas. Since 2010, they managed to enforce the reform of the Bretton-Woods institutions, create their own development bank and reserve fund. They also signed the Strategy for Economic Partnership including negotiations of preferential trade.

Despite the EU boosting preferential trade agreements mainly with the developing world, there is only one valid free trade agreement between the EU and any member of the BRICS
group, with South Africa. New trade agreement is negotiated with India. Free trade is also negotiated with Brazil within the EU-Mercosur framework, and investment agreement is expected with China. As the current state of the EU-Russia relations remains subdued, there is no possibility to restore their old cooperation agreement.

The analytical part of the chapter showed that the position of BRICS in the global economy strengthens and their mutual trade with the EU countries significantly increased during the last two decades. It was found that BRICS become more important markets for the big EU countries, while small and new members rely more on the Single Market. However, the amount of mutual trade has been stagnating since 2011. The majority of the EU exports are based on capital and highly-skilled labour production well-fitting the import structure of BRICS. On the other hand, despite all BRICS belonging to the group of emerging markets, the development of China’s economy has surpassed all other countries. Its trade with the EU moved towards goods with higher value-added while the rest of BRICS still relies on the export of natural resources and labour production. China, thus, increased its comparative advantages converging with its export structure to the EU resulting in increasing intra-industry trade and better fit with the EU demand.

4 Empirical Analysis of Gravity Model and Estimation of Trade Potential between the EU and BRICS Countries
This chapter will provide a detailed insight to the pattern of bilateral trade flows between the EU Members and BRICS countries and will answer the question what markets hide untapped trade potential for producers from other countries they trade with.

Before discovering what lies behind the mutual exchange of goods between the EU Members and BRICS countries and estimate the amount of untapped trade potential, methods that will be utilized to estimate gravity equation should be introduced. Methods to solve economic and econometric issues, to correctly specify gravity model, define data and estimated gravity equations that will be used to gain unbiased parameters.

4.1 Empirical Studies Covering Main Issues of Structural Gravity Model

After decades of solving the theoretical impediments of the gravity model, the issues of correct estimation of the gravity equation came to the forefront. In this sub-chapter, there are three major issues presented that were solved during the last two decades in the gravity literature. Authors dealt not only with the correct specification of the gravity equation but also with the econometric issues that were overlooked for a long time but had a significant effect on the efficiency of the gravity estimates.

Firstly, the solution of the border puzzle that was introduced by McCallum (1995) and improved by Anderson and van Wincoop (2003) is presented. The main point of this issue was the explanation of the border effect. In other words, the authors were looking for the answer why is trade higher within one state than between states when the distance is similar. Findings presented by McCallum were improved by Anderson and van Wincoop using the multilateral resistance terms which importance was introduced already in chapter 2.5 dealing with the theoretical foundations of the gravity equation.

Secondly, the work of Head and Mayer (2014) that emphasized structural approach to the gravity model estimation based on panel data methods is presented. Despite Anderson and van Wincoop theoretically improving gravity equation by multilateral trade resistance terms, their estimation was not possible and later used the approach of remoteness index turned out as a weak tool. Head and Mayer (2014) offered a solution using relatively new econometric tools that enable to estimate multilateral resistance terms.

Finally, the newest findings of the gravity modelling were published by Piermartini and Yotov (2016) that offered several recommendations following recent developments and new challenges of gravity estimation. Especially, they improved the methodology of the multilateral trade resistance term estimation employing exporter-time and importer-time as well as country-
pair fixed effects, confirmed the Poisson Pseudo-Maximum Likelihood (PPML) as a better estimation method, and offered several other inventions to gain unbiased and efficient gravity estimates.

4.1.1 Solving the Border Puzzle by Anderson and van Wincoop (2003)

As it was already introduced in the subchapter 2.5, Anderson and van Wincoop’s (2003) structural gravity model includes two additional variables targeting the problem of omitted variable bias. Their work was the reaction to the paper of McCallum who estimated trade flows between Canada and United States of America. McCallum (1995) found that Canadian provinces trade 22 times more among each other than with the US federal states. In general, he confirmed the assumptions about the significant effect of the country border on trade patterns between countries. Since that time, it became one of the most crucial phenomena in the gravity modelling called border puzzle.\(^{155}\)

McCallum (1995) tested a simple version of gravity equation for one period of time as:

\[
x_{ij} = a + by_i + cy_j + dist_{ij} + DUMMY_{ij} + u_{ij},
\]

where \(x_{ij}\) is the total export from country \(i\) to \(j\), variables \(y_i\) and \(y_j\) mean the gross domestic product, \(dist_{ij}\) represents the distance between trading partners and \(DUMMY_{ij}\) represents a dummy variable equal to 1 for interprovincial trade, 0 otherwise. The variable \(u_{ij}\) is the error term. He estimated trade between all Canadian provinces and only 30 US federal states which accounted for more than 90% of Canada-US trade in 1988.

His findings are presented in Tab. 4.1. Equation (1) describes trade among Canadian provinces only, however, equation (2) considers trade among Canadian provinces and US federal states. Therefore, the second equation includes also the dummy variable representing a common border. The elasticities of export, with respect to production masses, have similar magnitude, as it can be found in other studies. However, McCallum emphasized that estimated coefficient of the distance variable is substantially larger\(^{156}\), which is explained as the effect of the mode of transport. More interestingly, he found that trade between two Canadian provinces is 22 times higher than trade between a province and a state. It means that even seemingly harmless Canadian-US border has a decisive effect on trade patterns. As McCallum realizes the fact of endogeneity problem within the gravity model, he estimated gravity equation replacing

\(^{155}\) He also tested the effect of population size on trade patterns since export is a part of each country’s GDP and creates McCallum’s (1995) problem. He found that this variable provides similar estimates as GDP.

\(^{156}\) Most of the international studies published values less than unity in absolute value.
the logarithms of GDP with the logarithms of population. He found that the coefficients and standard errors are remarkably stable, therefore, variables of the population may serve, in this case, as a proxy to national products.

**Tab. 4.1 Estimations of the Gravity Equation by McCallum (1995)**

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>(1) Canada - Canada</th>
<th>(2) Canada – US states</th>
<th>(3) Canada – US states</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln $y_i$</td>
<td>1.30</td>
<td>1.21</td>
<td>1.36</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.03)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>ln $y_j$</td>
<td>0.96</td>
<td>1.06</td>
<td>1.19</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.03)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>ln $\text{dist}_{ij}$</td>
<td>-1.52</td>
<td>-1.42</td>
<td>-1.48</td>
</tr>
<tr>
<td></td>
<td>(0.10)</td>
<td>(0.06)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>ln $\text{DUMMY}_{ij}$</td>
<td>3.09</td>
<td>3.07</td>
<td>3.07</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.14)</td>
<td></td>
</tr>
</tbody>
</table>

Number of observations | 90 | 683 | 683 |
Standard error | 0.80 | 1.10 | 1.15 |
Adjusted R$^2$ | 0.89 | 0.81 | 0.80 |


Anderson and van Wincoop (2003) tested McCallum’s model using more advanced econometric methods offering more precise and consistent results employing the multilateral trade resistance terms.\footnote{The theoretical foundation of Anderson’s model including multilateral trade resistance terms was introduced in the sub-chapter 2.5.} Their results offered two explanations of McCallum’s findings. At first, a large difference between trade flows within Canada and between Canadian and US states arises from omitted variable bias. At second, the magnitude of trade barriers on trade reflected the small size of the Canadian economy. Their findings are reported in Tab. 4.2, for three different datasets: (1) interprovincial and province-state trade, (2) interstate and state-province trade, (3) interstate, interprovincial and province-state trade. The border coefficients are the exponentials of the coefficients on the respective dummy variables. Anderson and van Wincoops estimated that interprovincial trade is 16.4 times higher than state-province trade. It is very similar result as McCallum estimated the effect of 22.\footnote{Important to note that Anderson and van Wincoop estimated the model on data for 1993, but McCallum used data for 1988. Nonetheless, the results should not differ significantly because of the change of base year.} However, the interstate trade is only 1.5 times higher than state-province trade. It means that even a moderate barrier to trade between Canada and the rest of the world has a large effect on the multilateral resistance of the provinces as Canada is an open economy. When pooling, the data offers very similar results of 15.7, 1.49 respectively.

**Tab. 4.2 McCallum’s Gravity Equation Estimated by Anderson and van Wincoop (2003)**

<table>
<thead>
<tr>
<th></th>
<th>(1) Canada - Canada</th>
<th>(2) US states – US states</th>
<th>(3) US states – US states</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 1: Regression Results

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ln y_i</td>
<td>1.22</td>
<td>1.13</td>
<td>1.13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.03)</td>
<td>(0.03)</td>
<td></td>
</tr>
<tr>
<td>ln y_j</td>
<td>0.98</td>
<td>0.98</td>
<td>0.97</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.02)</td>
<td>(0.02)</td>
<td></td>
</tr>
<tr>
<td>ln dist_{ij}</td>
<td>-1.35</td>
<td>-1.08</td>
<td>-1.11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.04)</td>
<td>(0.04)</td>
<td></td>
</tr>
<tr>
<td>Dummy-Canada</td>
<td>2.80</td>
<td></td>
<td>2.75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.12)</td>
<td></td>
<td>(0.12)</td>
<td></td>
</tr>
<tr>
<td>Dummy-US states</td>
<td>0.41</td>
<td>0.40</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.05)</td>
<td></td>
</tr>
<tr>
<td>Border Canada</td>
<td>16.4</td>
<td></td>
<td>15.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.0)</td>
<td></td>
<td>(1.9)</td>
<td></td>
</tr>
<tr>
<td>Border US states</td>
<td>1.50</td>
<td>1.49</td>
<td>1.49</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.08)</td>
<td></td>
</tr>
<tr>
<td>Adjusted R^2</td>
<td>0.76</td>
<td>0.85</td>
<td>0.85</td>
<td></td>
</tr>
</tbody>
</table>

Source: Anderson and van Wincoop (2003), p. 61-73, own elaboration, 2018

This part concluded that it is absolutely essential to control for the border effect as well as use the multilateral trade resistance terms that control for effect of other trade relationships within the global system. The gravity equation cannot be estimated just using the core variables of the model, but also other effects that may have an influence on international exchange need to be included as well.

### 4.1.2 Solving Panel Data Gravity Model by Head and Mayer (2014)

During the years, the gravity estimation has become a very popular tool to analyse international trade flows. As the vital debate about the economic foundations of the gravity model calmed, the deeper analysis of finding the best-practice estimating methods raised up. In 2014, Head and Mayer published a paper solving the process of considering the right way of theoretical underpinnings of the gravity equation. They found that there is not the only one right approach, but advocated a toolkit approach to research bilateral trade flows using this method. They, especially, emphasize the relevance of estimating methods and robustness since it was proved that the naive approaches to estimation lead to the biased and misinterpreted results.

They introduced and compared the estimation methods for general and structural gravity equations emphasizing that using the remoteness approach as a proxy for the multilateral resistance terms is already too weak construction. Instead, they suggested estimating the gravity equation with importer and exporter fixed-effect method on the panel data, allowing the fixed effects being time-varying as well. Using the fixed effect estimates gives the possibility to consider the various scopes of effects (for example the Rotterdam effect). However, as the

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159 Using panel data for estimating gravity equations is a relatively new method as most of the empirical studies were usually estimated on the cross-sections data.
importer and exporter fixed effects absorb all the possible determinants of international trade, there is no longer any space to estimate a variety of potentially interesting trade determinants. For example, (i) anything that affects imports without regard to origin, such as country-level applied tariffs, (ii) variables that affect exporters features (access to the sea) or (iii) any sums, differences or averages of country-specific variables. Moreover, using the country-pair fixed effects do not allow estimating any country-pair specific features such as trade agreements. It applies also to exchange rates since they are defined as a ratio. Fixed effects will simply swallow each of the price terms after usual logarithmic transformation of the gravity equation (Head and Mayer, 2014).

They consider cross-section gravity equation:

$$\ln X_{ni} = \alpha_i + \beta V_i + \gamma_n + \delta D_{ni} + \epsilon_{ni},$$

where $X_{ni}$ is export from country $i$ to $n$, $\alpha_i$ represents all other $i$-level determinants of exports, $V_i$ is a monadic variable of interest representing some characteristics of the country $i$, while $\gamma_n$ is a destination fixed effect with the same meaning and $D_{ni}$ represents dyadic controls representing country pair characteristics. In the case of one-step estimation, the terms $\alpha_i$ and $\epsilon_{ni}$ are combined in the error term of equation (4.2), even if the term $\alpha_i$ is uncorrelated with $V_i$. Therefore, it is necessary to cluster standard errors by the exporter, otherwise, it would result in downward biased errors of $\beta$. Head and Mayer (2014) compiled dozens of papers’ results of gravity equation to find the most usual results of gravity. Tab. 4.3 shows the average value and standard deviation of 744 coefficients obtained from 32 papers, which focused on trade costs elasticities. They found that structural gravity models yield larger effect of trade flows to the price shifters than naive gravity models. Additionally, they found that exchange rates affect trade flows much less than bilateral tariffs. Head and Mayer (2014) findings improved the gravity modelling as they created the method enabling the estimation of the multilateral resistance terms using exporter and importer fixed effects. As the work of Head and Mayer includes the meta-analysis of structural gravity estimates, it will serve to compare results of the structural gravity models presented in the doctoral thesis.

**Tab. 4.3 Head and Mayer (2014) Elasticities in Gravity Equations**

<table>
<thead>
<tr>
<th>Estimates</th>
<th>median</th>
<th>mean</th>
<th>s.d.</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full sample</td>
<td>-3.19</td>
<td>-4.51</td>
<td>8.93</td>
<td>744</td>
</tr>
<tr>
<td>Naive gravity</td>
<td>-1.31</td>
<td>-1.35</td>
<td>5.17</td>
<td>122</td>
</tr>
<tr>
<td>Structural gravity</td>
<td>-3.78</td>
<td>-5.13</td>
<td>9.37</td>
<td>622</td>
</tr>
</tbody>
</table>

Split structural estimates by: Estimation method
4.1.3 Solving Economic and Econometric Issues by Piermartini and Yotov (2016)

In 2016, Piermartini and Yotov published a paper containing new approaches and best practices of the panel data gravity estimations. They formulated several recommendations to obtain reliable estimates of partial equilibrium model on aggregated data, which are theoretically consistent with the econometric specification. Their work is based on the foundations of structural gravity model derived by Anderson and van Wincoop (2003) who used a non-linear least squares estimation method, that recently appeared to be the most correct one, although it was hardly followed. As the gravity estimates introduced in the doctoral thesis are based on the same approach, the theoretical system of structural gravity equations is based on Anderson and van Wincoop (2003): \(^{160}\)

\[
X_{i,j,t} = \frac{Y_{i,t}Y_{j,t}}{Y_t^W} \left( \frac{t_{i,j,t}}{P_{j,t} \Pi_{i,t}} \right)^{1-\sigma},
\]

where:

\[
(P_{i,t})^{1-\sigma} = \sum_{i=1}^{N} \left( \frac{t_{i,j,t}}{P_{j,t} \Pi_{i,t}} \right)^{1-\sigma} \frac{Y_{j,t}}{Y_t^W}, \tag{4.4}
\]

\[
(P_{j,t})^{1-\sigma} = \sum_{i=1}^{N} \left( \frac{t_{i,j,t}}{P_{j,t} \Pi_{i,t}} \right)^{1-\sigma} \frac{Y_{i,t}}{Y_t^W}. \tag{4.5}
\]

In each point of time \(t\), the size term of the gravity equation is represented by \(X_{i,j,t}\) as trade flows from exporter \(i\) to importer \(j\), \(Y_{j,t}\) as the total expenditures of importer \(j\), \(Y_{i,t}\) as the total production of exporter \(i\), and \(Y_t^W\) denotes the total value of world output. The trade cost term is determined by \(t_{i,j}\) representing bilateral trade frictions between the country \(i\) and \(j\), \(P_{j,t}\) and \(\Pi_{i,t}\) are the inward and outward multilateral trade resistances according to Anderson and van Wincoop (2003) and \(\sigma > 1\) is the Armington’s elasticity of substitution.

The importance of the multilateral resistance terms was mentioned already many times in the thesis. Baldwin and Taglioni (2006) indicate the omission of MRT variables as the gold

\(^{160}\) See that the system of gravity equations based on Anderson and van Wincoop (2003) is similar to the equations 4.3-4.5 which are completed by the time dimension.
medal mistake, despite not being directly observable. Therefore, several methods how to estimate their effect were established. They follow an approach of Feenstra (2004) consisting of country fixed effects, which was improved by Olivero and Yotov (2012) by accounting for time effect. Their combination resulted in the newest approach to the gravity model estimation that is based on the exporter-time and importer-time fixed effect. Using this approach will accommodate all other country-specific time-variant characteristics such as unilateral (e.g. export subsidies) or non-discriminatory trade policies (e.g. most favoured nation tariffs). Moreover, as using fixed effect is important to address multilateral resistance issue, it is not possible to observe country-specific trade policies. However, Head, Larch, and Yotov (2015) offered an elegant but non-easy solution to use data of intra-national trade. Specifically, unilateral and non-discriminatory trade measures are applied only to external trade, however, the intra-national trade is untouched. This approach is more consistent with the economic theory as it accounts for the world where consumers may choose among domestic and foreign products. Therefore, they suggest incorporating also intra-national trade flows to control for, what they call ‘missing globalization puzzle’, thus a difference between the international and intra-national trade costs.

Estimating the zero trade flows between the country pairs used to be also a big challenge. Despite the fact that this issue usually appears when estimating disaggregated trade data, this effect may appear even on the aggregated level when estimating trade flows among developing countries in the long time horizon. Using the OLS estimator in logarithmic form, the zero trade flows will be simply dropped from the estimation sample. However, they can keep important information. To address this issue, it is necessary to use the multiplicative form of the gravity equation by non-linear Poisson Pseudo-Maximum Likelihood estimator, which is advocated as the best solution in a paper of Santos Silva and Tenreyro (2006). Piermartini and Yotov (2016) emphasized additional benefits of PPML estimator. As the trade data are full of heteroscedasticity, using the log-linear OLS estimator offers not only biased results but also inconsistent estimates, while the PPML estimator accounts for heteroscedasticity.

Using several variables representing trade policy, the issue of endogeneity rises up. To explain the problem of endogeneity in the gravity model estimation, one can imagine the example of reverse causality that two countries, which trade high values of goods between each other, are more likely to liberalize their mutual trade relations, ceteris paribus. Baier and Bergstrand (2007) advocate the use of country-pair fixed effects to account for the unobservable relations between the endogenous trade policy covariates with the error term in the gravity
equations. Moreover, country-pair fixed effects will also account for any other unobservable time-invariant trade cost components. The last issue connected to trade policy effect estimation is the trade policy time inconsistency as trade policy decisions are not reflected in international trade immediately. Therefore, some papers use different types of time intervals. According to Olivero and Yotov (2012), the most promising are estimates gained from 3-year and 5-year interval trade data.

To sum up the structural gravity model estimation based on the most modern approaches, Piermartini and Yotov (2016) suggest to use:

1) Panel data – they offer several benefits such as using the country-specific and country-pair fixed effects, improving estimation efficiency and addressing the issue of endogeneity.
2) Time intervals – they should be used to address the time inconsistency of trade policy or other changes in trade costs.
3) Country-specific time-varying fixed effects – they are important to control for multilateral trade resistances and other observable and unobservable characteristics that vary over time across countries.
4) Country-pair fixed effects – they account for the endogeneity of regional trade agreements and offer a simple solution to control for effects of all time-invariant bilateral trade costs.
5) Intra-national trade flows – they ensure consistency with the theory as well as with the effects of bilateral trade policies, allowing for non-discriminatory trade policy effect, and improving the solution for McCallum’s distance puzzle.
6) Poisson Pseudo-Maximum Likelihood estimator – it offers an easy solution for solving heteroscedasticity and zero trade flows issues, which are very common in the gravity models. Moreover, it ensures that gravity effects are identical to their corresponding structural terms and generates more robust estimates.

4.2 Estimation Methods Used to Solve Structural Gravity Equation

Early gravity equations were analysed on cross-sectional data. Unfortunately, the results were found to be biased due to the heterogeneity of trade data across individuals. Moreover, the cross-section results may vary substantially depending on the selected group of countries, which may also lead to the estimation bias. Therefore, the panel data models became more appropriate estimation method as they offer the possibility to control for country-pair heterogeneity (Nowak-Lehmann et al., 2007). Most recent studies use the panel data (also known as
longitudinal or cross-sectional time-series data) techniques of estimation, where several countries are observed over several years, offering results that are robust. Panel framework allows recognizing how the relevant variables vary over time and recognize the specific time or country effects (Gomez-Herrera, 2013). Moreover, panel data approach allows exploring effects of unobservable variables through their collinearity with observed variables, assuming the unobserved variables constant over time (Schmidheiny, 2010). The biggest benefit of panel data is the possibility to (i) control for individual heterogeneity to avoid the risk of biased estimates. It enables to control for unobserved variables that change over time but not across individuals. The second advantage of panel data is (ii) higher information, more variability, less collinearity among variables, more degrees of freedom and more efficiency. Panel data also (iii) better identify and measure effects that cannot be observed in cross-section or time-series data. On the other hand, the panel data are difficult for (iv) data collection problems, (v) selectivity problems and (vi) possible cross-section dependence.\footnote{For more information about advantages and disadvantages of panel data, see Frees (2004) or Baltagi (2013).}

The problem with biased results in cross-sectional estimations was solved by the fixed effects which are possible to use in panel data. The fixed effects allow having individual intercept for each country-pair and indicate the effect of variables that are constant over time or specific across all individuals (pairs of countries) in the estimation. In general, most empirical studies show that fixed effect models tend to provide better results (Hanoušek and Kočenda, 2014). However, the research of international trade also focuses on coefficients of bilateral time-invariant variables, which cannot be estimated using the fixed effects method, due to the perfect collinearity between the time-invariant regressors and the error term. Brun et al. (2002) admits the possibility of random effects models if it is necessary as they impose no correlation between the individual effects and the regressors, implicitly assuming that the unobserved heterogeneous component is strictly exogenous (Gomez-Herrera, 2013). Therefore, all gravity equations presented in the following chapter were estimated using both fixed and random effect model. Later on, the Hausman test is used to decide, which method is more appropriate for particular gravity estimation.

Fixed and random effect models are the most commonly used estimating methods of gravity equation. The former essentially corresponds to the dummy variables least square method, while the latter can be interpreted as regression model based on the generalized least squares method (Němec, 2010). The classic pooled model, using the assumptions of the OLS estimation, processes all individuals as if they came from the same regression model.
Considering the multiple linear regression models for individual \(i=1,\ldots,N\) that is observed at several time periods \(t=1,\ldots,T\), the general description of basic panel data model can be written as:

\[
y_{it} = \alpha + \beta X_{it} + u_{it},
\]

where \(i\) represents individuals (cross-section dimension) and \(t\) time (time-series dimension). The \(\alpha\) is a constant, \(\beta\) is \(K \times 1\) and \(X_{it}\) is \(it\) observation on \(K\) explanatory variables. Most of the panel data models utilize a one-way error component model for the disturbances, with

\[
u_{it} = \mu_i + \nu_{it},
\]

where \(\mu_i\) denotes the remainder disturbance that varies with individuals and time and \(\nu_{it}\) represents the unobservable time-invariant individual-specific effect that is not included in the regression (Baltagi, 2013). In the equation (4.6), the intercept \(\alpha\) is common for all individuals. However, the right assumption for panel data models considers a single intercept for each individual. Therefore, the equation (4.6) should be rewritten and extended as:

\[
y_{it} = \alpha_i + \beta X_{it} + \gamma Z_{it} + \delta_t + u_{it},
\]

where \(y_{it}\) is the dependent variable for each individual \(i\) in time \(t\).

The intercept \(\alpha_i\) is specific for each individual and does not vary across time, while \(u_{it}\) is different for each individual at each point of time. The term \(\alpha_i\) also represents the effect of all time-invariant variables not included in the panel data model. The term \(X'\) stands for a vector of time-variant variables and the term \(Z'\) stands for a vector of time-invariant variables, which is possible to include in the panel data model as well. The terms \(\beta\) and \(\gamma\) are the coefficients for the time-varying, time-invariant variables respectively. The term \(\delta_t\) is the intercept term that can differ through time periods but not across individuals.

The most important term from equation (4.8) is \(\alpha_i\), which determines what kind of the panel data model should be estimated. If the assumption of uncorrelated error term with the regressors is violated, the fixed effects model can be estimated. However, if \(\alpha_i\) is uncorrelated with the regressors, the random effects model can provide unbiased results for both types of coefficients with generally lower standard errors.

### 4.2.1 Fixed Effects Model

The main benefit of the fixed effects model is the ability to control for the time-invariant effects. Under the validity of omitted variables assumption, the fixed effects may provide a means for controlling omitted variables bias, if these variables are collinear with the variables
included in the model. Therefore, each individual serves as its own control variable. This approach assumes that, if there is an effect of the omitted variable, there will be the same effect at other times (fixed effect) that represents the heterogeneity of the sample. For the fixed effect model, there is an assumption that each individual has the within-subject variability; otherwise, the standard errors will be too large to tolerate this assumption (Frees, 2004). It follows the biggest disadvantage of the fixed effect models. They are not able to estimate the effect of time-invariant variables (γ). Such variables included in the model will be omitted due to their perfect collinearity with the error term. Also, fixed effect models do not control for unmeasured stable characteristics if their effect change over time.

Fixed effect model is based on the OLS regression represented by equation 4.8. Averaging of this equation over time t gives:

\[
\bar{y}_i = \alpha_i + \beta \bar{X}_i + \gamma \bar{Z}_i + \bar{\delta}_t + \bar{u}_i. \tag{4.9}
\]

Subtracting equation 4.9 from 4.8 gives:

\[
y_{it} - \bar{y}_i = \beta (X'_{it} - \bar{X}_i) + (\delta_t - \bar{\delta}) + (u_{it} - \bar{u}_i). \tag{4.10}
\]

Note, that both \( \alpha_i \) representing the effect of all time-invariant variables and \( Z'_i \) representing a vector of time-invariant variables included in the equation 4.9 were omitted in the equation 4.10. If the error term follows the assumption of the zero mean and uniform variance-covariance matrix, it is possible to use OLS estimation because it will be the best linear unbiased estimator. However, the fixed effect models suffer from large loss of degrees of freedom because it creates a specific dummy variable for each entity. In this case, the fixed effect model, thus, can be described as follows:

\[
y_{it} = \alpha_1 D_{it}^{(1)} + \alpha_2 D_{it}^{(2)} + \cdots + \alpha_N D_{it}^{(N)} + \beta X'_{it} + u_{it}, \tag{4.11}
\]

where the variable \( D_{it}^{(1)} \) represents the first individual entity in the dataset at a given time \( t \). Such equation is special only for the first individual characterized by specific intercept, which is different compared to other individuals’ intercepts. Many dummies, thus, can cause multicollinearity problem among the regressors. In the short panel data models, where \( T \) is fixed and \( N \to \infty \), the fixed effect estimator of \( \beta \) is consistent, however, the individual effects (\( \alpha_i \)) are not.\(^{162}\) Therefore, if the fixed effect model is the true model, the classic OLS yields biased and

\(^{162}\) However, this problem can be omitted using robust estimates of the standard errors.
inconsistent estimates due to the omission of variables bias caused by deleting the individual
dummies, which are relevant (Baltagi, 2013).

4.2.2 Random Effects Model

Random effects model is based on the Generalized Least Squares estimator using the
assumption that the variation across entities is random and uncorrelated with the independent
variables in the regression model. The random effect model produces unbiased estimates under
the assumption of no omitted variables or at least the omitted variables are not correlated with
the explanatory variables included in the model. The advantage of random effect model is that
it can include time-invariant variables, which are absorbed by intercept in the fixed effect
model, and, thus, it allows observing the effect of these variables as regular time-variant
variables. Random effect models tend to have also smaller standard errors as they use within-
individual, as well as between-individual differences. If predictor variables vary highly across
individuals, while it has a little within-individual variation over time, then the fixed effects
model will have larger standard errors.

The random effect model can be presented as:

$$y_{it} = \alpha_i + \beta X'_{it} + \gamma Z'_{i} + \delta_t + u_{it}, \quad (4.12)$$

where $\alpha_i$ contains random value $v_i$ for each individual:

$$\alpha_i = \alpha + v_i. \quad (4.13)$$

The existence of random effect in each $\alpha_i$ gives the name to the random effect model. As
well as in the case of fixed effects model, it is assumed that $\alpha_i$ are identically and independently
distributed with zero mean and constant variance $\sigma^2_{\alpha}$ (Frees, 2004) and that it is independent of
the error random variables ($u_{it}$). The error term, thus, comprises either unimportant or
unobservable variables. The random effects model, thus, does not need to use $N$ dummy
variables as the fixed effects model and therefore keeps a higher value of degrees of freedom.

There is usually a trade-off between the bias and efficiency of both fixed effect and random
effect estimator. Therefore, the Hausman test must be used to decide between a specification of
both models. It tests whether the unique errors ($u_i$) are correlated with the regressors or not. The
random effect model provides unbiased estimates of time-variant and time-invariant variables
because it assumes that $\alpha_i$ is uncorrelated with the regressors. Therefore, the null hypothesis of
the Hausman test states that the preferred estimation method is the random effect. The Hausman
test statistic is defined as:
\[ m = q' (\text{var} \hat{\beta}_{FE} - \text{var} \hat{\beta}_{RE})^{-1} q, \]  

(4.14)

where \( q \) compares an estimator that is consistent and unbiased (fixed effect model) with an estimator that is efficient (random effect model). If the null hypothesis is true, the random effect and fixed effect estimates are both consistent and therefore they provide similar results. However, if the null hypothesis is rejected, the estimates are different and only the fixed effect model is consistent. In other words, if the estimates do not significantly differ from each other, the random effect estimator is preferable because of the lower standard errors (Allison, 2009).

### 4.2.3 Poisson Pseudo-Maximum Likelihood Estimator

There are many other methods of gravity model estimation.\(^{163}\) The fixed and random effect models are based on the OLS methodology which has, however, several drawbacks that are very often the subject of criticism from an econometric point of view. Santos Silva and Tenreyro (2006) point out that the log-linearization of the gravity equation changes the property of the error term leads to inefficient estimations in the presence of heteroscedasticity in data. As the trade data are usually not homoscedastic, the expected value of the error term is a function of the regressors. Heteroscedasticity does not affect the parameters estimates, meaning that the coefficients should be still unbiased, but it biases their variance, hence the t-values cannot be trusted (Gomez-Herrera, 2013). Therefore, the Poisson Pseudo-Maximum Likelihood method was chosen as the main estimation method because it offers certain properties that help to overcome issues that usually accompany gravity estimations. As there was already emphasized in the sub-chapter 4.1.3, the PPML estimator is now very commonly used in the gravity literature, hence it should be never omitted when running the gravity model. It this part, there will elaborated why this estimator needs to be used as a basic one in the panel data-based gravity equation. The PPML estimator is based on the maximum likelihood estimate of the Poisson distribution. In other words, this estimator generates the parameter that maximizes the likelihood of the sample accounting for the exponential distribution. This is the PPML biggest power because gravity model data usually suffer from heteroscedasticity issues.

The gravity equation is derived in the logarithmic form from the structural gravity equation of Anderson and van Wincoop (see equation 2.23). As you can see in the equation 4.15, the

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163 Except for the above-presented fixed and random effect models, the gravity equations are very often estimated by the Least Square Dummy Variable estimator, Tobit estimator, Generalized Least Square estimator, Heckman estimator or Mundlak estimator.
dependent variable is introduced in levels instead of logarithms. Adding a multiplicative error term $e_{ij}$ to that equation, one can get:

$$M_{ij} = \log Y_j + \log Y_i - \log Y^W + (1 - \sigma)[\log \tau_{ij} - \log P_j - \log \Pi_i] + \log e_{ij}, \quad (4.15)$$

where the mean of $\log e_{ij}$ depends on higher-order moments of its distribution (Santos Silva and Tenreyro, 2006). If the error term is heteroskedastic, which is highly probable in the gravity models, the expected value of the error term depends on one or more regressors as it includes the variance term, hence the estimates would be biased and inefficient. Shepherd (2013) emphasizes that this kind of heteroscedasticity can be dealt with neither by applying a robust covariance matrix estimator since it affects the parameter estimates in addition to the standard errors. Therefore, Santos Silva and Tenreyro (2006) suggest using the PPML method as an alternative to the log-linear OLS, or its Gamma PPML version, that provides consistent estimates of the original non-linear model.

The Poisson estimator does not take full account of the heteroskedasticity but it calculates the covariance matrix, standard errors and confidence intervals by a robust covariance matrix estimator. The PPML regression allows correcting for biases resulting from heteroskedastic error terms in log-linear specifications, it does not eliminate the need for correction of standard errors due to the presence of heteroskedasticity. Moreover, the estimation of gravity equation with PPML estimator is consistent with a more structural approach of gravity estimation, meaning while the exporter and importer effects are included, that imposes further restrictions on exporter and importer multilateral resistance terms.

Finally, as Head and Mayer (2014) mentioned, the moment conditions for the PPML, OLS and Gamma PML are:

$$\sum z_{ni} * (X_{ni} - \hat{X}_{ni}) = 0, \quad Poisson PML$$

$$\sum z_{ni} * (\ln X_{ni} - \ln \hat{X}_{ni}) = 0, \quad OLS \quad (4.16)$$

$$\sum z_{ni} * \left(\frac{X_{ni}}{\hat{X}_{ni}} - 1\right) = 0, \quad Gamma PML$$

with $\hat{X}_{ni} = \exp(z'_{nj}\zeta)$ denoting the prediction for $X_{ni}$ conditional on observables. As you can see, the difference between PPML and log OLS is that Poisson involves level deviations of $X_{ni}$ and Gamma percent deviations, which is similar to OLS. As both PPML methods offer consistent estimates, the only difference is in their efficiency. For this reason, Head and Mayer
(2014) suggest to use all three methods and compare the results with the following conclusions: \(^{164}\)

1) If all three models are similar, the model appears to be well specified.

2) If both PPML estimates are similar but far from the OLS, there is a heteroscedasticity problem which cannot be solved with the OLS method.

3) It is always the best procedure to use big samples, which are necessary for correct Poisson estimation.

4) If a big sample is used, but there is also a big difference between PPML and Gamma PPML estimates, there is some misspecification problem.

Except solving the heteroscedasticity issue, the PPML estimator has many other positive attributes. First, it naturally accounts for zero trade flows, which is not possible with the OLS procedure. As not all countries trade with each other, or the data are not available, as it may happen in the case of some developing countries, running the OLS can potentially lead to sample selection bias. Santos Silva and Tenreyro (2011) proved that PPML estimator performs well even with a large proportion of zero trade flows.

Second, the PPML is consistent in the presence of fixed effects, which are identical to the corresponding multilateral trade resistance terms. It is an essential attribute for the correct estimation of the gravity equation (see part 4.1.3). Third, interpretation of coefficients is the same as in the case of the OLS. Therefore, the use of PPML estimator in the gravity modelling is highly desirable.

### 4.3 Input Data and Model Specification

In this section, there is provided a detailed description of variables and explain all gravity equations that will be estimated in the empirical part depending on the research question and following the newest findings of gravity methodology. Gravity models are usually very demanding on data inputs that provide an advantage of precise and stable estimations, however, it is cumbersome for data collection and correct data treatment. It is necessary to control for many effects that may not be significant \textit{per se} but may influence final estimates of other variables.

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\(^{164}\) In the empirical part of the doctoral thesis, this recommendation will be included and the sensitivity analysis will be provided using OLS and PPML method, comparing the robustness of estimates and choose the most reliable method of estimation for the followed analysis of trade potential.
4.3.1 Data Specification

Two models will be estimated in several modifications in the following sub-chapters. Each model explains bilateral trade flows between the EU Members and BRICS countries creating a panel of 140 country-pairs (28 EU Member countries and 5 countries of BRICS) during the period 1995-2016. Each model, thus, contains about 3,000 observations, depending on the research question. First model includes BRICS imports from the EU member countries. Second model includes the EU Members’ imports from BRICS. For comparison purposes, there will be always estimated the same specification for both trade flows to see differences in effects and patterns of trade in each direction.

There are many studies of gravity model that use different variables representing bilateral trade flows. Choosing the correct dependent variable and its correct form may have a crucial effect on final results of gravity equation and as such, contains many problems that have to be solved. The usual mistakes that can be met in the gravity literature take place in the case of (i) data conversion, (ii) zero-trade flows, and (iii) typology. At first, since it is possible to use international trade databases which contain bilateral trade flows in a single currency (usually in USD), the problem of conversion disappears. At second, the correct treatment of zero-trade flows depends on the method of estimation and the amount of zero-trade observation. The dataset presented in the doctoral thesis contains only a little of zero-trade flows (1.4% in the first sample and 4.5% in the second sample), which are caused by insufficient statistics, covering the beginning of the observed period. Therefore, those observations will be omitted during the estimating process (using fixed and random effects), as they contain just a little information, or treated by PPML method. Third, the typology issue comes from the several possibilities how to measure bilateral trade flows: average bilateral trade flows, export or import flows. Baldwin and Taglioni (2006) highlighted that the microeconomic gravity equation describes modified expenditure function, where expenditures of one country are used to purchase goods that are produced in other countries. Therefore, they proposed a four-averaging method of trade flows. However, it is assumed that using a weighted average of bilateral trade flows among two partners causes skewed results as trade flows are not usually balanced, especially in the case of North-South trade. Shepherd (2013) claimed that gravity model applies to unidirectional export/import flows, hence, each line of the gravity equation should represent trade in only one way. The direction of trade may contain an important piece of information,

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165 If the share of missing observations is significant, it is necessary to use different methods of estimation such as Heckman correction model or Poisson Pseudo-Maximum Likelihood method.
which would be excluded by averaging. Moreover, wrong averaging of trade flows leads to misspecification of the estimates.

Confirming Shepherd’s claim, the methodology used in Fukao et al. (2003), Martínez-Zarzoso, Suárez-Burguet (2005) or Lampe (2008) that observed bilateral imports among trading partners will be followed. There are several benefits of using import data. Firstly, it is a common practice that administrative authorities monitor imports more accurately as a part of trade policy.\textsuperscript{166} Secondly, using import data serves better to the purpose of the doctoral thesis. As there is estimated the effect of tariffs on trade flows, it is necessary to analyse import flows, which are measured in Cost of Insurance and Freight (CIF) prices, including tariff costs as well.

Following Tab. 4.4 offers a summary of all variables used in the doctoral thesis and their expected effect on bilateral imports according to the economic theory. Tab. 4.5 contains descriptive statistics of all variables used in the gravity model for both directions of bilateral imports. As it was already mentioned in the previous paragraphs, the dependent variable in the gravity equations represents bilateral imports of the EU and BRICS, which are observed in millions USD. Description of explanatory variables is divided into three subgroups: (i) time-variant variables, (ii) country-pair time-invariant variables, and (iii) time-variant trade policy variables.

The most commonly used time-variant variable in the gravity equation, which creates the core of the model, is an aggregated nominal gross domestic product reflecting economic size of the country, both in terms of production capacity (supply side), and market size (demand side). Both variables are observed in nominal terms in million USD. The gross domestic product per capita is very often used as proxy variable to economic size. It is expected that it will have higher positive effect as the standard of living in the country reflects higher value added of production on the supply side and higher income on the demand side. In the empirical part, it will be tested whether this substitution of GDP variables has a similar impact on trade flows in the case of the presented models. Moreover, there will be used the variable of GDP per capita to test the hypothesis of intra-industry trade between the EU and BRICS countries. According to the theory of gravity model, all variables included in this group should have a positive effect on bilateral trade flows.

\textsuperscript{166} Income from customs represents a significant part of the public budget in many developing countries. Moreover, customs administrations monitor inflows of goods to the country because of many non-economic reasons and tracks for counterfeited and dangerous products.
The second group of explanatory variables contains all country-pair time-invariant variables. The distance was part of gravity model way long before Tinbergen’s gravity model derivation. It is mostly measured by "great circle distance" formula, which approximates the shape of the earth resulting in a minimum distance between two points along the surface. Many studies proved that distance matters (see Brun et al, 2002; Melitz, 2007; Disdier and Head, 2008; or Behar a Venables, 2011) because it approximates transport costs as well as time elapsed during shipment, synchronization costs, communication costs, or transaction costs (Head, 2003). The effect of distance among the EU and BRICS countries that represents the main natural barrier to trade will be tested, using data from the Centre d’Etudes Prospectives et d’Informations Internationales (CEPII, 2017) database.

Tab. 4.4 List of Variables Used in the Structural Gravity Equations

<table>
<thead>
<tr>
<th>Variables</th>
<th>Units</th>
<th>Variable name</th>
<th>Type of variable</th>
<th>Expected direction of coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import</td>
<td>Million USD</td>
<td>IM_{ij}</td>
<td>quantitative</td>
<td></td>
</tr>
<tr>
<td>Exporter’s nominal GDP (supply side)</td>
<td>Million USD</td>
<td>Y_i</td>
<td>quantitative</td>
<td>positive</td>
</tr>
<tr>
<td>Importer’s nominal GDP (demand side)</td>
<td>Million USD</td>
<td>Y_j</td>
<td>quantitative</td>
<td>positive</td>
</tr>
<tr>
<td>Exporter’s nominal GDP per capita</td>
<td>USD</td>
<td>Y_i/P_i</td>
<td>quantitative</td>
<td>positive</td>
</tr>
<tr>
<td>Importer’s nominal GDP per capita</td>
<td>USD</td>
<td>Y_j/P_j</td>
<td>quantitative</td>
<td>positive</td>
</tr>
<tr>
<td>Distance</td>
<td>Km</td>
<td>dist_{ij}</td>
<td>quantitative</td>
<td>negative</td>
</tr>
<tr>
<td>Common border</td>
<td>0,1</td>
<td>contig_{ij}</td>
<td>dummy</td>
<td>positive</td>
</tr>
<tr>
<td>Landlocked country</td>
<td>0,1</td>
<td>locked_{ij}</td>
<td>dummy</td>
<td>negative</td>
</tr>
<tr>
<td>Common language</td>
<td>0,1</td>
<td>comlag_{ij}</td>
<td>dummy</td>
<td>positive</td>
</tr>
<tr>
<td>Colony of trading partner</td>
<td>0,1</td>
<td>colony_{ij}</td>
<td>dummy</td>
<td>positive</td>
</tr>
<tr>
<td>CMEA membership</td>
<td>0,1</td>
<td>cmea_{ij}</td>
<td>dummy</td>
<td>positive</td>
</tr>
<tr>
<td>WTO membership</td>
<td>0,1</td>
<td>WTO_{ij}</td>
<td>dummy</td>
<td>positive</td>
</tr>
<tr>
<td>Preferential agreement</td>
<td>0,1</td>
<td>fta_{ij}</td>
<td>dummy</td>
<td>positive</td>
</tr>
<tr>
<td>EU membership</td>
<td>0,1</td>
<td>eu_memb</td>
<td>dummy</td>
<td>positive</td>
</tr>
<tr>
<td>Exchange rate USD per EUR</td>
<td>Unit</td>
<td>eur_usd</td>
<td>quantitative</td>
<td>positive, negative</td>
</tr>
<tr>
<td>Exchange rate LCY per EUR</td>
<td>Unit</td>
<td>lcy_eur</td>
<td>quantitative</td>
<td>positive, negative</td>
</tr>
<tr>
<td>Tariff barrier</td>
<td>%</td>
<td>ear_wa_{ij}</td>
<td>quantitative</td>
<td>negative</td>
</tr>
</tbody>
</table>

Source: own elaboration, 2018

However, getting an unbiased coefficient of distance, it is necessary to control for other features influencing bilateral trade costs. It is a common practice in the gravity literature to proxy the bilateral trade costs by the series of observable variables representing several country-specific as well as country-pair specific geographical, social or trade policy characteristics. As it was emphasized in the part 4.1.1., McCallum (1995) improved the gravity equation by common border variable to avoid the problem of omitted variable bias, known as the border puzzle. The variable contig_{ij} that takes the value 1 if countries of the pair share common border, 0 otherwise, will be used as well. It will be also tested whether there is any significant negative effect on trade for landlocked countries. We assume that access of country to the sea offers a big advantage for trade compared to those who do not. It is not a coincidence that the European
nations that have access to the sea were those who colonized the world. Moreover, Collier (2007) emphasizes that access to the sea has a significant influence on economic development of poor nations. In this case, the variable $\text{landlocked}_{ijt}$ gains 1 if at least one country of the pair is landlocked, 0 otherwise.

Other distance-control variables included in the gravity equations were chosen based on the assumption that they may have a positive effect on bilateral trade flows between the EU and BRICS countries for historical reasons. Melitz (2008), Lohnan (2011), or Isphording and Otten (2013) found a significant effect of common language on trade. The existence of common language, especially between developed and developing countries, is the result of the common historical development given by colonial relationships. Therefore, the variable of common language $\text{comlang}_{ijt}$ takes the value 1, if countries of the pair have a common language, 0 otherwise. The variable $\text{colony}_{ijt}$ takes the value 1, if countries of the pair used to have a colonial relationship in the past, 0 otherwise.\footnote{Brazil used to be Spanish and later Portugal colony. India and South Africa were colonized by the British Empire. As China’s territory was colonized just in several small coastal areas by many European countries, compared to its current area, it is assumed that China was not colonized at all.} More detailed studies on this topic may be found in Head, Mayer and Ries (2010), Didier and Hoarau (2014) or Colley (2015).

One specific factor that may have effect on trade between the EU and BRICS countries will be also tested. It is assumed that there will be strong trade effect between Russia and countries that are currently the EU members, but they were members of the Council of Mutual Economic Assistance (CMEA) in the past. Simply said, the hypothesis is that division of Europe on the West and East during the Cold War era can still drive recent mutual trade among its former members. Therefore, a dummy variable $\text{cmea}_{ijt}$ is taking the value 1, if both countries of the pair used to be the members of the CMEA before 1991, 0 otherwise. The last group contains time-variant trade policy variables; quantitative, as well as dummy variables representing any tool of trade policy that is supposed to be observed. Most of the studies use dummy variables representing multilateral or bilateral trade agreements among trading partners. The commonly used variable is the WTO membership $\text{wto}_{ijt}$, which takes the value 1, if both countries of the pair are members of the World Trade Organization in time $t$, 0 otherwise. The positive effect of the WTO was found in Rose (2004) or Eicher and Henn (2011).

The mainstream approach to estimate effect of preferential trade policy follows original Tinbergen’s work using a dummy variable that takes the value 1, if the preferential trade policy affects bilateral imports. Due to lack of data about preferential tariffs, the gravity equation
usually uses this approach, represented by variable $fta_{ijt}$, which takes value 1, if there is preferential trade agreement in the given year, 0 otherwise. The advantage of this method is its easy implementation; however, if there is no reciprocal preferential trade agreement between countries, the identification for policy measure may be biased (Benedictis and Taglioni, 2011). This variable is used to observe the effect of the only valid free trade agreement existing between the EU and South Africa since 2000.

As there is observed trade between the EU and BRICS countries, another effect that should be controlled for is the EU membership that represents both the biggest free trade area in the world and the presence of the EU Common Commercial Policy. The variable $eu\_memb_t$ takes the value 1, if one of the countries of the country-pair is the member of the European Union in time $t$. It is expected that the EU membership has a positive effect on bilateral trade with BRICS. Some evidence of this effect were analysed in Cheng a Tsai (2008) or Stack (2009).

No gravity equation should miss the effect of the exchange rate. The exchange rate, which represents sovereign monetary policy, is an important economic tool that may significantly affect bilateral trade flows. Therefore, there is used annual average US dollar per Euro exchange rate, as well as the local currency (LCY) per EUR exchange rate of each country. According to the economic theory, it is expected that the US dollar depreciation against Euro will have a negative effect on imports of BRICS from the EU and vice versa. Similarly, depreciation of the BRICS local currencies against Euro and other European currencies will have a negative effect on BRICS imports and positive effect on the EU imports.

There are very few gravity model papers that use tariff rate values (Wilson et al. 2003; or Lee a Park, 2007) because of the lack of data about bilateral tariffs applied in certain years (United Nations, 2012). Therefore, the last but very essential variable that will be observed in the gravity equations are administrative barriers represented by the weighted average effective applied tariff rate, which is imposed on the country $j$’s imports from country $i$ in the year $t$ expressed by $ear\_wa_{ijt}$. As the effect of administrative trade barriers is one of the essential aims of the doctoral thesis, more detailed analysis of applied tariffs between the EU and BRICS countries is provided in the Annex 8.

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168 There were analysed three sets of tariff rates: the effective applied rate, the preferential tariff rate, and the Most Favourite Nations rate, both simple and weighted average. Simple average rates were excluded as it was found that they are significantly biased by outliers. There were also excluded preferential tariff rates because of large amount of missing values. Finally, there was chosen the effective applied tariff rate over the Most Favourite Nations rate as it better explains the real state of trade policy administrative measures.
Following Tab. 4.5 shows descriptive statistics of both samples used in the panel regressions. All models are estimated on data for the period 1995-2016 including trade among 28 EU member countries and 5 BRICS countries forming 140 country pairs in each sample. The only difference between the samples’ size is due to the lag of trade flows observations. There are 3,038 observations in the first sample describing the BRICS imports from the EU countries. The second sample describing the EU imports from BRICS contains 2,940 observations. The mean value of dependent variable $IM_{ijt}$ in the first sample shares only 51% trade flows in the opposite direction. It points out two important facts: at first, the EU keeps, on average, negative trade balance with BRICS. At second, trade flows between the EU and BRICS are substantially misbalanced and therefore it is better to observe both trade flows separately as suggested in Shepherd (2013). Tab. 4.5 also shows that mean economic size of BRICS countries is 3.2 times higher than the mean economic size of the EU countries. On the other hand, standard of living, represented by the gross domestic product per capita ($Y_{ij}/P_{ij}$) is more than five times higher on average in the EU countries than in BRICS.\textsuperscript{169} The average distance between both groups of countries is 6,635 kilometres. The standard deviation is quite large resulting from the fact that the shortest distance between Lithuania and Russia is only 791 kilometres, while the longest distance is between Finland and Brazil is 10,610 kilometres.

Descriptive statistics of dummy variables also offer important information about both samples. Only very limited share of observations contains properties of the common border, language or colonial history. Most of the countries have access to the sea. In the case of foreign trade policy properties, most of the country-pairs were the WTO members during the observed period, while there is only small amount of FTA observations. As Tab. 4.5 shows, the average BRICS weighted effective applied rate on imports from the EU was 9.8%, close to the median, while the same tariff applied in the opposite direction has only the value of 3.7%, also close to the median. It means that the average BRICS tariff was about 2.5 times higher than the value of the EU tariffs during the entire period 1995-2016. There is also big difference between the minimum and maximum tariff applied rate.

**Tab. 4.5 Descriptive Statistics of Variables Used in Panel Regressions**

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<tr>
<th>Variable</th>
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<th>Mean</th>
<th>Std. Dev.</th>
<th>Median</th>
<th>Min</th>
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<td>1.41</td>
<td>103</td>
<td>101</td>
<td>105</td>
</tr>
</tbody>
</table>

\textsuperscript{169} Note that the average values of variables creating core of the gravity equation are substantially bias from the median values.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>Std. Dev.</th>
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<td>8.36</td>
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<td>79.08</td>
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Source: own elaboration in STATA13, 2018

It is important to note that all variables such as import, gross domestic product and its alternatives, distance and exchange rates will enter the panel regression analysis in the logarithmic form, while the variable representing the weighted average of effective applied tariff rate in percent, and other variables as dummy variables. More detailed panel descriptive statistics of variables in logarithmic form are presented in Annex 9 and Annex 10 for both import flows.
4.3.2 Specification of Structural Gravity Model

In this section, the theoretical form of the structural gravity equation (2.23) of Anderson and van Wincoop (2003) is transformed to the stochastic multiplicative form with the error term $\epsilon_{ij}$ and with the dependent variable of bilateral imports $IM_{ij}$ and used in the models:

$$IM_{ij} = \frac{Y_i^{\beta_1}Y_j^{\beta_2}}{Y_w^{\beta_3}P_j^{\beta_5}P_i^{\beta_6}} (t_{ij}^{\beta_4})^{1-\sigma} \epsilon_{ij}, \quad (4.17)$$

where $\beta_1, ..., \beta_6$ represents unknown parameters of variables. Log-linearizing the equation 4.17, one can obtain the estimated gravity equation:

$$\ln IM_{ij} = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j - \beta_3 \ln Y_w + (1 - \sigma) \left[ \beta_4 \ln t_{ij} - \beta_5 \ln P_j - \beta_6 \ln P_i \right] + \ln \epsilon_{ij}, \quad (4.18)$$

with parameters $\beta_1, ..., \beta_6$ as elasticities that need to be estimated and $\ln \epsilon_{ij}$ that depends on higher moments of $\epsilon_{ij}$, including its variance. In this form, the gravity equations will be estimated by OLS methods. However, as Shepherd (2013) emphasizes, gravity models usually suffer of heteroskedastic error terms violating the OLS assumptions and causing biased and inconsistent estimates. As it was presented in the part 4.3.2, this issue can be solved by non-linear estimation method like PPML, which has more plausible properties that were presented in the part 4.1 and 4.2. Therefore, all gravity equations are estimated also in non-linear form:

$$IM_{ij} = \exp \left( \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j - \beta_3 \ln Y_w + (1 - \sigma) \left[ \beta_4 \ln t_{ij} - \beta_5 \ln P_j - \beta_6 \ln P_i \right] \right) \cdot \ln \epsilon_{ij}. \quad (4.19)$$

In the empirical part, there will be always estimated two gravity equations. First equation describes BRICS imports from the EU, second equation describes the EU imports from BRICS. For the comparison purposes, the same variables will be used in both equations depending on the research question. The reason for this approach is the expectation of different impact of variables representing trade barriers and trade policy on bilateral trade.

First set of gravity equations contains all variables presented in Tab. 4.4 and creates some kind of the basic gravity equation in the doctoral theses.\footnote{To account for deviations from the theory of gravity model, stochastic versions of the equations are always used in empirical studies.} Using equation 4.20, the focus is

\footnote{If not stated otherwise, all variables stated in the equation 4.20 are included in all gravity equations.}
taken on the effect of trade barriers and trade policy measures on bilateral import. The final equation takes the form:

\[
\ln IM_{ijt} = \alpha_i + \gamma_j + \delta_t + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln dist_{ijt} + \beta_4 contig_{ijt} + \\
\beta_5 \ln landlocked_{ijt} + \beta_6 \ln comlag_{ijt} + \beta_7 \ln colony_{ijt} + \beta_8 \ln cmea_{ijt} + \beta_9 \ln wto_{ijt} + \\
\beta_{10} \ln ftal_{ijt} + \beta_{11} \ln eu_memb_{t} + \beta_{12} \ln neur_usd_{t} + \beta_{13} \ln lncy_eur_{t} + \\
\beta_{14} \ln near_wa_{ijt} + \varepsilon_{ijt},
\]

(4.20)

where \( i \) means always country of export, \( j \) means country of import and \( t \) given year. The dependent variable \( IM_{ijt} \), thus, represents import of country \( j \) from country \( i \) in time \( t \).

The parameter \( \alpha_i \) controls for the country of export, \( \gamma_j \) for the country of import and \( \delta_t \) for the time effect. From the econometric point of view, the country-specific effects \( \alpha, \gamma \) and \( \delta \) can be treated as fixed parameters (fixed effect model) or random variables (random effect model). As Mátyás (1997) emphasizes, country specific parameters represent the effects influencing behaviour of the value of imports beyond those explained by the regressors included in the model. The relatively high value of target specific effects indicates the openness of the economy. The parameter \( \alpha_i \) indicates the efficiency of the exporter to export relatively to other countries in the sample as well as relative to its given size. This can be applied also on parameter \( \gamma_j \), which shows relative efficiency of the country of import. The last parameter \( \delta_t \) shows time-varying features to capture global trends such as global inflation, economic growth or economic shocks (in gravity models called as business cycle effect). Using the target specific effects approximates for the multilateral trade resistance terms. As it was already said, the MTR variables are unobservable because they do not correspond to any price indices observed by statistics. Therefore, it is necessary to estimate gravity models using any approximation of inward and outward multilateral resistance (Shepherd, 2013). By using fixed effects, represented by country-specific component \( \alpha_i \) and \( \gamma_j \), this approach accounts for all sources of unobserved heterogeneity that is constant for the given country of export across all countries of import and vice versa. Country-specific effects are simply dummy variables for each country giving a consistent, unbiased and efficient OLS estimator if other conditions are met. Although the introduction of fixed effects creates the restriction of using time-invariant variables that vary only in the same dimension, it is possible to use time-invariant regressors that vary bilaterally.

The variable \( Y_{it} \) and \( Y_{jt} \) is the size of trading countries and \( dist_{ijt} \) represents their bilateral distance. The variable \( contig_{ijt} \) means common border, \( landlocked_{ijt} \) means landlocked country,
comlag\textsubscript{ijt} is a common language, variable colony\textsubscript{ijt} represents colonial relationship, and cmea\textsubscript{ijt} represents the membership in the Council of Mutual Economic Assistance in the past. In the case of trade policy variables, there are used wto\textsubscript{ijt} for the WTO membership, fta\textsubscript{ijt} for a preferential trade agreement, eu\textsubscript{memb}\textsubscript{ijt} for the EU membership, eur\_usdt as Euro per USD exchange rate, lcy\_eur\textsubscript{t} as local currency per Euro and ear\_wa\textsubscript{ijt} is effective applied tariff rate. Finally, the variable $\varepsilon\textsubscript{ijt}$ represents the error term, which captures all unobserved factors, which can influence bilateral imports.

Following models will test whether using alternative indicators is consistent with the classic variables of the basic gravity model. In the first equation, there will be observed the effect of gross domestic product per capita as proxy for standard of living:

$$
\ln IM\textsubscript{ijt} = \alpha_i + \gamma_j + \delta_t + \beta_1 \ln(Y_i/P_i) + \beta_2 \ln(Y_j/P_j) + \beta_3 \ln dist\textsubscript{ijt} + \\
\beta_4 contig\textsubscript{ijt} + \beta_5 landlocked\textsubscript{ijt} + \beta_6 comlag\textsubscript{ijt} + \beta_7 colony\textsubscript{ijt} + \beta_8 cmea\textsubscript{ijt} + \\
\beta_9 wto\textsubscript{ijt} + \beta_{10} fta\textsubscript{ijt} + \beta_{11} eu\textsubscript{memb}\textsubscript{t} + \beta_{12} lneur\_usdt + \beta_{13} lnlcy\_eur\textsubscript{t} + \\
\beta_{14} lnear\_wa\textsubscript{ijt} + \varepsilon\textsubscript{ijt},
$$

where $Y_i/P_i$ stands for GDP per capita of the country of export, $Y_j/P_j$ stands for GDP per capita of the country of import. It is expected that increasing standard of living has positive effect on bilateral imports. In the following equation, there will be observed the effect of distance in the form of categorical variables dist\_cat\textsubscript{ijt}:

$$
\ln IM\textsubscript{ijt} = \alpha_i + \gamma_j + \delta_t + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 dist\_cat\textsubscript{ijt} + \beta_4 contig\textsubscript{ijt} + \\
\beta_5 landlocked\textsubscript{ijt} + \beta_6 comlag\textsubscript{ijt} + \beta_7 colony\textsubscript{ijt} + \beta_8 cmea\textsubscript{ijt} + \beta_9 wto\textsubscript{ijt} + \\
\beta_{10} fta\textsubscript{ijt} + \beta_{11} eu\textsubscript{memb}\textsubscript{t} + \beta_{12} lneur\_usdt + \beta_{13} lnlcy\_eur\textsubscript{t} + \\
\beta_{14} lnear\_wa\textsubscript{ijt} + \varepsilon\textsubscript{ijt}.
$$

To get detailed knowledge about the distance effect, there were created categorical variables for distance in four intervals: up to 2000 km, up to 5000 km, up to 10 000 km and over 10 000 km. It is assumed that the longer distance between trading partners, the more negative effect on bilateral imports.

Finally, in the last equation based on the basic gravity equation, there will be tested the validity of Heckscher-Ohlin theory of inter-industry trade and Linder’s theory of intra-industry trade on the sample of trade between the EU and BRICS countries. As it was already stated in chapter 2.2, Heckscher-Ohlin theory assumes that the amount of trade is higher between countries with a high difference of income. On the other hand, Linder’s theory states that
countries with similar level of income will trade more. The validity of those hypothesis observing the effect of difference of income of the country pair \((Y_{ij}/P_{ij})-(Y_{ji}/P_{ji})\) on the level of import will be tested:

\[
\ln I_{M_{ijt}} = \alpha_i + \gamma_j + \delta_t + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln [(Y_{it}/P_{it})-(Y_{jt}/P_{jt})] + \\
\beta_4 \text{Indist}_{ijt} + \beta_5 \text{contig}_{ijt} + \beta_6 \text{landlocked}_{ijt} + \beta_7 \text{comlag}_{ijt} + \beta_8 \text{colony}_{ijt} + \\
\beta_9 \text{cmea}_{ijt} + \beta_{10} \text{wto}_{jt} + \beta_{11} \text{fta}_{ijt} + \beta_{12} \text{eu memb}_{t} + \beta_{13} \text{lnlcy eur}_{t} + \\
\beta_{14} \text{lnear wa}_{ijt} + \epsilon_{ijt}.
\] (4.23)

The coefficient \(\beta_3\) may be positive or negative depending on whether the bilateral trade is determined rather by inter-industry or intra-industry trade. The direction of the coefficient is expected to be positive, which is typical for the North-South trade.\(^{172}\)

### 4.3.3 Specification of Structural Gravity Model According to the Newest Methodology

The literature of the gravity equation has grown fast during the last decades and therefore it is desirable to follow the newest approaches and apply them to solve specific research questions. In this sub-chapter, there will be applied the methodology of Piermartini and Yotov (2016) which will be used to estimate the untapped trade potential between the EU and BRICS countries.

The gravity estimations will meet almost all conditions that were presented in the section 4.1.3 to get unbiased and efficient results of the gravity results. There are used (i) panel data, (ii) time intervals that were set to three years after several estimations with different intervals, (iii) country-specific time-varying fixed effects, (iv) country-pair fixed effects, and (v) PPML estimator. The only condition of intra-national trade flows could not be met as there are no free available data and manual computation would be too costly.

To gain comparable results and analyse the effect of the most modern gravity estimation approaches, the traditional OLS estimation of gravity equation is used at the beginning, very similar to the equation 4.20. All variables remain the same, however, the exporter-fixed effects \(\alpha_i\), importer-fixed effects \(\gamma_j\) and time effects \(\delta_t\) are not estimated in the equation 4.24:

\[
\ln I_{M_{ijt}} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \text{Indist}_{ijt} + \beta_4 \text{contig}_{ijt} + \\
\beta_5 \text{landlocked}_{ijt} + \beta_6 \text{comlag}_{ijt} + \beta_7 \text{colony}_{ijt} + \beta_8 \text{cmea}_{ijt} + \beta_9 \text{wto}_{jt} + \\
\beta_{14} \text{lnear wa}_{ijt} + \epsilon_{ijt}.
\] (4.24)

\(^{172}\) Note that including the lagged value of any trade or GDP variable is not a standard in gravity equations because they may mess up the properties of the estimator as there cannot be assumed a strict exogeneity of the regressors.
\[ \beta_{10} fta_{ijt} + \beta_{11} eu_{memb_t} + \beta_{12} lnur_{usd_t} + \beta_{13} lnley_{eur_t} + \]
\[ \beta_{14} lnear_{wa_{ijt}} + \varepsilon_{ijt}. \]

Instead, according to Piermartini and Yotov (2016), including the time dimension in gravity equation, one has to estimate multilateral resistance terms as exporter-time \( \pi_{it} \) and importer-time \( \chi_{jt} \) fixed effects to capture the dynamic of the gravity model. It is important to note that using exporter-time and importer-time fixed effects will absorb all other observable as well as unobservable country-specific characteristics which vary over time:

\[
lnI_M_{ijt} = \pi_{it} + \chi_{jt} + \beta_1 ln\text{dist}_{ijt} + \beta_2 contig_{ijt} + \beta_3 \text{landlocked}_{ijt} + \beta_4 comlag_{ijt} + \beta_5 \text{colony}_{ijt} + \beta_6 \text{cmea}_{ijt} + \varepsilon_{ijt}. \tag{4.25}
\]

Because of its favourable properties, the equation 4.25 is formulated in multiplicative form and re-estimated by applying the PPML estimator instead of the OLS:

\[
I_M_{ijt} = \exp(\pi_{it} + \chi_{jt} + \beta_1 ln\text{dist}_{ijt} + \beta_2 contig_{ijt} + \beta_3 \text{landlocked}_{ijt} + \beta_4 comlag_{ijt} + \beta_5 \text{colony}_{ijt} + \beta_6 \text{cmea}_{ijt}) \ast \ln \varepsilon_{ij}. \tag{4.26}
\]

The final gravity equation 4.27 includes the country-pair fixed effects \( \mu_{ij} \) that are able to control for endogeneity of covariates, however, their drawback is that they also absorb all bilateral time-invariant variables, that are used in the structural gravity equations (for example the distance):

\[
I_M_{ijt} = \exp(\pi_{it} + \chi_{jt} + \mu_{ij}) \ast \ln \varepsilon_{ij}. \tag{4.27}
\]

Final estimates of the gravity equations are, thus, country-time and country-pair specific, absorbing all time-variant and country-pair fixed observable and unobservable effects on bilateral trade flows. It means that all attributes, effects, and characteristics of countries and their mutual relations are absorbed in each own coefficients. As the equation includes the time dimension, the results may be used for estimation of untapped trade potential for each country-pair and may be comparable in time. Results of gravity estimates using Piermartinery and Yotov (2016) procedure are provided in sub-chapter 4.4.5.

Finally, all equations will be tested on model misspecification. For this purpose, there was used the Ramsey RESET test that detects, whether any potential variables are omitted in the model specification. The null hypothesis \( H_0 \) states that the model does not suffer from misspecification errors and it can be rejected if the \( p\text{-value} \) is larger than the significance value (usually 0.05).
4.4 Empirical Results

In this sub-chapter, the results of all structural gravity models for bilateral trade between the EU Members and BRICS countries will be presented. The aim is to find answers to the research questions stated in the sub-chapter 1.1.

The validity of the gravity model of international trade will be confirmed and the determinants and barriers of bilateral import flows between the EU Members and BRICS countries will be observed. The focus was on positive and negative factors tailored to the bilateral imports among observed countries in the period 1995-2016. Specifically, it will be elaborated whether liberalization and protectionist measures affect imports according to the theory and test, whether trade liberalization benefits international trade while protectionism has a negative effect. An insigne to the alternative approaches to estimate the core of the gravity equation will be provided. It will be also examined whether bilateral trade flows between the EU Members and BRICS are rather inter-industrial, determined by differences in factor endowments according to the neoclassical theory, or intra-industrial, determined by income similarity according to the monopolistic competition theory of trade. Finally, gravity equation will be estimated using the newest knowledge of structural gravity modelling to gain the most accurate panel gravity estimates which will be used to determine untapped trade potential between the EU and BRICS countries in the year 2016.

4.4.1 Panel Gravity Model Verification Tests

Before the results discussion, it is necessary to provide specification tests to accomplish basic assumptions of OLS estimation that leads to unbiased results, verify the hypotheses and deduce some conclusions. Most of the papers focusing on the gravity model of international trade test only some of the panel assumptions (mostly heteroscedasticity) but that is not the case of the analysis provided in the doctoral thesis.

Firstly, the assumption of linearity in parameters that was confirmed after the logarithmic transformation was tested. However, it was found that several parameters have a better fit in the non-linear form (especially distance, tariffs, and gross domestic product per capita). It is additional reason for using non-linear estimation technique such as Poisson Pseudo-Maximum Likelihood estimator.

Heteroscedasticity test confirmed the presence of heteroscedasticity since the residual variance decreases as the value of import grows. Hence, the variance of residuals is not constant,
although it is expected to be.\textsuperscript{173} However, the problem of heteroscedasticity is a very frequent problem in gravity model and these findings are not surprising. As Shepherd (2013) emphasizes, the gravity equation should always use the robust standard errors procedure which is a simple and effective way to fix the violation of homoscedasticity assumption. Moreover, one of the major positive features of the PPML estimator is that it is able to account for the bias caused by the logarithmic transformation of the gravity equation in the case of heteroscedasticity in the error term.

In the same manner, there is supposed to be used robust standard errors or any clustering technique correcting the correlation of the error terms within the groups, defined by the variable identifying each country-pair independently. Distance or country-pair variable (used in presented samples) may serve for this purpose. Serial correlation tests proved the presence of autocorrelation which causes smaller standard errors than they actually are and increases the coefficient of determination.\textsuperscript{174} But since the serial correlation issues are also well known in panel gravity model, using clustering techniques causes that standard errors estimates are robust to disturbances being autocorrelated. In connection to this, there are usual questions about the stationarity of variables in the gravity model. However, as the $N$ dimension of country-pairs is much larger than time $T$ dimension, the non-stationarity in some panels is not a problem. In other words, the spurious correlation problem is less important in panels than in time series analysis, as the fixed effects estimator for non-stationary data is asymptotically normal, the results of standard panel unit root tests are still biased (Fidrmuc, 2009).

The pair-wise correlation tests did not find neither perfect multicolinearity nor higher collinearity than 0.7.\textsuperscript{175} However, Pesaran (2007) proved that violation of cross-sectional dependence often leads to undesirable finite sample properties. Therefore, a general diagnostic test was used for cross-sectional dependence in panels after each estimation to find the existence of cross-sectional dependence among the panel variables.\textsuperscript{176} The rejection of null hypothesis confirmed the existence of cross-sectional dependence across countries, which was expected. The last assumption of normality of residuals was indicated as not normally distributed.\textsuperscript{177}

\textsuperscript{173} The presence of heteroscedasticity was tested using Modified Wald test, White test, and Preusch-Pegan heteroscedasticity test.
\textsuperscript{174} The presence of autocorrelation was tested by Wooldridge test for autocorrelation in panel data.
\textsuperscript{175} Multicolinearity was tested using correlation matrix and variance inflation factor analysis.
\textsuperscript{176} This test uses the correlation coefficients between the time-series for each panel country. The null hypothesis assumes cross-sectional independence against the alternative hypothesis of cross-sectional dependence.
\textsuperscript{177} Univariate kernel density estimation, Shapiro-Wilk test for normality, Skewness and Kurtosis test for normality and Jarque-Bera test for normality were used.
However, since this assumption is very weak, statistical inference is consistent for large samples (about 2,600 observations), therefore the approximation should work well.

4.4.2 Determinants of Trade between the EU Members and BRICS Countries and Effect of Trade Policy Measures

This section provides the estimation of determinants of trade and effects of natural and administrative trade barriers on bilateral imports between the EU and BRICS countries that will help to confirm or reject the research hypothesis. Gravity literature usually uses more model estimators that are compared with each other in order to confirm the direction and size of the effects of determinants on trade. Therefore, this approach is followed and estimated all gravity models by basic OLS method, panel fixed effect and random effect method and finally by PPML estimator. First, all estimation results of the gravity equation 4.20 will be discussed, then the attention will be paid only to the alternative variables according to the equation 4.21, 4.22. Finally, it will be estimated whether bilateral trade flows are determined in line with the neoclassical or monopolistic competition theory of trade according to the equation 4.23.

Tab. 4.6 shows results of estimation of the equation 4.20 describing the effect of geographical and trade policy measures on trade between the EU and BRICS countries. The dataset includes a total of 140 country-pairs holding 2,617 observations for BRICS imports and 2,722 observations for the EU imports. According to the F-test, all models have a high value of Wald statistics indicating strong joint significance of variables, which is completed by a high value of goodness of fit.

Most of the GDP elasticities are close to unity, hence it follows the properties of the structural gravity model set by Anderson and van Wincoop (2003). As expected, both exporter’s and importer’s GDP have a positive impact on bilateral imports between the EU Members and BRICS. With the exception of the PPML estimations in the model of BRICS imports, all results suggest that the EU have a bit higher effect on bilateral trade flows. Interpreting the coefficients $\beta_1$ and $\beta_2$, the growth of the exporter’s (importer’s) GDP by 1% caused an increase of bilateral imports between 0.7-1%, *ceteris paribus*.

The results of the effect of distance are also in line with the theory of gravity model as it keeps high negative effect on the bilateral imports. Tab. 4.6 shows that 1% growth of distance between the EU and BRICS countries has a negative effect on BRICS imports approximately in the same size. The presence of the common border, common language or former colonial relationships seem to have rather no significant effect on bilateral trade between the EU
Members and BRICS as they were found significant just in basic OLS models. Therefore, the stability of those estimations cannot be confirmed and rather conclude that they do not have a significant effect on bilateral trade flows between the EU and BRICS.\(^{178}\) On the other hand, the variable representing former CMEA membership offers very interesting results. The partial effect shows that imports of BRICS from the EU increased by 167% more in the observed period compared to the countries without this relationship. On the opposite direction, the EU imports from BRICS, this effect is much higher.\(^{179}\) The average value of coefficient suggests that imports of the former CMEA members from BRICS countries increased by 390% more in the observed period compared to the countries without this relationship. Such results highlight that, despite the considerable change in the orientation of the foreign trade of Central and East European countries during the 1990s towards the European Union members, trade relations with Russia have "long memory" and significantly drive their bilateral trade. Moreover, the size of this effect is understandable due to the share of oil and gas imports from Russia and development of international prices during the last two decades.

As it was expected, the WTO membership and Free Trade Agreement between the EU and South Africa have a significantly positive effect on bilateral trade. It clearly confirms the hypothesis that bilateral or multilateral liberalization has significantly positive effect on international trade. Moreover, the results show that emerging countries benefit more from the multilateral and bilateral liberalization as the coefficients are higher in the case of the EU imports from BRICS. The WTO membership has a twice as high effect on trade flows from BRICS to the EU than in the opposite direction. Tab. 4.6 also shows that the EU-South Africa FTA significantly boosted the EU imports, thus, export revenues of the South African producers, while the effect on South Africa’s imports is relatively negligible.

At the first sight, the effect of the EU membership is not so clear. Accession to the European integration process had a significantly positive effect on BRICS imports from the EU. In other words, the exporters from new EU member countries, thus, those that joined the EU after the year 2004, gained better access to the BRICS markets. However, all models of trade flows in the direction from BRICS to the EU show the negative effect of the EU membership. It is assumed that those results describe the trade diversion effect. The EU accession decreased consumption of goods from BRICS by 25% on average. It means that consumers of the new

\(^{178}\) Those results will be discussed more in detail in the part about country specific effects.

\(^{179}\) The correct interpretation of the dummy variable is: \(\%\Delta y=[\exp(\beta)-1]\times 100.\)
EU countries rather changed their consumption habits and substituted the consumption of goods originating in BRICS countries by goods from the Common market.

Tab. 4.6 Estimates of Panel Gravity Model with Trade Policy Variables

<table>
<thead>
<tr>
<th>Dep. var.: $M_{ij}$</th>
<th>BRICS imports from the EU</th>
<th>EU imports from BRICS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td>FE</td>
</tr>
<tr>
<td>$Y_i$</td>
<td>0.816***</td>
<td>0.859***</td>
</tr>
<tr>
<td>$Y_j$</td>
<td>0.808***</td>
<td>0.787***</td>
</tr>
<tr>
<td>$dist_{ij}$</td>
<td>-1.030***</td>
<td>-0.985**</td>
</tr>
<tr>
<td>contig$_i$</td>
<td>0.506**</td>
<td>0.569</td>
</tr>
<tr>
<td>locked$_i$</td>
<td>0.053</td>
<td>0.157</td>
</tr>
<tr>
<td>complag$_i$</td>
<td>-0.186</td>
<td>-0.144</td>
</tr>
<tr>
<td>colony$_y$</td>
<td>0.464**</td>
<td>0.447</td>
</tr>
<tr>
<td>cmea$_i$</td>
<td>1.061***</td>
<td>1.067***</td>
</tr>
<tr>
<td>wto$_i$</td>
<td>0.167**</td>
<td>0.158</td>
</tr>
<tr>
<td>$flow_{ij}$</td>
<td>0.094</td>
<td>0.044</td>
</tr>
<tr>
<td>$eu_{mem}$</td>
<td>0.399***</td>
<td>0.363**</td>
</tr>
<tr>
<td>$usd_{eur}$</td>
<td>-0.265</td>
<td>-0.567</td>
</tr>
<tr>
<td>$lc_y_{eur}$</td>
<td>-0.493***</td>
<td>-0.486***</td>
</tr>
<tr>
<td>ear_wto$_i$</td>
<td>-0.383***</td>
<td>-0.414***</td>
</tr>
<tr>
<td>Observations</td>
<td>2617</td>
<td>2617</td>
</tr>
<tr>
<td>Control for country of export</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Control for country of import</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Control for year</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Coefficient of determination</td>
<td>0.9100</td>
<td>0.6667</td>
</tr>
</tbody>
</table>

Legend: * p < 0.05; ** p < 0.01; *** p < 0.001
Source: own elaboration, 2018

Effect of currency depreciation is in line with the expectations. As the table 4.6 shows, the USD depreciation against Euro makes BRICS imports from the EU more expensive and the EU imports from BRICS cheaper. Therefore, the effect of USD depreciation has a significantly negative effect on BRICS imports as it makes the EU production more expensive on the foreign markets.\(^{180}\) The LCY depreciation has also a significantly negative effect on imports. Depending on the estimation process, the results show that one percent LCY depreciation against Euro decreased BRICS imports from the EU by 1.6-4.9%. On the other hand, this effect of LCY depreciation against the Euro on imports was not confirmed on the side of the EU countries, as the results are significant, moreover negligible, just in the case of the PPML estimator.

Finally, the effective applied tariff has a negative effect on trade flows between the EU and BRICS countries. It confirms the hypothesis, and economic theory as well, that tariffs create a barrier to trade. With the exception of PPML estimator, all models suggest that 1% increase of weighted average applied tariff has a negative effect on BRICS imports from the EU of around

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\(^{180}\) As the bilateral trade flows are always two sides of the same coin, the USD depreciation has negative effect on the revenues of the EU exporters.
In the case of the EU import from BRICS, the effects of tariffs are insignificant or negligible. It is caused by the very low level of tariffs applied on the EU imports and liberalization process in the observed period as it was discussed in the chapters 3 and 4.3.1.

The results of country and time specific effects for all models estimated and discussed in this sub-chapter are, due to its scope, presented in Annex 11-14 for all gravity equations. Because of the similarity of these results, the comment will hold only the estimates of the equation 4.20. Commenting on the exporter and importer fixed effects, keep in mind that Austria is considered as a reference country for other EU members, and Brazil as a reference country for other BRICS members. In case of the first model, BRICS imports from the EU, the only significantly higher effect was measured in case of Germany. The coefficient for this country is 1.057 on average, which means that BRICS imports from Germany increased by 188% more than imports from Austria during the observed period. Other EU countries having positive country-specific coefficient are Belgium, France, Italy, and Netherlands, however, the estimates are not significant. Other EU countries have a negative sign of the $\alpha_i$ coefficient, meaning that BRICS imports from those countries grew less than imports from Austria (see for example results for Cyprus or Greece) as it can be seen in Annex 11. In case of BRICS countries, the coefficient $\gamma_j$ is not significant in most cases. Hence, the country-specific effect of other BRICS countries is not significantly different from Brazil. The results of time factor presented in the Annex 11 show that BRICS import growth was significantly lower in the period 1998-2001 compared to 1995, but significantly higher since 2003. The dynamics of the coefficient clearly show the global economic cycle before and after the economic crisis in 2009, followed by their economic slowdown caused by low international commodity prices since 2013.

In case of the EU imports from BRICS, China keeps a dominant position among other countries. The average coefficient of 1.2 means that the EU imports from China increased by 237% more than imports from Brazil in the observed period. The coefficients $\alpha_i$ for other BRICS countries are mostly insignificant. On the other hand, the country-specific effect of the EU countries $\gamma_j$ shows one interesting phenomenon in the international trade called the Rotterdam effect. Belgium and Netherlands keep significantly positive effect compared to

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181 Keep in mind that the value of tariff is in percentage, therefore the interpretation of $\beta_{14}$ coefficient means effect of one percentage change of the tariff rate on percentage point change of imports.

182 The Rotterdam effect occurs when the foreign trade transactions are reported first as the imports from the third country (for example outside the EU) to any state of economic integration and then it is exported to another country to final consumption. This second step is then recorded as a dispatch (export) and arrival (import) between the two member states of the economic integration. Rotterdam effect also exists in the case of export but to a lesser extent.
the other EU countries. Specifically, imports of Belgium and Netherlands from BRICS increased by 207%, respectively 225%, more than imports of Austria in the given period. Positive coefficient of the country of import, pictured in Annex 11, is also significant in the case of Czechia and Germany. The significantly lower growth of imports was measured in the case of Ireland, Latvia, and Luxembourg. Finally, the effect of time dummy variable $\delta_t$ is positive until 2013 and negative in the following two years. It can be interpreted by the economic slowdown in Brazil and China, drop of commodity prices on international markets and weak rebound of the Eurozone. Hence, the business cycles of both trade flows are quite different.

Following Tab. 4.7 shows the results of panel gravity estimates of the equation 4.21 using gross domestic product per capita variable as a substitute variable for the economic size, represented by GDP. The results suggest that the GDP per capita serves as a very good approximation of GDP as it offers very similar results as in Tab. 4.6. All estimation coefficients are positive, significant and their values are close to unity. It is in line with the results presented in the other gravity literature. The Tab. 4.7 shows that the level of standard of living in the EU determines trade flows between the EU and BRICS countries more than the level of standard of living in the BRICS countries. These results are in line with the expectations as the EU countries have higher productivity on the supply side and higher purchasing power on the demand side. It is also worth mentioning that the negative effect of inland locations, represented by the $locked_{ijt}$ variable, is significantly higher when using the standard of living as a proxy to economic size. It can be caused by the effect of transportation costs that increase the final price of production and decline purchasing power of inhabitants in the inland countries. The results of this coefficient may be interpreted as if the country is inland, BRICS imports from the EU countries was by 90% lower compared to the EU countries with the access to the sea. On the other hand, the growth of import from BRICS of the EU countries without the access to the sea was lower by 95% on average. It shows that the inland location represents significant impediment to trade. Other coefficients are similar to those presented in Tab. 4.6.

Tab. 4.7 Estimates of Panel Gravity Model with Alternative GDP Variables

<table>
<thead>
<tr>
<th>Dep. var.: $IM_{ijt}$</th>
<th>BRICS imports from the EU</th>
<th>EU imports from BRICS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) OLS</td>
<td>(2) FE</td>
</tr>
<tr>
<td></td>
<td>(1) OLS</td>
<td>(2) FE</td>
</tr>
<tr>
<td>$Y/P_i$</td>
<td>0.826***</td>
<td>0.864***</td>
</tr>
<tr>
<td>$Y/P_j$</td>
<td>0.700***</td>
<td>0.688***</td>
</tr>
<tr>
<td>$dist_{ij}$</td>
<td>-1.028***</td>
<td>-0.982**</td>
</tr>
</tbody>
</table>

It leads to an overestimation of exports and imports of countries that serve as an important trade node, mostly having big international ports such as Rotterdam (Rojiček, 2010).
In Tab. 4 the first category and 74% in the case of radius 5,000 and 10,000 kilometres is in this radius compared to other.

The result of transportation costs having an effect on BRICS imports approximately in the same size. It means that the effect of distance should be somehow, in general, negatively proportionate to the bilateral trade flow. However, if the distance is categorized to the intervals, the size of trade flows grows exponentially to the distance. It needs to be emphasized that these results are valid specifically to the bilateral trade between the EU and BRICS countries, hence they should not be generalized.

In the case of BRICS imports from the EU, the negative effect on trade flows increases with the distance which is in line with the theory of gravity model. Longer distance means higher transportation costs having a negative effect on trade. Using the example of the PPML estimator, the result of -0.721 of the second distance interval, which is defined between 2,000 and 5,000 kilometres, means that imports decline by 51% on average when the country partner is in this radius compared to other trading partners which are located closer than 2,000 kilometres. Two other categories may be similarly described. In case of the radius between 5,000 and 10,000 kilometres, the imports of BRICS from the EU declined by 71% compared to the first category and 74% in the case of radius higher than 10,000 kilometres.

Tab. 4.8 presents the results of alternative distance variables according to the equation 4.22. In the previous part of this chapter, there was found that 1% growth of distance between the EU and BRICS countries has a negative effect on BRICS imports approximately in the same size. It means that the effect of distance should be somehow, in general, negatively proportionate to the bilateral trade flow. However, if the distance is categorized to the intervals, the size of trade flows grows exponentially to the distance. It needs to be emphasized that these results are valid specifically to the bilateral trade between the EU and BRICS countries, hence they should not be generalized.

In the case of BRICS imports from the EU, the negative effect on trade flows increases with the distance which is in line with the theory of gravity model. Longer distance means higher transportation costs having a negative effect on trade. Using the example of the PPML estimator, the result of -0.721 of the second distance interval, which is defined between 2,000 and 5,000 kilometres, means that imports decline by 51% on average when the country partner is in this radius compared to other trading partners which are located closer than 2,000 kilometres. Two other categories may be similarly described. In case of the radius between 5,000 and 10,000 kilometres, the imports of BRICS from the EU declined by 71% compared to the first category and 74% in the case of radius higher than 10,000 kilometres.

Tab. 4.8 Estimates of Panel Gravity Model with Categorical Distance Variables

<table>
<thead>
<tr>
<th>Dep. var.: IM&lt;sub&gt;jt&lt;/sub&gt;</th>
<th>BRICS imports from the EU</th>
<th>EU imports from BRICS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td>FE</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td>FE</td>
</tr>
<tr>
<td>Y&lt;sub&gt;t&lt;/sub&gt;</td>
<td>0.808***</td>
<td>0.859***</td>
</tr>
<tr>
<td>Y&lt;sub&gt;j&lt;/sub&gt;</td>
<td>0.802***</td>
<td>0.787***</td>
</tr>
<tr>
<td>dist&lt;sub&gt;cat&lt;sub&gt;jt&lt;/sub&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-0.502***</td>
<td>-0.496</td>
</tr>
<tr>
<td>3</td>
<td>-1.533***</td>
<td>-1.538***</td>
</tr>
<tr>
<td>4</td>
<td>-1.781***</td>
<td>-1.809***</td>
</tr>
</tbody>
</table>

Legend: * p < 0.05; ** p < 0.01; *** p < 0.001
Source: own elaboration, 2018
4.4.3 Inter-Industry versus Intra-Industry Trade between the EU and BRICS Countries

In this part, there will be tested whether the bilateral trade flows between the EU and BRICS countries are rather inter-industrial, referring to the Heckscher-Ohlin theory of factor endowments, or intra-industrial, in line with the Linder’s hypothesis of similarity of income between trading partners.

The gross domestic product per capita is used to compute the differences between the income for each country pair and estimate this effect on the value of import in both directions according to the equation 4.23. The gravity estimates presented in the Tab. 4.9 shows consistent results for all variables as it was presented in the sub-chapter 4.4.2. However, the most interesting is the $\beta_3$ coefficient. The estimates of both gravity equations show positive sign. Therefore, it can be concluded that the bilateral trade between the EU and BRICS is based rather on the assumption of Heckscher-Ohlin theory of inter-industry trade. It means that the production and following exchange of goods between the EU and BRICS countries is driven by labour and...
capital abundant factors, which determine comparative advantages of producers in these countries. Similar results were found, for example, in (Rasoulinezhad and Jabalameli, 2018).

However, there are some differences between trade flows in both directions. In case of BRICS imports, the panel linear regression estimates are not significant and only the PPML estimator provides significant results. In this case, the \( \beta_3 \) coefficient can be interpreted as follows: the growth of the absolute value of the difference between the gross domestic product per capita of the EU and BRICS by 1% causes an increase of BRICS imports by 0.01% in the monitored period. Hence, the effect of the income difference change is absolutely negligible but still significant.

### Tab. 4.9 Estimates of Panel Gravity Model Testing the Validity of Inter-Industry Trade

<table>
<thead>
<tr>
<th></th>
<th>BRICS imports from the EU</th>
<th></th>
<th></th>
<th>EU imports from BRICS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td>FE</td>
<td>RE</td>
<td>PPML</td>
<td>OLS</td>
<td>FE</td>
</tr>
<tr>
<td>( Y_t )</td>
<td>0.813***</td>
<td>0.787***</td>
<td>0.862***</td>
<td>0.217***</td>
<td>0.987***</td>
<td>0.836***</td>
</tr>
<tr>
<td>( Y_t )</td>
<td>0.701***</td>
<td>0.684***</td>
<td>0.689***</td>
<td>0.763***</td>
<td>0.855***</td>
<td>0.741***</td>
</tr>
<tr>
<td>((Y_t/P_t)-(Y/P))</td>
<td>0.008</td>
<td>0.016</td>
<td>0.020</td>
<td>0.013***</td>
<td>0.194***</td>
<td>0.300***</td>
</tr>
<tr>
<td>distij</td>
<td>-1.057***</td>
<td>-1.032**</td>
<td>-0.945**</td>
<td>-0.743***</td>
<td>-0.743***</td>
<td>-0.582</td>
</tr>
<tr>
<td>contigij</td>
<td>0.334</td>
<td>0.469</td>
<td>0.474</td>
<td>0.362**</td>
<td>0.362**</td>
<td>0.185</td>
</tr>
<tr>
<td>lockedij</td>
<td>-0.062</td>
<td>-0.051</td>
<td>0.216</td>
<td>0.307*</td>
<td>0.307*</td>
<td>0.240</td>
</tr>
<tr>
<td>comlagi</td>
<td>0.356</td>
<td>0.374</td>
<td>0.141</td>
<td></td>
<td>0.541***</td>
<td>0.634</td>
</tr>
<tr>
<td>colonyij</td>
<td>0.058</td>
<td>0.178</td>
<td>-0.987**</td>
<td>-0.467</td>
<td>-0.467</td>
<td>-0.649</td>
</tr>
<tr>
<td>cmcaij</td>
<td>1.253***</td>
<td>1.156***</td>
<td>0.853***</td>
<td></td>
<td>1.642***</td>
<td>2.019***</td>
</tr>
<tr>
<td>wtoij</td>
<td>0.268***</td>
<td>0.276***</td>
<td>0.275***</td>
<td>0.079***</td>
<td>0.253***</td>
<td>0.269***</td>
</tr>
<tr>
<td>( \beta_3 )</td>
<td>0.086</td>
<td>0.108</td>
<td>0.108</td>
<td>-0.123***</td>
<td>0.661***</td>
<td>-0.178</td>
</tr>
<tr>
<td>( \beta_4 )</td>
<td>0.395***</td>
<td>0.361**</td>
<td>0.365**</td>
<td>0.450***</td>
<td>-0.336***</td>
<td>-0.183</td>
</tr>
<tr>
<td>eu_membij</td>
<td>-1.869</td>
<td>-2.151</td>
<td>-0.985**</td>
<td></td>
<td>3.724***</td>
<td>2.634</td>
</tr>
<tr>
<td>wto_eur</td>
<td>-0.486***</td>
<td>-0.467***</td>
<td>-0.471***</td>
<td>-0.150***</td>
<td>0.116</td>
<td>0.012</td>
</tr>
<tr>
<td>cmca_eur</td>
<td>-0.018***</td>
<td>-0.021**</td>
<td>-0.020**</td>
<td>-0.004***</td>
<td>-0.003</td>
<td>-0.014</td>
</tr>
<tr>
<td>observations</td>
<td>2479</td>
<td>2479</td>
<td>2479</td>
<td>2479</td>
<td>2612</td>
<td>2612</td>
</tr>
<tr>
<td>control for country of export</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>control for country of import</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>control for year</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>coefficient of determination</td>
<td>0.9172</td>
<td>0.6970</td>
<td>0.9167</td>
<td>0.1793</td>
<td>0.9325</td>
<td>0.7471</td>
</tr>
</tbody>
</table>

Legend: * \( p < 0.05 \); ** \( p < 0.01 \); *** \( p < 0.001 \)
Source: own elaboration, 2018

Compared to that, the EU imports from BRICS are more determined by comparative advantages coming from the factor endowments abundance. The coefficient \( \beta_3 \) has a significantly positive effect on the EU imports using all methods of estimation. The value ranges between 0.2-0.3%, meaning that the growth of the absolute value of the difference between the gross domestic product per capita of the EU and BRICS by 1% causes an increase of the EU imports by 0.2-0.3% in the monitored period. In other words, bigger difference in incomes between the EU Members and BRICS countries makes trade flow to the EU stronger. It proves that lower costs in developing countries represent a significant comparative advantage for their production as lower prices helps to boost the demand from abroad. Moreover, it was
found that trade flows from BRICS countries are more determined by factor endowments than in the opposite direction, which is in line with the results of intra-industrial trade index presented in the sub-chapter 3.4.3.

Such results would be worthy of additional research, however, it can be assumed that inter-industry trade between the EU and BRICS countries is a result of different factor endowments abundance, which determines countries’ comparative advantages and production. These results are in line with the North-South trade pattern. It can be expected that increasing similarities of countries production caused by the global value chains evolution, fast industrialization, high investment activity and buoyant income growth during last two decades may result in the changes of the production structure. It means that trade between the EU and BRICS may become intra-industrial due to globalization in the future.

Finally, all above presented gravity models of bilateral trade flows were analysed by both fixed and random effect estimator. Therefore, the Wald test for fixed effects as well as Breusch-Pagan-Lagrangian multiplier test for random effects was applied. However, both tests reject the null hypothesis, which refers to the possibility of using both estimators. Therefore, the Hausman test was used to distinguish between both fixed and random effect estimators. Whereas, under the null hypothesis both estimators are consistent, the random effect estimator is more asymptotically efficient. Under the alternative hypothesis, the fixed effect estimator is still consistent, but the random effect estimator is not. Hence, if it is possible to reject the null hypothesis, the fixed effect model is the preferable one. In the last two subchapters, there were provided eight models using fixed effect and random effect estimations. Each model was tested by Hausman test. All tests suggest the fixed effect model as a more appropriate approach to estimate the gravity equation.

4.4.4. Comparison with Meta-Analysis of Head and Mayer (2014)

In 2014, Head and Mayer published results of the meta-analysis consisting of all papers published in top-5 journals during the period 2006-2012 according to Disdier and Head (2008) and other specially selected studies including 159 papers and more than 2,500 usable estimates. Their results are presented in the Tab. 4.10. Following part will discuss the results presented in the Tab. 4.6 with the results of Head and Mayer (2014). In general, the estimations are in line with the meta-analysis, however, differs in the values because of the comparison with the case study.
Structural panel gravity model presented in the doctoral thesis provides results that are comparable with results of Head and Mayer (see Tab. 4.6). The GDP of exporter and importer is significantly positive, yielding the elasticity between the value of 0.74 and 0.97, which is in line with their meta-analysis. They found the average of GDP’s coefficient between 0.84 and 0.98 in gravity models and between 0.58 and 0.74 in structural gravity models. Their results found a stronger effect of domestic GDP (supply side) than the foreign one (demand side).

Tab. 4.10 Head and Mayer (2014) Meta-Analysis Results

<table>
<thead>
<tr>
<th>Estimates</th>
<th>All Gravity</th>
<th></th>
<th>Structural Gravity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>median</td>
<td>mean</td>
<td>s.d.</td>
<td>#</td>
</tr>
<tr>
<td>Origin GDP</td>
<td>.97</td>
<td>.98</td>
<td>.42</td>
<td>700</td>
</tr>
<tr>
<td>Destination GDP</td>
<td>.85</td>
<td>.84</td>
<td>.28</td>
<td>671</td>
</tr>
<tr>
<td>Distance</td>
<td>-.89</td>
<td>-.93</td>
<td>.4</td>
<td>1835</td>
</tr>
<tr>
<td>Contiguity</td>
<td>.49</td>
<td>.53</td>
<td>.57</td>
<td>1066</td>
</tr>
<tr>
<td>Common language</td>
<td>.49</td>
<td>.54</td>
<td>.44</td>
<td>680</td>
</tr>
<tr>
<td>Colonial link</td>
<td>.91</td>
<td>.92</td>
<td>.61</td>
<td>147</td>
</tr>
<tr>
<td>RTA/FTA</td>
<td>.47</td>
<td>.59</td>
<td>.5</td>
<td>257</td>
</tr>
<tr>
<td>EU</td>
<td>.23</td>
<td>.14</td>
<td>.56</td>
<td>329</td>
</tr>
<tr>
<td>CUSA/NAFTA</td>
<td>.39</td>
<td>.43</td>
<td>.67</td>
<td>94</td>
</tr>
<tr>
<td>Common currency</td>
<td>.87</td>
<td>.79</td>
<td>.48</td>
<td>104</td>
</tr>
<tr>
<td>Home</td>
<td>1.93</td>
<td>1.96</td>
<td>1.28</td>
<td>279</td>
</tr>
</tbody>
</table>

Notes: The number of estimates is 2508, obtained from 159 papers. Structural gravity refers here to some use of country fixed effects or ratio-type method.
Source: Head and Mayer (2014).

The EU has a bigger effect on bilateral trade with BRICS on both sides, which is typical for trade between developed and developing countries. Effect of distance provided in the doctoral thesis is significantly negative, which is again, comparable with Head and Mayer (2014) findings. The distance estimates range between -0.66 and -1.03 depending on the method of estimation, while their estimates range between -0.89 and -1.14.

The effect of a common border is positive in the models, however a bit weaker than average findings of Head and Mayer (2014). The results of common language and former colonial relations have a positive effect on bilateral imports, but they are not significant in the presented models. However, this is caused by the sample observing just a specific set of countries. Nonetheless, it was found that the effect of the EU membership differs compared to Head and Mayer (2014) results. The gravity estimations also show a higher effect of exchange rate on bilateral trade flows than the effect of tariffs. But it is given by different structure of data. Finally, the results of free trade agreement are weaker but in line with the results of the meta-analysis.
4.4.5 Gravity Results for Untapped Trade Potential Analysis

In this part, the structural gravity estimates will be presented according to the methodology of Piermartiny and Yotov (2016) using the equations presented in sub-chapter 4.3.3. There are used the newest findings of the gravity modelling, which takes into account important estimation challenges to get unbiased and consistent estimates. Following their recommendations, there will be obtained the most accurate exporter-time, importer-time and country-pair estimates that will be used to calculate untapped trade potential between the EU Members and BRICS countries.

As there were already estimated panel data models in the previous sub-chapter, the same procedure will follow here as well. Moreover, these two gravity equations will be estimated with time intervals of 3 years to address the time inconsistency of trade policy decisions or other changes in trade costs. Moreover, it is necessary to emphasise the use of the country-specific time varying fixed effects that serve to control for multilateral trade resistances and all other observable and unobservable characteristics that vary over time for each exporter and for each importer (Piermartiny and Yotov, 2016). Additionally, country-pair fixed effects are used as well as they help to account for the endogeneity of regional trade agreements and offer a simple solution to control for effects of all time-invariant observable and unobservable characteristics specific for a given country pair. Using country-specific time varying fixed effects and country-pair fixed effects thus absorb all observable variables that were estimated in the previous sub-chapters plus take into account all possible unobservable characteristics. Finally, the gravity equation is estimated there using the PPML estimator to address heteroscedasticity and zero trade flows issues. As a result of the above mentioned characteristics of estimation, three coefficients received as a result are specific for each exporter-time, importer-time and country pair absorbing all observable and unobservable characteristics of bilateral trade flows. Therefore, the coefficients of determinants presented in the Tab. 4.11 are very close to unity. Nonetheless, for the purposes of the estimation using the PPML estimator, it is more important to focus on results of the Ramsey RESET test to decide about the validity of the gravity model.

Tab. 4.11 presents panel gravity estimates for both directions of trade flows between the EU Members and BRICS countries. Different methods were applied there to account for multilateral trade resistance terms. As presented in sub-chapter 4.3.3, gravity equations are usually estimated using traditional OLS method without any panel effects serving only as a default model for results comparison. As there was used the same set of explanatory variables,
it is not necessary to make any comments on the gravity estimates. It is only important to remind that estimates in the column (1) follow standard results of the gravity literature with a high coefficient of determination of 0.84 and 0.81. Most of the estimates are statistically significant and have the expected sign.\footnote{The only difference is in the size of coefficients as it is not controlled for any form of fixed effects.}

Results provided in the column (2) are estimated by the OLS method using specific country-time fixed effects according to the equation 4.25. By definition of the equation, both exporter-time and importer-time fixed effects absorb all observable and unobservable country-specific characteristics varying over time. Therefore, the coefficient of determination is higher than in case of traditional OLS estimation. Using this method, a much higher number of estimated parameters\footnote{Because of using exporter-time and importer-time fixed effects, as well as country-pair fixed effects in the column (2) - (4), there cannot be presented all the estimates in the thesis, but they may be provided upon request.} was gained. The remaining estimates reported in column (2) follow the message from the results in column (1) in the sign and significance of variables. However, using country-time specific factors, the $landlocked_{ijt}$ and $cmea_{ijt}$ have a stronger effect on bilateral imports than traditional estimates of the OLS method. The effect of the common border, language, and former colonial relationships remain insignificant as in the previous results.

Following recommendations of Piermartini and Yotov (2016), the gravity equation 4.26 includes the full set of exporter-time and importer-time fixed effects and it is formulated in the multiplicative form and re-estimated using the PPML estimator instead of the OLS. The PPML estimates of this equation are presented in columns (3). Using the PPML estimation method, there can be done several conclusions that are different from the OLS estimation. Firstly, there is a difference in terms of magnitudes and significance of the estimates which are in line with findings of Piermartini and Yotov (2016) and Santos Silva and Tenreyro (2006). For example, the negative effect of distance is lower in the case of BRICS imports and even insignificant while the effect of the common border had become highly significant. In the case of the EU imports, the effect of distance is similar to the OLS and fixed effect estimates, however, the effect of colonial relationship increased and gained a high level of significance. It suggests that post-colonial ties are still important for developing countries once there are taken into account zero trade flows. The magnitude of the CMEA remained the same for BRICS imports but decreased by half in the opposite direction. To conclude about the equation 4.26 results, the p-value of the Ramsey RESET test, reported at the bottom of the Tab. 4.11, reveal that the PPML
estimator is the only one to pass the misspecification test while using multilateral trade resistance terms.

Table 4.11 Estimates of Panel Gravity Model using the Newest Methodology

<table>
<thead>
<tr>
<th>BRICS imports from the EU</th>
<th>EU imports from BRICS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) OLS (2) FE (3) PPML (4) PPML</td>
</tr>
<tr>
<td></td>
<td>(1) OLS (2) FE (3) PPML (4) PPML</td>
</tr>
<tr>
<td>$Y_i$</td>
<td>1.153***</td>
</tr>
<tr>
<td>$Y_j$</td>
<td>0.609***</td>
</tr>
<tr>
<td>$dist_{ij}$</td>
<td>-1.402*** -1.009* -0.390</td>
</tr>
<tr>
<td>$contig_{ij}$</td>
<td>0.812 0.542 0.586***</td>
</tr>
<tr>
<td>$landlocked_{ij}$</td>
<td>0.481*** -3.106*** -3.093***</td>
</tr>
<tr>
<td>$comlag_{ij}$</td>
<td>0.884 0.122 0.311</td>
</tr>
<tr>
<td>$colony_{ij}$</td>
<td>-0.373 0.266 0.374</td>
</tr>
<tr>
<td>$cmca_{ij}$</td>
<td>0.636* 1.117*** 1.191***</td>
</tr>
<tr>
<td>$wto_{ij}$</td>
<td>0.309***</td>
</tr>
<tr>
<td>$fta_{ij}$</td>
<td>0.575***</td>
</tr>
<tr>
<td>$eu_memb_{ij}$</td>
<td>0.261</td>
</tr>
<tr>
<td>$usd_eur_{ij}$</td>
<td>-1.077***</td>
</tr>
<tr>
<td>$lcy_eur_{ij}$</td>
<td>-0.387***</td>
</tr>
<tr>
<td>$ear_{lj}wto_{ij}$</td>
<td>-0.025**</td>
</tr>
<tr>
<td>$const$</td>
<td>-3.738* 15.380*** 9.660*** .759**</td>
</tr>
<tr>
<td>Observations</td>
<td>857</td>
</tr>
<tr>
<td>Number of parameters</td>
<td>15 261 261 364</td>
</tr>
<tr>
<td>Exporter time effect</td>
<td>NO YES YES YES</td>
</tr>
<tr>
<td>Importer time effect</td>
<td>NO YES YES YES</td>
</tr>
<tr>
<td>Country pair effect</td>
<td>NO NO NO YES</td>
</tr>
<tr>
<td>R$^2$</td>
<td>0.8378 0.9268 0.9772 0.9954</td>
</tr>
<tr>
<td>RESET test</td>
<td>0.0039 0.0000 0.0386 0.2817</td>
</tr>
<tr>
<td>Source: own elaboration, 2018</td>
<td></td>
</tr>
</tbody>
</table>

Finally, the column (4) includes results of the equation 4.27 that was augmented by country-pair fixed effects to address potential endogeneity issues. Due to the perfect collinearity, using the country-pair fixed effects does not allow to include any gravity variables that do not vary over time. Moreover, as the Piermartiny and Yotov (2016) emphasized, one of the bilateral fixed effects has to be dropped from the model specification. More than 360 parameters, which were used to estimate untapped trade potential between the EU Members and BRICS countries, were obtained as a result. The results of Ramsey RESET test confirmed the validity of the panel gravity model with a very high coefficient of determination.

4.5 Estimation of the Untapped Trade Potential

The gravity model is usually used to analyse determinants of international trade. However, it is also possible to use gravity estimates to calculate the potential of trade flows by comparing predicted and observed values of trade. The predicted value of trade means the amount of bilateral trade that naturally follows the gravity model, given by the current level of economic size, trade barriers and other characteristics. Trade potential, thus, may vary over time as production, income, trade barriers and other possible variables change. This part of the doctoral thesis will offer the answer to the research question: what markets do hide untapped trade

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potential for producers from the other countries in case of trade between the EU Members and BRICS?

There are more approaches to calculate trade potential. Nevertheless, all methods use the estimates from the gravity equation to gain predicted values of trade regarding the explanatory variables. The parameters of the gravity equation were estimated according to the Equation 4.27 and then used to project "natural" trade flows between the EU and BRICS countries. However, Benedictis and Vicarelli (2004) claim that the name of this method, in the form as it appears in the gravity literature, is a bit misleading. Estimation of the gravity equation gives information about some average trade level, i.e. that some countries trade more than average, while others trade less than average. In other words, there is used the sign and size of the error term to examine trade potential as there was gained the prediction of average trade level of selected sample from the gravity equation.\textsuperscript{185} Moreover, the error term includes statistical noise and measurement errors, despite the PPML estimator gave very high goodness of fit. Therefore, this approach is better to be called the analysis of residuals. The importance of results of trade potential should not be overemphasized but should be used to gain a basic idea about the particular trade relationship between observed countries. This approach is used by Maurel and Cheikbossian (1998) or Montanari (2005).

The results of trade potential presented in Tab. 4.12 and Tab. 4.13 are recalculated on relative terms according to International Trade Centre (2003) and Pasteels (2006). Trade potential is calculated as follows:

\[ TP_{ijt} = \left[ \frac{\hat{I}_m_{ijt} - I_{m_{ijt}}}{I_{m_{ijt}} + I_{m_{ijt}}} \right] \cdot 100, \quad (4.28) \]

where \( \hat{I}_m_{ijt} \) represents estimated import from country \( i \) to country \( j \) in the year \( t \), and \( I_{m_{ijt}} \) represents the real value of trade between them. The relative difference varies between the value of +100 (current trade is zero, trade potential is > 0) and -100 (trade potential is zero, current trade is > 0). If the value of trade potential is approximately close to the value of zero (±5%), the predicted trade is close to the current level of exchange among observed countries. If the value of trade potential moves within the interval (-5% to -30%), there is moderately higher current trade exchange than estimated by the model. If the value of trade potential is lower than -30%, there is a strong current trade (significantly higher than predicted). On the other hand, if the value of trade potential moves within the interval (5% to 30%), there is moderately lower

\textsuperscript{185} In some cases, the predicted values are usually used as an input for computable general equilibrium models.
current trade exchange between country-pair than estimated by the model, hence moderate trade potential. Finally, if the value of trade potential is higher than 30%, there is high untapped trade potential among countries.

All values presented in the following Tab. 4.12 and Tab. 4.13 are valid only for BRICS imports in goods from the EU countries (Tab. 4.12) and the EU imports from BRICS (Tab. 4.13) for the last year of the analysis (2016). Results presented in the Tab. 4.12 show that the EU exporters still do not fully use the market potential of BRICS. There are two major findings. The Brazilian, Indian and Russian market still hide untapped trade potential for the EU producers, while the potential on the Chinese and South African market is rather fully employed according to the model. Second, there were not found any big differences of untapped trade potential on BRICS markets between the old and new EU member countries. It suggests that the presence of the EU Common Commercial Policy benefits the old as well as new EU members.

High utilization of demand on the BRICS markets was found in the case of the EU countries such as Bulgaria, Greece, Lithuania, Malta, and Sweden. Demand coming from the BRICS markets also kept high scope for goods produced in other small EU countries in 2016. Demand for goods from countries such as Germany, France, and Italy was highly in line with the gravity model estimation. On the other hand, there was found lower than estimated demand for goods from Latvia, Poland, or United Kingdom. The worst position and the biggest untapped trade potential on the BRICS markets were measured for Croatia, followed, quite surprisingly, by Belgium. However, there may be offered several explanations for such results. As Croatia is a relatively new member of the EU, its economic ties with BRICS countries are not fully developed yet, hence the values of trade potential with BRICS markets are high. The observed values of trade lower than predicted in the case of Belgium may be given by its favourable properties such as location, infrastructure, colonial past and political importance of the country within the European Union, which is not fully employed.

More specifically, the results show that trade flow in a direction from the EU to Brazil is still not fully employed by several EU countries. Especially, high untapped trade potential to export on Brazilian market remains in the case of Belgium, Croatia, Cyprus, Ireland, Latvia, Poland, or Slovenia, while most of the other EU countries traded according to the prediction of the gravity model. Seven out of twenty-eight EU members exported to the Brazilian market higher value of goods than predicted by the model.
Half of the EU countries did not fully use the potential to export on the Russian market either. Quite surprisingly, Poland kept the highest untapped trade potential with Russia, which may be caused, among the other effects, by historical reasons. This effect was emphasized because the other EU countries, similarly close to Russia as Poland (Scandinavian and Baltic states) had the values of demand for their goods in line with the prediction of the model. Most of big EU countries traded mostly in accordance with the model as well. On the other hand, the model shows highly above predicted Russian imports from Belgium and Sweden.

Indian market contains very high untapped trade potential for several EU countries (especially Belgium and Croatia). Other eight EU countries kept under-the-predicted values of trade flows to India. It just confirms the fact that Indian market remains highly protected. However, also other impediments such as low standard of living or bad infrastructure keep demand for European goods under the predicted values. Moreover, there was found that nine EU countries reached strong export flow to India (mostly new EU countries), while very strong flow was measured just in the case of Cyprus.

The EU exporters fully exploited the potential of South African and Chinese market in 2016. Half of the EU countries showed strong or very strong trade flows to South Africa, which is the most positive result compared to other BRICS countries. As it was proved by the gravity model in the sub-chapter 4.4.2, the effect of the free trade agreement between both economies on bilateral imports was positive; that may be reflected in the better use of trade potential. More specifically, Bulgaria, Greece, and Lithuania exported to South Africa highly above the prediction given by the gravity model. The observed import flows of South Africa from another seventeen EU countries were above, or in line with, the predicted values of trade. Only seven EU countries, especially Belgium, Croatia, and Ireland held high untapped trade potential on the South African market.

**Tab. 4.12 Estimated Trade Potential on BRICS markets for the EU producers in 2016**

<table>
<thead>
<tr>
<th></th>
<th>Brazil</th>
<th>China</th>
<th>India</th>
<th>Russia</th>
<th>South Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>-8.05</td>
<td>-0.81</td>
<td>-9.83</td>
<td>6.48</td>
<td>18.65</td>
</tr>
<tr>
<td>Belgium</td>
<td>44.76</td>
<td>-16.11</td>
<td>80.16</td>
<td>-35.41</td>
<td>30.13</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>-2.70</td>
<td>1.31</td>
<td>-10.31</td>
<td>6.98</td>
<td>-50.85</td>
</tr>
<tr>
<td>Croatia</td>
<td>66.05</td>
<td>17.73</td>
<td>36.25</td>
<td>33.19</td>
<td>54.98</td>
</tr>
<tr>
<td>Cyprus</td>
<td>66.76</td>
<td>-31.49</td>
<td>-46.37</td>
<td>-2.52</td>
<td>-26.25</td>
</tr>
<tr>
<td>Czechia</td>
<td>-2.92</td>
<td>-3.40</td>
<td>8.55</td>
<td>2.80</td>
<td>-5.89</td>
</tr>
<tr>
<td>Denmark</td>
<td>-10.64</td>
<td>-4.91</td>
<td>7.98</td>
<td>22.38</td>
<td>-4.77</td>
</tr>
<tr>
<td>Estonia</td>
<td>-3.80</td>
<td>-1.40</td>
<td>-27.33</td>
<td>2.41</td>
<td>5.97</td>
</tr>
<tr>
<td>Finland</td>
<td>-16.42</td>
<td>6.72</td>
<td>-16.71</td>
<td>-1.30</td>
<td>-4.09</td>
</tr>
<tr>
<td>France</td>
<td>3.36</td>
<td>1.72</td>
<td>-2.46</td>
<td>-7.54</td>
<td>1.95</td>
</tr>
<tr>
<td>Germany</td>
<td>3.09</td>
<td>0.50</td>
<td>-3.47</td>
<td>-0.25</td>
<td>-3.31</td>
</tr>
<tr>
<td>Greece</td>
<td>-28.09</td>
<td>4.30</td>
<td>-8.84</td>
<td>11.46</td>
<td>-30.32</td>
</tr>
</tbody>
</table>
Finally, the potential of the Chinese market is fully used by the most of the EU countries. Above-predicted values of BRICS import from Belgium, Cyprus, Hungary, Ireland, Latvia, Lithuania, Slovenia, Sweden, and United Kingdom were measured. The under-predicted imports were measured only in case of Croatia, Finland, Luxembourg, and Spain, however no extremely high values. It seems that most of the EU producers try to exploit tremendous potential of the Chinese market, but there remains some space to penetrate this market.\textsuperscript{186}

Results presented in Tab. 4.13 show trade potential of the EU countries for BRICS producers. For the first look, it can be seen that the EU Members kept higher untapped trade potential than BRICS markets presented in the Tab. 4.12. There are assumed two reasons for these results. First, producers in BRICS countries do not have such production capacity to fully exploit the potential of the EU market. Second, the EU consumers have a broad scale of substitutes for the BRICS production from other countries due to higher living standard and developed trade relations.

The best utilization of the EU market potential was reached by India and China, and the worst by Brazil. Nevertheless, there is no clear pattern for the best country to import to as the results are highly mixed. The only above-predicted results were found in case of small open EU economies such as Cyprus, Estonia, Luxembourg, and Slovenia. On the other hand, the highest

\textsuperscript{186} Estimation of untapped trade potential for import of Brazil from Lithuania and import of India from Luxembourg could not be provided as the model excluded their country-pair fixed effects from the estimation.
untapped trade potential for BRICS countries was found in case of Bulgaria, Greece, Ireland, Malta, Spain, and Sweden.

Using the results of Tab. 4.13, the country-pair trade flows can be elaborated more into detail. The highest untapped trade potential was found for the EU imports from Brazil. In more than twenty EU countries, the estimates show high untapped potential for import from Brazil. The most negative results for Brazil were found in the case of Austria, Bulgaria, and Malta. With a little exaggeration, one could say that Brazilian producers did not show a strong effort to supply the EU market. Imports from Brazil were found to be above-predicted only in case of Ireland and Slovenia, the best-fit predicted values in case of Croatia and Estonia.

More than two-thirds of the EU markets represented untapped trade potential for products originating in Russia, especially in case of Spain and Ireland. It was found that most of new EU members, for example Bulgaria, Czechia, Slovakia or Slovenia, also hide untapped potential for Russian goods despite their historical ties. The predicted values of import from Russia fitted only to countries geographically close, and countries such as Germany and Netherlands. High values of observed import flows were found mostly for the old EU members such as Austria, Belgium, Denmark, and Portugal, plus small EU economies such as Cyprus, Luxembourg and Malta.

The results of the EU potential for Chinese producers give very different picture compared to Brazil and Russia. There is only one EU country which belongs to the category of high untapped trade potential: Ireland. Moreover, it was found that import flows from China are very strong rather in case of the new EU member countries than with the old one. The reason is simple; cheap production for consumption and intermediates for production. Markets of Bulgaria, Croatia, Czechia, Lithuania, Romania, and Slovakia have above-predicted values of imports from China, while Austria, Belgium or Portugal, countries with higher standard of living, kept rather untapped trade potential in 2016. Nevertheless, most of the estimated results for the potential of the EU imports from China are in line with the observed import flows.

Tab. 4.13 Estimated Trade Potential on the EU markets for BRICS producers in 2016

<table>
<thead>
<tr>
<th></th>
<th>Brazil</th>
<th>China</th>
<th>India</th>
<th>Russia</th>
<th>South Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>53.35</td>
<td>6.41</td>
<td>-2.92</td>
<td>-27.89</td>
<td>-</td>
</tr>
<tr>
<td>Belgium</td>
<td>12.98</td>
<td>8.06</td>
<td>5.43</td>
<td>-18.00</td>
<td>-</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>72.21</td>
<td>-6.21</td>
<td>-16.51</td>
<td>1.59</td>
<td>-</td>
</tr>
<tr>
<td>Croatia</td>
<td>4.04</td>
<td>-5.30</td>
<td>-34.47</td>
<td>17.67</td>
<td>24.12</td>
</tr>
<tr>
<td>Cyprus</td>
<td>31.93</td>
<td>6.13</td>
<td>-19.33</td>
<td>-18.46</td>
<td>-5.66</td>
</tr>
<tr>
<td>Czechia</td>
<td>19.67</td>
<td>-5.03</td>
<td>-7.00</td>
<td>24.02</td>
<td>-4.19</td>
</tr>
<tr>
<td>Denmark</td>
<td>43.01</td>
<td>2.97</td>
<td>3.87</td>
<td>-26.78</td>
<td>2.91</td>
</tr>
<tr>
<td>Estonia</td>
<td>0.19</td>
<td>2.55</td>
<td>-9.76</td>
<td>-0.98</td>
<td>-5.28</td>
</tr>
</tbody>
</table>
As it was already indicated, the best results of using the potential of the EU market were found in case of India. There are only six EU countries with untapped trade potential for Indian producers (Belgium, Greece, Ireland, Malta, Netherlands, and Romania). Half of the EU countries imported more goods from India than it was estimated in the gravity model. The overwhelming majority of them are the new EU member countries, similarly as in case of China. Strong import flows from India were, especially, found for Bulgaria, Cyprus, and Hungary. Quite surprisingly given to the historical ties, trade potential of the United Kingdom is not fully used by Indian producers.

Last BRICS country, but not less important, is South Africa. Estimation of trade potential of the EU markets for producers from this African country shows very high untapped potential. In other words, according to the estimated model, South African producers do not fully use the consumption potential of the EU countries, moreover, when they may benefit from the preferential trade agreement. Only one very strong import flow was found, to Lithuania, and four strong import flows (to Cyprus, Estonia, Luxembourg, and United Kingdom). On the other hand, Ireland, Malta, Spain, and Sweden represent the EU markets with the highest untapped potential for South Africa production, completed by another twelve EU members that kept...

<table>
<thead>
<tr>
<th>Country</th>
<th>Current Trade</th>
<th>Untapped Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>8.72</td>
<td>4.49</td>
</tr>
<tr>
<td>France</td>
<td>23.40</td>
<td>-2.20</td>
</tr>
<tr>
<td>Germany</td>
<td>15.45</td>
<td>0.82</td>
</tr>
<tr>
<td>Greece</td>
<td>41.47</td>
<td>0.34</td>
</tr>
<tr>
<td>Hungary</td>
<td>10.23</td>
<td>-3.57</td>
</tr>
<tr>
<td>Ireland</td>
<td>-8.93</td>
<td>37.10</td>
</tr>
<tr>
<td>Italy</td>
<td>14.37</td>
<td>2.07</td>
</tr>
<tr>
<td>Latvia</td>
<td>38.56</td>
<td>1.34</td>
</tr>
<tr>
<td>Lithuania</td>
<td>23.60</td>
<td>-5.89</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>28.71</td>
<td>0.23</td>
</tr>
<tr>
<td>Malta</td>
<td>55.89</td>
<td>13.45</td>
</tr>
<tr>
<td>Netherlands</td>
<td>16.18</td>
<td>0.20</td>
</tr>
<tr>
<td>Poland</td>
<td>8.04</td>
<td>-3.67</td>
</tr>
<tr>
<td>Portugal</td>
<td>6.21</td>
<td>5.40</td>
</tr>
<tr>
<td>Romania</td>
<td>10.98</td>
<td>-7.38</td>
</tr>
<tr>
<td>Slovakia</td>
<td>-27.36</td>
<td>1.83</td>
</tr>
<tr>
<td>Spain</td>
<td>-3.21</td>
<td>-8.01</td>
</tr>
<tr>
<td>Sweden</td>
<td>13.79</td>
<td>-</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>17.24</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Source: own elaboration in Microsoft Excel, 2018
untapped trade potential. Predicted values of import fitted observed values only for three EU countries (Denmark, Czechia, and Germany).\textsuperscript{187}

Finally, a summary table in Annex 15 was created to show how many markets kept the untapped potential for their trading partner’s production. In general, the results are in line with the North-South trade which is characterized by inter-industrial trade flows as it was proved in the sub-chapter 4.4.3. While the EU production was not able to fill the potential of the Indian and Russian market, both countries completed by China took rather full advantage of the EU countries. The highest untapped trade potential was found in the case of Brazil in both directions. It was also found that producers from most of the EU countries fully used the potential of BRICS markets. In other words, trade potential remained untapped for less than one-third of the EU countries. To be more specific, eight countries did not fully use trade potential of the Brazilian market, four EU members of the Chinese and South African market, and ten countries of the Indian and Russian market. The biggest untapped trade potential for BRICS producers remained in the case of Ireland, Malta, and Spain. Finally, the summary Table 4.14 also shows how great the model fits to the actual trade flows as predicted values of the model are mostly equal to the current trade flows.

4.6 Summary

In the empirical chapter, an overview of the best practices of gravity modelling was provided and estimated the effect of natural and administrative barriers to trade between the EU and BRICS countries. It was shown that, besides the knowledge of theoretical foundations of the gravity model, it is desirable to be familiar with the milestones of empirical gravity research, which helps to avoid many mistakes that occur in the gravity literature. It was proved that it is important to control for more than the distance, as a representative of trade barriers. It was shown that including the multilateral trade resistance variables using fixed effects have a significant impact on estimation results and that the most recent findings of gravity modelling suggest many technical upgrades to gain unbiased and efficient results. Finally, when applying OLS methods on trade data, the heteroscedasticity can result in biased and inefficient estimates. Moreover, Gomez-Herrera (2013) points out that it helps to solve the sample selection bias in the presence of the zero trade flows. Therefore, in the presence of the zero trade flows and heteroscedasticity which is typical for the gravity model, the PPML is the best estimator.

\textsuperscript{187} There cannot be provided the estimation results of trade potential for several country-pairs for the EU imports from BRICS for several country-pairs.
Applying gravity model on bilateral trade flows between the EU and BRICS countries, the validity of gravity equation in its core as well as augmented version was confirmed. Natural barriers to trade, such as distance, common border or landlocked position of the country, have significant effect on bilateral trade flows. On the other hand, properties such as common language or former colonial relationship, do not improve bilateral trade between the EU and BRICS, while trade ties between the former CMEA members are still very strong.

Observing the effect of trade policy tools, a positive effect of the WTO membership was found as well as of bilateral trade agreement on trade flows, confirming the general effort for international trade liberalization as a right way to boost economic performance and living standard. However, the bilateral trade tariffs still represent a significant barrier to trade between the EU and BRICS countries. Bilateral exchange rates were found to work effectively as an equalizing mechanism to trade imbalances. Using panel gravity approach, there were found several specific effects that exist when considering trade between the EU and BRICS members. Trade diversion effect of the EU accession of the new EU member countries was found as well as the Rotterdam effect valid for Belgium and Netherlands and the existence of inter-industry trade between the EU and BRICS countries.

Finally, high untapped trade potential was found for the EU producers on Brazilian, Indian and Russian market, while trade potential of China and South Africa was rather fully employed. On the other hand, the best utilization of the EU market was discovered in the case of Asian economies, while Brazilian producers have still a significant space to develop their business activities.

5 Conclusion

The doctoral thesis dealt with the bilateral trade flows between the EU Members and BRICS countries. The aim of the doctoral thesis is finding of determinants of bilateral trade flows between the EU Members and BRICS, estimation of the effect of natural and administrative barriers to trade using the structural gravity model of international trade and, and uncover their mutual untapped trade potential resulting from their underdeveloped trade relations. The results
support the main research hypothesis and that is that the protectionist barriers, represented by bilateral tariffs, have still significant effect on bilateral trade flows between the EU Members and BRICS countries and that they are one of the reasons behind the untapped trade potential among them.

The main benefits of the presented doctoral thesis are threefold. The reasons for the international trade, benefits of free trade and international economic cooperation were explained and it was proved that claims of the protectionist are false on many levels. This part was considered especially important given to the current situation on the global political scene which is characterized by the rebirth of protectionist ideas and growth of barriers to trade. As the European Union has become, though inadvertently, the part of international trade wars, it is important to understand the functioning of the EU Common Commercial Policy and the scope of tools that the European Commission may use to protect its interests on the global market. Therefore, a comprehensive theoretical and practical knowledge of the EU Common Commercial Policy with a special focus on foreign trade relations with BRICS countries was elaborated. The determinants of bilateral trade flows between the EU Members and BRICS countries were estimated proving that administrative impediments still represent a significant barrier to trade. Finally, using the newest methodology of gravity modelling, the gravity estimates were used to calculate the untapped trade potential between observed countries. This part is unique as there is not a lot of literature of this kind that would deal with the bilateral trade flows between the given countries in such a scope. Moreover, the methodology of structural gravity model was described in detail and summarized the evolution of this methodology and emphasized the most recent findings and approaches that should be always taken account when using the gravity model.

To be more specific, the content and conclusions of each chapter will be elaborated. The second chapter dealt with theories of international trade emphasizing the benefits of free trade and disproving arguments defending protectionism. Observing the effect of trade liberalization and protectionist measures, there were elaborated the arguments in favour of free trade. The determinants of international exchange and benefits of liberalisation, i.e. the reduction of tariffs and other barriers to trade respectively were logically explained. As the representatives of liberal thoughts, the arguments of Adam Smith, David Ricardo, John Stuart Mill, Eli Hecksher and Bertil Ohlin, or Paul Krugman, that favour the benefits of free trade were chosen. On the other hand, it was necessary to pay attention to the arguments of protectionism that still represent a significant challenge to understand by a big part of society in developed as well as developing countries. There were covered most of the arguments that emphasize the need of
protectionism, including thoughts of Mercantilism about trade balance, the protection of infant industries, the protection of employment, the growth of standard of living in developing countries, tax revenues and many others, and disproved their validity on the real examples.

The essence of liberal economic theories was explained that emphasize the freedom of exchange among entities concluding that the only free choice to produce and consume may take full advantage of the international division of labour and benefit everybody in the long-term. There was found no reasonable argument that would prove the negative effect of free trade on the economic performance or standard of living. Bad economic conditions or slow economic development of emerging and developing countries is not caused by the liberalization of their market *per se*, as it is usually mistakenly attributed to the free trade effect, but by the lack of structural and public sector reforms, investment in infrastructure, internal political disputes or even the wars. In other words, if the subjects of trade consider their mutual exchange as beneficial, they will trade. Therefore, any government intervention into free trade cannot be defended by the arguments of protectionism.

It was proved that any kind of trade barrier cannot lead to the people’s higher well-being, despite it is claimed by defenders of protectionism, and that most of judgments and reasoning about the benefits of protectionism are false. A recent disappointing development of multilateral trade liberalization, an increase of protectionism in the period after the economic crisis and a mismanagement of politicians and economists was discussed to explain benefits of free trade to people. Finally, the effect of tariffs was elaborated, as the main representative of protectionist measures used in the international trade, and demonstrated that the trade policy can be used as a tool for trade liberalization as well as a tool that can make a free trade impossible.

There is a vast literature covering most of the trade theories, however, the logical arguments and simple explanation on specific and real examples are missing very often. Therefore, the first chapter of the doctoral thesis may be beneficial for the students and professors of international economics, but also for regular people as they can find simple arguments to defend liberalization thoughts and bullets to face mostly false and inconceivable opinions of protectionism.

The second chapter also contained the theoretical foundations of the gravity model, describing its evolution over the last five decades presented in the economic literature. As the gravity model has been used for decades in international trade analysis, it has become one of the most popular tools for economic analysis. Theoretical derivation of the gravity equation
was presented on the example of work of Anderson (1979) and Anderson and van Wincoop (2003) that is based on the assumptions of the single economy model with monopolistic competition, using identical homothetic preferences across regions represented by Cobb-Douglas utility function and product differentiation by their place of origin according to Armington’s assumptions.

In the third chapter, the principles and functioning of the EU Common Commercial Policy were presented and discussed bilateral trade relations with BRICS countries. This chapter is beneficial for all readers who are interested in international relations and trade ties between the EU and BRICS countries. As the EU CCP belongs to the oldest policies of the EU where the European Commission has a full power, it represents the highest level of integration effort among member countries. It promotes international trade liberalization process on the multilateral basis, however, the European Commission is very active in regional and bilateral trade agreements’ negotiations not going beyond the WTO multilateral framework. The EU CCP is changing and evolving as needed to keep the EU competitive and in the centre of the global economic power.

There was also introduced the group of BRICS, that includes Brazil, Russia, India, China and South Africa, countries representing regional and some of them even global powers. The story of BRICS is very exciting as the first speculations about the current fully formal group of countries were based on the research article. Going through several years of informal meetings, the BRICS formatted to the group of five countries that cooperate in many fields. Increasing power of BRICS is reflected in changes of international institutions as well as relations with developed countries. The most recent EU trade strategy puts great emphasis on BRICS. New trade strategy of the European Commission focuses its EU Common Commercial Policy agenda on improvement and deepening of economic relations with strategic partners such as China, Russia and Brazil. Currently, there is only one valid free trade agreement between the EU and any member of the BRICS group, i.e. South Africa. New trade agreements are therefore negotiated with India, Brazil within the EU-Mercosur framework, and the investment agreement is expected with China. Unfortunately, the negotiations about new form of trade relations between the EU and Russia were recently interrupted by the conflict on Ukraine, hence their trade relations are still managed according to the "old" cooperation agreements.

In the analytical part of the third chapter, it was shown that the position of BRICS in the global economy strengthens and that the mutual trade with the EU countries significantly increased during the last two decades until the economic crisis, while since that time rather
stagnates. It was found that BRICS countries have become more important markets for big EU economies, while small and new members rely rather on the EU Single Market. Elaborating mutual trade with goods more into detail, there was found that the EU export is based on capital and highly-skilled labour production well-fitting the import structure of the BRICS. Therefore, the shape of bilateral trade flows is represented by inter-industrial trade flows, which was proven by the results of gravity model in the fourth chapter. The research showed that the development of Chinese economy has surpassed all other BRICS members. Trade of the EU with China has moved towards goods with higher value-added, while the rest of BRICS still relies on the export of natural resources and labour abandoned production. It was found that China increased its comparative advantages converging with its export structure closer to the EU resulting in the increasing intra-industry trade and better fit with the EU demand.

Finally, the fourth chapter started with an overview of the best practices of gravity modelling and introduced the most common estimation techniques for panel structural gravity estimation. It was shown that, besides the knowledge of theoretical foundations, it is also important to know the milestones of empirical research that significantly changed the process of gravity modelling. It was proved that it is important to control for more than the distance, mainly include the multilateral trade resistance terms that may considerably influence the results of estimation. The most recent findings that were included in the analysis, suggest many technical upgrades to gain unbiased and efficient results.

Applying the gravity model on bilateral trade flows between the EU Members and BRICS countries, the validity of the gravity equation in its core as well as augmented version was proved. Two models of bilateral import flows in the period 1995-2016 were estimated. It was found that bilateral tariffs still represent barriers to trade, while liberalization measures significantly support the international exchange of goods. Finally, employing the most up-to-date methodology of the gravity model estimation, the results were used to determine the untapped trade potential among the EU Members and BRICS countries.

More specifically, the economic size has a significantly positive effect on imports. The effect of the EU countries was found stronger for both trade flows. It can be explained by higher value added in production and purchasing power parity within the EU. Such results were confirmed when substituting the GDP variable by the gross domestic product per capita as an alternative variable to capture the effect of standard of living in the gravity model. It means that both determinants may be used in the gravity model estimation. Distance, as the main proxy to the natural barrier to trade, was found to have a significantly negative effect on bilateral imports.
Moreover, it was discovered that while the countries’ mutual distance increases, the negative effect on their trade flows grows but in lower momentum. In other words, the effect of distance behaves non-linearly in case of bilateral trade flows between the EU Members and BRICS countries.

In case of other determinants to trade, it was confirmed significant effect of the common border, while the common language and former colonial relationships play no significant role for trade between the EU and BRICS. It is worth to mention that the landlocked location of the country was found to have a strong negative effect on imports using gross domestic product per capita as a proxy to economic size in the gravity equation. This effect can be explained by higher costs on consumption caused by worse access to international trade. The most interesting, and quite unexpected, information gained from the gravity results of the time-invariant variables is about the membership in the former Council for Mutual Economic Assistance. Strong trade relations among the economic entities of former CMEA members were still found. It confirms the assumption of the long memory of international trade ties among countries. To be more specific, the trade linkage between the central and east European countries and Russia was found to be still strong, despite their tremendous economic transformation during the 1990’s and their EU membership.

In the doctoral thesis, the effects of trade policy on bilateral trade between the EU Members and BRICS countries were elaborated. The variables representing various kinds of trade policy measures offered very interesting findings. The WTO membership, as well as the preferential trade agreement between the EU and South Africa, has a positive effect on bilateral trade. It confirms the general effort for international trade liberalization as a right way to boost economic performance and proves that free trade benefits international trade. It was also found that the EU accession significantly helped to increase BRICS imports from the EU. It means that countries that entered the EU after 2004 benefited from the EU Common Commercial Policy as they get better access to foreign markets. Moreover, consumers in BRICS countries increased their demand as they get easier access to goods produced in the new EU member countries. Nevertheless, a strong effect of *trade diversion* for the EU imports was found. It can be explained as consumers from the new EU countries partially substituted their consumption habits from BRICS countries by the production from older EU Members since they entered the Common Market that enabled them to purchase goods with lower costs or better quality. Finally, the negative effect of administrative trade barriers represented by bilateral tariffs was confirmed to be strong in the case of BRICS imports but negligible on the EU side. It confirms
the assessment that the EU exporters had to face higher administrative costs on BRICS markets, which increases prices of their goods and vice versa, BRICS production faces a very low level of tariffs when entering the EU market, enabling lower competitive prices for the EU consumers. Moreover, it confirms the assumption of faster liberalization process from the side of the EU in favour of developing countries, while those countries still keep tariffs significantly high to ban imports from the EU.

In case of the country-specific effects, BRICS countries do not significantly deviate from Brazil when import from the EU. It means that other BRICS countries do not keep such attributes that would significantly support or mute their imports from the EU compared to Brazil. On the other hand, when speaking about the EU exports to BRICS, the only strong effect was found in case of Germany, confirming its position as the main EU economy and major European industrial producer.

Speaking about the EU imports from BRICS, the results showed sovereign position of Belgium and Netherland explained as the Rotterdam effect. On the side of BRICS exports to the EU, China kept a dominant position among other BRICS countries. The time effect was found to be in line with the domestic demand side cycles, as they reflect a negative effect on BRICS imports in late 1990 when all BRICS countries went through the economic transformation process. In case of the EU Members, there was observed significant positive effect before the economic recession in 2009 and a slow recovery in the following years.

The results also confirmed the validity of inter-industry trade between the EU and BRICS countries. It was proved that bilateral trade flows are in line with the conclusions of Heckscher-Ohlin theory corresponding to the North-South trade pattern which is stronger for the EU imports from BRICS than in the opposite direction.

Finally, the final structural gravity equation was used to estimate the untapped trade potential between the above-mentioned trading partners. Using such gravity estimates, high untapped trade potential was found for the EU producers on the Brazilian, Indian and Russian market, while the potential of China and South Africa is rather fully employed. The explanation is that Brazilian and Indian markets still remain highly protected by tariff and non-tariff barriers, while EU-Russia relations are significantly affected by a foreign policy. On the other hand, rather fully used potential of China’s market may be attributed to the high reliance on semi-products and increasing consumption, and in the case of South Africa to the free trade agreement. The best utilization of the EU market was found in case of Asian economies which amount of export
was in line with the gravity model estimation. The results fitted also the EU imports from Russia caused by a high dependency on oil and gas production. Nevertheless, Brazilian and South African producers still keep huge gaps to export on the EU market.

Based on the results of the doctoral thesis, several recommendations to the economic and trade policy were put together. Results of the empirical part of the doctoral thesis confirmed that free trade benefits producers as well as consumers, increases productivity and the standard of living, while trade protectionism builds up barriers to higher trade exchange. Whether they are politicians, economists, the media or representatives of the European Commission who believe the liberal arguments, they should better and more practically explain the benefits of free trade to people and be more active in the fight against the myths offered by the defenders of protectionism as it was emphasised in the theoretical part of the doctoral thesis. It is easier to understand the need for the employment protection than Ricardo’s comparative advantages, hence the simple protectionist measures gain an easy credit among those who are not interested in economics. The more it is important to promote and patiently explain the sense of the freedom of exchange, hence the absence of any state intervention to trade.

From the theoretical point of view, the governments, or the European Commission in the case of the EU, should remove all tariff and non-tariff barriers to trade among countries. It is necessary to continue in the liberalization process and eliminate tariff and non-tariff barriers to the fullest extent possible. In case of trade relations with BRICS, the European Commission and representatives of the EU member states should strive to improve trade relations with BRICS through the free trade agreements’ negotiations resulting in the final reduction of tariff and most of the non-tariff barriers. It is highly probable to establish free trade with most of BRICS countries, especially with Brazil and India, despite many exceptions in the matters of agriculture may be expected. Moreover, the new Partnership and Cooperation Agreement with Russia could be possible to re-negotiate once the problem on Ukraine is resolved. Unfortunately, in this case, all matters depend on international politics and division of power, as there are no logical reasons for trade impediments between both economies.

On the other hand, the possibility of free trade area between the EU and China is highly unlikely, as there is a huge potential for the violation of the free trade agreement rules, property rights and state-driven-support for companies on the side of China. Moreover, as it was emphasized in the second chapter based on the rules of the Lisbon Treaty, there should not be negotiated beneficial trade relations with political regimes that violate human rights and occupy foreign territories. The trade agreement should be seen as a possibility of negotiating tactic for
the social change. Finally, the free trade agreement between the EU and South Africa is considered as an example of successful and beneficial cooperation between both economies, despite there are still many exceptions that do not allow declaring this relation as free trade. Despite the fact that there are many question marks over the current development of the global economy and international trade, it is necessary to remain optimistic about the future of the European Union and its relations with the rest of the world.

6 Závěr

Předložená doktorská dizertační práce se zabývá bilaterálními obchodními vztahy mezi členskými zeměmi Evropské unie a zeměmi BRICS. Cílem doktorské dizertační práce bylo najít determinanty bilaterálního obchodu se zbožím mezi těmito zeměmi, odhadnout vliv přírodních a administrativních bariér obchodu za použití strukturálního gravitačního modelu mezinárodního obchodu, a na závěr odhalit velikost nevyužitího obchodního potenciálu mezi danými zeměmi, který vyplývá z jejich relativně nedostatečně rozvinutých obchodních vztahů. Výsledky potvrdily hlavní výzkumnou hypotézu pojednávající o stále významném negativním vlivu protekcionistických opatření, které jsou reprezentovány bilaterálními celními sazbami, na vzájemné obchodní toky zemí členskými zeměmi Evropské unie a zeměmi BRICS, které jsou jedním z důvodů jejich nedostatečně využívaného obchodního potenciálu.
Předložená doktorská disertační práce přispívá výzkumu mezinárodního obchodu ve třech směrech. V jejím úvodu vysvětlujeme důvody existence mezinárodní směny a výhody plynoucí z volného obchodu a mezinárodní ekonomické spolupráce mezi zeměmi, a zároveň prokazujeme, že tvrzení zastánců protekcionismu jsou chybná v mnoha oblastech. Tuto část považujeme za zvláště důležitou z důvodu současného mezinárodně-politického prostředí a ostatních obchodních barií. Jelikož se i Evropská unie stala, naprosto neúmyslně, součástí obchodní vály, je více než důležité pochopit fungování Společné obchodní politiky EU a možnosti Evropské komise vedoucí k ochraně jejich zájmů na globálním trhu. Z toho důvodu bylo vypracováno komplexní teoretické a praktické pojednání o Společné obchodní politice EU se zvláštním zaměřením na bilaterální obchodní vztahy se zeměmi BRICS. V empirické části byly zkoumány determinanty vzájemných obchodních toků mezi členy EU a zeměmi BRICS, díky kterým se nám podařilo prokázat, že administrativní překážky obchodu stále představují významnou bariéru. Za pomocí nejnovějších poznatků gravitačního modelování a byl odhadnut rozsah nevyužitého obchodního potenciálu. Tuto část je unikátní v tom, že doposud existuje jen skromný počet výzkumných prací, které se zabývají vztahům mezi členskými zeměmi Evropské unie a skupinou BRICS. Navíc, v předložené doktorské disertační práci je dopodrobna rozebírána metodologie strukturálního gravitačního modelu s cílem prokázat jeho univerzální použití v oblasti modelování mezinárodních obchodních vztahů, popsán dlouholetý vývoj jeho metodologie a zdůrazněn nejnovější poznatky a přístupy, které by měli být vždy zohledněny při použití gravitačního modelu.

Druhá kapitola obsahuje pojednání o teoriích mezinárodního obchodu, kde jsou zdůrazněny výhody volného obchodu a vyvráceny argumenty, které prosazují zastánci protekcionismu. Jelikož jsou předmětem výzkumu efekty liberalizace a protekcionismu mezinárodního obchodu, zabýváme se detailněji argumenty ve prospěch volného obchodu stejně tak jako argumenty protekcionismu. Obsahem je logické vysvětlení důvodů mezinárodní směny a výhod liberalizace, tedy snižování celních i jiných bariér obchodu. Za hlavní reprezentanty liberálních myšlenek byla vybrána tvrzení Adama Smitha, Davida Ricarda, Johna Stuarta Milla, Eli Heckshera a Brtila Ohlina nebo Paula Krumana, kteří obhajaji volný obchod. Na druhou stranu, pozornost ulpěla také na tvrzeních protekcionistů, jejichž argumenty jsou zastoupeny jak v rozvíjejících se, tak i rozvinutých zemích. V doktorské disertační práci jsou rozebírány nejčastější tvrzení zastánců obchodního protekcionismu, počínaje Merkantilistickými myšlenkami ohledně obchodní bilance, a pokračujíce přes ochranu dětských odvětví, ochranu
zaměstnanosti, cíl růstu životní úrovně v rozvojových zemích, daňovými příjmy a mnoha dalších, a na skutečných příkladech jsou tato protekcionistická tvrzení vyvrácena.

Byla vysvětlena podstata liberálních ekonomických teorií, které zdůrazňují svobodu mezinárodní směny mezi ekonomickými subjekty, se závěrem, že jedině svobodná volba může plně využít výhody mezinárodní dělby práce a z dlouhodobého hlediska prospívat všem. Nebyl nalezen jediný rozumný argument, který by prokazoval negativní vliv volného obchodu na hospodářský růst nebo životní úroveň. Špatné ekonomické podmínky nebo pomalý hospodářský rozvoj rozvíjejících se zemí není způsoben liberalizací jejich trhu *per se*, jak se obvykle mylně připisuje účinkům volného obchodu, ale nedostatkem doprovodných strukturálních reforem, investic do infrastruktury, politickými spory nebo dokonce ozbrojenými konflikty. Jinými slovy, pokud subjekty obchodu považují svou vzájemnou výměnu za prospěšnou, budou obchodovat, pokud ne tak obchodovat nebudou. Jakýkoliv zásah vlády do volného obchodu proto nemůže být bráněn argumenty protekcionismu.

Ve druhé kapitole bylo prokázáno, že jakákoli obchodní bariéra nemůže vést k vyššímu blahobytu obyvatel, navzdory různým obhajobám protekcionistů, a že většina tvrzení a úvah o výhodách protekcionismu jsou falešná. Bylo také pojednáno o naprosto neuspokojivém vývoji mnohostranné liberalizace obchodu, nárůstu protekcionismu v období po finanční a ekonomické krizi v roce 2009, a špatném postoji politiků a ekonomů k vysvětlování výhod volného obchodu lidem. Nakonec byl analyzován vliv cel na velké a malé ekonomiky a prokázáno, že obchodní politika může být použита jako nástroj pro liberalizaci obchodu, stejně tak jako nástroj protekcionistický.

Existuje rozsáhlá literatura zabývající se mezinárodní ekonomií, ale logické argumenty a jednoduché vysvětlení na konkrétních a reálných příkladech velmi často chybí. Z toho důvodu může být druhá kapitola doktorské disertační práce přínosná pro studenty a profesory mezinárodní ekonomie, stejně tak jako pro obyčejné lidi, neboť v ní mohou najít logické argumenty k obraně liberalizačních myšlenek a fakta, která jim pomohou čelit většině falešných a neprokazatelných názorům protekcionistů.

Druhá kapitola taká obsahovala teoretické poznatky gravitačního modelu, popisující jeho vývoj za posledních pět desetiletí, které byly prezentovány v ekonomické literatuře. Vzhledem k tomu, že gravitační model byl používán po desetiletí k analýze mezinárodního obchodu, stal se jedním z nejoblíbenějších nástrojů pro ekonomickou analýzu. Byla v ní představena teoretická derivace gravitačního modelu na základě článků Anderson (1979) a Anderson a van
Wincoop (2003) na základě předpokladů modelu ekonomiky s monopolistickou konkurencí, identických a homotetických preferencí napříč státy zastoupených Cobb-Douglasovou produkční funkcí a diferenciací produktů podle místa původu vycházejících z Armingtonových předpokladů.

Ve třetí kapitole byl představen vývoj a současná podoba Společné obchodní politiky EU a podoba jejich bilaterálních obchodních vztahů se zeměmi BRICS. Tato kapitola je určena pro všechny čtenáře, kteří mají zájem o mezinárodní vztahy a jejména obchodní vztahy mezi EU a zeměmi BRICS. Vzhledem k tomu, že členské země EU přenesli veškeré pravomoci na Evropskou komisi, představuje Společná obchodní politika EU nejvyšší dosaženou úroveň integračního úsilí na evropském kontinentu. Cílem Společné obchodní politiky EU je podpora procesu mnohohranité liberalizace mezinárodního obchodu, nicméně Evropská komise je velmi aktivní i v jednáních o regionálních a bilaterálních obchodních dohodách, které nepřekračují mnohohranitý rámec stanovený Světovou obchodní organizací. Bylo popsáno, jak se Společná obchodní politika EU měnila a vyvíjela podle potřeby tak, aby EU byla konkurenceschopná a zůstala v centru globálního ekonomického vývoje.

Další část byla zaměřena na skupinu zemí BRICS, mezi něž patří Brazílie, Rusko, Indie, Čína a Jihoafričká republika, tedy skupinu zemí reprezentující regionální, a některé z nich dokonce globální mocnosti. Vývoj skupiny BRICS je skutečně zajímavé pozorovat, jelikož první zmínka o současně plně formální skupině zemí, byla založena na výzkumném článku. Několik let neformálních schůzek proměnilo skupinu BRICS na zcela formální skupinu pěti zemí, které spolupracují v mnoha oblastech. Zvyšující se hospodářská síla skupiny BRICS se odráží ve změnách mezinárodních institucí i ve vztazích s vyspělými zeměmi. Nová obchodní strategie EU klade silný důraz na skupinu zemí BRICS. Zaměřuje svou Společnou obchodní politiku EU na zlepšení a prohloubení hospodářských vztahů se strategickými partnery, jako jsou Čína, Rusko nebo Brazílie. V současně době existuje pouze jedna platná dohoda o volném obchodu mezi EU a jakýmkoli členem skupiny BRICS, tj. s Jižní Afrikou. Nové dohody o obchodu jsou sjednávány s Indií, a s Brazílií v rámci EU-Mercosur. S Čínou se očekává uzavření investiční dohody. Jednání o nové formě obchodních vztahů mezi EU a Ruskem byla nedávno přerušena konfliktům na Ukrajině. Z toho důvodu se jejich obchodní vztahy stále řídí podle starších dohod o spolupráci.

Analytická část čtvrté kapitoly prokazuje posilující pozici zemí BRICS ve světové ekonomice a analýzu vzájemného obchodu se zeměmi EU během posledních dvou desetiletí, který se výrazně zvýšil až do doby hospodářské krize, od jejíž doby objem obchodu spíše
stagnuje. Bylo zjištěno, že země BRICS se staly důležitějšími trhem pro velké ekonomiky EU, zatímco malí a noví členové EU se spoléhají spíše na jednotný vnitřní trh EU. Analýzou vzájemného obchodu se zbožím mezi zeměmi EU a BRICS bylo zjištěno, že vývoz zboží z EU má spíše formu kapitálového zboží s vysokou přidanou hodnotou, dobře odpovídající dovozní strukturu zemí BRICS. Podoba bilaterálních obchodních toků je tudíž reprezentována meziodvětovým obchodem, který se podařilo prokázat také prostřednictvím gravitačního modelu ve čtvrté kapitole. Bylo také zjištěno, že rozvoj čínské ekonomiky v posledních dvou desetiletí významně překonal všechny ostatní členy skupiny BRICS. Vývoz Číny do EU se změnil směrem ke zboží s vyšší přidanou hodnotou, zatímco zbytek zemí BRICS se stále spoléhá na vývoz přírodních zdrojů a spíše pracovně náročnou produkci. Závěrem byla zjištěna posilující konkurenční výhoda Číny na globálním trhu, při bližnější strukturě vývozu k EU, což vede k rostoucímu podílu vnitro-odvětového obchodu.

Čtvrtá kapitola byla zahájena přehledem nejlepších postupů gravitačního modelování a uvedla nejběžnější techniky odhadu strukturální gravitační rovnice za použití panelových dat. Vedle znalostí teoretických základů gravitačního modelu je také důležité znát milníky empirického výzkumu, které výrazně změnily proces odhadování parametrů gravitační rovnice. Bylo prokázáno, že je důležité brát zřetel nejen na proměnnou reprezentující vzdálenost obchodujících agentů, ale především na nepozorované proměnné reprezentující multilaterální obchodní překážky, které mohou výrazně ovlivnit výsledky odhadu. Nejnovější výsledky výzkumů, které byly zahrnuty do analýzy, přinesly mnoho technických vylepšení pro získání nezkreslených a dostatečně robustních výsledků odhadu.

Použitím gravitačního modelu na bilaterální obchodní toky mezi členskými zeměmi EU a zeměmi BRICS byla prokázána platnost gravitační rovnice ve své základní i rozšířené podobě. Odhad modelu byl proveden na dvou vzorcích bilaterálních obchodních toků v období let 1995-2016. Výsledkem byla zjištěna, že celní zatížení stále představuje významnou překážku obchodu mezi pozorovanými zeměmi, zatímco liberalizační opatření výrazně podporují mezinárodní obchod se zbožím. Výsledky odhadů parametrů gravitační rovnice, které byly získány nejnovějšími přístupům gravitačního modelování, byly použity na určení velikosti nevyužitého obchodního potenciálu mezi členy EU a zeměmi skupiny BRICS.

Z výsledků výzkumu vyplývá, že ekonomická velikost má výrazně pozitivní vliv na dovoz zboží, přičemž efekt byl nalezen větší v případě zemí EU pro oba obchodní toky. Vysvětlením je vyšší přidaná hodnota v produkci zboží a vyšší kupní síla v rámci EU. Tyto výsledky byly potvrzeny, když byla proměnná reprezentující velikost ekonomiky nahrazena proměnnou
reprezentující velikost životní úrovně v pozorovaných zemích. Závěrem této komparativní metody je, že obě proměnné mohou být použity v odhadu gravitačního modelu jako substituty. Dále bylo potvrzeno, že vzdálenost, která je hlavní přírozenou překázkou obchodu, má výrazně nepříznivý vliv na bilaterální obchodní toky. Navíc bylo zjištěno, že při vyšší vzdálenosti se její negativní vliv na obchodní toky zvyšuje, avšak s nižší dynamikou. Jinými slovy, účinek vzdálenosti se chová nelineárně v případě bilaterálních obchodních toků mezi členskými zeměmi EU a zeměmi BRICS.

Empirické analýze bylo podrobeno mnoho dalších efektů, které ovlivňují mezinárodní obchodní toky. Například byl nalezen významný pozitivní vliv společné hranice, zatímco existence společného jazyka nebo bývalých koloniálních vztahů již nehrají pro obchod mezi EU a zeměmi BRICS významnou roli. Za zmínku však stojí skutečnost, že vnitrozemská poloha země má výrazně negativní vliv na dovoz, a to zejména v případě použití proměnné reprezentující životní úroveň obyvatel. Tento efekt lze vysvětlit vyššími náklady na spotřebu způsobenou horším přístupem k mezinárodnímu obchodu. Nejzajímavější a zcela nečekané informace získané výsledků gravitačního modelu je efekt členství v dnes již neexistující Radě vzájemné hospodářské pomoci (RVHP), která existovala mezi zeměmi bývalého východního bloku. Bylo zjištěno, že mezi hospodářskými subjekty bývalých členů RVHP jsou stále silné obchodní vazby. To potvrzuje myšlenku tzv. dlouhé paměti mezinárodních obchodních vazeb mezi zeměmi. Přesněji řečeno, obchodní styk mezi středoevropskými a východoevropskými zeměmi a Ruskem se ukazuje být stále silný, navzdory obrovské hospodářské transformaci v průběhu 90. let 20. století a následnému členství v EU.

V předložené doktorské dizertační práci byl také zpracován dopad obchodní politiky na bilaterální obchod mezi zkoumanými zeměmi. Proměnné představující různé druhy opatření obchodní politiky nabízejí velmi zajímavé poznatky. Členství ve WTO a preferenční obchodní dohoda mezi EU a Jihoafrickou republikou mají pozitivní vliv na bilaterální obchod. To potvrzuje všeobecně úsilí o liberalizaci mezinárodního obchodu jako správný způsob, jak zvýšit obchodní výměnu a dokazuje, že volný obchod prospívá mezinárodnímu obchodu. Bylo zjištěno, že vstup do EU výrazně přispěl ke zvýšení dovozu BRICS z EU. To znamená, že země, které vstoupily do EU po roce 2004, měly prospěch ze Společné obchodní politiky EU, protože tak získali lepší přístup na zahraniční trhy. Na druhou stranu, spotřebitelé v zemích BRICS zvýšili svou poptávku po zboží, protože mají snazší přístup ke zboží vyráběnému v nových členských státech EU. Na druhou stranu byl ale zjištěn silný vliv odklonu obchodu pro dovozy do EU. Vysvětlením může být skutečnost, že spotřebitelé z nových členských zemí EU
nahradili své původní spotřební zvyklosti produkci ze starších členských zemí EU od doby, kdy vstoupili na společný trh, což jim umožnilo nakupovat zboží s nižšími náklady nebo lepší kvalitou. Za použití skutečných celních sazeb byl potvrzen negativní vliv administrativních překážek obchodu v případě dovozu zemí BRICS z EU, avšak na straně EU byl tento efekt shledán jako zanedbatelný. To potvrzuje hypotézu, že vývozci z EU musejí čelit na trzích zemí BRICS vyšším administrativním nákladům, což zvyšuje konečnou cenu jejich zboží vstupujícího na tyto trhy a naopak, výroba BRICS je při vstupu na trh EU vystavena velmi nižší celní sazbě, což umožňuje nižší ceny pro konečné spotřebitele. Kromě toho to potvrzuje předpoklad rychlejšího procesu liberalizace ze strany EU ve prospěch rozvojových zemí, zatímco tyto země stále udržují celní sazby výrazně výše.

V případě konkrétních dopadů na jednotlivé země bylo zjištěno, že celkové efekty ostatních zemí BRICS se při dovozu z EU významně neodchylují od Brazílie, která byla pro účely analýzy vybrána jako referenční země. To znamená, že znaky jednotlivých zemí BRICS se významně neliší od znaků Brazílie tak, že by významně podpořily nebo potlačily jejich dovoz z EU. V případě vývozu EU do zemí BRICS, byl jediný významný efekt zjištěn v Německu, což potvrzuje jeho postavení jako nejsilnější ekonomiky EU a významného evropského průmyslového výrobce.


Jak již bylo naznačeno výše, výsledky rovněž potvrdily existenci mezipodmětného obchodu mezi zeměmi EU a BRICS. Bylo prokázáno, že bilaterální obchodní toky mezi těmito zeměmi jsou v souladu se závěry teorie Heckscher-Ohlina, odpovídající obchodnímu modelu sever-jih. Bylo však také zjištěno, že platnost této teorie je pro dovozy EU z BRICS silnější než v opačném směru.

Odhady koefficientů finální strukturální gravitační rovnice byly využity pro odhad nevyužitého obchodního potenciálu mezi členskými zeměmi EU a zeměmi BRICS. Díky tomu byl nalezen vysoký nevyužitý obchodní potenciál pro výrobce z EU na brazilském, indickém a ruském trhu,
zatímco potenciál Číny a Jihoafrické republiky je spíše plně využit. Vysvětlením je, že brazilský a indický trh zůstává i nadále vysoce chráněn tarifními a netarifními bariérami, a vztahy mezi EU a Ruskem jsou stále negativně ovlivněny zahraniční politikou. Na druhou stranu, plně využívaný potenciál čínského trhu lze připsat vysoké závislosti čínské produkce na kapitálových státcích a rostoucí domácí spotřebě, v případě Jihoafrické Afriky dohodě o volném obchodu s EU. Nejlepší využití trhu EU ze strany zemí BRICS bylo zjištěno v případě asijských ekonomik. Poměrně solidní jsou i výsledky pro dovoz z Ruska, na kterém jsou výrobci a spotřebitelé v EU do jisté míry závislí z důvodu dodávek energetických surovin. Na druhou stranu, brazilští a jihoafričtí výrobci stále mají obrovské mezery v exportu na trh Evropské unie.

Na základě výsledků doktorské dizertační práce bylo vytvořeno několik doporučení k hospodářské a obchodní politice. Bylo poukázáno na fakt, že volný obchod prospívá výrobcům i spotřebitelům na obou stranách, zvyšuje produktivitu a životní úroveň, zatímco obchodní protekcionismus vytváří překážky hospodářského rozvoje. Atť už jsou to politici, ekonomové, média nebo zástupci Evropské komise, kteří věří liberálním argumentům, měli by lépe a praktičtěji vysvětlovat výhody volného obchodu lidem a být více aktivní v boji proti poloprávadlám, které nabízejí zastánci protekcionismu. Nejlepší pochopit potřebu ochrany zaměstnání než teorii komparativních výhod, a proto jednoduchá protekcionistická opatření získají snadnou popularitu mezi těmi, kteří se o ekonomii či ekonomiku nezajímají. Tím více je důležité podporovat a trpělivě vysvětlovat smysl svobodného obchodu, a tím i absenci jakéhokoli státního zásahu do mezinárodního obchodu.

Z teoretického hlediska by jednotlivé vlády, nebo Evropská komise v případě EU, měly odstranit všechny celní a netarifní překážky obchodu mezi zeměmi. Všechny celně by měly pokračovat v procesu liberalizace a odstraňování celních a necelních překážek obchodu v nejvyšší možné míře. V případě obchodních vztahů v zemích BRICS by Evropská komise a zástupci členských států EU měli usilovat o zlepšení vzájemných obchodních vztahů prostřednictvím jednání o dohodách o volném obchodu, které povedou ke konečnému snížení sazeb a odstranění většiny necelních překážek. Volný pohyb zboží s většinou zemí BRICS je možný, zejména s Brazílií a Indií, přestože je jistá četnost různých výjimek v oblasti zemědělství. O uzavření nové dohody o partnerství a spolupráci s Ruskem je možné vyjednávat znovu, jakmile bude problém na Ukrajině vyřešen. V tomto případě je však nepochybné, že všechny záležitosti závisí na mezinárodní politice a rozdělení moci, protože logické důvody pro obchodní překážky mezi oběma ekonomikami neexistují.
Na druhou stranu, možnosti vytvoření zóny volného obchodu mezi EU a Čínou jsou spíše nepravděpodobné vzhledem k tomu, že existuje obrovský potenciál pro porušování pravidel dohody o volném obchodu, vlastnických práv a státní podpory pro producenty na straně Číny. Mimo to, v souladu s Lisabonskou smlouvou a se zahrnutím Společné obchodní politiky EU pod pravidla vnější činnosti EU by neměly být uzavírány obchodní dohody s politickými režimy, které porušují lidská práva a okupují cizí území. Nicméně, možnost uzavření preferenčních obchodních dohod by měla sloužit jako vyjednávací taktika ke společenské změně v takovýchto zemích. Dohodu o volném obchodu mezi EU a Jihoafrickou republikou lze považovat za příklad úspěšné a prospěšné spolupráce mezi oběma ekonomikami, přestože existují některé výjimky, které neumožňují prohlásit tento vztah za volný obchod. I přes to, že nad současným vývojem globální ekonomiky a mezinárodního obchodu visí mnoho otází, je důležité zůstat optimistický a držet se určitých ideálů ohledně budoucnosti Evropské unie a jejich vztahů se zbytkem světa.

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**List of Abbreviations**

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<tr>
<td>BRICS</td>
<td>Brazil, Russia, India, China and South Africa</td>
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<tr>
<td>CCP</td>
<td>Common Commercial Policy</td>
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<tr>
<td>CCT</td>
<td>Common Customs Tariff</td>
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<tr>
<td>CEPII</td>
<td>Centre d’Etudes Prospectives et d’Informations Internationales</td>
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<tr>
<td>CIF</td>
<td>Cost of Insurance and Freight</td>
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<tr>
<td>CMEA</td>
<td>Council of Mutual Economic Assistance</td>
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<tr>
<td>DG</td>
<td>Directorate General</td>
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<tr>
<td>EC</td>
<td>European Commission</td>
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<tr>
<td>EEC</td>
<td>European Economic Community</td>
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<tr>
<td>EPA</td>
<td>Economic Partnership Agreement</td>
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<td>EU</td>
<td>European Union</td>
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<tr>
<td>FAC</td>
<td>Council on Foreign Affairs</td>
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<td>FTA</td>
<td>Free Trade Area</td>
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<td>GATT</td>
<td>General Agreement on Tariffs and Trade</td>
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<td>GATS</td>
<td>General Agreement on Trade in Services</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GSP</td>
<td>General System of Preferences</td>
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G20  Group of twenty biggest economies
IMF  International Monetary Fund
LCY  Local Currency
MFN  Most Favourite Nation
MTR  Multilateral Resistance Terms
NDB  New Development Bank
OECD Organization for Economic Cooperation and Development
OLS  Ordinary Least Squares
PCA  Partnership and Cooperation Agreement
PPML Poisson-Pseudo Maximum Likelihood
RCA  Revealed Comparative Advantage
RTA  Regional Trade Agreement
RVHP Rada vzájemné hospodářské pomoci
SITC Standard International Trade Classification
SPA  Strategic Partnership Agreement
TDCA Trade, Development and Cooperation Agreement
UNCTAD United Nations Commission for Trade and Development
USA  United States of America
WB  World Bank
WTO  World Trade Organization
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Ostrava, ........................................

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